UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

# NORTHERN STATES POWER COMPANY

## DOCKET NO. 50-282

## PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 1

## AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 136
License No. DPR-42

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Northern States Power Company (the licensee) dated January 15, 1998, as supplemented May 29, 1998, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. DPR-42 is hereby amended to read as follows:

   Technical Specifications

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 136 , are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of issuance, with full implementation within 30 days.

FOR THE NUCLEAR REGULATORY COMMISSION

Beth A. Wetzel

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Attachment: Changes to the Technical Specifications

Date of Issuance: July 28, 1998

ATTACHMENT TO LICENSE AMENDMENT NO. 136

FACILITY OPERATING LICENSE NO. DPR-42

DOCKET NO. 50-282

Revise Appendix A Technical Specifications by removing the pages identified below and inserting the attached pages. The revised pages are identified by amendment number and contain vertical lines indicating the area of change.

| REMOVE | INSERT |
| --- | --- |
| TS.3.10-1 | TS.3.10-1 |
| TS.3.10-2 | TS.3.10-2 |
| TS.3.10-3 | TS.3.10-3 |
| TS.3.11-1 | TS.3.11-1 |
| B.3.11-1 | B 3.11-1 |

# 3.10 CONTROL ROD AND POWER DISTRIBUTION LIMITS

## Applicability

Applies to the limits on core fission power distribution and to the limits on control rod operations.

## Objective

To assure 1) core subcriticality after reactor trip, 2) acceptable core power distributions during POWER OPERATION, and 3) limited potential reactivity insertions caused by hypothetical control rod ejection.

## Specification

A. Shutdown Margin

1. Reactor Coolant System Average Temperature > 200°F

   The SHUTDOWN MARGIN shall be greater than or equal to the applicable value shown in Figure TS.3.10-1 when in HOT SHUTDOWN and INTERMEDIATE SHUTDOWN.

2. Reactor Coolant System Average Temperature ≤ 200°F

   The SHUTDOWN MARGIN shall be greater than or equal to 1%Δk/k when in COLD SHUTDOWN.

3. With the SHUTDOWN MARGIN less than the applicable limit specified in 3.10.A.1 or 3.10.A.2 above, within 15 minutes initiate boration to restore SHUTDOWN MARGIN to within the applicable limit.

B. Power Distribution Limits

1. At all times, except during low power PHYSICS TESTING, measured hot channel factors, $F^N_Q$ and $F^N_{\Delta H}$, as defined below and in the bases, shall meet the following limits:

   $$F^N_Q \times 1.03 \times 1.05^* \leq (F_Q^{RTP} / P) \times K(Z)$$

   $$F^N_{\Delta H} \times 1.04^{**} \leq F_{\Delta H}^{RTP} \times [1 + PFDH(1-P)]$$

   where the following definitions apply:

   - $F_Q^{RTP}$ is the $F_Q$ limit at RATED THERMAL POWER specified in the CORE OPERATING LIMITS REPORT.
   - $F_{\Delta H}^{RTP}$ is the $F_{\Delta H}$ limit at RATED THERMAL POWER specified in the CORE OPERATING LIMITS REPORT.
   - PFDH is the Power Factor Multiplier for $F^N_{\Delta H}$ specified in the CORE OPERATING LIMITS REPORT.
   - K(Z) is a normalized function that limits $F_Q(z)$ axially as specified in the CORE OPERATING LIMITS REPORT.

* For Unit 1, Cycle 19, when the number of available moveable detector thimbles is greater than or equal to 50% and less than 75% of the total, the 5% measurement uncertainty shall be increased to [5% + (3-T/9)(3%)] where T is the number of available thimbles. |

** For Unit 1, Cycle 19, when the number of available moveable detector thimbles is greater than or equal to 50% and less than 75% of the total, the 4% measurement uncertainty shall be increased to [4% + (3-T/9)(2%)] where T is the number of available thimbles. |

3.10.B.1. - Z is the core height location.

- P is the fraction of RATED THERMAL POWER at which the core is operating. In the $F^N_Q$ limit determination when $P \leq 0.50$, set $P = 0.50$.

- $F^N_Q$ or $F^N_{\Delta H}$ is defined as the measured $F_Q$ or $F_{\Delta H}$ respectively, with the smallest margin or greatest excess of limit.

- 1.03 is the engineering hot channel factor, $F^E_Q$, applied to the measured $F^N_Q$ to account for manufacturing tolerance.

- 1.05* is applied to the measured $F^N_Q$ to account for measurement uncertainty.

- 1.04** is applied to the measured $F^N_{\Delta H}$ to account for measurement uncertainty.

2. Hot channel factors, $F^N_Q$ and $F^N_{\Delta H}$ , shall be measured and the target flux difference determined, at equilibrium conditions according to the following conditions, whichever occurs first:

(a) At least once per 31 effective full-power days in conjunction with the target flux difference determination, or

(b) Upon reaching equilibrium conditions after exceeding the reactor power at which target flux difference was last determined, by 10% or more of RATED THERMAL POWER.

$F^N_Q$ (equil) shall meet the following limit for the middle axial 80% of the core:

$$F^N_Q \text{ (equil)} \times V(Z) \times 1.03 \times 1.05^* \leq (F_Q^{RTP} / P) \times K(Z)$$

where V(Z) is specified in the CORE OPERATING LIMITS REPORT and other terms are defined in 3.10.B.1 above.

3. (a) If either measured hot channel factor exceeds its limit specified in 3.10.B.1, reduce reactor power and the high neutron flux trip set-point by 1% for each percent that the measured $F^N_Q$ or by the factor specified in the CORE OPERATING LIMITS REPORT for each percent that the measured $F^N_{\Delta H}$ exceeds the 3.10.B.1 limit. Then follow 3.10.B.3(c).

(b) If the measured $F^N_Q$ (equil) exceeds the 3.10.B.2 limits but not the 3.10.B.1 limit, take one of the following actions:

1. Within 48 hours place the reactor in an equilibrium configuration for which Specification 3.10.B.2 is satisfied, or

2. Reduce reactor power and the high neutron flux trip setpoint by 1% for each percent that the measured $F^N_Q$ (equil) x 1.03 x 1.05* x V(Z) exceeds the limit.

* For Unit 1, Cycle 19, when the number of available moveable detector thimbles is greater than or equal to 50% and less than 75% of the total, the 5% measurement uncertainty shall be increased to [5% + (3-T/9)(3%)] where T is the number of available thimbles.

** For Unit 1, Cycle 19, when the number of available moveable detector thimbles is greater than or equal to 50% and less than 75% of the total, the 4% measurement uncertainty shall be increased to [4% + (3-T/9)(2%)] where T is the number of available thimbles.

3.10.B.3. (c) If subsequent in-core mapping cannot, within a 24 hour period, demonstrate that the hot channel factors are met, the reactor shall be brought to a HOT SHUTDOWN condition with return to power authorized up to 50% of RATED THERMAL POWER for the purpose of PHYSICS TESTING. Identify and correct the cause of the out of limit condition prior to increasing THERMAL POWER above 50% of RATED THERMAL POWER. THERMAL POWER may then be increased provided $F^N_Q$ or $F^N_{\Delta H}$ is demonstrated through in-core mapping to be within its limits.

(d) If two successive measurements indicate an increase in the peak rod power $F^N_{\Delta H}$ with exposure, either of the following actions shall be taken:

1. $F^N_Q$ (equil) shall be multiplied by 1.02 x V(Z) x 1.03 x 1.05** for comparison to the limit specified in 3.10.B.2, or

2. $F^N_Q$ (equil) shall be measured at least once per seven effective full power days until two successive maps indicate that the peak pin power, $F^N_{\Delta H}$, is not increasing.

4. Except during PHYSICS TESTS, and except as provided by specifications 5 through 8 below, the indicated axial flux difference for at least three operable excore channels shall be maintained within the target band about the target flux difference. The target band is specified in the CORE OPERATING LIMITS REPORT.

5. Above 90 percent of RATED THERMAL POWER:

If the indicated axial flux difference of two OPERABLE excore channels deviates from the target band, within 15 minutes either eliminate such deviation, or reduce THERMAL POWER to less than 90 percent of RATED THERMAL POWER.

6. Between 50 and 90 percent of RATED THERMAL POWER:

a. The indicated axial flux difference may deviate from the target band for a maximum of one* hour (cumulative) in any 24-hour period provided that the difference between the indicated axial flux difference about the target flux difference does not exceed the envelope specified in the CORE OPERATING LIMITS REPORT.

b. If 6.a is violated for two OPERABLE excore channels then the THERMAL POWER shall be reduced to less than 50% of RATED THERMAL POWER and the high neutron flux setpoint reduced to less than 55% of RATED THERMAL POWER.

*May be extended to 16 hours during incore/excore calibration.

** For Unit 1, Cycle 19, when the number of available moveable detector thimbles is greater than or equal to 50% and less than 75% of the total, the 5% measurement uncertainty shall be increased to [5% + (3-T/9)(3%)] where T is the number of available thimbles.

## 3.11 CORE SURVEILLANCE INSTRUMENTATION

Applicability

Applies to the OPERABILITY of the moveable detector instrumentation system and the core thermocouple instrumentation system.

Objective

To specify OPERABILITY requirements for the moveable detector and core thermocouple systems.

Specification

A. The moveable detector system shall be OPERABLE following each refueling so that the power distribution can be confirmed. If the moveable detector system is degraded to the extent that less than 75% of the detector thimbles are available, the measurement error allowance due to incomplete mapping shall be substantiated by the licensee.

B. A minimum of 2 moveable detector thimbles per quadrant*, and sufficient detectors, drives, and readout equipment to map these thimbles, shall be operable during recalibration of the excore axial offset detection system per Specification 4.1. If this OPERABILITY for recalibration of excore nuclear instruments when required by Specification 4.1 cannot be achieved, power shall be limited to 90% of RATED THERMAL POWER until recalibration is completed in accordance with this specification.

C. A minimum of 4 thermocouples or 2 moveable detectors per quadrant shall be operable for readout if the reactor is operated above 85% of RATED THERMAL POWER with one excore nuclear power channel inoperable (see Specification 3.10.C.4).

D. The provisions of specification 3.0.C are not applicable.

* For Unit 1, Cycle 19, when the number of available moveable detector thimbles is greater than or equal to 50% and less than 75% of the total, there should be a minimum of two thimbles available per quadrant, where quadrant includes both horizontal-vertical quadrants and diagonally-bounded quadrants (eight individual quadrants in total).

## 3.11 CORE SURVEILLANCE INSTRUMENTATION

### Bases

The moveable detector system is used to measure the core fission power density distribution. A power map made with this system following each fuel loading will confirm the proper fuel arrangement within the core. The moveable detector system is designed with substantial redundancy so that part of the system could be out of service without reducing the value of a power map. If the system is severely degraded, large measurement uncertainty factors must be applied. The uncertainty factors would necessarily depend on the operable configuration.

Two detector thimbles per quadrant are sufficient to provide data for the normalization of the excore detector system's axial power offset feature.

For Unit 1, Cycle 19, when the number of available moveable detector thimbles is greater than or equal to 50% and less than 75% of the total, the requirements are modified to require a minimum of two thimbles available per quadrant, where quadrant includes both horizontal-vertical quadrants and diagonally-bounded quadrants (eight individual quadrants in total). This requirement arises from the use of random thimble deletion events as the basis for the Westinghouse analysis. As a result of random failures, distribution of remaining thimbles would be relatively uniform, while systematic failure could result in large areas of the core being uninstrumented. In order to apply the error correction developed in the Westinghouse analysis, and to establish the bounds of applicability of the peaking factor uncertainties, coverage is required in each of the eight quadrants defined above.

The core thermocouples provide an independent means of measuring the balance of power among the core quadrants. If one excore power channel is out of service, it is prudent to have available an independent means of determining the quadrant power balance.

The moveable detector system and the thermocouple system are not integral parts of the reactor protection system. These systems are, rather, surveillance systems which may be required in the event of an abnormal occurrence such as a power tilt or a control rod misalignment. Since such occurrences cannot be predicted a priori, it is prudent to have the surveillance systems in an OPERABLE state.