UNITED STATES NUCLEAR REGULATORY COMMISSION

NORTHERN STATES POWER COMPANY

MONTICELLO NUCLEAR GENERATING PLANT DOCKET NO. 50-263

REQUEST FOR AMENDMENT TO
OPERATING LICENSE DPR-22

LICENSE AMENDMENT REQUEST DATED June 22, 1987

Northern States Power Company, a Minnesota corporation, requests authorization for changes to Appendix A of the Monticello Operating License as shown on the attachments labeled Exhibits A and B. Exhibit A describes the proposed changes, describes the reasons for the changes, and contains a significant hazards evaluation. Exhibits B consists of copies of the Monticello Technical Specifications incorporating the proposed changes.

This letter contains no restricted or other defense information.

NORTHERN STATES POWER COMPANY

By _____
David Musolf
Manager-Nuclear Support Services

On this 22 day of June 1987 before me a notary public in and for said County, personally appeared David Musolf, Manager-Nuclear Support Services, and being first duly sworn acknowledged that he is authorized to execute this document on behalf of Northern States Power Company, that he knows the contents thereof, and that to the best of his knowledge, information, and belief the statements made in it are true and that is is not interposed for delay.

_____

JUDY L. KLAPPERICK
NOTARY PUBLIC—MINNESOTA
ANOKA COUNTY
My Commission Expires Sept. 29, 1991

Exhibit A

Monticello Nuclear Generating Plant

License Amendment Request Dated June 22, 1987

Proposed changes to the Technical Specifications
Appendix A of Operating License DPR-22.

Pursuant to 10 CFR Part 50, Section 50.59 and 50.90, the holders of Operating License DPR-22 hereby propose the following changes to Appendix A Technical Specifications:

1. Standby Liquid Control System Requirements

Proposed Change (Section 3.4 & 4.4)

Revise Sections 3.4 and 4.4 of the Technical Specifications as shown on pages 93, 95, 96, 97, 98, 99 and 100 of Exhibit B. These Changes implement the requirements of 10 CFR Part 50, Section 50.62. Specifically, Paragraph 50.62(c)(4), which addresses the standby liquid control system (SLCS). Paragraph 50.62(c)(4) requires a standby liquid control system with a minimum flow capacity and boron content equivalent in control capacity to 86 gallons per minute of 13 weight percent sodium pentaborate solution.

Reason for Change

The proposed changes incorporate those values for pump flow rate, boron concentration and boron enrichment which are necessary to meet the original system design basis as well as the ATWS rule and provide surveillance requirements for ensuring that the proper boron enrichment is maintained.

1. Comparison with the original design basis.

The original design objective of the Standby Liquid Control System (SLCS) was to provide the capability of bringing the reactor from full power to a cold, xenon-free shutdown assuming that none of the withdrawn control rods could be inserted. To meet this objective, the standby liquid control system was designed to inject a quantity of boron which produces a concentration of 660 ppm of boron in the reactor in less than 125 minutes. In addition, a 25% boron concentration margin was added to account for possible imperfect mixing of the chemical solution in the reactor water and dilution from the water in the cooldown circuit. This resulted in the requirement to inject a quantity of boron which produces a concentration of 825 ppm of boron in the reactor in less than 125 minutes. With a sodium pentaborate solution with natural Boron-10 isotopic enrichment of 19.8 % a volume of 1400 gallons of solution having a 21.4% sodium pentaborate concentration was required to meet the shutdown requirement. At a boron concentration of 10.8%, a volume of solution equal to the maximum tank capacity of 2895 gallons was required. With a flow rate of 24 gpm (current Technical Specification value) the contents of the tank could be pumped into the reactor vessel in less that 121 minutes.

The proposed modified SLCS will utilize enriched boron and a flow rate value of 26 gpm. The increased value for the flow rate is being achieved by taking credit for 2 gpm of the difference between the previous value contained in the Technical Specifications (24 gpm) and the design capacity of the pump (28 gpm). The planned boron enrichment of the sodium pentaborate solution is a Boron-10 atom% of 39.6 % or greater as compared to 19.8 % (naturally occurring Boron-10). This is equivalent to an enrichment ratio of 2. With the enriched boron being utilized, the required boron concentration level (concentration of B-10 and B-11) can be reduced by the ratio of enrichment. The weight of sodium pentaborate necessary to to meet the shutdown requirement can be calculated as follows:

$SB(lbs) = (W)(BC/10^6)(1.25)(1/MW)(19.8/E)$ where;

W = Weight of the Water to be Borated = 715,000 (lbs)
including; a) Reactor Coolant Weight = 521,440 lbs
(level 8 @ 70 F)
b) Reactor Recirculation Loops = 61,780 lbs
c) RHR Loops (in shutdown cooling mode) = 130,000 lbs
BC = Boron Concentration Level = 660 ppm
1.25 = 25% to account for imperfect mixing
MW = Molecular Weight Ratio of boron to sodium pentaborate ($Na_2B_{10}O_{16}\cdot H_2O$)
SB = Weight of Sodium Pentaborate (lbs.)
E = Boron Enrichment (%)

$$(1/MW) = \frac{482.1 + 10(11.01 - E/100)}{10(11.01 - E/100)} = 1 + \frac{4821}{1101-E}$$

$$SB = (715{,}000)(660/10^6)(1.25)(1+ \frac{4821}{1101-E})(19.8/E)$$

This equation may be used to calculate the Indicated Tank Volume which the operator reads in the control room. The minimum indicated volume (gal) necessary to meet the original design basis would be calculated as follows:

$$\text{Volume} = \frac{(SB)(VC)}{(WD)(SG^{SB})(C/100)} + 128 \text{ gal } *$$

where;
SB = Weight of Sodium Pentaborate in lbs.
VC = Volume Conversion = 7.481 gal/ft^3
WD = Density of Water = 62.00 lbs/ft^3 at 100 ^{o}F
SG^{SB} = Specific Gravity of Sodium Pentaborate = 0.0051*C + 0.998
C = Concentration of Sodium Pentaborate in wt%

* To account for instrument inaccuracies (100 gal on the wide range and 28 gal on the narrow range) an additional 128 gallons is added.

Substituting in for "SB" using the equation on the bottom of the previous page and multiplying the constants together:

$$\text{Volume} = \frac{(71.18)(1+\frac{4821}{1101-E})(19.8/E)(100/C)}{(0.0051C + 0.998)} + 128 \text{ gal}$$

This yields a minimum indicated value of 1476 gallons of solution required at 13.7 wt% is necessary to meet the original design basis with an enrichment of 39.6%. With the new Technical Specification flow rate value of 26 gpm, the solution necessary to bring the reactor to shutdown will be pumped in under 57 minutes. With a concentration of 16 wt%, 1270 gallons is required.

The operator will shut the SLCS pump off at an indicated volume of 0 gallons. An indicated volume of 0 gallons results in an actual volume remaining in the tank of 335 gallons. This 335 gallons represents 225 gallons for that unusable portion of the tank volume below the suction nozzle of the pump and 100 gallons for the wide range instrument inaccuracy which is necessary to prevent pump cavitation should the instrumentation be reading higher than actual level.

2. Comparison with the ATWS Rule

To comply with the ATWS rule, a higher pumping rate is required. This rate must be equivalent to 86 gpm of sodium pentaborate at a 13 wt% concentration and natural Boron-10 enrichment for a 251-inch reactor vessel. Monticello has a 206-inch vessel. In Generic Letter 85-03, "Clarification of Equivalent Control Capacity for Standby Liquid Control Systems", dated January 28, 1985, the Staff provided clarification of equivalent control capacity as follows:

1) The "equivalent in control capacity" wording was chosen to allow flexibility in the implementation of the requirement. For example, the equivalence can be obtained by increasing flow

rate, boron concentration, or boron enrichment.

2) The 86 gallons per minute and 13-weight percent sodium pentaborate were values used in NEDE-24222, "Assessment of BWR Mitigation of ATWS, Volumes I and II", December 1979, for BWR/4, BWR/5 and BWR/6 plants with a 251-inch vessel inside diameter. The fact that different values would be equivalent for smaller plants was recognized in NEDE-24222.

   "The flow rates given here are normalized from a 251-inch diameter vessel plant to a 218-inch diameter vessel plant, i.e., the 66 gpm control liquid injection rate in a 218 is equivalent to 86 gpm in a 251. This is done to bound the analysis....(pp. 2-15 [NEDE-24222])."

3) The important parameters to consider in establishing equivalence are vessel boron concentration required to achieve shutdown and the time required to achieve that vessel boron concentration. The minimally acceptable system should show an equivalence in the parameters to the 251-inch diameter vessel studied in NEDE-24222.

The equivalency requirement can be demonstrated if the following relationship is shown to be true:

$(Q/86\ \text{gpm})(M_{251}/M)(C/13\ \text{wt.\%})(E/19.8\ \text{atom\%}) \geq 1$

where the plant-specific parameters are defined as:

Q = minimum SLCS flow rate (one or two pump operation as appropriate), gpm.

M = mass of water in the reactor vessel and recirculation system at the hot rated conditions, lbs.

C = minimum sodium pentaborate solution concentration, weight percent.

E = minimum expected B^{10} isotope enrichment (19.8% for natural boron), atom percent.

The value of M_{251} (the mass of water in the reactor vessel and recirculation system at rated conditions in the reference plant) is 628,300 lbs for a BWR/3/4. This value was calculated based on rated temperature, rated void content, normal water level, control rods fully withdrawn, expected minimum vessel dimensions, and nominal vessel internals dimensions. The plant specific values chosen for Monticello, which are reflected in the proposed technical specification changes, are a flow rate (Q) of 26 gpm, a boron concentration (C) of 13.7% and a boron enrichment (E) of 39.6%. The mass of water in the reactor vessel and recirculation system at the hot rated conditions for Monticello (M) is 400,000 lbs. Using the Monticello specific values yields:

$(26/86)(628,300/400,000)(13.7/13)(39.6/19.8) = 1.00090$

3. Supporting information for the new values and figures contained in the proposed Technical Specifications.

Changes that have been proposed to the Technical Specifications include, a) increasing the required pump flow rate from 24 to 26 gpm, b) incorporating a new Figure 3.4-1 which is based on the new enriched boron, c) changing the format of Figure 3.4-2 to match Figure 3.4-1, d) adding boron enrichment surveillance requirements and e) adding a time to place the reactor in a shutdown condition when the SCLC operability requirements are not met.

a. The 26 gpm flow requirement is necessary to meet the ATWS rule as demonstrated in Section 2 above. As demonstrated in Section 1 above, it is consistent with the original design basis.

b. The curves in Figures 3.4.1 provide boundaries which define an area of operation that ensures the original design basis and the ATWS rule are satisfied. The equation for the left hand curve or boundary is as provided in Section 1 above. The lower boundary is provided by a straight line at 13.7 wt% below which the requirements of the ATWS rule are not met if a pump flow rate of 26 gpm and boron enrichment of 39.6 atom% or 2 times that naturally occurring are assumed. Should the volume, concentration or enrichment requirements not be met, compliance with the original design basis or the ATWS Rule can be demonstrated by the following equations which are variations of or the same as those equations found in Sections 1 and 2:

Equation 1 (Original Design Basis):

$$V \geq \left(\frac{71.18}{0.0051xC + 0.998} \right)\left(1+\frac{4821}{1101-E}\right)(19.8/E)(100/C) + 128 \text{ gal}$$

Equation 2 (ATWS Rule):

$$(Q/86 \text{ gpm})(M_{251}/M)(C/13 \text{ wt.\%})(E/19.8 \text{ atom\%}) \geq 1$$

Solving Equation 2 for "C", including mass ratio values and mutliplying constants, yields:

$$C \geq (8.28)(86/Q)(19.8/E)$$

c. The curve in Figure 3.4.2 has been reformatted to be consistent with Figure 3.4.1. It is based on the latest data provided by General Electric on Sodium Pentaborate solubility and is accurate within $\pm$ 1%. The curve contains 5 ^{o}F of conservativitism as does the existing curve.

d. Surveillance requirements have been added for verifying boron enrichment to assure continued high system reliability of the SLCS.

e. Section 3.4.D has been modified to include a required time to reach Hot Shutdown consistent with the Standardized Technical Specifications.

Safety Evaluation and Determination of Significant Hazards Considerations

The proposed changes to Appendix A of the Operating License have been evaluated to determine whether they constitute a significant hazards consideration as required by 10 CFR Part 50, Section 50.91 using the standards provided in Section 50.92. This evaluation is provided below:

1. The proposed amendment will not involve a significant increase in the probability or consequences of an accident previously evaluated.

   The proposed amendment would revise the Technical Specifications to incorporate the requirements of the ATWS Rule for the Standby Liquid Control System (SLCS). The modifications to the SLCS necessary to meet the ATWS Rule, and reflected in the proposed changes, in no way detract from the ability of the SLCS to meet its original design basis. The proposed changes, with an increase in the minimum pump flow rate and doubling of the naturally occuring Boron-10 content of the Sodium Pentaborate, results in being able to achieve shutdown in approximately half the required time. Therefore, this change has no effect on the probability or consequences of an accident previously evaluated or the ability of the SLCS to deal with that accident.

2. The proposed amendment will not create the possibility of a new or different kind of accident from any accident previously evaluated.

   The changes which are being made to comply with the ATWS Rule and result in the proposed license amendment have resulted in no mechanical modifications to the SLCS. The changes being made are in the enrichment of the Boron-10 in the Sodium Pentaborate. Boron-10 is a stable isotope and no degradation of the enrichment level over time is expected. Other solution characteristics, such as concentration, are within the ranges where they have been operated in the past. This method of compliance was chosen specifically because of its minimum impact on the SLCS. Therefore, these changes result in no new or different kind of accident from any accident previously evaluated.

3. The proposed amendment will not involve a significant reduction in the margin of safety.

   The proposed Technical Specifications have deleted no requirement previously contained in the Technical Specifications for the SLCS. The ability of the the SLCS to meet its original design basis has been improved by reducing the time needed to achieve shutdown. In addition, operating under the proposed Technical Specifications results in meeting the requirements of the ATWS Rule. The proposed changes will not, therefore, involve a reduction in the margin of safety.

The Commission has provided guidance concerning the application of the Standards for determinimg whether a significant hazards consideration exists by providing certain examples of amendments that

are considered not likely to involve significant hazards considerations. These examples were published in the Federal Register on March 6, 1986.

Changes proposed in this License Amendment Request are represenative of example (vii). They are changes to conform a license to changes in the regulations, where the license changes result in very minor changes to facility operations clearly in keeping with the regulations.

As previously described, the Technical Specification changes reflect changes made to the SLCS in complying with the ATWS Rule. The changes being made do not effect operation of the system, they result in only having to procure enriched sodium pentaborate solution, which has no major impact on facility operation.