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10 CFR 50.90

Serial: RNP-RA/15-0016
APR 24 2016

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261 / RENEWED LICENSE NO. DPR-23

APPLICATION FOR TECHNICAL SPECIFICATION CHANGE TO ADOPT TECHNICAL SPECIFICATIONS TASK FORCE (TSTF)-339, RELOCATE TS PARAMETERS TO THE COLR CONSISTENT WITH WCAP-14483, REVISION 2

Dear Sir/Madam:

In accordance with the provisions of 10 CFR 50.90 Duke Energy Progress, Inc. is submitting a request for an amendment to the technical specifications (TS) for H. B. Robinson Steam Electric Plant, Unit No. 2 (HBRSEP2). The proposed amendment would relocate Reactor Coolant System (RCS)-related cycle-specific parameters and core safety limits from the TS to the Core Operating Limits Report (COLR).

Attachment 1 provides a description and assessment of the proposed change, the requested confirmation of applicability, and plant-specific verifications. Attachment 2 provides the existing TS pages marked up to show the proposed change. Attachment 3 provides revised (clean) TS pages. Attachment 4 provides proposed TS bases changes, for information only.

HBRSEP2 requests approval of the proposed License Amendment by April 30, 2017, with the amendment being implemented within 120 days of issuance.

In accordance with 10 CFR 50.91, a copy of this application, with attachments, is being provided to the designated South Carolina Official.

Please address any comments or questions regarding this matter to Mr. Scott Connelly, Acting Manager – Nuclear Regulatory Affairs at (843) 857-1569.

I declare under penalty of perjury that the foregoing is true and correct. Executed on April 24, 2016.

Sincerely,

R. Michael Glover

R. Michael Glover
Site Vice President

RMG/jmw

Attachments

1. Description and Assessment
2. Proposed Technical Specification Changes
3. Revised Technical Specification Pages
4. Proposed Technical Specification Bases Changes

cc: Administrator, NRC, Region II
Dennis Galvin, NRC Project Manager, NRR
NRC Resident Inspector, HBRSEP2
Ms. S. E. Jenkins, Manager, Infectious and Radioactive Waste Management Section (SC)

Description And Assessment of Proposed Changes

1.0 DESCRIPTION AND BASIS OF PROPOSED CHANGES

1.1 Description of Proposed Changes

The proposed amendment would revise Technical Specification (TS) 3.4.1, "RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits," and associated Bases, by relocating the pressurizer pressure, Reactor Coolant System (RCS) average temperature, and RCS total flow rate values to the Core Operating Limits Report (COLR).

The proposed amendment would relocate TS Figure 2.1.1-1, "Reactor Core Safety Limits," to the COLR, replacing it with more specific requirements regarding the safety limits (i.e. fuel DNB design basis and the fuel centerline melt design basis) conforming with WCAP-14483-A. As discussed in the Safety Evaluation Reports to Westinghouse Topical Report, WCAP-14483-A, it is necessary to relocate TS Figure 2.1.1-1 to the COLR since cycle-dependent changes to parameters upon which TS Figure 2.1.1-1 is based would require a license amendment request to revise the figure.

The amendment would revise TS Table 3.3.1-1, "Reactor Protection System Instrumentation," by relocating numerical values pertaining to Overtemperature ΔT and Overpower ΔT, nominal RCS operating pressure, nominal Tavg, time constants (τ), and constant (K) values to the COLR.

TS 5.6.5, "Core Operating Limits Report (COLR)," will be modified to reflect the above relocations to the COLR.

The proposed changes will allow Duke Energy Progress, Inc. (DEP) the flexibility of enhancing operating and core design margins without the need for cycle-specific license amendment requests. The relocation of these cycle-specific TS values to the COLR will result in a more complete COLR, containing cycle-specific operating conditions and core reload related parameters. The safety and quality of operations at H. B. Robinson Steam Electric Plant, Unit No. 2, (HBRSEP2) will not be compromised by the implementation of this amendment request as TS 5.6.5(c) requires that all applicable limits of the safety analyses be met when generating cycle-specific requirements in the COLR.

1.2 Basis For Proposed Change

NRC Generic Letter 88-16, "Removal of Cycle-Specific Parameter Limits From Technical Specifications," dated October 3, 1988, provides guidance to licensees for the removal of cycle-dependent variables from the TS provided that these values are included in a COLR and are determined with NRC-approved methodologies referenced in the TS. Westinghouse Electric Company (Westinghouse) subsequently developed WCAP-14483, "Generic Methodology for Expanding Core Operating Limits Report," describing how cycle-specific parameters may be relocated to the COLR. WCAP-14483 was accepted for referencing by the NRC on January 19, 1999. The Safety Evaluation Report, contained in the January 19, 1999 NRC letter approving WCAP-14483-A, concludes that additional information contained in the TS may be relocated to the COLR.

The limits on the parameters which are removed from the TS and added to the COLR must be developed or justified using NRC-approved methodologies. All accident analyses, performed in accordance with these methodologies, must meet the applicable NRC-approved limits of the safety analysis. The removal of parameter limits from the TS and their addition to the COLR does not obviate the requirement to operate within these limits. Furthermore, any changes to those limits must be performed in accordance with TS 5.6.5(c). If any of the applicable limits of the safety analyses are not met, prior NRC approval of the change is required, as is the case for a license amendment request. For more routine modifications, where NRC-approved methodologies and limits of the safety analysis remain applicable, the potentially burdensome and lengthy process of amending the TS may be avoided. The requested changes are essentially administrative in nature; therefore, the required level of safety will be maintained.

The requested changes are based upon NRC-approved Westinghouse Owner's Group (WOG) Technical Specifications Task Force (TSTF)-339, "Relocated TS Parameters to the COLR Consistent with WCAP-14483," Revision 2, and Westinghouse WCAP-14483-A. In accordance with these documents, previously approved RCS minimum total flow rates are retained in the TS to preclude the use of lower flow rates without prior NRC approval.

In addition, it has been discovered that there is conflicting information in the Bases of TS 3.4.1. The Applicable Safety Analysis section of the Bases states:

> "The pressurizer pressure limit of 2205 psig and the RCS average temperature limit of 579.4°F correspond to analytical limits used in the safety analyses, with allowance for measurement uncertainty."

The Limiting Conditions for Operation (LCO) section provides the following guidance:

> "The LCO numerical values for pressure, temperature and flow rate are given for the measurement location but have not been adjusted for instrument error."

The above conflicting statements were contained in NUREG-1431, Standard Technical Specifications Westinghouse Plants, Revision 1, which served as the basis for HBRSEP2's conversion from Custom Technical Specifications to Improved Standard Technical Specifications. This conflict was subsequently corrected in Revision 2.2 of NUREG-1431 to reflect that instrument uncertainty should be included in the values and this correction continues to be present in the latest revision of NUREG-1431 (Revision 4). DEP has revised the Bases of the Bases of the HBRSEP2 TS to reflect that instrument uncertainty should be included in the LCO and surveillance values consistent with the guidance in the last revision of NUREG-1431.

The LCO and Surveillance values in TS 3.4.1 for RCS pressure and temperature do not currently account for instrument uncertainty and are therefore non-conservative. The LCO and surveillance values for RCS flow do account for instrument uncertainty. In accordance with the guidance in NRC Administrative Letter 98-10, DEP has implemented administrative controls to utilize conservative limits for RCS pressure and temperature that do account for instrument uncertainty. It is intended to incorporate RCS pressure and temperature LCO and surveillance

values, which do account for instrument uncertainty, into the COLR as part of the implementation of the proposed amendment.

2.0 ASSESSMENT

2.1 Applicability of TSTF-339

DEP has reviewed TSTF-339, Rev. 2, and has concluded that the information in WCAP-14483-A and TSTF-339 is applicable to HBRSEP2 and justify the proposed amendment for the incorporation of the changes to the HBRSEP2 TS.

2.2 Optional Changes and Variations

DEP is not proposing any variations or deviations from the TS changes described in TSTF-339, Revision 2.

3.0 REGULATORY ANALYSIS

3.1 No Significant Hazards Consideration Determination

As required by 10 CFR 50.91(a)(1), this analysis is provided to demonstrate that the proposed license amendment does not involve a significant hazard.

Conformance of the proposed amendment to the standards for a determination of no significant hazards, as defined in 10 CFR 50.92, is shown in the following:

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

   No. The relocation of RCS-related cycle-specific parameter limits from the TS to the COLR proposed by this amendment request does not result in the alteration of the design, material, or construction standards that were applicable prior to the change. The proposed change will not result in the modification of any system interface that would increase the likelihood of an accident since these events are independent of the proposed change. The proposed amendment will not change, degrade, or prevent actions, or alter any assumptions previously made in evaluating the radiological consequences of an accident described in the Updated Final Safety Analysis Report (UFSAR). Therefore, the proposed amendment does not result in an increase in the probability or consequences of an accident previously evaluated.

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

   No. There are no new accident causal mechanisms created as a result of NRC approval of this amendment request. No changes are being made to the facility which would introduce any new accident causal mechanisms. This amendment request does not

impact any plant systems that are accident initiators. Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3) Does the proposed change involve a significant reduction in margin of safety?

No. Implementation of this amendment would not involve a significant reduction in the margin of safety. Previously approved methodologies will continue to be used in the determination of cycle-specific core operating limits that are present in the COLR. Additionally, previously approved RCS minimum total flow rates for HBRSEP2 are retained in the TS to assure that lower flow rates will not be used without prior NRC approval. Based on the above, it is concluded that the proposed license amendment request does not impact any safety margins and will not result in a reduction in margin with respect to plant safety.

Based on the preceding analysis, it is concluded that the relocation of RCS-related cycle-specific parameter limits from the TS to the COLR does not involve a significant hazards consideration finding as defined in 10 CFR 50.92.

4.0 ENVIRONMENTAL ANALYSIS

DEP has concluded that the proposed amendment meets the criteria provided by 10 CFR 51.22(c)(9) for categorical exclusion from the requirement for an Environmental Impact Statement. The proposed amendment does not involve a significant hazards consideration, an increase in the types and amounts of effluents that may be released offsite, or result in an increase in individual or cumulative occupational radiation exposures.

U. S. Nuclear Regulatory Commission
Attachment 2 to Serial: RNP-RA/15-0016
11 Pages (including this cover page)

Proposed Technical Specification Changes

2.0 SAFETY LIMITS (SLs)

2.1 SLs

2.1.1 Reactor Core SLs

In MODES 1 and 2, the combination of THERMAL POWER, Reactor Coolant System (RCS) highest cold leg temperature, and pressurizer pressure shall not exceed the ~~SLs~~ limits specified in ~~Figure 2.1.1-1~~. Add INSERT # 1 here

2.1.2 RCS Pressure SL

In MODES 1, 2, 3, 4, and 5, the RCS pressure shall be maintained ≤ 2735 psig.

2.2 SL Violations

2.2.1 If SL 2.1.1 is violated, restore compliance and be in MODE 3 within 1 hour.

2.2.2 If SL 2.1.2 is violated:

2.2.2.1 In MODE 1 or 2, restore compliance and be in MODE 3 within 1 hour.

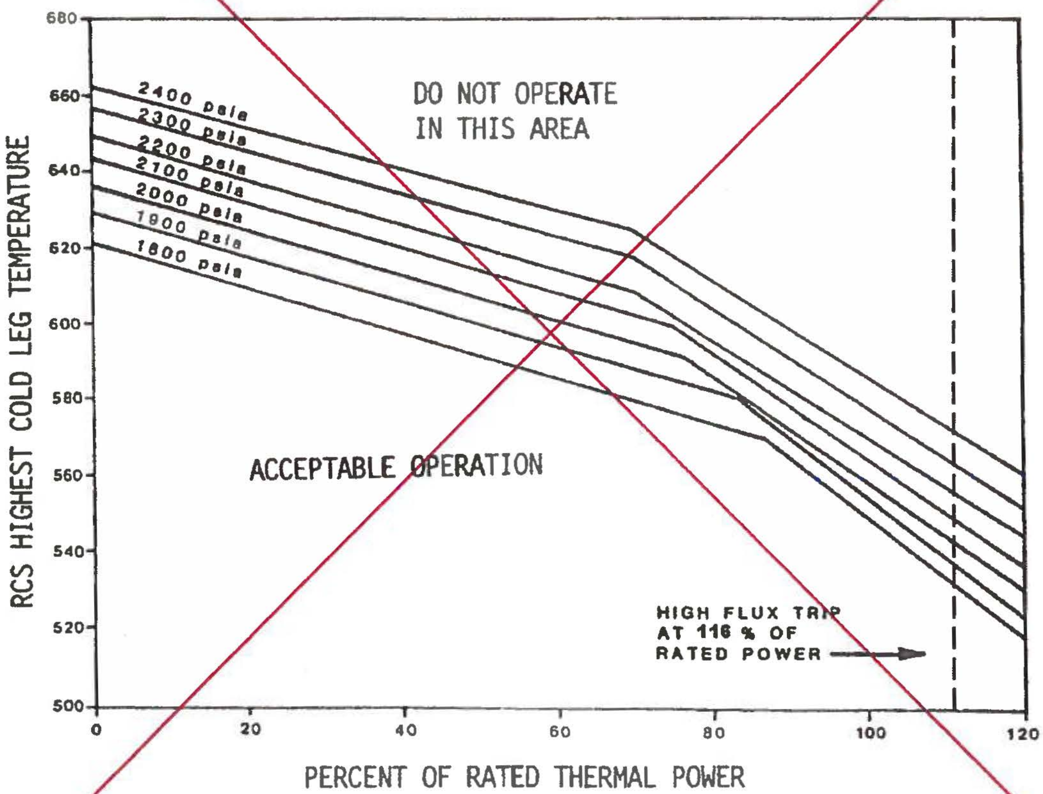
2.2.2.2 In MODE 3, 4, or 5, restore compliance within 5 minutes.

INSERT #1

the COLR; and the following SLs shall not be exceeded:

2.1.1.1 The departure from nucleate boiling ratio (DNBR) shall be maintained $\geq$ 1.141 for the HTP correlation and $\geq$1.17 for the XNB correlation.

2.1.1.2 The peak fuel centerline temperature shall be maintained < [(2790 – 17.9 x P – 3.2 x B) x 1.8 + 32] °F where P is the maximum weight percent of Gadolinia (%) and B is the maximum pin burnup (GWD/MTU).



NOTE: BASED ON A MINIMUM RCS FLOW OF 97.3 x 10^6 lbm/hr

Figure 2.1.1-1 (page 1 of 1)
Reactor Core Safety Limits

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Figure 2.1.1-1

Table 3.3.1-1 (page 6 of 7)
Reactor Protection System Instrumentation

Note 1: Overtemperature ΔT

The Overtemperature ΔT Function Allowable Value shall not exceed the following Nominal Trip Setpoint by more than 2.96% of ΔT span.

$$\Delta T_{setpoint} \le \Delta T_0 \{ K_1 - K_2 \ (1 + \tau_1 S) / (1 + \tau_2 S) \} (T - T') + K_3(P - P') - f(\Delta I)\}$$

Where: ΔT_0 is the indicated ΔT at RTP, °F.
s is the Laplace transform operator, sec^{-1}.
T is the measured RCS average temperature, °F. [*]
T' is the reference T_{avg} at RTP, ≤ ~~575.9~~°F.

P is the measured pressurizer pressure, psig [*]
P' is the nominal RCS operating pressure, ≥ ~~2235~~ psig [*]

K_1 ≤~~1.1265~~ ← [*] K_2 = ~~0.01228~~/°F [*] K_3 = ~~0.00089~~/psig [*]
τ_1 ≥~~20.08~~ sec [*] τ_2 ≤~~3.08~~ sec [*]

f(ΔI) = ~~2.4%~~{(q_b - q_t) - ~~17~~} [*] when q_t - q_b < ~~17%~~ RTP [*] [*] [*]
0% of RTP [*] when ~~17%~~ RTP ≤q_t - q_b ≤~~12%~~ RTP
~~2.4%~~{(q_t - q_b) - ~~12~~} [*] [*] when q_t - q_b > ~~12%~~ RTP [*]

Where q_t and q_b are percent RTP in the upper and lower halves of the core, respectively, and q_t + q_b is the total THERMAL POWER in percent RTP.

The values denoted with [*] are specified in the COLR.

Table 3.3.1-1 (page 7 of 7)
Reactor Protection System Instrumentation

Note 2: Overpower ΔT

The Overpower ΔT Function Allowable Value shall not exceed the following Nominal Trip Setpoint by more than 3.17% of ΔT span.

$$\Delta T_{setpoint} \leq \Delta T_0 \left\{ K_4 - K_5 \left[\frac{\tau_3 S}{1 + \tau_3 S} \right] T - K_6 (T - T') - f(\Delta I) \right\}$$

Where: ΔT_0 is the indicated ΔT at RTP, °F.
s is the Laplace transform operator, sec^{-1}.
T is the measured RCS average temperature, °F.
T' is the reference T_{avg} at RTP, ≤ ~~575.9~~ [*] °F.

K_4 ≤ ~~1.06~~ [*] K_5 ≥ ~~0.02~~ [*] /°F for increasing T_{avg} K_6 ≥ ~~0.00277~~ [*] /°F when T > T'
[*] ~~0~~/°F for decreasing T_{avg} [*] ~~0~~/°F when T ≤ T'
τ_3 ≥ ~~9~~ [*] sec

~~f(ΔI) = as defined in Note 1 for Overtemperature ΔT~~

Place INSERT 3 here.

INSERT #3

$f(\Delta I) =$ [*] {($q_b - q_t$) – [*] } when $q_t - q_b <$ [*] RTP

0% of RTP when [*] RTP $\leq q_t - q_b \leq$ [*] RTP

[*] {($q_t - q_b$) – [*] } when $q_t - q_b >$ [*] RTP

Where q_t and q_b are percent RTP in the upper and lower halves of the core, respectively, and $q_t + q_b$ is the total THERMAL POWER in percent RTP.

The values denoted with [*] are specified in the COLR.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.1 RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits

LCO 3.4.1 RCS DNB parameters for pressurizer pressure, RCS average temperature, and RCS total flow rate shall be ~~within the limits specified~~ below:

a. Pressurizer pressure ~~≥ 2205 psig~~ is greater than or equal to the limit specified in the COLR;

b. RCS average temperature ~~≤ 579.4°F~~ is less than or equal to the limit specified in the COLR; and

c. RCS total flow rate ≥97.3 x 10^6 lbm/hr and greater than or equal to the limit specified in the the COLR.

APPLICABILITY: MODE 1.

---NOTE---

Pressurizer pressure limit does not apply during:

a. THERMAL POWER ramp > 5% RTP per minute; or

b. THERMAL POWER step > 10% RTP.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One or more RCS DNB parameters not within limits.	A.1	Restore RCS DNB parameter(s) to within limit.	2 hours
B. Required Action and associated Completion Time not met.	B.1	Be in MODE 2.	6 hours

greater than or equal to the limit specified in the COLR.

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.4.1.1	Verify pressurizer pressure is ~~≥ 2205 psig~~.	12 hours
SR 3.4.1.2	Verify RCS average temperature is ~~≤ 579.4°F~~.	12 hours
SR 3.4.1.3	Verify RCS total flow rate is ≥ 97.3 x 10^6 lbm/hr.	12 hours
SR 3.4.1.4	---------------------------NOTE-------------------------------- Not required to be performed until 24 hours after ≥ 90% RTP. -- Verify by precision heat balance that RCS total flow rate is ≥ 97.3 x 10^6 lbm/hr.	18 months

and greater than or equal to the limit specified in the COLR.

and greater than or equal to the limit specified in the COLR.

less than or equal to the limit specified in the COLR.

5.6 Reporting Requirements (continued)

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

7. Axial Flux Difference (AFD) limits for Specification 3.2.3; and

Place INSERT 4 here

8. Boron Concentration limit for Specification 3.9.1.

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC. The approved version shall be identified in the COLR. These methods are those specifically described in the following documents:

1. Deleted
2. XN-NF-84-73(P), "Exxon Nuclear Methodology for Pressurized Water Reactors: Analysis of Chapter 15 Events," approved version as specified in the COLR.
3. XN-NF-82-21(A), "Application of Exxon Nuclear Company PWR Thermal Margin Methodology to Mixed Core Configurations," approved version as specified in the COLR.
4. Deleted
5. XN-75-32(A), "Computational Procedure for Evaluating Rod Bow," approved version as specified in the COLR.
6. Deleted.
7. Deleted
8. XN-NF-78-44(A), "Generic Control Rod Ejection Analysis," approved version as specified in the COLR.
9. XN-NF-621(A), "XNB Critical Heat Flux Correlation," approved version as specified in the COLR.
10. Deleted
11. XN-NF-82-06(A), "Qualification of Exxon Nuclear Fuel for Extended Burnup," approved version as specified in the COLR.
12. Deleted
13. Deleted.

(continued)

INSERT #4

9. Reactor Core Safety Limits Figure for Specification 2.1.1

10. Overtemperature ΔT and Overpower ΔT setpoint parameter values for Specification 3.3.1

11. Reactor Coolant System pressure, temperature and flow Departure from Nucleate Boiling (DNB) limits for Specification 3.4.1

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Attachment 3 to Serial: RNP-RA/15-0016
9 Pages (including this cover page)

Revised Technical Specification Pages

2.0 SAFETY LIMITS (SLs)

2.1 SLs

2.1.1 Reactor Core SLs

In MODES 1 and 2, the combination of THERMAL POWER, Reactor Coolant System (RCS) highest cold leg temperature, and pressurizer pressure shall not exceed the limits specified in the COLR; and the following SLs shall not be exceeded:

2.1.1.1 The departure from nucleate boiling ratio (DNBR) shall be maintained ≥ 1.141 for the HTP correlation and ≥ 1.17 for the XNB correlation.

2.1.1.2 The peak fuel centerline temperature shall be maintained < [(2790 – 17.9 x P – 3.2 x B) x 1.8 + 32] °F where P is the maximum weight percent of Gadolinia (%) and B is the maximum pin burnup (GWD/MTU).

2.1.2 RCS Pressure SL

In MODES 1, 2, 3, 4, and 5, the RCS pressure shall be maintained ≤ 2735 psig.

2.2 SL Violations

2.2.1 If SL 2.1.1 is violated, restore compliance and be in MODE 3 within 1 hour.

2.2.2 If SL 2.1.2 is violated:

2.2.2.1 In MODE 1 or 2, restore compliance and be in MODE 3 within 1 hour.

2.2.2.2 In MODE 3, 4, or 5, restore compliance within 5 minutes.

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Figure 2.1.1-1

Table 3.3.1-1 (page 6 of 7)
Reactor Protection System Instrumentation

Note 1: Overtemperature ΔT

The Overtemperature ΔT Function Allowable Value shall not exceed the following Nominal Trip Setpoint by more than 2.96% of ΔT span.

$$\Delta T_{setpoint} \le \Delta T_0 \{ K_1 - K_2 [(1 + \tau_1 S) / (1 + \tau_2 S)] (T - T') + K_3(P - P') - f(\Delta I)\}$$

Where: ΔT_0 is the indicated ΔT at RTP, °F.
s is the Laplace transform operator, sec^{-1}.
T is the measured RCS average temperature, °F.
T' is the reference T_{avg} at RTP, ≤ [*]°F.

P is the measured pressurizer pressure, psig
P' is the nominal RCS operating pressure, ≥ [*] psig

$K_1 \le$ [*] $K_2 =$ [*]/°F $K_3 =$ [*]/psig
$\tau_1 \ge$ [*] sec $\tau_2 \le$ [*] sec

$f(\Delta I) =$	[*] $\{(q_b - q_t)$ - [*]}	when $q_t - q_b <$ [*] RTP
	0% of RTP	when [*] RTP ≤ $q_t - q_b$ ≤ [*] RTP
	[*] $\{(q_t - q_b)$ - [*]}	when $q_t - q_b >$ [*] RTP

Where q_t and q_b are percent RTP in the upper and lower halves of the core, respectively, and $q_t + q_b$ is the total THERMAL POWER in percent RTP.

The values denoted with [*] are specified in the COLR.

Table 3.3.1-1 (page 7 of 7)
Reactor Protection System Instrumentation

Note 2: Overpower ΔT

The Overpower ΔT Function Allowable Value shall not exceed the following Nominal Trip Setpoint by more than 3.17% of ΔT span.

$$\Delta T_{setpoint} \leq \Delta T_0 \{ K_4 - K_5 [\tau_3 S / (1 + \tau_3 S)] T - K_6(T - T') - f(\Delta I)\}$$

Where: ΔT_0 is the indicated ΔT at RTP, °F.
s is the Laplace transform operator, sec^{-1}.
T is the measured RCS average temperature, °F.
T' is the reference T_{avg} at RTP, ≤ [*] °F.

$K_4 \leq$ [*]

$K_5 \geq$ [*]/°F for increasing T_{avg}
[*]/°F for decreasing T_{avg}

$K_6 \geq$ [*]/°F when T > T'
[*]/°F when T ≤ T'

$\tau_3 \geq$ [*] sec

f(ΔI) =	[*] $\{(q_b - q_t)$ - [*]}	when $q_t - q_b <$ [*] RTP
	0% of RTP	when [*] RTP $\leq q_t - q_b \leq$ [*] RTP
	[*] $\{(q_t - q_b)$ - [*]}	when $q_t - q_b >$ [*] RTP

Where q_t and q_b are percent RTP in the upper and lower halves of the core, respectively, and $q_t + q_b$ is the total THERMAL POWER in percent RTP.

The values denoted with [*] are specified in the COLR.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.1 RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits

LCO 3.4.1 RCS DNB parameters for pressurizer pressure, RCS average temperature, and RCS total flow rate shall be within the limits specified below:

a. Pressurizer pressure is greater than or equal to the limit specified in the COLR;

b. RCS average temperature is less than or equal to the limit specified in the COLR; and

c. RCS total flow rate ≥ 97.3 x 10^6 lbm/hr and greater than or equal to the limit specified in the COLR.

APPLICABILITY: MODE 1.

---NOTE---
Pressurizer pressure limit does not apply during:

a. THERMAL POWER ramp > 5% RTP per minute; or

b. THERMAL POWER step > 10% RTP.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One or more RCS DNB parameters not within limits.	A.1	Restore RCS DNB parameter(s) to within limit.	2 hours
B. Required Action and associated Completion Time not met.	B.1	Be in MODE 2.	6 hours

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.4.1.1	Verify pressurizer pressure is greater than or equal to the limit specified in the COLR.	12 hours
SR 3.4.1.2	Verify RCS average temperature is less than or equal to the limit specified in the COLR.	12 hours
SR 3.4.1.3	Verify RCS total flow rate is ≥ 97.3 x 10^6 lbm/hr and greater than or equal to the limit specified in the COLR.	12 hours
SR 3.4.1.4	-----------------------------NOTE----------------------------- Not required to be performed until 24 hours after ≥ 90% RTP. -- Verify by precision heat balance that RCS total flow rate is ≥ 97.3 x 10^6 lbm/hr and greater than or equal to the limit specified in the COLR.	18 months

5.6 Reporting Requirements (continued)

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

7. Axial Flux Difference (AFD) limits for Specification 3.2.3; and

8. Boron Concentration limit for Specification 3.9.1.

9. Reactor Core Safety Limits Figure for Specification 2.1.1

10. Overtemperature ΔT and Overpower ΔT setpoint parameter values for Specification 3.3.1

11. Reactor Coolant System pressure, temperature and flow Departure from Nucleate Boiling (DNB) limits for Specification 3.4.1

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC. The approved version shall be identified in the COLR. These methods are those specifically described in the following documents:

1. Deleted

2. XN-NF-84-73(P), "Exxon Nuclear Methodology for Pressurized Water Reactors: Analysis of Chapter 15 Events," approved version as specified in the COLR.

3. XN-NF-82-21(A), "Application of Exxon Nuclear Company PWR Thermal Margin Methodology to Mixed Core Configurations," approved version as specified in the COLR.

4. Deleted

5. XN-75-32(A), "Computational Procedure for Evaluating Rod Bow," approved version as specified in the COLR.

6. Deleted.

7. Deleted

8. XN-NF-78-44(A), "Generic Control Rod Ejection Analysis," approved version as specified in the COLR.

9. XN-NF-621(A), "XNB Critical Heat Flux Correlation," approved version as specified in the COLR.

10. Deleted

(continued)

5.0 ADMINISTRATIVE CONTROLS

5.6 Reporting Requirements (continued)

11. XN-NF-82-06(A), "Qualification of Exxon Nuclear Fuel for Extended Burnup," approved version as specified in the COLR.

12. Deleted

13. Deleted.

(continued)

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9 Pages (including this cover page)

Proposed Technical Specification Bases Changes

critical heat flux

BASES

APPLICABLE SAFETY ANALYSES (continued)

critical

predict the ~~DNB flux~~ and the location of DNB for axially uniform and non-uniform heat flux distributions. The local ~~DNB~~ heat flux ratio, defined as the ratio of the heat flux that would cause DNB at a particular core location to the local heat flux, is indicative of the margin to DNB. The minimum DNB ratio, or DNBR, during normal operational and anticipated transients, is restricted to the safety limit. A DNBR at the safety limit corresponds to a 95% probability, at a 95% confidence level, that DNB will not occur, and is chosen as an appropriate margin to DNB for all operating conditions. The DNBR safety limit is a conservative design value which is used as a basis for setting core safety limits. Based on rod bundle tests, no fuel damage is expected at this DNBR or greater. For the standard mixing vane fuel, the Siemens Power Corporation XNB correlation has a DNBR safety limit of 1.17 (Ref. 2) and for the high thermal performance fuel the Siemens HTP correlation has a DNBR safety limit of 1.141 (Ref. 3). ~~The safety limit curves provided in Figure 2.1.1-1 remain valid using the Siemens HTP correlation.~~

The Reactor Trip System setpoints specified in Limiting Condition for Operations (LCO) 3.3.1, in combination with all the LCOs, are designed to prevent any anticipated combination of transient conditions for Reactor Coolant System (RCS) temperature, pressurizer pressure, flow, core power distribution, and THERMAL POWER level that would result in a departure from nucleate boiling ratio (DNBR) of less than the DNBR limit and preclude the existence of flow instabilities.

The fuel centerline temperature limit is a function of weight percent of Gadolinia and pin burnup as presented in Reference 5 and approved for use at RNP per Reference 6.

Automatic enforcement of these reactor core SLs is provided by the ~~following functions:~~

appropriate operation of the RPS and the main steam safety valves.

~~a. Overtemperature ΔT trip;~~

~~b. Overpower ΔT trip;~~

~~c. Power Range Neutron Flux trip; and~~

~~d. Main steam safety valves.~~

~~Maintaining the DNBR above the limit ensures that the average enthalpy in the hot leg is less than or equal to the enthalpy of saturated liquid and also ensures that the ΔT~~

(continued)

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APPLICABLE SAFETY ANALYSES (continued)

~~measured by instrumentation, used in the RPS design as a measure of core power, is proportional to core power.~~

The SLs represent a design requirement for establishing the RPS trip setpoints identified previously. LCO 3.4.1, "RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits," or the assumed initial conditions of the safety analyses (as indicated in the Updated Final Safety Analysis Report (UFSAR), Ref. 4) provide more restrictive limits to ensure that the SLs are not exceeded.

safety limits figure

the COLR shows

SAFETY LIMITS

The ~~curves~~ provided in ~~Figure 2.1.1-1 show~~ the loci of points of THERMAL POWER, RCS pressure, and reactor vessel inlet temperature for which the minimum DNBR is not less than the safety analyses limit, that fuel centerline temperature remains below melting, that the average enthalpy in the hot leg is less than or equal to the enthalpy of saturated liquid, or that the core exit quality is within the limits defined by the DNBR correlation. ~~Figure 2.1.1-1 shows the allowable power level decreasing with increasing reactor vessel inlet temperature at selected pressurizer pressures for constant flow (i.e., three loop operation, minimum flow 97.3 x 10^6 lbm/hr). The area where clad integrity is assured is below these lines. The temperature limits at low power are considerably more conservative than would be required if they were based on the minimum allowable DNB ratio, but are set to preclude bulk boiling at the vessel exit. The safety limit curves given in Figure 2.1.1-1 are for constant flow conditions. These curves would not be applicable in cases where total reactor coolant flow is less than 97.3 x 10^6 lbm/hr. The evaluation of such an event would be based upon the analysis presented in Section 15.3 of the UFSAR.~~

PLACE INSERT # 2 HERE

~~The SL is higher than the limit calculated when the Axial Flux Difference (AFD) is within the limits of the $F_T(\Delta I)$ function of the overtemperature ΔT reactor trip. When the AFD is not within the tolerance, the AFD effect on the overtemperature and overpower ΔT reactor trips will reduce the setpoints to provide protection consistent with the reactor core SLs (Ref. 4).~~

(continued)

INSERT #2

The reactor core SLs are established to preclude violation of the following fuel design criteria:

a. There must be at least a 95% probability at a 95% confidence level (the 95/95 DNB criterion) that the hot fuel rod in the core does not experience DNB; and

b. There must be at least a 95% probability at a 95% confidence level that the hot fuel pellet in the core does not experience centerline fuel melting.

The reactor core SLs are used to define the various RPS functions such that the above criteria are satisfied during steady state operation, normal operational transients, and anticipated operational occurrences (AOOs). To ensure that the RPS precludes the violation of the above criteria, additional criteria are applied to the Overtemperature and Overpower ΔT reactor trip functions. That is, it must be demonstrated that the average enthalpy in the hot leg is less than or equal to the saturation enthalpy and the core exit quality is within the limits defined by the DNBR correlation. Appropriate functioning of the RPS ensures that for variations in the THERMAL POWER, RCS Pressure, RCS average temperature, RCS flow rate, and ΔI that the reactor core SLs will be satisfied during steady state operation, normal operational transients, and AOOs.

BASES

APPLICABILITY

SL 2.1.1 only applies in MODES 1 and 2 because these are the only MODES in which the reactor is critical. Automatic protection functions are required to be OPERABLE during MODES 1 and 2 to ensure operation within the reactor core SLs. The main steam safety valves and automatic protection actions serve to prevent RCS heatup to the reactor core SL conditions or to initiate a reactor trip function, which forces the unit into MODE 3. Setpoints for the reactor trip functions are specified in LCO 3.3.1, "Reactor Protection System (RPS) Instrumentation." In MODES 3, 4, 5, and 6, Applicability is not required since the reactor is not generating significant THERMAL POWER.

SAFETY LIMIT VIOLATIONS

If SL 2.1.1 is violated, the requirement to restore compliance and go to MODE 3 places the unit in a safe condition and in a MODE in which this SL is not applicable.

The allowed Completion Time of 1 hour recognizes the importance of bringing the unit to a MODE of operation where this SL is not applicable, and reduces the probability of fuel damage.

REFERENCES

1. 10 CFR 50, Proposed Appendix A, 32FR10213, July 11, 1967.

2. XN-NF-621(P)(A) Revision 1, "Exxon Nuclear DNB Correlation PWR Fuel Designs," Exxon Nuclear Company, September 1983.

3. EMF-92-153(P)(A), "HTP: Departure from Nucleate Boiling Correlation for High Thermal Performance Fuel."

4. UFSAR, Sections 3.1, 4.4, 7.2, and 15.0.

5. XN-NF-79-56(P)(A) Revision 1, "Gadolinia Fuel Properties for LWR Safety Evaluation.

6. XN-NF-85-92(P)(A), "Exxon Nuclear Uranium Dioxide/Gadolinia Irradiation Examination and Thermal Conductivity Results.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

5. Overtemperature)T (continued)

- axial power distribution - f(ΔI), the Trip Setpoint is varied to account for imbalances in the axial power distribution as detected by the NIS upper and lower power range detectors. If axial peaks are greater than the design limit, as indicated by the difference between the upper and lower NIS power range detectors, the Trip Setpoint is reduced in accordance with Note 1 of Table 3.3.1-1.

Dynamic compensation is included for system piping delays from the core to the temperature measurement system and RTD response time.

The Overtemperature ΔT trip Function is calculated for each loop as described in Note 1 of Table 3.3.1-1. Trip occurs if Overtemperature ΔT is indicated in two loops. The function $(1+\tau_1 s)/(1+\tau_2 s)$; is generated by the lead-lag controller for T_{avg} dynamic compensation and f(ΔI) is a function of the indicated difference between top and bottom detectors of the power-range nuclear ion chambers; with gains to be selected based on measured instrument response during plant startup tests. ~~For every % that ($q_b - q_t$) exceeds 17%, the Overtemperature ΔT setpoint is reduced by 2.4% and for every % that ($q_t - q_b$) exceeds 12%, the Overtemperature ΔT setpoint is reduced by 2.4%.~~ The shape of the f(ΔI)penalty is described in the Core Operating Limits Report (COLR). Note that this Function also provides a signal to generate a turbine runback prior to reaching the Trip Setpoint. A turbine runback will reduce turbine power and reactor power. A reduction in power will normally alleviate the Overtemperature ΔT condition and may prevent a reactor trip.

The LCO requires all three channels of the Overtemperature ΔT trip Function to be OPERABLE. Note that the Overtemperature ΔT Function receives input from channels shared with other RPS Functions. Failures that affect multiple Functions require entry into the Conditions applicable to all affected Functions.

In MODE 1 or 2, the Overtemperature ΔT trip must be OPERABLE to prevent DNB. In MODE 3, 4, 5, or 6, this

(continued)

The shape of the f(ΔI)penalty is described in the Core Operating Limits Report (COLR).

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

6. Overpower ΔT (continued)

constant utilized in the rate-lag controller for T_{avg}.
Note that this Function also provides a signal to generate a turbine runback prior to reaching the Allowable Value. A turbine runback will reduce turbine power and reactor power. A reduction in power will normally alleviate the Overpower ΔT condition and may prevent a reactor trip.

The LCO requires three channels of the Overpower ΔT trip Function to be OPERABLE. Note that the Overpower ΔT trip Function receives input from channels shared with other RPS Functions. Failures that affect multiple Functions require entry into the Conditions applicable to all affected Functions.

In MODE 1 or 2, the Overpower ΔT trip Function must be OPERABLE. These are the only times that enough heat is generated in the fuel to be concerned about the heat generation rates and overheating of the fuel. In MODE 3, 4, 5, or 6, this trip Function does not have to be OPERABLE because the reactor is not operating and there is insufficient heat production to be concerned about fuel overheating and fuel damage.

7. Pressurizer Pressure

The same sensors provide input to the Pressurizer Pressure - High and - Low trips and the Overtemperature ΔT trip.

a. Pressurizer Pressure - Low

The Pressurizer Pressure - Low trip Function ensures that protection is provided against violating the DNBR limit due to low pressure.

The LCO requires three channels of Pressurizer Pressure - Low to be OPERABLE.

In MODE 1, when DNB is a major concern, the Pressurizer Pressure - Low trip must be OPERABLE. This trip Function is automatically enabled on increasing power by the P-7 interlock (NIS power range P-10 or turbine impulse pressure greater

(continued)

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APPLICABLE SAFETY ANALYSES (continued)

result in meeting the DNBR criterion ~~of ≥ 1.17 for the Standard Mixing Vane fuel, and ≥ 1.141 for the High Thermal Performance fuel (Ref. 2).~~ This is the acceptance limit for the RCS DNB parameters. Changes to the unit that could impact these parameters must be assessed for their impact on the DNBR criteria. The transients analyzed for include loss of coolant flow events and dropped or stuck rod events. A key assumption for the analysis of these events is that the core power distribution is within the limits of LCO 3.1.6, "Control Bank Insertion Limits"; LCO 3.2.3, "AXIAL FLUX DIFFERENCE (AFD)"; and LCO 3.2.4, "QUADRANT POWER TILT RATIO (QPTR)."

The pressurizer pressure limit ~~of 2205 psig~~ and the RCS average temperature limit ~~of 579.4°F~~ correspond ~~to~~ the analytical limits used in the safety analyses~~, with allowance for measurement uncertainty~~.

the

The RCS DNB parameters satisfy Criterion 2 of the NRC Policy Statement.

LCO

This LCO specifies limits on the monitored process variables - pressurizer pressure, RCS average temperature, and RCS total flow rate - to ensure the core operates within the limits assumed in the safety analyses~~,~~ Operating within these limits will result in meeting the DNBR criterion in the event of a DNB limited transient.

RCS total flow rate contains a measurement error ~~of 2.6%~~ based on performing a precision heat balance and using the result to calibrate the RCS flow rate indicators.

The ~~LCO~~ numerical values for pressure, temperature, and flow rate are given for the measurement location ~~but~~ have ~~not~~ been adjusted for instrument error.

and

APPLICABILITY

In MODE 1, the limits on pressurizer pressure, RCS coolant average temperature, and RCS flow rate must be maintained during steady state operation in order to ensure DNBR criteria will be met in the event of an unplanned loss of forced coolant flow or other DNB limited transient. In all

The variables are contained in the COLR to provide operating and analysis flexibility from cycle to cycle. However, the minimum RCS flow is retained in the TS LCO.

specified in the COLR

(continued)

BASES

APPLICABILITY (continued)

other MODES, the power level is low enough that DNB is not a concern.

A Note has been added to indicate the limit on pressurizer pressure is not applicable during short term operational transients such as a THERMAL POWER ramp increase > 5% RTP per minute or a THERMAL POWER step increase > 10% RTP. These conditions represent short term perturbations where actions to control pressure variations might be counterproductive. Also, since they represent transients initiated from power levels < 100% RTP, an increased DNBR margin exists to offset the temporary pressure variations.

The DNBR limit → ~~Another set of limits on DNB related parameters~~ is provided in SL 2.1.1, "Reactor Core SLs." ~~Those limits~~ The conditions which define the DNBR limit are less restrictive than the limits of this LCO, but violation of a Safety Limit (SL) merits a stricter, more severe Required Action. Should a violation of this LCO occur, the operator must check whether or not an SL may have been exceeded.

ACTIONS

A.1

RCS pressure and RCS average temperature are controllable and measurable parameters. With one or both of these parameters not within LCO limits, action must be taken to restore parameter(s).

RCS total flow rate is not a controllable parameter and is not expected to vary during steady state operation. If the indicated RCS total flow rate is below the LCO limit, power must be reduced, as required by Required Action B.1, to restore DNB margin and eliminate the potential for violation of the accident analysis bounds.

The 2 hour Completion Time for restoration of the parameters provides sufficient time to adjust plant parameters, to determine the cause for the off normal condition, and to restore the readings within limits, and is based on plant operating experience.

(continued)