Progress Energy

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December 21, 2006

SERIAL: BSEP 06-0136
TSC-2006-04

10 CFR 50.90

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

Subject: Brunswick Steam Electric Plant, Unit Nos. 1 and 2
Docket Nos. 50-325 and 50-324/License Nos. DPR-71 and DPR-62
Request for License Amendment
Technical Specification 3.4.1, "Recirculation Loops Operating"
Recirculation Loop Operating Requirements

Ladies and Gentlemen:

In accordance with the Code of Federal Regulations, Title 10, Part 50.90, Carolina Power & Light Company (CP&L), now doing business as Progress Energy Carolinas, Inc., is requesting a revision to the Technical Specifications (TSs) for the Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2. The proposed license amendment revises TS 3.4.1, "Recirculation Loops Operating," to require the recirculation loops be operated with matched flows versus recirculation pump speeds as currently required. This change affects the Limiting Condition for Operation (LCO) requirements and Surveillance Requirements of TS 3.4.1. An evaluation of the proposed license amendment is provided in Enclosure 1.

CP&L has evaluated the proposed change in accordance with 10 CFR 50.91(a)(1), using the criteria in 10 CFR 50.92(c), and determined that this change involves no significant hazards considerations.

CP&L is providing, in accordance with 10 CFR 50.91(b), a copy of the proposed license amendment to the designated representative for the State of North Carolina.

CP&L requests approval of the proposed amendment by August 31, 2007, and that once approved, the amendment shall be implemented within 90 days.

No regulatory commitments are contained this submittal. Please refer any questions regarding this submittal to Mr. Randy C. Ivey, Manager - Support Services, at (910) 457-2447.

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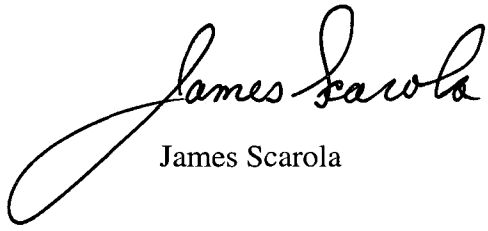
I declare, under penalty of perjury, that the foregoing is true and correct. Executed on December 21, 2006.

Sincerely,



James Scarola

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Enclosures:

1. Evaluation of License Amendment Request
2. Marked-up Technical Specification Pages - Unit 1
3. Typed Technical Specification Pages - Unit 1
4. Typed Technical Specification Pages - Unit 2
5. Marked-up Technical Specification Bases Pages - Unit 1 (For Information Only)

cc (with enclosures):

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Evaluation of Proposed License Amendment Request

Subject: Technical Specification 3.4.1, "Recirculation Loops Operating" Recirculation Loop Operating Requirements

1.0 Description

This letter is a request to amend Renewed Operating Licenses DPR-71 and DPR-62 for the Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2.

The proposed change revises Technical Specification (TS) 3.4.1, "Recirculation Loops Operating," to require the recirculation loops be operated with matched flows versus recirculation pump speeds as currently required. During conversion of the BSEP TSs to the Improved Technical Specifications, as contained in Revision 1 of NUREG-1433, "Standard Technical Specifications General Electric Plants, BWR/4," a more restrictive change was made to require that operating recirculation loops be matched with respect to recirculation pump speeds. This deviated from the wording for Revision 1 of NUREG-1433, in that the NUREG required the loops be matched with respect to flows rather than pump speed. The Improved Technical Specifications were approved for BSEP Units 1 and 2 in Amendments 203 and 233, respectively, on June 5, 1998. Previous to conversion, the BSEP TSs required that two recirculation loops be in operation with no specific requirement for matching of flows or pump speeds. The change in nomenclature was made for operator convenience. Recirculation pump speed indication is readily available to the control room operators; whereas recirculation loop jet pump flow indication is not. As such, pump speed was chosen as the means to verify recirculation loop flow matching. Subsequently, it has been determined that pump speed requirements, established in Surveillance Requirement (SR) 3.4.1.1, are not sufficiently conservative. To remedy this condition, the Limiting Condition for Operation (LCO) requirements of TS 3.4.1 and SR 3.4.1.1 are being revised to require matched recirculation loop jet pump flow, consistent with NUREG-1433.

This condition was discovered on October 27, 2006, and is documented in Nuclear Condition Report 210701. Consistent with the guidance provided in Administrative Letter 98-10, "Disposition of Technical Specifications That Are Insufficient to Assure Plant Safety," dated December 29, 1998, administrative controls have been established to confirm recirculation loop jet pump flows are matched as well as complying with the existing SR 3.4.1.1 requirements. Plant procedure 0PT-13.5, "Reactor Recirculation Pump Differential Speed and Loop Flow Check," was issued, on October 27, 2006, to include the loop flow surveillance requirements.

2.0 Proposed Change

The proposed change revises LCO 3.4.1 to require that two recirculation loops with matched flows be in operation. Currently, LCO 3.4.1 requires that the two recirculation loops have matched recirculation pump speeds. As a result of the revised LCO, SR 3.4.1.1 is being revised

to require verification of matched recirculation loop jet pump flows. The specific wording of the proposed changes follows.

Existing Requirement		Proposed Requirement	
LCO 3.4.1	Two recirculation loops with matched recirculation pump speeds shall be in operation.	LCO 3.4.1	Two recirculation loops with matched flows shall be in operation.
SR 3.4.1.1	----------NOTE---------- Not required to be performed until 24 hours after both recirculation loops are in operation. ---------- Verify the following recirulation pump speed match criteria are satisfied: a. The recirculation pump speeds are ≤ 20% of each other when operating at < 75% of rated core flow; and b. The recirculation pump speeds are ≤ 10% of each other when operating at ≥ 75% of rated core flow.	SR 3.4.1.1	----------NOTE---------- Not required to be performed until 24 hours after both recirculation loops are in operation. ---------- Verify recirculation loop jet pump flow mismatch with both recirculation loops in operations is: a. ≤ 10% of rated core flow when operating at < 75% of rated core flow; and b. ≤ 5% of rated core flow when operating at ≥ 75% of rated core flow.

In summary, the overall affect of the proposed amendment is to implement more conservative requirements associated with recirculation loop operation. These requirements assure that the mismatch between recirculation loop flows remains bounded by existing design bases analyses. These changes are consistent with the current version of the Standard Technical Specifications (i.e., Reference 1: NUREG-1433, Revision 3.1).

For convenience, Enclosure 2 contains a marked-up version of the Unit 1 TSs showing the proposed changes. Since TS Sections 3.4.1 for Unit 1 and Unit 2 are identical, only the mark-up for Unit 1 is provided. Enclosures 3 and 4 provide typed versions of the Unit 1 and Unit 2 TSs, respectively. These typed TS pages are to be used for issuance of the proposed amendment.

Carolina Power & Light Company (CP&L), now doing business as Progress Energy Carolinas, Inc., will make supporting changes to the TS Bases in accordance with TS 5.5.10, "Technical Specifications (TS) Bases Control Program." Enclosure 5 provides marked-up TS Bases pages for Unit 1. These pages are being submitted for information only and do not require issuance by the NRC.

3.0 Background

System Description/Applicable Safety Analysis

The Reactor Recirculation system is designed to provide a forced coolant flow through the core to remove heat from the fuel. The operation of the Reactor Recirculation system is an initial condition assumed in the design basis loss of coolant accident (LOCA). During a LOCA caused by a recirculation loop pipe break, the intact loop is assumed to provide coolant flow during the first few seconds of the accident. The initial core flow decrease is rapid because the recirculation pump in the broken loop ceases to pump reactor coolant to the vessel almost immediately. The pump in the intact loop coasts down relatively slowly. This pump coastdown governs the core flow response for the next several seconds until the jet pump suction is uncovered. The LOCA analysis assumes that both loops are operating at the same flow prior to the accident. However, the LOCA analysis was reviewed for the case with a flow mismatch between the two loops, with the pipe break assumed to be in the loop with the higher flow. While the flow coastdown and core response are potentially more severe in this assumed case (i.e., since the intact loop starts at a lower flow rate and the core response is the same as if both loops were operating at a lower flow rate), a small mismatch has been determined to be acceptable based on engineering judgment. The recirculation system is also assumed to have sufficient flow coastdown characteristics to maintain fuel thermal margins during abnormal operational transients.

Need for Change

On October 27, 2006, as documented in Nuclear Condition Report 210701, CP&L determined that the existing SR 3.4.1.1, which verifies that recirculation pumps speeds are within 20% of each other when operating at less that 75% of rated core flow or within 10% of each other when operating at greater than or equal to 75% of rated core flow, does not provide adequate assurance that the recirculation loops are operating within the initial conditions of the existing LOCA analysis. To be bounded by the existing LOCA analysis, SR 3.4.1.1 must verify that for core flows less than 75% of rated, the loop flows shall be within 10% of rated core flow and for flows greater than or equal to 75% of rated, the loop flows shall be within 5% of rated core flow.

4.0 Technical Analysis

The intent of LCO 3.4.1 and SR 3.4.1.1 is to ensure that the Reactor Recirculation system is operated within the bounds of the existing LOCA analysis, which assumes that both loops are operating at essentially the same flow prior to an accident. For BSEP, GE Nuclear Energy has determined (i.e., Reference 2) that the LOCA analysis assumption is met, for core flows less than 75% of rated, when the recirculation loop flows are operating within 10% of rated core flow and, for flows greater than or equal to 75% of rated, when the recirculation loop flows are within 5% of rated core flow. The same GE Nuclear Energy document indicates that a 5% mismatch in terms of core flow conservatively equates to a 10% mismatch in terms of either loop flow or

pump speed. Based on this guidance, the existing LCO 3.41 and SR 3.4.1.1 requirements were established.

In October 2006, Operations personnel noted that for a small indicated difference in recirculation pump speeds the deviation in loop flow was larger than expected. Based on this observation, Engineering initiated an evaluation of the bases for the criteria established in SR 3.4.1.1. As a result of the evaluation, three concerns were identified with the existing methodology of determining recirculation loop mismatch. The following discussion addresses each area of concern, from most significant to least significant.

Core Flow to Recirculation Pump Speed Correlation

The GE Nuclear Energy guidance indicated that recirculation pump speeds were to be within 20% of each other for core flows less than 75% of rated or within 10% of each other for core flows greater than or equal to 75% of rated. This was based on the determination that a 5% mismatch in terms of core flow conservatively equates to a 10% mismatch in terms of recirculation pump speed. For this 5% core flow to 10% recirculation pump speed correlation to be accurate, the mismatch must be determined based on a ratio of one recirculation pump's speed to the other pump's speed. When SR 3.4.1.1 was implemented at BSEP, the procedure merely subtracted one loop's pump speed from the other loop's pump speed. This effectively doubled the mismatch when equated to core flow.

Hydraulic Interaction

When the GE Nuclear Energy guidance was issued, a one-to-one relationship between speed and flow was assumed to exist based on the pump affinity relationship, which indicates that as the speed of a pumps is changed, the pump flow change will be proportional and the pump differential pressure (dP) change will be proportional to the square of the change in speed. However, when a small speed mismatch occurs, the interaction between dPs causes a greater than one-to-one flow change. The potential for this hydraulic interaction was not clearly addressed in the GE Nuclear Energy guidance and, as a result, was overlooked by CP&L when developing TS 3.4.1.

Scaling

The GE Nuclear Energy guidance indicated the potential need for scaling to account for conditions where the recirculation pump speed scale (i.e., 0 to 100% pump speed) is offset from the 0 to 100% rated core flow range. For example, on Unit 1, 86% to 87% recirculation pump speed is required to achieve 100% of rated core flow and, on Unit 2, 94% to 95% recirculation pump speed is required to reach 100% of rated core flow. Again, the scaling issue was not clearly addressed in the GE Nuclear Energy guidance and, as a result, was overlooked by CP&L when developing TS 3.4.1.

Conclusion

The above factors resulted in the potential that, although meeting the requirements of SR 3.4.1.1, the operating recirculation loops could, in fact, be outside the bounds of the LOCA analysis with respect to core flow.

To remedy this condition, the LCO requirements of TS 3.4.1 and SR 3.4.1.1 are being revised to directly monitor recirculation loop jet pump flows, consistent with the LOCA analysis assumption as well as the current version of the Standard Technical Specifications (i.e., NUREG 1433, Revision 3.1).

5.0 Regulatory Safety Analysis

5.1 No Significant Hazards Consideration

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

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

   Response: No

   The proposed amendment implements more conservative requirements associated with recirculation loop operation. Specifically, the LCO requirements of TS 3.4.1 and SR 3.4.1.1 are being revised to directly monitor recirculation loop jet pump flows versus recirculation pump speed, eliminating potential non-conservatism associated with relating recirculation loop jet pump flow to recirculation pump speed. These requirements assure that the mismatch between recirculation loop jet pump flows are bounded by the existing design bases analyses. As a result, the proposed change ensures that the consequences of a design bases LOCA remain within the existing evaluation.

   The proposed change does not involve a physical change to the Reactor Recirculation system, nor does it alter the assumptions of the accident analyses. Therefore the probability of an accident previously evaluated is not affected.

   Based on the above, the proposed change does not involve a significant 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?

   Response: No

The proposed change does not involve a physical change to the Reactor Recirculation system, nor does it alter the assumptions of the accident analyses. The implementation of more conservative requirements associated with recirculation loop operation does not introduce any new failure modes. 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 a margin of safety?

Response: No

The proposed amendment implements more conservative requirements associated with recirculation loop operation. These requirements ensure that the Reactor Recirculation system is operated consistent with the initial conditions of the existing design bases analyses. Since the design bases analyses assumptions are unchanged, the proposed change does not involve a reduction in a margin of safety.

Based on the above, CP&L concludes that the proposed amendments present 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.

5.2 Applicable Regulatory Requirements/Criteria

The Commission's regulatory requirements related to the content of the TSs are set forth in Title 10 of the Code of Federal Regulations (10 CFR) Section 50.36, "Technical specifications." This regulation requires that the TS include items in five specific categories. These categories include (1) safety limits, limiting safety system settings and limiting control settings, (2) limiting LCOs, (3) SRs, (4) design features, and (5) administrative controls. Additionally, Criterion 2 of 10 CFR 50.36(c)(2)(ii) requires a limiting condition for operation to be established for a process variable, design feature, or operating restriction that is an initial condition of a design-basis accident (DBA) or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier. The proposed change ensures that the LCO and SR associated with operation of the Reactor Recirculation system establish conditions that are consistent with the initial conditions assumed in the LOCA analysis.

The BSEP design was reviewed for construction under the "General Design Criteria for Nuclear Power Plant Construction" issued for comment by the AEC in July 1967 and is committed to meet the intent of the General Design Criteria (GDC), published in the Federal Register on May 21, 1971, as Appendix A to 10 CFR Part 50.

Criterion 10, "Reactor Designs," requires that the reactor core and associated coolant, control, and protective systems be designed with appropriate margins to assure that specified acceptable fuel design limits are not exceeded during normal operation and anticipated operational occurrences. The proposed change does not affect BSEP's compliance with the intent of

GDC 10. Rather, it imposes TS requirements to ensure that the operation of the Reactor Recirculation system is within the bounds of the existing LOCA analysis. This ensures that fuel design limits are not exceeded during normal operation and anticipated operational occurrences.

6.0 Environmental Considerations

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

7.0 References

1. NUREG-1433, Revision 3.1, "Standard Technical Specifications General Electric Plants, BWR/4," dated December 1, 2005.

2. Letter (KFC-37-90) from K. F. Cornewll (GE Nuclear Energy) to Bruce Morgan (CP&L), "Final SLO Operational Guideline Summary," dated April 16, 1990.

Marked-up Technical Specification Pages - Unit 1

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.1 Recirculation Loops Operating

LCO 3.4.1 Two recirculation loops with matched ~~recirculation pump speeds~~ flows shall be in operation,

OR

One recirculation loop may be in operation provided the following limits are applied when the associated LCO is applicable:

a. LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)," single loop operation limits specified in the COLR;

b. LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)," single loop operation limits specified in the COLR; and

c. LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," Function 2.b (Average Power Range Monitors Simulated Thermal Power—High), Allowable Value of Table 3.3.1.1-1 is reset for single loop operation.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of the LCO not met.	A.1 Satisfy the requirements of the LCO.	6 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Action and associated Completion Time of Condition A not met. OR No recirculation loops in operation.	B.1 Be in MODE 3.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.1.1	----------NOTE---------- Not required to be performed until 24 hours after both recirculation loops are in operation. ---------- Verify ~~the following recirculation pump speed match criteria are satisfied~~: a. ~~The recirculation pump speeds are ≤ 20% of each other~~ when operating at < 75% of rated core flow; and ≤ 10% of rated core flow b. ~~The recirculation pump speeds are ≤ 10% of each other~~ when operating at ≥ 75% of rated core flow.	24 hours

recirculation loop jet pump flow mismatch with both recirculation loops in operation is:

≤ 5% of rated core flow

Typed Technical Specification Pages - Unit 1

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.1 Recirculation Loops Operating

LCO 3.4.1 Two recirculation loops with matched flows shall be in operation,

OR

One recirculation loop may be in operation provided the following limits are applied when the associated LCO is applicable:

a. LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)," single loop operation limits specified in the COLR;

b. LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)," single loop operation limits specified in the COLR; and

c. LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," Function 2.b (Average Power Range Monitors Simulated Thermal Power—High), Allowable Value of Table 3.3.1.1-1 is reset for single loop operation.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of the LCO not met.	A.1 Satisfy the requirements of the LCO.	6 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Action and associated Completion Time of Condition A not met. OR No recirculation loops in operation.	B.1 Be in MODE 3.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.1.1	----------NOTE---------- Not required to be performed until 24 hours after both recirculation loops are in operation. ---------- Verify recirculation loop jet pump flow mismatch with both recirculation loops in operation: a. ≤ 10% of rated core flow when operating at < 75% of rated core flow; and b. ≤ 5% of rated core flow when operating at ≥ 75% of rated core flow.	24 hours

Typed Technical Specification Pages - Unit 2

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.1 Recirculation Loops Operating

LCO 3.4.1 Two recirculation loops with matched flows shall be in operation,

OR

One recirculation loop may be in operation provided the following limits are applied when the associated LCO is applicable:

a. LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)," single loop operation limits specified in the COLR;

b. LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)," single loop operation limits specified in the COLR; and

c. LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," Function 2.b (Average Power Range Monitors Simulated Thermal Power—High), Allowable Value of Table 3.3.1.1-1 is reset for single loop operation.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of the LCO not met.	A.1 Satisfy the requirements of the LCO.	6 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Action and associated Completion Time of Condition A not met. OR No recirculation loops in operation.	B.1 Be in MODE 3.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.1.1	----------NOTE---------- Not required to be performed until 24 hours after both recirculation loops are in operation ---------- Verify recirculation loop jet pump flow mismatch with both recirculation loops in operation: a. ≤ 10% of rated core flow when operating at < 75% of rated core flow; and b. ≤ 5% of rated core flow when operating at ≥ 75% of rated core flow.	24 hours

BSEP 06-0136
Enclosure 5

Marked-up Technical Specification Bases Pages - Unit 1
(For Information Only)

BASES

APPLICABLE SAFETY ANALYSES (continued)

A plant specific LOCA analysis has been performed assuming only one operating recirculation loop. This analysis has demonstrated that, in the event of a LOCA caused by a pipe break in the operating recirculation loop, the Emergency Core Cooling System response will provide adequate core cooling, without the requirement to modify the APLHGR requirements (Ref. 3). However, the COLR may require APLHGR limits to restrict the peak clad temperature for a LOCA with a single recirculation loop operating below the corresponding temperature for both loops operating.

The transient analyses of Chapter 15 of the UFSAR have also been performed for single recirculation loop operation (Ref. 3) and demonstrate sufficient flow coastdown characteristics to maintain fuel thermal margins during the abnormal operational transients analyzed without the requirement to modify the MCPR requirements. During single recirculation loop operation, modification to the Reactor Protection System (RPS) average power range monitor (APRM) Simulated Thermal Power—High Allowable Value is required to account for the different analyzed limits between two-recirculation drive flow loop operation and operation with only one loop. The APRM channel subtracts the ΔW value from the measured recirculation drive flow to effectively shift the limits and uses the adjusted recirculation drive flow value to determine the APRM Simulated Thermal Power—High Function trip setpoint.

Recirculation loops operating satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii) (Ref. 4).

LCO

Two recirculation loops are normally required to be in operation with their ~~recirculation pump speeds~~ flows matched within the limits specified in SR 3.4.1.1 to ensure that during a LOCA caused by a break of the piping of one recirculation loop the assumptions of the LOCA analysis are satisfied. Alternately, with only one recirculation loop in operation, modifications to the required APLHGR limits (LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)"), MCPR limits (LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)"), and APRM Simulated Thermal Power—High Allowable Value (LCO 3.3.1.1), as

(continued)

BASES

LCO (continued)

applicable, must be applied to allow continued operation. The COLR defines adjustments or modifications required for the APLHGR and MCPR limits for the current operating cycle.

APPLICABILITY

In MODES 1 and 2, requirements for operation of the Reactor Coolant Recirculation System are necessary since there is considerable energy in the reactor core and the limiting design basis transients and accidents are assumed to occur.

In MODES 3, 4, and 5, the consequences of an accident are reduced and the coastdown characteristics of the recirculation loops are not important.

ACTIONS

A.1

With the requirements of the LCO not met, the recirculation loops must be restored to operation with matched ~~recirculation pump speeds within 6 hours. A recirculation loop is considered not in operation when the pump in that loop is idle or when the difference in pump speeds of the two recirculation pumps is greater than the match criteria. The loop with the lower recirculation pump speed~~ must be considered not in operation. Should a LOCA occur with one recirculation loop not in operation, the core flow coastdown and resultant core response may not be bounded by the LOCA analyses. Therefore, only a limited time is allowed to restore the inoperable loop to operating status.

Alternatively, if the single loop requirements of the LCO are applied to operating limits and RPS setpoints, as applicable, operation with only one recirculation loop would satisfy the requirements of the LCO and the initial conditions of the accident sequence.

The 6 hour Completion Time is based on the low probability of an accident occurring during this time period, on a reasonable time to complete the Required Action (i.e., reset the applicable limits or setpoints for single recirculation loop operation), and on frequent core monitoring by operators allowing abrupt changes in core flow conditions to be quickly detected.

(continued)

flows within 6 hours. A recirculation loop is considered not in operation when the pump in that loop is idle or when the mismatch between total jet pump flows of the two loops is greater than the required limits. The loop with the lower flow

BASES

ACTIONS

A.1 (continued)

This Required Action does not require tripping the recirculation pump ~~with the lowest pump speed when the pump speeds between the two recirculation pumps are greater than the match criteria. However, in cases where large deviations from the recirculation pump speed match criteria occur, low flow or reverse flow can occur in the recirculation loop jet pumps associated with the lower speed recirculation pump~~ causing vibration of the jet pumps. If zero or reverse flow is detected, the condition should be alleviated by changing pump speeds to re-establish forward flow.

in the lowest flow loop when the mismatch between the total jet pump flows of the two loops is greater than the required limits. However, in cases where large flow mismatches occur, low flow or reverse flow can occur in the low flow loop jet pumps.

B.1

With no recirculation loops in operation or the Required Action and associated Completion Time of Condition A not met, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to MODE 3 within 12 hours. In this condition, the recirculation loops are not required to be operating because of the reduced severity of DBAs and minimal dependence on the recirculation loop coastdown characteristics. The allowed 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 plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.4.1.1

This SR ensures the recirculation pump ~~speeds are within the allowable match criteria~~. At low core flow (i.e., < 75% of rated core flow), the MCPR requirements provide larger margins to the fuel cladding integrity Safety Limit such that the potential adverse effect of early boiling transition during a LOCA is reduced. A larger ~~difference between recirculation pump speeds can therefore be allowed when core flow is < 75% of rated core flow. The recirculation pump speed match criteria, as used in this Surveillance, conservatively corresponds to recirculation loop flow match criteria. The 10% match criterion in terms of recirculation pump speed conservatively equates to the 5% match criterion in terms of recirculation loop flow and the 20% match criterion in terms of recirculation pump~~

loops' jet pump flows are within the allowable limits for mismatch

(continued)

flow mismatch can therefore be allowed when core flow is < 75% of rated core flow. The recirculation loop jet pump flow, as used in this Surveillance, is the summation of the flows from all of the jet pumps associated with a single recirculation loop.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.1.1 (continued)

~~speed conservatively equates to the 10% match criterion in terms of recirculation loop flow. The generator speed associated with the recirculation pump motor-generator set may be used to measure recirculation pump speed.~~

~~The match criteria are measured in terms of the percent difference between recirculation pump speeds. If the difference between the recirculation pump speeds exceeds the match criteria, the loop with the lower recirculation pump speed~~ is considered not in operation. The SR is not required when both loops are not in operation since the ~~match criteria~~ are meaningless during single loop or natural circulation operation. The Surveillance must be performed within 24 hours after both loops are in operation. The 24 hour Frequency is consistent with the Surveillance Frequency for jet pump OPERABILITY verification and has been shown by operating experience to be adequate to detect off normal ~~recirculation pump speeds~~ in a timely manner.

REFERENCES

1. UFSAR, Section 5.4.1.3.
2. UFSAR, Chapter 15.
3. NEDC-31776P, Brunswick Steam Electric Plant Units 1 and 2 Single Loop Operation, February 1990.
4. 10 CFR 50.36(c)(2)(ii).