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10 CFR 50.90

RS-03-209

November 3, 2003

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

Dresden Nuclear Power Station, Units 2 and 3
Facility Operating License Nos. DPR-19 and DPR-25
NRC Docket Nos. 50-237 and 50-249

LaSalle County Station, Units 1 and 2
Facility Operating License Nos. NPF-11 and NPF-18
NRC Docket Nos. 50-373 and 50-374

Quad Cities Nuclear Power Station, Units 1 and 2
Facility Operating License Nos. DPR-29 and DPR-30
NRC Docket Nos. 50-254 and 50-265

Subject: Request for Amendment to Technical Specifications to Add Requirement to Modify Linear Heat Generation Rate Limit During Single Recirculation Loop Operation

In accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," Exelon Generation Company, LLC (EGC) requests an amendment to Appendix A, Technical Specifications (TS), of the Facility Operating Licenses listed above. The proposed changes modify TS 3.4.1, "Recirculation Loops Operating," to add a requirement for the linear heat generation rate (LHGR) limits specified in the Core Operating Limits Report (COLR) to be met during single recirculation loop operation.

TS 3.4.1 for Dresden Nuclear Power Station (DNPS) Units 2 and 3, LaSalle County Station (LSCS) Units 1 and 2, and Quad Cities Nuclear Power Station (QCNPS) Units 1 and 2, currently requires limits for average planar linear heat generation rate (APLHGR) and minimum critical power ratio (MCPR), as well as allowable values for certain Reactor Protection System and Control Rod Block functions, to be modified during single recirculation loop operation. The modified limits for APLHGR and MCPR are specified in the COLR. The proposed changes add a requirement to modify the LHGR limit as specified in the COLR with one recirculation loop in operation. Although there is currently no TS requirement to adjust the LHGR limit during single recirculation loop operation, in accordance with NRC Administrative Letter 98-10, "Dispositioning of Technical Specifications that Are Insufficient to Assure Plant Safety," administrative controls are in place at DNPS and QCNPS to ensure that the LHGR limits are appropriately adjusted.

A001

This request is subdivided as follows.

- Attachment 1 provides an evaluation supporting the proposed TS changes.
- Attachment 2 contains the marked-up TS pages with the proposed changes indicated.
- Attachment 3 provides the marked-up TS Bases pages with the proposed changes indicated. The TS Bases pages are provided for information only, and do not require NRC approval.
- Attachment 4 provides revised TS pages with the proposed changes incorporated.

The proposed changes have been reviewed by the Plant Operations Review Committees at each respective station and approved by the Nuclear Safety Review Board in accordance with the requirements of the EGC Quality Assurance Program. EGC requests approval of these changes by November 3, 2004. Once approved, the amendments shall be implemented within 60 days. This implementation period will provide adequate time for station documents to be revised using the appropriate change control mechanisms.

In accordance with 10 CFR 50.91, "Notice for public comment; State consultation," paragraph (b), EGC is notifying the State of Illinois of this application for changes to the TS by transmitting a copy of this letter and its attachments to the designated State Official.

Should you have questions concerning this submittal, please contact Mr. Kenneth M. Nicely at (630) 657-2803.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 3rd day of November 2003.

Respectfully,

Patrick R. Simpson

Patrick R. Simpson
Manager – Licensing

Attachments:

Attachment 1: Description of Proposed Changes, Technical Analysis, and Regulatory Analysis
Attachment 2: Markup of Technical Specification Pages
Attachment 3: Markup of Technical Specification Bases Pages
Attachment 4: Retyped Technical Specification Pages

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Dresden Nuclear Power Station
NRC Senior Resident Inspector – LaSalle County Station
NRC Senior Resident Inspector – Quad Cities Nuclear Power Station
Office of Nuclear Facility Safety – Illinois Department of Nuclear Safety

ATTACHMENT 1
Description of Proposed Changes, Technical Analysis, and Regulatory Analysis

1.0 DESCRIPTION

2.0 PROPOSED CHANGE

3.0 BACKGROUND

4.0 TECHNICAL ANALYSIS

5.0 REGULATORY ANALYSIS

- 5.1 No Significant Hazards Consideration
- 5.2 Applicable Regulatory Requirements/Criteria

6.0 ENVIRONMENTAL CONSIDERATION

7.0 REFERENCES

ATTACHMENT 1
Description of Proposed Changes, Technical Analysis, and Regulatory Analysis

1.0 DESCRIPTION

In accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," Exelon Generation Company, LLC (EGC) requests an amendment to Appendix A, Technical Specifications (TS), to Facility Operating License Nos. DPR-19 and DPR-25 for Dresden Nuclear Power Station (DNPS) Units 2 and 3, Facility Operating License Nos. NPF-11 and NPF-18 for LaSalle County Station (LSCS) Units 1 and 2, and Facility Operating License Nos. DPR-29 and DPR-30 for Quad Cities Nuclear Power Station (QCNPS) Units 1 and 2. The proposed changes modify TS 3.4.1, "Recirculation Loops Operating," to add a requirement for the linear heat generation rate (LHGR) limits specified in the Core Operating Limits Report (COLR) to be met during single loop operation (SLO).

2.0 PROPOSED CHANGE

The proposed change adds a requirement for LHGR limits specified in the COLR to be met during SLO. Specifically, the proposed change revises TS 3.4.1 to add the following statement:

> "c. LCO 3.2.3, "LINEAR HEAT GENERATION RATE (LHGR)," single loop operation limits specified in the COLR;"

The proposed change also re-designates existing LCO 3.4.1.c as LCO 3.4.1.d, and LCO 3.4.1.d as LCO 3.4.1.e to reflect the addition of the new requirement to meet the LHGR limit specified in the COLR during SLO.

A markup of the affected TS pages is provided in Attachment 2. Attachment 3 provides a markup of the affected TS Bases pages. Information contained in Attachment 3 is provided for information only, and does not require NRC approval. Attachment 4 provides revised TS pages with the proposed change incorporated.

EGC has reviewed the proposed changes for impact on previous submittals awaiting NRC approval for DNPS, LSCS, and QCNPS, and has determined that there is no impact to any of them.

3.0 BACKGROUND

The need for the proposed TS change is a result of a change in the treatment of both the maximum average planar linear heat generation rate (MAPLHGR) and the LHGR. The Emergency Core Cooling System (ECCS) analyses establish both MAPLHGR and LHGR limits. The local peaking assumed in the ECCS analyses is flatter (i.e., smaller) than the actual local peaking. Therefore, a fuel assembly operating at the ECCS MAPLHGR limit would have an actual LHGR value above the ECCS analysis value. To accommodate this difference, the actual local peaking may be either: (1) incorporated into the MAPLHGR limit by using a composite ECCS/thermal-mechanical MAPLHGR limit, or (2) incorporated into the exposure dependent LHGR limit monitoring such that the resultant LHGR limit remains within the ECCS analysis basis as well as remaining within the fuel thermal-mechanical basis.

The ECCS analyses also establish a MAPLHGR multiplier in order to limit the peak cladding temperature (PCT) increase during SLO. When the SLO multiplier is developed, both the LHGR and MAPLHGR values are reduced in the ECCS analyses until the PCT passes the acceptance criterion.

The change in the three-dimensional core simulator used for core licensing calculations for DNPS, LSCS, and QCNPS from PANAC10 to PANAC11 accentuates the difference in the treatment of the MAPLHGR and LHGR limits. PANACEA is a static, three-dimensional coupled nuclear-thermal-hydraulic computer program representing a boiling water reactor core. The program was approved by the NRC as part of Amendment 26 to General Electric's Standard Application for Reactor Fuel (GESTAR) in Reference 1, and is used by General Electric during the core design process for detailed three-dimensional design and operational calculations of neutron flux, power distributions, and thermal performance as a function of control rod position, refueling pattern, coolant flow, reactor pressure, and other operational and design variables.

PANAC10 contains a provision for a SLO MAPLHGR multiplier. A SLO LHGR multiplier is not needed when monitoring or designing with PANAC10 because composite ECCS/thermal-mechanical MAPLHGR limits are used and the SLO MAPLHGR multiplier is sufficient to ensure that the SLO PCT is bounded by the two loop PCT.

When designing or monitoring with PANAC11, LHGR can now be treated independently from MAPLHGR, providing more flexibility and improved accuracy. PANAC11 contains a provision for a SLO MAPLHGR multiplier. However, the MAPLHGR limit used with PANAC11 is based on the ECCS PCT limit whereas the fuel thermal-mechanical limits are addressed separately using an exposure dependent LHGR limit. Since ECCS and thermal-mechanical limits are analyzed and monitored separately, a SLO LHGR multiplier is also required to be consistent with the ECCS SLO analysis and ensure that the SLO PCT is bounded by the two loop PCT.

TS 3.4.1 currently lists the core thermal limits that must be adjusted during SLO (i.e., average planar linear heat generation rate and minimum critical power ratio). A revision to TS 3.4.1 is needed to ensure that the LHGR limit is also adjusted during SLO, since a SLO LHGR multiplier is required to be consistent with the ECCS analyses.

DNPS and QCNPS currently use PANAC11 for core licensing calculations. Although there is currently no TS requirement to adjust the LHGR limit during single recirculation loop operation, in accordance with Reference 2, administrative controls are in place at DNPS and QCNPS to ensure that the LHGR limits are appropriately adjusted. In addition, PANAC11 will be used for future core reload designs at LSCS.

4.0 TECHNICAL ANALYSIS

The LHGR is a measure of the heat generation rate of a fuel rod in a fuel assembly at any axial location. Limits on the LHGR are specified to ensure that fuel design limits are not exceeded anywhere in the core during normal operation, including anticipated operational occurrences (AOOs), and to ensure that the PCT during a postulated design basis LOCA does not exceed the limits specified in 10 CFR 50.46. Exceeding the LHGR limit could potentially result in fuel damage and subsequent release of radioactive materials. Fuel design limits are specified to

ensure that fuel system damage, fuel rod failure, or inability to cool the fuel does not occur during the normal operations and anticipated operating conditions.

The LHGR is a basic assumption in the fuel design analysis. The fuel has been designed to operate at rated core power with sufficient design margin to the LHGR calculated to cause a 1% fuel cladding plastic strain and centerline melting of the fuel during AOOs and steady state operation. Reference 3 defines a value of 1% plastic strain of the fuel cladding as the limit below which fuel damage caused by overstraining of the fuel cladding is not expected to occur.

LOCA-based LHGR limits, including the SLO LHGR multiplier, are calculated in accordance with SAFER/GESTR methodology (i.e., Reference 4), which was approved by the NRC in Reference 5. The SAFER/GESTR methodology requires the following limits to be met when performing LOCA analyses.

1. 10 CFR 50 Appendix K licensing basis PCT less than 2200°F
2. Upper bound PCT (UBPCT) less than licensing basis PCT

The criteria for conservatism of the calculation with 10 CFR 50 Appendix K assumptions relative to UBPCT is assured by determining a LHGR and MAPLHGR multiplier that maintains the SLO PCT below the two-loop PCT. The fuel LHGR is significant in determining the PCT during LOCA analyses. At lower core flow conditions, such as during SLO, operation with the rated LHGR value could drive the PCT above the two-loop PCT. In order to prevent the SLO point from being the limiting operating point, the LHGR and MAPLHGR are reduced until the PCT is below the two-loop PCT. The application of these LHGR and MAPLHGR limits at SLO conditions prevent the SLO point from being more limiting than the limiting power/flow point during normal two-loop plant operation.

The SLO LHGR limit is determined by iterating on the LHGR and MAPLHGR until the PCT is below the two-loop PCT. The ratio of single loop to two-loop LHGR and MAPLHGR that maintains PCT below the two-loop value is the LHGR and MAPLHGR multiplier. This process is performed using the NRC-approved SAFER/GESTR methodology (i.e., Reference 4).

TS 5.6.5, "CORE OPERATING LIMITS REPORT (COLR)," requires core operating limits to be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and documented in the COLR to ensure that all applicable limits of the safety analysis are met. Therefore, calculation of the SLO LHGR limit is required on a cycle-specific basis.

5.0 REGULATORY ANALYSIS

5.1 No Significant Hazards Consideration

According to 10 CFR 50.92, "Issuance of amendment," paragraph (c), a proposed amendment to an operating license involves no significant hazards consideration if operation of the facility in accordance with the proposed amendment would not:

(1) Involve a significant increase in the probability or consequences of an accident previously evaluated; or

(2) Create the possibility of a new or different kind of accident from any accident previously evaluated; or

(3) Involve a significant reduction in a margin of safety.

In accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," Exelon Generation Company, LLC (EGC) requests an amendment to Appendix A, Technical Specifications (TS), to Facility Operating License Nos. DPR-19 and DPR-25 for Dresden Nuclear Power Station (DNPS) Units 2 and 3, Facility Operating License Nos. NPF-11 and NPF-18 for LaSalle County Station (LSCS) Units 1 and 2, and Facility Operating License Nos. DPR-29 and DPR-30 for Quad Cities Nuclear Power Station (QCNPS) Units 1 and 2. The proposed change revises TS 3.4.1, "Recirculation Loops Operating," to add a requirement for linear heat generation rate (LHGR) limits specified in the Core Operating Limits Report (COLR) to be met during single loop operation (SLO). The proposed change also re-designates existing limiting condition for operation (LCO) 3.4.1.c as LCO 3.4.1.d, and LCO 3.4.1.d as LCO 3.4.1.e to reflect the addition of the new requirement.

The need for the proposed TS change is a result of the MAPLHGR and LHGR limits being treated separately rather than as a composite limit. The change in the treatment of these limits is accentuated by the change in the core design software from PANAC10 to PANAC11. With PANAC11, LHGR can be treated independently from maximum average planar linear heat generation rate (MAPLHGR), providing more operating flexibility and improved accuracy. Since LHGR and MAPLHGR are monitored separately, a SLO LHGR multiplier is required to be consistent with the loss-of-coolant accident (LOCA) analyses.

EGC has evaluated the proposed change using the criteria in 10 CFR 50.92, and has determined that the proposed change does not involve a significant hazards consideration. The following information is provided to support a finding of no significant hazards consideration.

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

Response: No

The probability of an evaluated accident is derived from the probabilities of the individual precursors to that accident. The consequences of an evaluated accident are determined by the operability of plant systems designed to mitigate those consequences. The LHGR is a measure of the heat generation rate of a fuel rod in a fuel assembly at any axial location. Limits on the LHGR are specified to ensure that fuel design limits are not exceeded anywhere in the core during normal operation, including anticipated operational occurrences, and to ensure that the peak cladding temperature (PCT) during a postulated design basis LOCA does not exceed the limits specified in 10 CFR 50.46.

LHGR limits have been established consistent with the NRC-approved GESTAR methodology to ensure that fuel performance during normal, transient, and accident conditions is acceptable. The proposed change establishes a requirement for LHGR limits to be modified, as specified in the COLR, during SLO such that the fuel is protected during SLO and during any plant transients or anticipated operational occurrences that may occur while in SLO.

Modifying the LHGR limits during SLO does not increase the probability of an evaluated accident. The proposed change does not require any physical plant modifications, physically affect any plant components, or entail changes in plant operation. Therefore, no individual precursors of an accident are affected.

Limits on the LHGR are specified to ensure that fuel design limits are not exceeded anywhere in the core during normal operation, including anticipated operational occurrences, and to ensure that the PCT during a postulated design basis LOCA does not exceed the limits specified in 10 CFR 50.46. This will ensure that the fuel design safety criteria (i.e., less than 1% plastic strain of the fuel cladding and no fuel centerline melting) are met and that the core remains in a coolable geometry following a postulated design basis LOCA. Since the operability of plant systems designed to mitigate any consequences of accidents has not changed, the consequences of an accident previously evaluated are not expected to increase.

Therefore, the proposed changes do 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

Creation of the possibility of a new or different kind of accident would require the creation of one or more new precursors of that accident. New accident precursors may be created by modifications of the plant configuration, including changes in allowable modes of operation. The proposed changes does not involve any modifications of the plant configuration or allowable modes of operation. Requiring the LHGR limits to be modified for SLO by applying the SLO LHGR multiplier ensures that the assumptions of the LOCA analyses are met.

Therefore, the proposed changes do not create the possibility of a new or different kind of accident from any previously evaluated.

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

Response: No

The margin of safety is established through equipment design, operating parameters, and the setpoints at which automatic actions are initiated. The proposed change will not adversely affect operation of plant equipment. The change will not result in a change to the setpoints at which protective actions are initiated. LHGR limits during SLO are established to ensure that the PCT during a postulated design basis LOCA does not exceed the limits specified in 10 CFR 50.46. This will ensure that the core remains in a coolable geometry following a postulated design basis LOCA. The proposed change will ensure the appropriate level of fuel protection.

Therefore, the proposed changes do not involve a significant reduction in a margin of safety.

Based upon the above, EGC concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c). Accordingly, a finding of no significant hazards consideration is justified.

5.2 Applicable Regulatory Requirements/Criteria

10 CFR 50.36, "Technical specifications," provides the regulatory requirements for the content required in a licensee's TS. 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 or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," establishes the acceptance criteria for the design basis LOCA. Specifically, paragraph (b)(1) requires the calculated maximum fuel element cladding temperature (i.e., PCT) to not exceed 2200°F.

The specific LHGR limits to be applied during single recirculation loop operation are evaluated each fuel cycle and documented in the COLR. The limits are established to ensure that the PCT during a design basis LOCA does not exceed 2200°F, thus the requirements of 10 CFR 50.46(b)(1) are satisfied.

The proposed change to TS 3.4.1 ensures that the LHGR limit is adjusted during single recirculation loop operation. In addition, the LHGR satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii) for the reasons described above.

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

6.0 ENVIRONMENTAL CONSIDERATION

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, "Standards for Protection Against Radiation," 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, "Criterion for categorical exclusion; identification of licensing and regulatory actions eligible for categorical exclusion or otherwise not requiring environmental review," paragraph (c)(9). Therefore, pursuant to 10 CFR 51.22, paragraph (b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

7.0 REFERENCES

1. Letter from S. A. Richards (U. S. NRC) to G. A. Watford (GE Nuclear Energy), "Amendment 26 to GE Licensing Topical Report NEDE-24011-P-A, 'GESTAR II' Implementing Improved GE Steady-State Methods (TAC No. MA6481)," dated November 10, 1999

2. NRC Administrative Letter 98-10, "Dispositioning of Technical Specifications that Are Insufficient to Assure Plant Safety," dated December 29, 1998

3. NUREG-0800, Section 4.2.II A.2(g), Revision 2, July 1981

4. NEDE-23785-1-PA, "The GESTR-LOCA and SAFER Models for the Evaluation of the Loss-of-Coolant Accident, Volume III, SAFER/GESTR Application Methodology," dated October 1984

5. Letter from C. O. Thomas (U. S. NRC) to J. F. Quirk (General Electric), "Acceptance for Referencing of Licensing Topical Report NEDE-23785, Revision 1, Volume III (P), 'The GESTR-LOCA and SAFER Models for the Evaluation of the Loss-of-Coolant Accident,'" dated June 1, 1984

ATTACHMENT 2
Markup of Technical Specification Pages

Request for Amendment to Technical Specifications to Add Requirement to Modify Linear Heat Generation Rate Limit During Single Recirculation Loop Operation

DRESDEN NUCLEAR POWER STATION, UNITS 2 AND 3
FACILITY OPERATING LICENSE NOS. DPR-19 AND DPR-25

REVISED TECHNICAL SPECIFICATIONS PAGE

3.4.1-1

LASALLE COUNTY STATION, UNITS 1 AND 2
FACILITY OPERATING LICENSE NOS. NPF-11 AND NPF-18

REVISED TECHNICAL SPECIFICATIONS PAGE

3.4.1-1

QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2
FACILITY OPERATING LICENSE NOS. DPR-29 AND DPR-30

REVISED TECHNICAL SPECIFICATIONS PAGE

3.4.1-1

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 shall be in operation with the following limits 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;

~~c.~~ d. LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," Function 2.b (Average Power Range Monitors Flow Biased Neutron Flux–High), Allowable Value of Table 3.3.1.1-1 is reset for single loop operation; and

~~d.~~ c. LCO 3.3.2.1, "Control Rod Block Instrumentation," Function 1.a (Rod Block Monitor–Upscale), Allowable Value of Table 3.3.2.1-1 is reset for single loop operation.

c. LCO 3.2.3, "LINEAR HEAT GENERATION RATE (LHGR)," single loop operation limits specified in the COLR;

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. No recirculation loops in operation.	A.1 Be in MODE 2.	8 hours
	AND	
	A.2 Be in MODE 3.	12 hours

(continued)

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 within Region III of Figure 3.4.1-1.

OR

One recirculation loop shall be in operation within Region III of Figure 3.4.1-1 with the following limits 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;

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

d. LCO 3.3.2.1, "Control Rod Block Instrumentation," Function 1.a (Rod Block Monitor—Upscale), Allowable Value of Table 3.3.2.1-1, specified in the COLR, is reset for single loop operation.

APPLICABILITY: MODES 1 and 2.

c. LCO 3.2.3, "LINEAR HEAT GENERATION RATE (LHGR)," single loop operation limits specified in the COLR;

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 shall be in operation with the following limits 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;

c. LCO 3.2.3, "LINEAR HEAT GENERATION RATE (LHGR)," Single loop operation limits specified in the COLR;

d. LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," Function 2.b (Average Power Range Monitors Flow Biased Neutron Flux—High), Allowable Value of Table 3.3.1.1-1 is reset for single loop operation; and

e. LCO 3.3.2.1, "Control Rod Block Instrumentation," Function 1.a (Rod Block Monitor—Upscale), Allowable Value of Table 3.3.2.1-1 is reset for single loop operation.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. No recirculation loops in operation.	A.1 Be in MODE 2.	8 hours
	AND	
	A.2 Be in MODE 3.	12 hours

(continued)

ATTACHMENT 3
Markup of Technical Specification Bases Pages

Request for Amendment to Technical Specifications to Add Requirement to Modify Linear Heat Generation Rate Limit During Single Recirculation Loop Operation

DRESDEN NUCLEAR POWER STATION, UNITS 2 AND 3
FACILITY OPERATING LICENSE NOS. DPR-19 AND DPR-25

REVISED TECHNICAL SPECIFICATIONS BASES PAGES

B 3.2.3-1
B 3.2.3-4
B 3.4.1-3
B 3.4.1-5
B 3.4.1-6

LASALLE COUNTY STATION, UNITS 1 AND 2
FACILITY OPERATING LICENSE NOS. NPF-11 AND NPF-18

REVISED TECHNICAL SPECIFICATIONS BASES PAGES

B 3.2.3-1
B 3.2.3-3
B 3.4.1-3
B 3.4.1-4
B 3.4.1-8
B 3.4.1-9

QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2
FACILITY OPERATING LICENSE NOS. DPR-29 AND DPR-30

REVISED TECHNICAL SPECIFICATIONS BASES PAGES

B 3.2.3-1
B 3.2.3-3
B 3.4.1-3
B 3.4.1-5
B 3.4.1-6

Insert 1

anticipated operational occurrences, and to ensure that the peak cladding temperature (PCT) during the postulated design basis loss of coolant accident (LOCA) does not exceed the limits specified in 10 CFR 50.46

Insert 2

LHGR limits (LCO 3.2.3, "LINEAR HEAT GENERATION RATE (LHGR)"),

Insert 3

3. XN-NF-80-19(P)(A), Advanced Nuclear Fuel Methodology for Boiling Water Reactors.
4. XN-NF-81-58(P)(A), RODEX2 Fuel Rod Thermal-Mechanical Response Evaluation Model.
5. NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel" (as specified in Technical Specification 5.6.5).
6. EMF-85-74(P)(A), RODEX2A (BWR) Fuel Rod Thermal-Mechanical Evaluation Model.

B 3.2 POWER DISTRIBUTION LIMITS

B 3.2.3 LINEAR HEAT GENERATION RATE (LHGR)

BASES

BACKGROUND

The LHGR is a measure of the heat generation rate of a fuel rod in a fuel assembly at any axial location. Limits on LHGR are specified to ensure that fuel design limits are not exceeded anywhere in the core during normal operation, (i.e., steady state). Exceeding the LHGR limit could potentially result in fuel damage and subsequent release of radioactive materials. Fuel design limits are specified to ensure that fuel system damage, fuel rod failure, or inability to cool the fuel does not occur during the normal operations and anticipated operating conditions identified in References 1 and 2.

INSERT 1

1, 2, 3, 4, 5, and 6

APPLICABLE SAFETY ANALYSES

The analytical methods and assumptions used in evaluating the fuel system design are presented in References 1 and 2. The fuel assembly is designed to ensure (in conjunction with the core nuclear and thermal hydraulic design, plant equipment, instrumentation, and protection system) that fuel damage will not result in the release of radioactive materials in excess of the guidelines of 10 CFR, Parts 20, 50, and 100. A mechanism that could cause fuel damage during normal operations and operational transients and that is considered in fuel evaluations is a rupture of the fuel rod cladding caused by strain from the relative expansion of the UO_2 pellet.

and establish LHGR limits

A value of 1% plastic strain of the fuel cladding has been defined as the limit below which fuel damage caused by overstraining of the fuel cladding is not expected to occur (Ref. 2). 7

Fuel design evaluations have been performed and demonstrate that the 1% fuel cladding plastic strain design limit is not exceeded during continuous operation with LHGRs up to the operating limit specified in the COLR. The analysis also includes allowances for short term transient excursions above the operating limit while still remaining within the AOO limits, plus an allowance for densification power spiking.

Flow-dependent LHGR limits, LHGRFAC(F), were designed to assure adherence to all fuel thermal-mechanical

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(continued)

BASES (continued)

REFERENCES

1. UFSAR, Chapter 4.

2. UFSAR, Chapter 15.

7 8 NUREG-0800, Section 4.2.II.A.2(g), Revision 2, July 1981.

INSERT 3

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, provided the APLHGR requirements are modified accordingly (Ref. 1).

and LHGR

The transient analyses in 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 provided the MCPR requirements are modified. During single recirculation loop operation, modification to the Reactor Protection System (RPS) average power range monitor (APRM) and the Rod Block Monitor Allowable Values is also required to account for the different relationships between recirculation drive flow and reactor core flow. The APLHGR, LHGR, and MCPR limits for single loop operation are specified in the COLR. The APRM Flow Biased Neutron Flux—High Allowable Value is in LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation." The Rod Block Monitor—Upscale Allowable Value is in LCO 3.3.2.1, "Control Rod Block Instrumentation."

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

LCO

Two recirculation loops are normally required to be in operation with their 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. Alternatively, 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)"), APRM Flow Biased Neutron Flux—High Allowable Value (LCO 3.3.1.1), and the Rod Block Monitor—Upscale Allowable Value (LCO 3.3.2.1) must be applied to allow continued operation consistent with the assumptions of Reference 1.

INSERT 2

(continued)

BASES

ACTIONS

B.1 and C.1 (continued)

With the requirements of the LCO not met for reasons other than Condition A or B (e.g., one loop "not in operation"), the recirculation loops must be restored to operation with matched flows within 24 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 required limits for greater than 2 hours (i.e., Required Action B.1 has been taken). 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 the APLHGR, LHGR, and MCPR operating limits and RPS and RBM Allowable Values, operation with only one recirculation loop would satisfy the requirements of the LCO and the initial conditions of the accident sequence.

The 2 hour and 24 hour Completion Times are based on the low probability of an accident occurring during this time period, on a reasonable time to complete the Required Action, and on frequent core monitoring by operators allowing abrupt changes in core flow conditions to be quickly detected.

D.1

With the Required Action and associated Completion Time of Condition C 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.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.4.1.1

, LHGR,

This SR ensures the recirculation loops are within the allowable limits for mismatch. At low core flow (i.e., < 70% of rated core flow), the APLHGR and 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 flow mismatch can therefore be allowed when core flow is < 70% of rated core flow. The jet pump loop flow, as used in this Surveillance, is the summation of the flows from all of the jet pumps associated with a single recirculation loop.

The mismatch is measured in terms of percent of rated core flow. If the flow mismatch exceeds the specified limits, the loop with the lower flow is considered not in operation. This SR is not required when both loops are not in operation since the mismatch limits 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 jet pump loop flows in a timely manner.

REFERENCES

1. UFSAR, Section 6.3.3.3.

2. UFSAR, Chapter 15.

3. UFSAR, Section 15.3.1.

B 3.2 POWER DISTRIBUTION LIMITS

B 3.2.3 LINEAR HEAT GENERATION RATE (LHGR)

BASES

BACKGROUND

The LHGR is a measure of the heat generation rate of a fuel rod in a fuel assembly at any axial location. Limits on the LHGR are specified to ensure that fuel design limits are not exceeded anywhere in the core during normal operation, including anticipated operational occurrences (AOOs). Exceeding the LHGR limit could potentially result in fuel damage and subsequent release of radioactive materials. Fuel design limits are specified to ensure that fuel system damage, fuel rod failure or inability to cool the fuel does not occur during the normal operations and anticipated operating conditions identified in References 1 and 2.

INSERT 1

APPLICABLE SAFETY ANALYSES

The analytical methods and assumptions used in evaluating the fuel system design are presented in References 1 and 2. The fuel assembly is designed to ensure (in conjunction with the core nuclear and thermal hydraulic design, plant equipment, instrumentation, and protection system) that fuel damage will not result in the release of radioactive materials in excess of the guidelines of 10 CFR, Parts 20, 50, and 100. A mechanism that could cause fuel damage during normal operations and operational transients and that is considered in fuel evaluations is a rupture of the fuel rod cladding caused by strain from the relative expansion of the UO_2 pellet.

and establish LHGR limits

1, 2, 3, 4, 5, and 6

A value of 1% plastic strain of the fuel cladding has been defined as the limit below which fuel damage caused by overstraining of the fuel cladding is not expected to occur (Ref. 3).

7

Fuel design evaluations have been performed and demonstrate that the 1% fuel cladding plastic strain design limit is not exceeded during continuous operation with LHGRs up to the operating limit specified in the COLR. The analysis also includes allowances for short term transient excursions above the operating limit while still remaining within the AOO limits, plus an allowance for densification power spiking.

The LHGR satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.2.3.1 (continued)

the assumptions of the safety analysis. The 24 hour Frequency is based on both engineering judgment and recognition of the slowness of changes in power distribution under normal conditions. The 12 hour allowance after THERMAL POWER ≥ 25% RTP is achieved is acceptable given the inherent margin to operating limits at lower power levels.

REFERENCES

1. UFSAR, Chapter 4.

2. UFSAR, Chapter 15.

7 → 3. NUREG-0800, Section 4.2.II A.2(g), Revision 2, July 1981.

INSERT 3

BASES

APPLICABLE SAFETY ANALYSES (continued)

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 (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 judgement.

The recirculation system is also assumed to have sufficient flow coastdown characteristics to maintain fuel thermal margins during abnormal operational transients (Ref. 2), which are analyzed in Chapter 15 of the UFSAR.

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, provided the APLHGR requirements are modified accordingly (Ref. 3).

and LHGR

The transient analyses in 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 provided the MCPR requirements are modified. During single recirculation loop operation, modification to the Reactor Protection System average power range monitor (APRM) and the Rod Block Monitor (RBM) Allowable Values is also required to account for the different relationships between recirculation drive flow and reactor core flow. The APLHGR, LHGR, and MCPR limits for single loop operation are specified in the COLR. The APRM Flow Biased Simulated Thermal Power-Upscale Allowable Value is in LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation." The Rod Block Monitor-Upscale Allowable Value is specified in the COLR. Safety analyses performed in References 1, 2, and 3 implicitly assume core conditions are stable. However, during operation at the high power/low flow region of the operating domain, a small probability of limit cycle neutron flux oscillations exists depending on combinations of operating conditions (e.g., power shape, bundle power, and bundle flow).

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

General Electric (GE) Service Information Letter (SIL) No. 380 (Ref. 4) addressed boiling instability and made several recommendations. In this SIL, the power/flow operating map was divided into several regions of varying concern. It also discussed the objectives and philosophy of "detect and suppress."

NRC Generic Letter 86-02 (Ref. 5) discussed both the GE and Siemens stability methodology and stated that due to uncertainties, 10 CFR 50, Appendix A, General Design Criteria (GDC) 10 and 12 could not be met using available analytical procedures on a BWR. The Generic Letter discussed SIL 380 and stated that GDC 10 and 12 could be met by imposing SIL 380 recommendations in operating regions of potential instability. The NRC concluded that regions of potential instability constituted decay ratios of 0.8 and greater by the GE methodology and 0.75 by the Siemens methodology. Figure 3.4.1-1 was generated as an interim solution to provide an increased margin of safety until the investigation is completed (Ref. 6)

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

LCO

INSERT 2

Two recirculation loops are normally required to be in operation with their 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. With the limits specified in SR 3.4.1.1 not met, the recirculation loop with the lower flow must be considered not in operation. 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)"), APRM Flow Biased Simulated Thermal Power—Upscale Allowable Value (LCO 3.3.1.1), and the Rod Block Monitor—Upscale Allowable Value (LCO 3.3.2.1) must be applied to allow continued operation consistent with the assumptions of Reference 3. In addition, during two-loop and single-loop

(continued)

BASES

ACTIONS (continued)

F.1 and G.1

With both recirculation loops operating but the flows not matched, the flows must be matched within 2 hours. If matched flows are not restored, the recirculation loop with lower flow must be declared "not in operation," as required by Required Action F.1. This Required Action does not require tripping the recirculation pump in the lowest flow loop when the mismatch between 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, causing vibration of the jet pumps. If zero or reverse flow is detected, the condition should be alleviated by changing flow control valve position to re-establish forward flow or by tripping the pump.

With the requirements of the LCO not met for reasons other than Conditions A, C, D, and F (e.g., one loop is "not in operation"), compliance with the LCO must be restored within 24 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 required limits for greater than 2 hours (i.e., Required Action F.1 has been taken). 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 the APLHGR, LHGR, and MCPR operating limits and RPS and RBM Allowable Values, operation with only one recirculation loop would satisfy the requirements of the LCO and the initial conditions of the accident sequence.

The 2 hour and 24 hour Completion Times are based on the low probability of an accident occurring during this time period, on a reasonable time to complete the Required Action, and on frequent core monitoring by operators allowing abrupt changes in core flow conditions to be quickly detected.

(continued)

BASES

ACTIONS (continued)

H.1

If the Required Action and associated Completion Time of Condition G is not met, the unit is required to 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

, LHGR,

This SR ensures the recirculation loop flows are within the allowable limits for mismatch. At low core flow (i.e., < 70% of rated core flow), the APLHGR and 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 flow mismatch can therefore be allowed when core flow is < 70% 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.

The mismatch is measured in terms of percent of rated core flow. If the flow mismatch exceeds the specified limits, the loop with the lower flow is considered not in operation. This SR is not required when both loops are not in operation since the mismatch limits 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 Frequency for jet pump OPERABILITY verification and has been shown by operating experience to be adequate to detect off normal jet pump loop flows in a timely manner.

(continued)

B 3.2 POWER DISTRIBUTION LIMITS

B 3.2.3 LINEAR HEAT GENERATION RATE (LHGR)

BASES

BACKGROUND

The LHGR is a measure of the heat generation rate of a fuel rod in a fuel assembly at any axial location. Limits on LHGR are specified to ensure that fuel design limits are not exceeded anywhere in the core during normal operation, including anticipated operational occurrences (AOOs). Exceeding the LHGR limit could potentially result in fuel damage and subsequent release of radioactive materials. Fuel design limits are specified to ensure that fuel system damage, fuel rod failure, or inability to cool the fuel does not occur during the normal operations and anticipated operating conditions identified in References 1 and 2.

INSERT 1

APPLICABLE SAFETY ANALYSES

The analytical methods and assumptions used in evaluating the fuel system design and establish LHGR limits are presented in References 1 and 2 1,2,3,4,5, and 6. The fuel assembly is designed to ensure (in conjunction with the core nuclear and thermal hydraulic design, plant equipment, instrumentation, and protection system) that fuel damage will not result in the release of radioactive materials in excess of the guidelines of 10 CFR, Parts 20, 50, and 100. A mechanism that could cause fuel damage during normal operations and operational transients and that is considered in fuel evaluations is a rupture of the fuel rod cladding caused by strain from the relative expansion of the UO_2 pellet.

A value of 1% plastic strain of the fuel cladding has been defined as the limit below which fuel damage caused by overstraining of the fuel cladding is not expected to occur (Ref. 3 7).

Fuel design evaluations have been performed and demonstrate that the 1% fuel cladding plastic strain design limit is not exceeded during continuous operation with LHGRs up to the operating limit specified in the COLR. The analysis also includes allowances for short term transient excursions above the operating limit while still remaining within the AOO limits, plus an allowance for densification power spiking.

(continued)

BASES (continued)

ACTIONS

A.1

If any LHGR exceeds its required limit, an assumption regarding an initial condition of the fuel design analysis is not met. Therefore, prompt action should be taken to restore the LHGR(s) to within its required limits such that the plant is operating within analyzed conditions. The 2 hour Completion Time is normally sufficient to restore the LHGR(s) to within its limits and is acceptable based on the low probability of a transient or Design Basis Accident occurring simultaneously with the LHGR out of specification.

B.1

If the LHGR cannot be restored to within its required limits within the associated Completion Time, the plant must be brought to a MODE or other specified condition in which the LCO does not apply. To achieve this status, THERMAL POWER is reduced to < 25% RTP within 4 hours. The allowed Completion Time is reasonable, based on operating experience, to reduce THERMAL POWER TO < 25% RTP in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.2.3.1

The LHGRs are required to be initially calculated within 12 hours after THERMAL POWER is ≥ 25% RTP and then every 24 hours thereafter. They are compared to the LHGR limits in the COLR to ensure that the reactor is operating within the assumptions of the safety analysis. The 24 hour Frequency is based on both engineering judgment and recognition of the slow changes in power distribution during normal operation. The 12 hour allowance after THERMAL POWER ≥ 25% RTP is achieved is acceptable given the large inherent margin to operating limits at lower power levels.

REFERENCES

1. UFSAR, Chapter 4.

2. UFSAR, Chapter 15.

7 8. NUREG-0800, Section 4.2.II.A.2(g), Revision 2, July 1981.

INSERT 3

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, provided the APLHGR requirements are modified accordingly (Ref. 3). and LHGR

The transient analyses in Chapter 15 of the UFSAR have also been performed for single recirculation loop operation (Ref. 4) and demonstrate sufficient flow coastdown characteristics to maintain fuel thermal margins during the abnormal operational transients analyzed provided the MCPR requirements are modified. During single recirculation loop operation, modification to the Reactor Protection System (RPS) average power range monitor (APRM) and the Rod Block Monitor Allowable Values is also required to account for the different relationships between recirculation drive flow and reactor core flow. The APLHGR, LHGR, and MCPR limits for single loop operation are specified in the COLR. The APRM Flow Biased Neutron Flux—High Allowable Value is in LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation." The Rod Block Monitor—Upscale Allowable Value is in LCO 3.3.2.1, "Control Rod Block Instrumentation."

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

LCO

Two recirculation loops are normally required to be in operation with their 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. Alternatively, 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)"), INSERT 2 APRM Flow Biased Neutron Flux—High Allowable Value (LCO 3.3.1.1), and the Rod Block Monitor—Upscale Allowable Value (LCO 3.3.2.1) must be applied to allow continued operation consistent with the assumptions of Reference 3.

(continued)

BASES

ACTIONS

B.1 and C.1 (continued)

With the requirements of the LCO not met for reasons other than Condition A or B (e.g., one loop is "not in operation"), the recirculation loops must be restored to operation with matched flows within 24 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 required limits for greater than 2 hours (i.e., Required Action B.1 has been taken). 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.

, LHGR,

Alternatively, if the single loop requirements of the LCO are applied to the APLHGR and MCPR operating limits and RPS and RBM Allowable Values, operation with only one recirculation loop would satisfy the requirements of the LCO and the initial conditions of the accident sequence.

The 2 hour and 24 hour Completion Times are based on the low probability of an accident occurring during this time period, on a reasonable time to complete the Required Action, and on frequent core monitoring by operators allowing abrupt changes in core flow conditions to be quickly detected.

D.1

With the Required Action and associated Completion Time of Condition C 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.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.4.1.1

, LHGR,

This SR ensures the recirculation loops are within the allowable limits for mismatch. At low core flow (i.e., < 70% of rated core flow), the APLHGR and 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 flow mismatch can therefore be allowed when core flow is < 70% of rated core flow. The jet pump loop flow, as used in this Surveillance, is the summation of the flows from all of the jet pumps associated with a single recirculation loop.

The mismatch is measured in terms of percent of rated core flow. If the flow mismatch exceeds the specified limits, the loop with the lower flow is considered not in operation. This SR is not required when both loops are not in operation since the mismatch limits 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 jet pump loop flows in a timely manner.

REFERENCES

1. UFSAR, Section 6.3.3.2.

2. UFSAR, Chapter 15.

3. UFSAR, Section 6.3.3.2.2.4.

4. UFSAR, Section 15.3.6.

ATTACHMENT 4
Retyped Technical Specification Pages

Request for Amendment to Technical Specifications to Add Requirement to Modify Linear Heat Generation Rate Limit During Single Recirculation Loop Operation

DRESDEN NUCLEAR POWER STATION, UNITS 2 AND 3
FACILITY OPERATING LICENSE NOS. DPR-19 AND DPR-25

REVISED TECHNICAL SPECIFICATIONS PAGE

3.4.1-1

LASALLE COUNTY STATION, UNITS 1 AND 2
FACILITY OPERATING LICENSE NOS. NPF-11 AND NPF-18

REVISED TECHNICAL SPECIFICATIONS PAGE

3.4.1-1

QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2
FACILITY OPERATING LICENSE NOS. DPR-29 AND DPR-30

REVISED TECHNICAL SPECIFICATIONS PAGE

3.4.1-1

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 shall be in operation with the following limits 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;

c. LCO 3.2.3, "LINEAR HEAT GENERATION RATE (LHGR)," single loop operation limits specified in the COLR;

d. LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," Function 2.b (Average Power Range Monitors Flow Biased Neutron Flux–High), Allowable Value of Table 3.3.1.1-1 is reset for single loop operation; and

e. LCO 3.3.2.1, "Control Rod Block Instrumentation," Function 1.a (Rod Block Monitor–Upscale), Allowable Value of Table 3.3.2.1-1 is reset for single loop operation.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. No recirculation loops in operation.	A.1 Be in MODE 2.	8 hours
	AND	
	A.2 Be in MODE 3.	12 hours

(continued)

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 within Region III of Figure 3.4.1-1.

OR

One recirculation loop shall be in operation within Region III of Figure 3.4.1-1 with the following limits 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;

c. LCO 3.2.3, "LINEAR HEAT GENERATION RATE (LHGR)," single loop operation limits specified in the COLR;

d. LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," Function 2.b (Average Power Range Monitors Flow Biased Simulated Thermal Power – Upscale), Allowable Value of Table 3.3.1.1-1 is reset for single loop operation; and

e. LCO 3.3.2.1, "Control Rod Block Instrumentation," Function 1.a (Rod Block Monitor – Upscale), Allowable Value of Table 3.3.2.1-1, specified in the COLR, is reset for single loop operation.

APPLICABILITY: MODES 1 and 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 shall be in operation with the following limits 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;

c. LCO 3.2.3, "LINEAR HEAT GENERATION RATE (LHGR)," single loop operation limits specified in the COLR;

d. LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," Function 2.b (Average Power Range Monitors Flow Biased Neutron Flux–High), Allowable Value of Table 3.3.1.1-1 is reset for single loop operation; and

e. LCO 3.3.2.1, "Control Rod Block Instrumentation," Function 1.a (Rod Block Monitor–Upscale), Allowable Value of Table 3.3.2.1-1 is reset for single loop operation.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. No recirculation loops in operation.	A.1 Be in MODE 2.	8 hours
	AND	
	A.2 Be in MODE 3.	12 hours

(continued)