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ONS-2015-047 10 CFR 50.90

May 19, 2015

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Duke Energy Carolinas, LLC (Duke Energy)

Oconee Nuclear Station (ONS), Units 1, 2, and 3
Docket Numbers 50-269, 50-270, and 50-287
Renewed License Numbers DPR-38, DPR-47, and DPR-55

Subject: License Amendment Request (LAR) to Add High Flux Trip for 3 Reactor Coolant Pump Operation
License Amendment Request No. 2014-05

In accordance with the provisions of Section 50.90 of Title 10 of the Code of Federal Regulations (10 CFR), Duke Energy is submitting a request for an amendment to the Technical Specifications (TS) for ONS, Units 1, 2, and 3. The proposed amendment adds a Reactor Protective System (RPS) Nuclear Overpower - High Setpoint trip for three (3) reactor coolant pump (RCP) operation to TS Table 3.3.1-1. The existing overpower protection for three (3) reactor coolant pump operation is the Nuclear Overpower Flux/Flow/Imbalance trip function. The new setpoint provides an absolute setpoint that can be actuated regardless of the transient or Reactor Coolant System (RCS) flow conditions and provides a significant margin gain for the small steam line break accident.

Applicable aspects of Technical Specification Task Force Traveler TSTF-493, "Clarify Application of Setpoint Methodology for LSSS Functions," are incorporated in the scope of the proposed changes.

The enclosure to this letter provides an evaluation of the proposed TS change. A regulatory evaluation (including the significant hazards consideration) and environmental considerations are provided in Sections 5 and 6 of the enclosure, respectively. Attachments 1 and 2 provide marked-up TS and TS Bases pages, respectively. Attachments 3 and 4 provide retyped (clean) TS and TS Bases pages, respectively. TS Bases pages are provided for information only.

In accordance with Duke Energy administrative procedures that implement the Quality Assurance Program Topical Report, these proposed changes have been reviewed and

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approved by the Plant Operations Review Committee. A copy of this LAR is being sent to the State of South Carolina in accordance with 10 CFR 50.91 requirements.

Duke Energy requests approval of the proposed LAR by May 19, 2016, effective immediately upon issuance with implementation within 30 days. Duke Energy will also update applicable sections of the ONS Updated Final Safety Analysis Report (UFSAR), the Selected Licensee Commitments (SLC) Manual, and NRC approved methodology report DPC-NE-3005, "UFSAR Chapter 15 Transient Analysis Methodology," as necessary, and submit the UFSAR and SLC Manual changes per 10 CFR 50.71(e). There are no new regulatory commitments being made as a result of the proposed change.

Inquiries on this proposed amendment request should be directed to Boyd Shingleton, ONS Regulatory Affairs, at (864) 873-4716.

I declare under penalty of perjury that the foregoing is true and correct. Executed on May 19, 2015.

Sincerely,

Scott L. Batson
Vice President
Oconee Nuclear Station

Enclosure: Evaluation of Proposed Changes

Attachments:

1 Marked-Up Technical Specifications Pages
2 Marked-Up Technical Specification Bases Pages
3 Retyped Technical Specifications Pages
4 Retyped Technical Specification Bases Pages

cc w/enclosure and attachments:

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License Amendment Request No. 2014-05

ENCLOSURE

EVALUATION OF PROPOSED CHANGES

LICENSE AMENDMENT REQUEST NO. 2014-05

Subject: License Amendment Request (LAR) to Add High Flux Trip for 3 Reactor Coolant Pump Operation

1 SUMMARY DESCRIPTION

Duke Energy is submitting a request for an amendment to the Technical Specifications (TS) for Oconee Nuclear Station (ONS), Units 1, 2, and 3. The proposed amendment adds a Reactor Protective System (RPS) Nuclear Overpower - High Setpoint trip for three (3) reactor coolant pump (RCP) operation to TS Table 3.3.1-1. The existing overpower protection for three (3) reactor coolant pump operation is the Nuclear Overpower Flux/Flow/Imbalance trip function. The new setpoint provides an absolute setpoint that can be actuated regardless of the transient or Reactor Coolant System (RCS) flow conditions and provides a significant margin gain for the small steam line break accident.

Applicable aspects of Technical Specification Task Force Traveler TSTF-493, "Clarify Application of Setpoint Methodology for LSSS Functions," are incorporated in the scope of the proposed changes.

An evaluation of the proposed TS change is provided in Sections 3 and 4 of this enclosure. A regulatory evaluation (including the significant hazards consideration) and environmental considerations are provided in Sections 5 and 6 of this enclosure, respectively. Attachments 1 and 2 provide marked-up TS and TS Bases pages, respectively. Attachments 3 and 4 provide retyped (clean) TS and TS Bases pages, respectively. TS Bases pages are provided for information only.

In accordance with Duke Energy administrative procedures that implement the Quality Assurance Program Topical Report, these proposed changes have been reviewed and approved by the Plant Operations Review Committee. A copy of this License Amendment Request (LAR) is being sent to the State of South Carolina in accordance with 10 CFR 50.91 requirements.

Duke Energy requests approval of the proposed LAR by May 19, 2016, effective immediately upon issuance with implementation within 30 days. Duke Energy will also update applicable sections of the ONS Updated Final Safety Analysis Report (UFSAR), the Selected Licensee Commitments (SLC) Manual, and NRC approved methodology report DPC-NE-3005, "UFSAR Chapter 15 Transient Analysis Methodology," as necessary, and submit the UFSAR and SLC Manual changes per 10 CFR 50.71(e). There are no new regulatory commitments being made as a result of the proposed change.

2 BACKGROUND

The Nuclear Overpower – High Setpoint trip provides protection for the design thermal overpower condition based on the measured out of core neutron leakage flux. The allowable value for the nuclear overpower setpoint with four (4) RCPs operating is ≤ 105.5% of 2568 megawatts thermal (MWt). The allowable value for the proposed nuclear overpower trip setpoint with three (3) RCPs operating will be ≤ 80.5% of 2568 MWt when manually reset for three pumps operating, which is 5.5% above the maximum three (3) RCP power level of 75% rated thermal power (RTP) to maintain the same delta that exists to the trip setpoint with four (4) RCPs operating. The three (3) RCP trip will provide protection for power

excursion events initiated from three (3) RCP operation, most notably the small steam line break accident.

The Nuclear Overpower – High Setpoint trip initiates a reactor trip when the neutron power reaches a predefined setpoint at the design overpower limit. Because thermal power lags the neutron power, tripping when the neutron power reaches the design overpower will limit thermal power to prevent exceeding acceptable fuel damage limits.

Thus, the Nuclear Overpower – High Setpoint trip protects against violation of the departure from nucleate boiling ratio (DNBR) and fuel centerline melt safety limits (SLs). However, the RCS Variable Low Pressure and Nuclear Overpower Flux/Flow Imbalance trips provide more direct protection. The role of the Nuclear Overpower – High Setpoint trip is to limit RTP below the highest power at which the other two trips are known to provide protection.

The Nuclear Overpower – High Setpoint trip also provides transient protection for rapid positive reactivity excursions during power operations. These events include the rod withdrawal accident and the rod ejection accident. By providing a trip during these events, the Nuclear Overpower – High Setpoint trip protects the unit from excessive power levels and also serves to limit reactor power to prevent violation of the RCS pressure SL.

Rod withdrawal accident analyses cover a large spectrum of reactivity insertion rates (rod worths), which exhibit slow and rapid rates of power increases. At high reactivity insertion rates, the Nuclear Overpower – High Setpoint trip provides the primary protection. At low reactivity insertion rates, the High Pressure trip provides primary protection.

The three pump pressure temperature limit is tied to the steady state DNB analysis, which is evaluated each cycle. Conservatively, the flow used is the minimum allowed for three pump operation. The actual RCS flow rate will exceed the assumed flow rate. With three pumps operating, overpower protection is automatically provided by the power to flow ratio of the RPS nuclear overpower trip setpoint based on flux/flow/imbalance. With the addition of the Nuclear Overpower - High Setpoint for three reactor coolant pumps operating, overpower protection will be automatically provided once it has been reset. The maximum power level for three pump operation is 75% RTP and is based on the three pump flow as a fraction of the four pump flow at full power.

3 DETAILED DESCRIPTION OF PROPOSED CHANGES

Duke Energy proposes to modify the TS and TS Bases (for information only). The proposed changes to ONS TS 3.3.1, Reactor Protective System Instrumentation, and TS 3.4.4, RCS Loops - MODES 1 and 2 are described below and shown in Attachment 1:

TS Table 3.3.1 Function 1, Nuclear Overpower

1. The Allowable Value for Function 1 is changed from "≤ 105.5% RTP" to:

   "≤ 105.5% RTP with four pumps operating, and ≤ 80.5% RTP when reset for three pumps operating per LCO 3.4.4, "RCS Loops - MODES 1 and 2"

2. In the Surveillance Requirements column for this function, SR 3.3.1.7 is modified by two new notes, (d) and (e).

3. Notes (d) and (e) are added as follows:

   (d) If the as-found channel setpoint is conservative with respect to the Allowable Value but outside its predefined as-found acceptance criteria band, 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 or a value that is more conservative than the Nominal Trip Setpoint; otherwise the channel shall be declared inoperable. The Nominal Trip Setpoint and the methodologies used to determine the predefined as-found acceptance criteria band and the as-left setpoint tolerance band are specified in the Selected Licensee Commitments Manual.

3.4.4 RCS Loops – MODES 1 and 2

1. LCO 3.4.4 b is modified as follows:

   b. Three RCPs operating and:
      1. THERMAL POWER is ≤ 75% RTP; and
      2. LCO 3.3.1, "Reactor Protection System (RPS) Instrumentation," Function 1.a (Nuclear Overpower– High Setpoint), Allowable Value of Table 3.3.1-1 is reset for 3 RCPs operating.

2. The ACTIONS table is modified as follows:

   a. Condition A is modified to address the condition where LCO 3.4.4.b.2 is not met requiring a reset of the allowable value within 10 hours.
   b. New Condition B is written requiring the unit be in MODE 3 in 12 hours if the new Required Action and associated completion time is not met or the requirements of the LCO are not met for reasons other than Condition A.

4 TECHNICAL EVALUATION

The proposed change modifies the existing Nuclear Overpower-High Setpoint trip function Allowable Value in TS Table 3.3.1 to delineate between a setpoint valid for four RCPs (reactor coolant pumps) operation (105.5% RTP) and three RCPs operation (80.5% RTP). The change provides overpower protection when the plant is operating with three RCPs. The existing overpower protection for three RCP operation is the Nuclear Overpower Flux/Flow/Imbalance trip function. However, if RCS flow were to increase, as it would for an overcooling event such as a steam line break accident described in UFSAR Chapter 15.17, the flux/flow/imbalance trip setpoint would increase. This increase would result in either a delayed reactor trip or avoidance of a reactor trip altogether. Providing a Nuclear Overpower flux setpoint trip provides an absolute setpoint that can be actuated regardless of the transient or RCS flow conditions. In addition to a fixed setpoint afforded by the nuclear overpower trip function, the faster response time of the nuclear overpower trip provides additional DNB and RCS protection than provided by the slower acting nuclear overpower flux/flow/imbalance trip function. Proposed LCO 3.4.4.b restricts thermal power to ≤ 75% when only three RCPs are operating and requires the allowable value of the Nuclear Overpower-High Setpoint trip function to be reset for three RCPs operating. Proposed new TS 3.4.4 Condition A is added to allow 10 hours to perform this reset. The proposed Completion Time of 10 hours is reasonable to allow the reset in an orderly manner and without challenging safety systems. The proposed change is consistent with current Davis-Besse Unit 1 Technical Specification 3.3.1 and 3.4.4, which includes a 3 RCP trip setpoint and a similar Completion Time for resetting the allowable value.

Notes (d) and (e) are added to Table 3.3.1-1 and made applicable to the Nuclear Overpower high function (described above) for consistency with TSTF-493, Option A, "Clarify Application of Setpoint Methodology for Limiting Safety System Settings." This change is responsive to NRC expectations that any facility making changes to Section 3.3 of the technical specifications after the notice of availability is expected to implement TSTF-493 (75 FR 26294 dated May 11, 2010). The TSTF allows two strategies for adopting TSTF-493, Option A or B. Option A requires surveillance notes to be added to required TS instrumentation functions and allows license applications to involve changes to single or multiple setpoint values. Option A allows the surveillance notes to be applied without making changes to setpoint values. Application of the surveillance notes to only the Nuclear Overpower high setpoints for four and three RCPs operating is consistent with TSTF-493, Revision 4, Option A.

The first new lettered footnote 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.

The second new lettered footnote requires that the as-left setting for the channel be returned to within the as-left tolerance of the Nominal Trip Setpoint (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. This footnote also requires that the NTSP and the methodologies for calculating the as-left and the as-found tolerances be in the Selected Licensee Commitments Manual.

These new footnotes enhance safety by ensuring that unexpected as-found conditions are evaluated prior to returning the channel to service, and ensuring that as-left settings provide sufficient margin for uncertainties. These changes will have no adverse effect on plant safety.

5 REGULATORY EVALUATION

5.1 Significant Hazards Consideration

Duke Energy Carolinas, LLC (Duke Energy) has evaluated whether or not a significant hazards consideration is involved with the proposed amendment to Oconee Nuclear Station (ONS) Facility Operating Licenses DPR-38, DPR-47, and DPR-55 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 amendment adds a high flux trip for three (3) Reactor Coolant Pump (RCP) Operation by modifying the existing Nuclear Overpower-High Setpoint function in Technical Specification (TS) Table 3.3.1-1 to delineate between a setpoint valid for four (4) RCP operation and three (3) RCP operation. TS 3.4.4 is modified to require the Nuclear Overpower - High Setpoint to be reset to less than or equal to the Allowable Value of Table 3.3.1-1 for three (3) RCPs operating. The proposed change provides automatic overpower protection when the plant is operating with three (3) RCPs. The existing overpower protection for three (3) RCP operation is the Nuclear Overpower Flux/Flow/Imbalance trip function. Providing a Nuclear Overpower flux setpoint provides an absolute setpoint that can be actuated regardless of the transient or RCS flow conditions. The proposed TS change does not modify the reactor coolant system pressure boundary, nor make any physical changes to the facility design, material, or construction standards. The probability of any design basis accident (DBA) is not affected by this change, nor are the consequences of any DBA significantly affected by this change. The proposed change does not involve changes to any structures, systems, or components (SSCs) that can alter the probability for initiating a LOCA event. This amendment request includes the adoption of Option A of Technical Specification Task Force (TSTF) TSTF-493-A, Revision 4, "Clarify Application of Setpoint Methodology for LSSS Functions," for the Nuclear Overpower - High Setpoint trip function of TS Table 3.3.1-1. The TS changes associated with the implementation of

TSTF-493-A will provide additional assurance that the instrumentation setpoints for the Nuclear Overpower - High Setpoint trip function are maintained consistent with the setpoint methodology to ensure the required automatic trips and safety feature actuations occur such that the safety limits are not exceeded. Therefore, the proposed TS changes do not significantly increase 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 amendment adds a high flux trip for three (3) Reactor Coolant Pump Operation by modifying the existing Nuclear Overpower-High Setpoint function in TS Table 3.3.1-1 to delineate between a setpoint valid for four (4) RCP operation and three (3) RCP operation. This proposed change and the implementation of TSTF-493-A do not alter the plant configuration (no new or different type of equipment will be installed) or make changes in methods governing normal plant operation. No new failure modes are identified, nor are any SSCs required to be operated outside the design bases. Therefore, the possibility of a new or different kind of accident from any kind of accident previously evaluated is not created.

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

   Response: No.

   The proposed amendment adds a high flux trip for three (3) Reactor Coolant Pump Operation by modifying the existing Nuclear Overpower-High Setpoint function in TS Table 3.3.1-1 to delineate between a setpoint valid for four (4) RCP operation and three (3) RCP operation. This proposed TS change and the implementation of TSTF-493-A do not involve: 1) a physical alteration of the Oconee Units; 2) the installation of new or different equipment; or 3) any impact on the fission product barriers or safety limits. The proposed change adds a new setpoint, which is more conservative than the existing high flux setpoint, that initiates a protective action to provide protection for power excursion events initiated from three (3) RCP operation equivalent to that provided for four (4) RCP operation. Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, Duke Energy concludes that the proposed amendment 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.

5.3 Applicable Regulatory Requirements/Criteria

10 CFR 50.36, Technical Specifications

5.4 Precedent

The proposed change is consistent with current Davis-Besse Unit 1 Technical Specification 3.3.1 and 3.4.4, which includes a 3 RCP trip setpoint, and TSTF-493 Option A, Revision 4, which allows adoption of the TSTF to only the TS instrumentation functions that are being changed.

5.5 Conclusions

In Section 5.1, Duke Energy made the determination that this amendment request involves a No Significant Hazards Consideration by applying the standards established by NRC regulations in 10 CFR 50.92. The regulatory requirements and guidance applicable to this LAR are identified in Section 5.2.

6 ENVIRONMENTAL CONSIDERATION

Duke Energy Carolinas, LLC (Duke Energy) has evaluated this License Amendment Request (LAR) against the criteria for identification of licensing and regulatory actions requiring environmental assessment in accordance with 10 CFR 51.21. Duke Energy has determined that this LAR meets the criteria for a categorical exclusion as set forth in 10 CFR 51.22(c)(9). This determination is based on the fact that the amendment meets the following specific criteria:

- The amendment involves no significant hazard consideration as demonstrated in Section 5.1.
- There is no significant change in the types or significant increase in the amounts of any effluent that may be released offsite. The principal barriers to the release of radioactive materials are not modified or affected by this change and no significant increases in the amounts of any effluent that could be released offsite will occur as a result of this change.
- There is no significant increase in individual or cumulative occupational radiation exposure. Because the principal barriers to the release of radioactive materials are not modified or affected by this change, there will be no significant increase in individual or cumulative occupational radiation exposure resulting from this change.

Therefore, no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment pursuant to 10 CFR 51.22(b).

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ATTACHMENT 1

MARKED-UP TECHNICAL SPECIFICATIONS PAGES

[3 pages follow this cover page]

NOTE: This attachment contains marked-up TS Pages 3.3.1-5, 3.3.1-6, and 3.4.4-1.

Table 3.3.1-1 (page 1 of 2)
Reactor Protective System Instrumentation

	FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	CONDITIONS REFERENCED FROM REQUIRED ACTION B.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1.	Nuclear Overpower				
	a. High Setpoint	1,2[a]	C	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.7 (d)(e)	≤ 105.5% RTP
	b. Low Setpoint	2[b],3[b] 4[b],5[b]	D	SR 3.3.1.1 SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.7	≤ 5% RTP
2.	RCS High Outlet Temperature	1,2	C	SR 3.3.1.1 SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.7	≤ 618°F
3.	RCS High Pressure	1,2[a]	C	SR 3.3.1.1 SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.7	≤ 2355 psig
4.	RCS Low Pressure	1,2[a]	C	SR 3.3.1.1 SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.7	≥ 1800 psig
5.	RCS Variable Low Pressure	1,2[a]	C	SR 3.3.1.1 SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.7	As specified in the COLR
6.	Reactor Building High Pressure	1,2,3[c]	C	SR 3.3.1.1 SR 3.3.1.6 SR 3.3.1.7	≤ 4 psig
7.	Reactor Coolant Pump to Power	1,2[a]	C	SR 3.3.1.1 SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.7	>2% RTP with ≤ 2 pumps operating
8.	Nuclear Overpower Flux/Flow Imbalance	1,2[a]	C	SR 3.3.1.1 SR 3.3.1.3 SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.7	As specified in the COLR

with four pumps operating, and ≤ 80.5% RTP when reset for three pumps operating per LCO 3.4.4, "RCS Loops – MODES 1 and 2"

Table 3.3.1-1 (page 2 of 2)
Reactor Protective System Instrumentation

	FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	CONDITIONS REFERENCED FROM REQUIRED ACTION B.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
9.	Main Turbine Trip (Hydraulic Fluid Pressure)	≥ 30% RTP	E	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.7	≥ 800 psig
10.	Loss of Main Feedwater Pumps (Hydraulic Oil Pressure)	≥ 2% RTP	F	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.7	≥ 75 psig
11.	Shutdown Bypass RCS High Pressure	2[(b)],3[(b)] 4[(b)],5[(b)]	D	SR 3.3.1.1 SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.7	≤ 1720 psig

(a) When not in shutdown bypass operation.

(b) During shutdown bypass operation with any CRD trip breakers in the closed position and the CRD System capable of rod withdrawal.

(c) With any CRD trip breaker in the closed position and the CRD System capable of rod withdrawal.

(d) If the as-found channel setpoint is conservative with respect to the Allowable Value but outside its predefined as-found acceptance criteria band, 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 limiting Trip Setpoint or a value that is more conservative than the Limiting Trip Setpoint; otherwise the channel shall be declared inoperable. The limiting Trip Setpoint and the methodology used to determine the limiting Trip Setpoint, the predefined as-found acceptance criteria band and the as-left setpoint tolerance band are specified in the Selected Licensee Commitments.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.4 RCS Loops – MODES 1 and 2

LCO 3.4.4 Two RCS Loops shall be in operation, with:

a. Four reactor coolant pumps (RCPs) operating; or

b. Three RCPs operating and THERMAL POWER restricted to 75% RTP.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
Requirements of LCO not met for reasons other than Condition A	B.1 Be in MODE 3.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.4.1	Verify required RCS loops are in operation.	In accordance with the Surveillance Frequency Control Program

A.	Requirements of LCO 3.4.4.b not met.	A.1	Reset the RPS to satisfy the requirements of LCO 3.4.4.b.2.	10 hours

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ATTACHMENT 2

MARKED-UP TECHNICAL SPECIFICATION BASES PAGES

[5 pages follow this cover page]

NOTE: This attachment contains marked-up TS Bases pages B 3.3.1-12, B 3.3.1-26, B 3.3.1-26 Insert, B 3.4.4-2, and B 3.4.4-3

BASES (continued)

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

assumptions of the setpoint calculations. Each Allowable Value specified is more conservative than instrument uncertainties appropriate to the trip Function. These uncertainties are defined in Reference 4.

For most RPS Functions, the Allowable Value in conjunction with the nominal trip setpoint ensure that the departure from nucleate boiling (DNB), center line fuel melt, or RCS pressure SLs are not challenged. Cycle specific values for use during operation are contained in the COLR.

Certain RPS trips function to indirectly protect the SLs by detecting specific conditions that do not immediately challenge SLs but will eventually lead to challenge if no action is taken. These trips function to minimize the unit transients caused by the specific conditions. The Allowable Value for these Functions is selected at the minimum deviation from normal values that will indicate the condition, without risking spurious trips due to normal fluctuations in the measured parameter.

The safety analyses applicable to each RPS Function are discussed next.

1. Nuclear Overpower

a. Nuclear Overpower – High Setpoint

There is a setpoint for 4 and 3 RCP operation. The purpose for the 3 RCP trip is to provide protection for power excursion events initiated from 3 RCP operation, most notably the small steam line break accident.

The Nuclear Overpower – High Setpoint trip provides protection for the design thermal overpower condition based on the measured out of core neutron leakage flux.

The Nuclear Overpower – High Setpoint trip initiates a reactor trip when the neutron power reaches a predefined setpoint at the design overpower limit. Because THERMAL POWER lags the neutron power, tripping when the neutron power reaches the design overpower will limit THERMAL POWER to prevent exceeding acceptable fuel damage limits.

Thus, the Nuclear Overpower – High Setpoint trip protects against violation of the DNBR and fuel centerline melt SLs. However, the RCS Variable Low Pressure, and Nuclear Overpower Flux/Flow Imbalance, provide more direct protection. The role of the Nuclear Overpower – High Setpoint trip is to limit reactor THERMAL POWER below the highest power at which the other two trips are known to provide protection.

The Nuclear Overpower – High Setpoint trip also provides transient protection for rapid positive reactivity excursions during power operations. These events include the rod

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.7 (continued)

measurement errors and processor output trip device setpoint errors are within the assumptions of the uncertainty analysis. Whenever a sensing element is replaced, the CHANNEL CALIBRATION of the resistance temperature detectors (RTD) sensors is accomplished by an inplace cross calibration that compares the other sensing elements with the recently installed sensing element.

Since the CHANNEL FUNCTIONAL TEST is a part of the CHANNEL CALIBRATION a separate SR is not required. The digital RPS software performs a continuous online automated cross channel check, separately for each channel, and continuous online signal error detection and validation. The protection system also performs continuous online hardware monitoring. The CHANNEL CALIBRATION essentially validates the self monitoring function and checks for a small set of failure modes that are undetectable by the self monitoring function.

The digital processors shall be rebooted as part of the calibration. This verifies that the software and setpoints have not changed. Signals into the system (from the field instrument or at the protective system cabinet) are applied during the channel calibration to ensure that the instrumentation is within the specified allowance requirements. This, in combination with ensuring the setpoints are entered into the software correctly per SR 3.3.1.5, verifies the setpoints are within the Allowable Values.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

Insert A →

REFERENCES

1. UFSAR, Chapter 7.
2. UFSAR, Chapter 15.
3. 10 CFR 50.49.
4. EDM-102, "Instrument Setpoint/Uncertainty Calculations."
5. NUREG-0737, "Clarification of TMI Action Plan Requirements," November 1979.
6. BAW-10167, May 1986.
7. 10 CFR 50.36.

Insert B →

Insert A

For Functions for which TSTF-493, "Clarify Application of Setpoint Methodology for LSSS Functions" (Reference 8) has been implemented, this SR is modified by two Notes as identified in Table 3.3.1-1. 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. 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. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be returned to within the as-left tolerance *of* the Nominal Trip Setpoint (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 the NTSP and the methodologies for calculating the as-left and the as-found tolerances be in the Selected Licensee Commitments Manual.

Insert B

8. Technical Specification Task Force, Improved Standard Technical Specifications Change Traveler, TSTF-493, "Clarify Application of Setpoint Methodology for LSSS Functions," Revision 4.

BASES (continued)

APPLICABLE SAFETY ANALYSES

Safety analyses contain various assumptions for the accident analyses initial conditions including: RCS pressure, RCS temperature, reactor power level, core parameters, and safety system setpoints. The important aspect for this LCO is the reactor coolant forced flow rate, which is represented by the number of pumps in service.

Both transient and steady state analyses have been performed to establish the effect of flow on DNB. The transient or accident analysis for the plant has been performed assuming either three or four pumps are in operation. The majority of the plant safety analysis is based on initial conditions at high core power or zero power. The analyses that are of most importance to RCP operation are the two pump coastdown, single pump locked rotor, and single pump broken shaft (Ref. 1).

assumes a maximum power level equal to the Nuclear Overpower – High Setpoint - for 4 reactor coolant pumps (RCPs) operating plus instrument uncertainty and conservatism

Steady state DNB analysis has been performed for four, and three pump combinations. For four pump operation, the steady state DNB analysis, which generates the pressure and temperature protective limit (i.e., the departure from nucleate boiling ratio (DNBR) limit), ~~assumes a maximum power level of 112% RTP. This is the design overpower condition for four pump operation. The 105.5% RTP value is the setpoint of the nuclear overpower (high flux) trip and is based on an analysis assumption that bounds possible instrumentation errors~~. The DNBR limit defines a locus of pressure and temperature points that result in a minimum DNBR greater than or equal to the critical heat flux correlation limit.

and the Nuclear Overpower – High Setpoint for 3 RCPs operating once it has been reset

The three pump pressure temperature limit is tied to the steady state DNB analysis, which is evaluated each cycle. The flow used is the minimum allowed for three pump operation. The actual RCS flow rate will exceed the assumed flow rate. With three pumps operating, overpower protection is automatically provided by the power to flow ratio of the RPS nuclear overpower trip setpoint based on flux/flow/imbalance. The maximum power level for three pump operation is 75% RTP and is based on the three pump flow as a fraction of the four pump flow at full power.

Continued power operation with two RCPs removed from service is not allowed by this Specification.

RCS Loops – MODES 1 and 2 satisfy Criterion 2 of 10 CFR 50.36 (Ref. 2).

LCO

The purpose of this LCO is to require adequate forced flow for core heat removal. Flow is represented by the number of RCPs in operation in both RCS loops for removal of heat by the two SGs. To meet safety analysis acceptance criteria for DNB, four pumps are required at rated power; if only three pumps are available, power must be reduced and the Nuclear Overpower – High Setpoint must be reset for 3 RCPs operating

BASES (continued)

APPLICABILITY

In MODES 1 and 2, the reactor is critical and has the potential to produce maximum THERMAL POWER. To ensure that the assumptions of the accident analyses remain valid, all RCS loops are required to be OPERABLE and in operation in these MODES to prevent DNB and core damage.

If the requirements of LCO 3.4.4.b.2 are not met, the Required Action is to reset the Nuclear Overpower - High Setpoint to satisfy the requirements of LCO 3.4.4.b.2. This minimizes the possibility of violating DNB limits.

The Completion Time of 10 hours is reasonable, based on operating experience, to reset the RPS setpoints in an orderly manner and without challenging safety systems.

B.1

The decay heat production rate is much lower than the full power heat rate. As such, the forced circulation flow and heat sink requirements are reduced for lower, noncritical MODES as indicated by the LCOs for MODES 3, 4, and 5.

Operation in other MODES is covered by:

LCO 3.4.5, "RCS Loops – MODE 3";
LCO 3.4.6, "RCS Loops – MODE 4";
LCO 3.4.7, "RCS Loops – MODE 5, Loops Filled";
LCO 3.4.8, "RCS Loops – MODE 5, Loops Not Filled";
LCO 3.9.4, "Decay Heat Removal (DHR) and Coolant Circulation – High Water Level" (MODE 6); and
LCO 3.9.5, "Decay Heat Removal (DHR) and Coolant Circulation – Low Water Level" (MODE 6).

ACTIONS

A.1

for reasons other than Condition A

the Required Action and associated Completion Time of Condition A is not met or

If the requirements of the LCO are not met, the Required Action is to reduce power and bring the unit to MODE 3. This lowers power level and thus reduces the core heat removal needs and minimizes the possibility of violating DNB limits.

The Completion Time of 12 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and without challenging safety systems.

SURVEILLANCE REQUIREMENTS

SR 3.4.4.1

This SR requires verification of the required number of loops in operation. Verification includes flow rate, temperature, or pump status monitoring, which help ensure that forced flow is providing heat removal while maintaining the margin to DNB. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

License Amendment Request No. 2014-04
May 19, 2015

ATTACHMENT 3

RETYPED TECHNICAL SPECIFICATIONS PAGES

[8 pages follow this cover page]

NOTE: This attachment contains retyped TS Pages 3.3.1-5, 3.3.1-6, 3.4.4-1, and 3.4.4-2.

3.3 INSTRUMENTATION

3.3.1 Reactor Protective System (RPS) Instrumentation

LCO 3.3.1 Three channels of RPS instrumentation for each Function in Table 3.3.1-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.1-1.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required channel inoperable.	A.1 Place channel in trip.	4 hours
B. Two or more required channels inoperable. OR Required Action and associated Completion Time of Condition A not met.	B.1 Enter the Condition referenced in Table 3.3.1-1 for the Function.	Immediately

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. As required by Required Action B.1 and referenced in Table 3.3.1-1.	C.1	Be in MODE 3.	12 hours
	AND		
	C.2	Open all control rod drive (CRD) trip breakers.	12 hours
D. As required by Required Action B.1 and referenced in Table 3.3.1-1.	D.1	Open all CRD trip breakers.	6 hours
E. As required by Required Action B.1 and referenced in Table 3.3.1-1.	E.1	Reduce THERMAL POWER < 30% RTP.	6 hours
F. As required by Required Action B.1 and referenced in Table 3.3.1-1.	F.1	Reduce THERMAL POWER < 2% RTP.	12 hours

SURVEILLANCE REQUIREMENTS

----------NOTE----------
Refer to Table 3.3.1-1 to determine which SRs apply to each RPS Function.

	SURVEILLANCE	FREQUENCY
SR 3.3.1.1	Perform CHANNEL CHECK.	In accordance with the Surveillance Frequency Control Program
SR 3.3.1.2	----------NOTE---------- Not required to be performed until 24 hours after THERMAL POWER is ≥ 15% RTP. --- Compare results of calorimetric heat balance calculation to the power range channel output and adjust power range channel output if calorimetric exceeds power range channel output by ≥ 2% RTP.	In accordance with the Surveillance Frequency Control Program
SR 3.3.1.3	----------NOTE---------- Not required to be performed until 24 hours after THERMAL POWER is ≥ 15% RTP. --- Compare out of core measured AXIAL POWER IMBALANCE (API_0) to incore measured AXIAL POWER IMBALANCE (API_I) as follows: $(RTP/TP)(API_0 - (CS \times API_I)) =$ imbalance error where CS is CORRELATION SLOPE Adjust power range channel output if the absolute value of imbalance error is ≥ 2% RTP.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.3.1.4	Not Applicable	Not Applicable
SR 3.3.1.5	Manually verify the setpoints are correct.	In accordance with the Surveillance Frequency Control Program
SR 3.3.1.6	Manually actuate the output channel interposing relays.	In accordance with the Surveillance Frequency Control Program
SR 3.3.1.7	----------NOTE---------- Neutron detectors are excluded from CHANNEL CALIBRATION. ---------- Perform CHANNEL CALIBRATION.	In accordance with the Surveillance Frequency Control Program

Table 3.3.1-1 (page 1 of 2)
Reactor Protective System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	CONDITIONS REFERENCED FROM REQUIRED ACTION B.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Nuclear Overpower				
a. High Setpoint	1,2[a]	C	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.7[d][e]	≤ 105.5% RTP with four pumps operating, and ≤ 80.5% RTP when reset for three pumps operating per LCO 3.4.4, "RCS Loops - MODES 1 and 2"
b. Low Setpoint	2[b],3[b] 4[b],5[b]	D	SR 3.3.1.1 SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.7	≤ 5% RTP
2. RCS High Outlet Temperature	1,2	C	SR 3.3.1.1 SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.7	≤ 618°F
3. RCS High Pressure	1,2[a]	C	SR 3.3.1.1 SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.7	≤ 2355 psig
4. RCS Low Pressure	1,2[a]	C	SR 3.3.1.1 SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.7	≥ 1800 psig
5. RCS Variable Low Pressure	1,2[a]	C	SR 3.3.1.1 SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.7	As specified in the COLR
6. Reactor Building High Pressure	1,2,3[c]	C	SR 3.3.1.1 SR 3.3.1.6 SR 3.3.1.7	≤ 4 psig
7. Reactor Coolant Pump to Power	1,2[a]	C	SR 3.3.1.1 SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.7	>2% RTP with ≤ 2 pumps operating
8. Nuclear Overpower Flux/Flow Imbalance	1,2[a]	C	SR 3.3.1.1 SR 3.3.1.3 SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.7	As specified in the COLR

Table 3.3.1-1 (page 2 of 2)
Reactor Protective System Instrumentation

	FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	CONDITIONS REFERENCED FROM REQUIRED ACTION B.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
9.	Main Turbine Trip (Hydraulic Fluid Pressure)	≥ 30% RTP	E	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.7	≥ 800 psig
10.	Loss of Main Feedwater Pumps (Hydraulic Oil Pressure)	≥ 2% RTP	F	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.7	≥ 75 psig
11.	Shutdown Bypass RCS High Pressure	2[(b)],3[(b)] 4[(b)],5[(b)]	D	SR 3.3.1.1 SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.7	≤ 1720 psig

(a) When not in shutdown bypass operation.

(b) During shutdown bypass operation with any CRD trip breakers in the closed position and the CRD System capable of rod withdrawal.

(c) With any CRD trip breaker in the closed position and the CRD System capable of rod withdrawal.

(d) If the as-found channel setpoint is conservative with respect to the Allowable Value but outside its predefined as-found acceptance criteria band, 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 or a value that is more conservative than the Nominal Trip Setpoint; otherwise the channel shall be declared inoperable. The Nominal Trip Setpoint and the methodologies used to determine the predefined as-found acceptance criteria band and the as-left setpoint tolerance band are specified in the Selected Licensee Commitments Manual.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.4 RCS Loops – MODES 1 and 2

LCO 3.4.4 Two RCS Loops shall be in operation, with:

a. Four reactor coolant pumps (RCPs) operating; or

b. Three RCPs operating and:
   1. THERMAL POWER is ≤ 75% RTP; and
   2. LCO 3.3.1, "Reactor Protection System (RPS) Instrumentation," Function 1.a (Nuclear Overpower – High Setpoint), Allowable Value of Table 3.3.1-1 is reset for 3 RCPs operating.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of LCO 3.4.4.b not met.	A.1 Reset the RPS to satisfy the requirements of LCO 3.4.4.b.2.	10 hours
B. Required Action and associated Completion Time of Condition A not met. OR Requirements of LCO not met for reasons other than Condition A.	B.1 Be in MODE 3.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.4.1	Verify required RCS loops are in operation.	In accordance with the Surveillance Frequency Control Program

License Amendment Request No. 2014-04
May 19, 2015

ATTACHMENT 4

RETYPED TECHNICAL SPECIFICATION BASES PAGES

[5 pages follow this cover page]

NOTE: This attachment contains retyped TS Bases pages B 3.3.1-12, B 3.3.1-26, B 3.3.1-27, B 3.4.4-2, and B 3.4.4-3 (pages with no changes other than repagination due to added text were not included)

BASES (continued)

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

assumptions of the setpoint calculations. Each Allowable Value specified is more conservative than instrument uncertainties appropriate to the trip Function. These uncertainties are defined in Reference 4.

For most RPS Functions, the Allowable Value in conjunction with the nominal trip setpoint ensure that the departure from nucleate boiling (DNB), center line fuel melt, or RCS pressure SLs are not challenged. Cycle specific values for use during operation are contained in the COLR.

Certain RPS trips function to indirectly protect the SLs by detecting specific conditions that do not immediately challenge SLs but will eventually lead to challenge if no action is taken. These trips function to minimize the unit transients caused by the specific conditions. The Allowable Value for these Functions is selected at the minimum deviation from normal values that will indicate the condition, without risking spurious trips due to normal fluctuations in the measured parameter.

The safety analyses applicable to each RPS Function are discussed next.

1. Nuclear Overpower

a. Nuclear Overpower – High Setpoint

The Nuclear Overpower – High Setpoint trip provides protection for the design thermal overpower condition based on the measured out of core neutron leakage flux.

There is a setpoint for 4 and 3 RCP operation. The purpose for the 3 RCP trip is to provide protection for power excursion events initiated from 3 RCP operation, most notably the small steam line break accident.

The Nuclear Overpower – High Setpoint trip initiates a reactor trip when the neutron power reaches a predefined setpoint at the design overpower limit. Because THERMAL POWER lags the neutron power, tripping when the neutron power reaches the design overpower will limit THERMAL POWER to prevent exceeding acceptable fuel damage limits.

Thus, the Nuclear Overpower – High Setpoint trip protects against violation of the DNBR and fuel centerline melt SLs. However, the RCS Variable Low Pressure, and Nuclear Overpower Flux/Flow Imbalance, provide more direct protection. The role of the Nuclear Overpower – High Setpoint trip is to limit reactor THERMAL POWER below the highest power at which the other two trips are known to provide protection.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.7 (continued)

measurement errors and processor output trip device setpoint errors are within the assumptions of the uncertainty analysis. Whenever a sensing element is replaced, the CHANNEL CALIBRATION of the resistance temperature detectors (RTD) sensors is accomplished by an inplace cross calibration that compares the other sensing elements with the recently installed sensing element.

Since the CHANNEL FUNCTIONAL TEST is a part of the CHANNEL CALIBRATION a separate SR is not required. The digital RPS software performs a continuous online automated cross channel check, separately for each channel, and continuous online signal error detection and validation. The protection system also performs continuous online hardware monitoring. The CHANNEL CALIBRATION essentially validates the self monitoring function and checks for a small set of failure modes that are undetectable by the self monitoring function.

The digital processors shall be rebooted as part of the calibration. This verifies that the software and setpoints have not changed. Signals into the system (from the field instrument or at the protective system cabinet) are applied during the channel calibration to ensure that the instrumentation is within the specified allowance requirements. This, in combination with ensuring the setpoints are entered into the software correctly per SR 3.3.1.5, verifies the setpoints are within the Allowable Values.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

For Functions for which TSTF-493, "Clarify Application of Setpoint Methodology for LSSS Functions" (Reference 8) has been implemented, this SR is modified by two Notes as identified in Table 3.3.1-1. 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. 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. The performance of these channels will be evaluated under the station's Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY. The second Note requires that the as-left setting for the channel be returned to within

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.7 (continued)

the as-left tolerance of the Nominal Trip Setpoint (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 the NTSP and the methodologies for calculating the as-left and the as-found tolerances be in the Selected Licensee Commitments Manual.

REFERENCES

1. UFSAR, Chapter 7.
2. UFSAR, Chapter 15.
3. 10 CFR 50.49.
4. EDM-102, "Instrument Setpoint/Uncertainty Calculations."
5. NUREG-0737, "Clarification of TMI Action Plan Requirements," November 1979.
6. BAW-10167, May 1986.
7. 10 CFR 50.36.
8. Technical Specification Task Force, Improved Standard Technical Specifications Change Traveler, TSTF-493, "Clarify Application of Setpoint Methodology for LSSS Functions," Revision 4.

BASES (continued)

APPLICABLE SAFETY ANALYSES

Safety analyses contain various assumptions for the accident analyses initial conditions including: RCS pressure, RCS temperature, reactor power level, core parameters, and safety system setpoints. The important aspect for this LCO is the reactor coolant forced flow rate, which is represented by the number of pumps in service.

Both transient and steady state analyses have been performed to establish the effect of flow on DNB. The transient or accident analysis for the plant has been performed assuming either three or four pumps are in operation. The majority of the plant safety analysis is based on initial conditions at high core power or zero power. The analyses that are of most importance to RCP operation are the two pump coastdown, single pump locked rotor, and single pump broken shaft (Ref. 1).

Steady state DNB analysis has been performed for four, and three pump combinations. For four pump operation, the steady state DNB analysis, which generates the pressure and temperature protective limit (i.e., the departure from nucleate boiling ratio (DNBR) limit), assumes a maximum power level equal to the Nuclear Overpower – High Setpoint for 4 reactor coolant pumps (RCPs) operating plus instrument uncertainty and conservatism. The DNBR limit defines a locus of pressure and temperature points that result in a minimum DNBR greater than or equal to the critical heat flux correlation limit.

The three pump pressure temperature limit is tied to the steady state DNB analysis, which is evaluated each cycle. The flow used is the minimum allowed for three pump operation. The actual RCS flow rate will exceed the assumed flow rate. With three pumps operating, overpower protection is automatically provided by the power to flow ratio of the RPS nuclear overpower trip setpoint based on flux/flow/imbalance and the Nuclear Overpower – High Setpoint for 3 RCPs operating once it has been reset. The maximum power level for three pump operation is 75% RTP and is based on the three pump flow as a fraction of the four pump flow at full power.

Continued power operation with two RCPs removed from service is not allowed by this Specification.

RCS Loops – MODES 1 and 2 satisfy Criterion 2 of 10 CFR 50.36 (Ref. 2).

LCO

The purpose of this LCO is to require adequate forced flow for core heat removal. Flow is represented by the number of RCPs in operation in both RCS loops for removal of heat by the two SGs. To meet safety analysis acceptance criteria for DNB, four pumps are required at rated power; if only three pumps are available, power must be reduced and the Nuclear Overpower – High Setpoint must be reset for 3 RCPs operating.

BASES (continued)

APPLICABILITY

In MODES 1 and 2, the reactor is critical and has the potential to produce maximum THERMAL POWER. To ensure that the assumptions of the accident analyses remain valid, all RCS loops are required to be OPERABLE and in operation in these MODES to prevent DNB and core damage.

The decay heat production rate is much lower than the full power heat rate. As such, the forced circulation flow and heat sink requirements are reduced for lower, noncritical MODES as indicated by the LCOs for MODES 3, 4, and 5.

Operation in other MODES is covered by:

LCO 3.4.5, "RCS Loops – MODE 3";
LCO 3.4.6, "RCS Loops – MODE 4";
LCO 3.4.7, "RCS Loops – MODE 5, Loops Filled";
LCO 3.4.8, "RCS Loops – MODE 5, Loops Not Filled";
LCO 3.9.4, "Decay Heat Removal (DHR) and Coolant Circulation – High Water Level" (MODE 6); and
LCO 3.9.5, "Decay Heat Removal (DHR) and Coolant Circulation – Low Water Level" (MODE 6).

ACTIONS

A.1

If the requirements of LCO 3.4.4.b.2 are not met, the Required Action is to reset the Nuclear Overpower - High Setpoint to satisfy the requirements of LCO 3.4.4.b.2. This minimizes the possibility of violating DNB limits.

The Completion Time of 10 hours is reasonable, based on operating experience, to reset the RPS setpoints in an orderly manner and without challenging safety systems.

B.1

If the Required Action and associated Completion Time of Condition A is not met or the requirements of the LCO are not met for reasons other than Condition A, the Required Action is to reduce power and bring the unit to MODE 3. This lowers power level and thus reduces the core heat removal needs and minimizes the possibility of violating DNB limits.

The Completion Time of 12 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and without challenging safety systems.