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

REVISION NO. 2 TO LICENSE AMENDMENT REQUEST DATED JANUARY 23, 1997

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, B, and C. Exhibit A describes the proposed changes, describes the reasons for the changes, and contains a Safety Evaluation, a Determination of Significant Hazards Considerations, and an Environmental Assessment. Exhibit B contains current Technical Specification pages marked up with the proposed changes. Exhibit C is a copy of the Monticello Technical Specification pages incorporating the proposed changes. Other attached exhibits contain engineering reports supporting the requested changes and responses to questions received from the NRC Staff related to our earlier submittals.

This letter contains no restricted or other defense information.

NORTHERN STATES POWER COMPANY

By William William J Hill

Plant Manager Monticello Nuclear Generating Plant

On this <u>M</u> day of <u>June</u>, <u>1997</u> before me a notary public in and for said County, perso-ally appeared William J Hill, Plant Manager, Monticello Nuclear Generating Plant, 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 it is not interposed for delay.

Samuel I Shirey (Notary Public - Minnesota Sherburne County My Commission Expires January 31, 2000



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Exhibit A

MONTICELLO NUCLEAR GENERATING PLANT

Revision No. 2 to License Amendment Request Dated January 23, 1997

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

Proposed Changes:

- Revise the Section 3.5/4.5.C Bases on pages 112 and 113 to read:
 - C. Containment Spray/Cooling Systems

Two containment spray/cooling subsystems of the RHR system are provided to remove heat energy from the containment and control torus and drywell pressure in the event of a loss of coolant accident. A containment spray/cooling subsystem consists of 2 RHR service water pumps, a RHR heat exchanger, 2 RHR pumps, and valves and piping necessary for Torus Cooling and Drywell Spray. Torus Spray is not considered part of a containment spray/cooling subsystem. Placing a containment spray/cooling subsystem into operation following a loss of coolant accident is a manual operation.

The most degraded condition for long term containment heat removal following the design basis loss of coolant accident results from the loss of one diesel generator. Under these conditions, only one RHR pump and one RHR service water pump in the redundant division can be used for containment spray/cooling. The containment temperature and pressure have been analyzed under these conditions assuming RHRSW and initial suppression pool temperature are both 90°F. Acceptable margins to containment design conditions have been demonstrated. Therefore the containment spray/cooling system is more than ample to provide the required heat removal capability. Refer to USAR Sections 5.2.3.3, 6.2.3.2.3, and 8.4.1.3.

During normal plant operation, the containment spray/cooling system provides cooling of the suppression pool water to maintain temperature within the limits specified in Specification 3.7.A.1.

The surveillance requirements provide adequate assurance that the containment spray/cooling system will be operable when required. The head and flow requirements specified for the RHR service water pumps provide assurance that the minimum required service water flow can be supplied to the RHR heat exchangers for the most degraded condition for long-term containment heat removal following the design basis loss of coolant accident.

2. Revise the last paragraph of the Section 3.7.A Bases on page 176 to read:

For an initial maximum suppression chamber water temperature of 90°F and conditions which lead to minimum containment pressure, adequate net positive suction head (NPSH) is maintained for the core spray, RHR, and HPCI pumps under loss of coolant accident conditions.

Reason for Changes:

Background

As discussed in Section 5.2.3.3 and Figures 5-2-14 through 5-2-16 of the original Monticello Final Safety Analysis Report (FSAR), availability of one RHR pump and one RHRSW pump represents the most degraded condition for long-term containment heat removal following a loss of coolant accident. This condition occurs on loss of off-site power combined with loss of one diesel generator. The load rating of the remaining diesel generator allows long term operation of only three large motors. The primary containment analysis assumes the use of one RHRSW pump and one RHR pump for suppression pool cooling and one core spray pump for makeup to the reactor. This is the limiting combination of pumps with respect to suppression pool temperature response.

Following the completion of the Mark I Containment Program, General Electric updated the FSAR containment pressure and temperature response analysis to be consistent with the Monticello Mark I Plant Unique Load Definition. The results of the revised analysis were contained in NEDO-30485, "Monticello Design Basis Accident Containment Pressure and Temperature Response for FSAR Update," December, 1983. NEDO-30435 was incorporated in the Updated Safety Analysis Report (USAR) and was submitted to the NRC to support Monticello License Amendment Request dated May 1, 1986. The amendment request was approved by the NRC and issued as Amendment No. 55 to the Monticello Operating License on November 25, 1987.

In 1992, as part of the Monticello Configuration Management Improvement Program, inconsistencies were discovered in the assumptions used in NEDO-30485 with respect to the number of operable RHR and RHRSW pumps. A Follow-On Item (FOI) was assigned for assessment of this problem. The assessment confirmed that the NEDO-30485 analysis assumed the availability of two RHR pumps and two RHRSW pumps for containment cooling. General Electric was contacted and requested to revise this analysis.

A revised General Electric analysis, "Monticello Nuclear Generating Plant Design Basis Accident Containment Pressure and Temperature Response for USAR Update," NEDO-32418, December, 1994, demonstrated ample margins to containment design limits with one RHR pump and one RHRSW pump available for long-term containment heat removal. Section 5.2.3.3 of the Monticello USAR was updated with the results of NEDO-32418 and reported to the NRC in the periodic report of changes, tests and experiments in accordance with 10 CFR Part 50.59 on April 20, 1995.

A System Operational Performance Inspection (SOPI) of the Monticello Residual Heat Removal (RHR) System was completed by an NRC Region III inspection team on January 8, 1997. The inspection team identified an unreviewed safety question related to the containment pressure and temperature analysis described in the Technical Specification Bases and in the Monticello USAR. The long-term containment heat removal evaluation in NEDO-32418 used the ANS 5.1,1979, decay heat model and resulted in a slightly higher suppression pool temperature. The previous analysis submitted to the NRC was based on the May-Witt decay power model. The inspection team also questioned the meaning of Technical Specification Bases Section 3.5/4.5.C. This section was interpreted by the inspection team to state that two RHR and two RHRSW pumps are required to perform the containment spray/cooling function. In the limiting case, however, only one RHR and one RHR service water pump are available to perform this function in the event of the worst case single failure for suppression pool cooling (loss of a diesel generator with loss of offsite power).

The NRC SOPI inspection team further noted that credit for containment overpressure has been the topic of several NRC generic communications. The team questioned the previous NPSH analyses performed for Monticello and stated that the amount of containment overpressure that may be credited in NPSH evaluations was not clearly established. This was identified as an unresolved item in the inspection report.

Purpose of Requested Technical Specification Change

The purpose of this request is to submit, for NRC Staff review and approval, revised loss of coolant accident containment temperature and pressure and ECCS pump NPSH analyses using analytical methods acceptable to the Staff.

Review and approval of the analyses and supplemental information provided with this License Amendment Request will resolve the unreviewed safety question and the unresolved item identified during the recent Monticello NRC SOPI inspection.

It is proposed that documentation of the acceptability of the new analyses to the NRC Staff be accomplished by issuing the following revisions to the Monticello Technical Specification Bases:

- Section 3.5/4.5.C of the Monticello Technical Specification Bases are clarified with respect to the minimum requirements for containment spray/cooling system pumps following a loss of coolant accident. One RHR pump and one RHRSW pump satisfy the minimum requirements for long-term containment heat removal.
- Section 3.7.A of the Monticello Technical Specification Bases are clarified with respect to the use of containment pressure to meet the NPSH requirements of the ECCS pumps following a loss of coolant accident.

Engineering Evaluation

NEDO-324 8 was submitted to the NRC with our original License Amendment Request dated January 23, 1997. This analysis used nominal values of decay heat based on the ANS 5.1, 1979, decay heat model. In NRC Request for Additional Information (RAI) dated March 12, 1997, the use of the ANS 5.1, 1979 model was questioned unless at least two standard deviations of confidence is provided in the analysis.

In response to this NRC concern a new analysis, General Electric (GE) report GE-NE-T2300731-2, "Monticello Nuclear Generating Plant LOCA Containment Analysis For Use in Evaluation of NPSH for the RHR and Core Spray Pumps," June, 1997, is being submitted for review (Exhibit D). The new containment analysis is based on the use of the GE SHEX code and a reactor thermal power of 1880 Mwt. As explained in the report, the margin in the analysis using 1880 Mwt bounds the two standard deviation margin requested by the NRC Staff. The 1880 Mwt is used for analytical purposes only and it should not be inferred that approval to being requested to actually operate at this power level.

Exhibit D also includes a baseline comparison and benchmark analysis. These are provided to justify the use of the GE SHEX code in place of the GE HXSIZ code and the use of the ANS 5.1, 1979, decay heat model instead of the May-Witt decay heat model.

Two short-term (\leq 10 minutes) and five long-term (> 10 minutes) cases were analyzed by General Electric.

The two short-term cases were performed at the current licensed power of 1670 Mwt and at a bounding power level of 1880 Mwt with assumptions that minimize containment pressure. In the short-term analyses, no credit is taken for operator action. Pumps are assumed to automatically initiate and operate at maximum possible flow rates (i.e. runout flow) for the entire 10-minute period. At 10 minutes, operator action is assumed to reduce pump flow rate to design values used for long-term core and containment cooling.

The five long-term cases evaluated by GE included potential scenarios that could be limiting for meeting pump NPSH requirements (i.e. low containment pressure, high suppression pool temperature, and high pump flow rate). All five long-term cases assumed a power level of 1880 Mwt. All cases assumed a RHRSW temperature of 90 °F. Results of the GE analyses are presented in Table 2 of Exhibit D.

Long-term Containment Cooling Evaluation

As shown in Table 2 of the GE report, Case 3 (diesel generator failure) results in the highest suppression pool temperature. In this scenario, only one RHR pump and one RHRSW pump are available for long-term containment cooling. Suppression pool temperature peaks at 194.2 °F in Case 3.

Various combinations of pumps, pump flow rates, containment heat removal heat exchanger capacities and containment pressures are possible. These vary based on postulated conditions such as availability of off-site power, the potential for a single failure based on selection of the broken loop for LPCI injection, the use of containment sprays or the number of pumps selected by the operators for use in the containment cooling mode. The limiting case for suppression pool temperature response is the use of one RHR pump operating at its design flow rate, one RHRSW pump operating at its design flow rate, and one associated RHR heat removal heat exchanger. All other combinations of pumps, or pump flow rates, result in lower suppression pool temperatures and are therefore acceptable during a postulated loss of coolant accident.

A reanalysis of torus attached piping for operation with a peak suppression pool temperature of 194.2 °F is provided in Exhibit F. All torus attached piping remains acceptable for operation at this temperature.

A reanalysis of RHR room temperature for operation with a peak suppression pool temperature of 194.2 °F is provided in Exhibit G. RHR room temperature will not exceed 140 ° F and will not present concerns related to equipment qualification.

Exhibit H evaluates the potential impact on the Monticello environmental qualification program. Environmental qualification bounding conditions will not be affected by the new limiting scenarios for long-term containment heat removal.

It is concluded that one RHR pump and one RHRSW pump provide adequate long-term containment cooling. Following NRC approval, the Monticello USAR will be updated with the results of these analyses with the next revision of the document.

ECCS Pump NPSH Evaluation

In their RAI dated May 13, 1997, the NRC Staff questioned the degree to which containment pressure must be credited to ensure the core spray and RHR pumps have sufficient NPSH under worst-case conditions. The original Monticello plant licensing basis documentation is not clear under what conditions, or to what extent, containment pressure is relied upon to prevent pump cavitation under both short-term and long-term conditions.

In response to this concern, and as described above, the GE containment analysis in Exhibit D was performed for a broad range of pump combinations and failure modes with input parameters selected to minimize containment pressure. The GE results were used by Duke Engineering & Services to define the minimum amount of containment pressure available to provide adequate NPSH in the short and long term. Results of the Duke Engineering analysis are provided in (Exhibit E).

The figures in Exhibit E demonstrate graphically the amount of containment pressure required and the minimum containment pressure available to supply the required NPSH for the emergency core cooling pumps in the limiting pump combinations evaluated. No pump cavitation will occur over either the short or long term periods under conditions resulting in minimum containment pressure. It is concluded that proper operation of the ECCS pumps is assured under worst case conditions following a loss of coolant accident. Following NRC approval, the Monticello USAR will be updated with the results of these analyses with the next revision of the document.

Safety Evaluation

The proposed change involves a clarification to the Technical Specification Bases in Sections 3.5/4.5.C and 3.7.A. The proposed wording correctly describes the design basis of the Monticello plant for minimum pump availability for long-term containment heat removal and for the limited use of containment pressure in assuring adequate ECCS pump NPSH. The proposed changes do not involve a change to the physical design of the facility in any way.

The proposed wording is supported by the information and analyses provided in Exhibits D through H.

No changes to the physical configuration of the plant or how the plant is operated are proposed. No changes to the Limiting Conditions for Operation or Surveillance Requirements in Sections 3.5.C or 4.5.C are proposed.

No Significant Hazards Considerations:

The Commission has provided standards (10 CFR Part 50, Section 50.92) for determining whether a significant hazards consideration exists. A proposed amendment to an operating license for a facility 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; (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.

Northern States Power Company proposes to amend Facility Operating License DPR-22, Appendix A Technical Specifications Bases, for the Monticello Nuclear Generating Plant to reflect revised analyses which define the minimum complement of long-term containment cooling pumps and the use of containment pressure to assure adequate net positive suction head (NPSH) for emergency core cooling system (ECCS) pumps.

The proposed changes to the Technical Specification Bases will provide documentation of NRC Staff review and approval of the technical resolution to one unreviewed safety question (50-263/96009-11(DRS)) and one unresolved item (50-263/96009-04(DRS)) identified during a recent NRC System Operational Performance Inspection (SOPI) completed on January 8, 1997.

In 1992, as part of the Monticello Configuration Management Improvement Program, inconsistencies were discovered in the assumptions used for the number of operable residual

heat removal (RHR) and RHR service water (RHRSW) pumps for long-term containment heat removal following a loss of coolant accident. Assuming a loss of offsite power and failure of a diesel generator, the minimum configuration of pumps available for containment cooling consists of one RHR and one RHRSW pump. A General Electric analysis has demonstrated ample margins to containment design limits with one RHR pump and one RHRSW pump available for long-term containment heat removal. This analysis was incorporated in the Monticello Updated Safety Analysis Report (USAR). However, the analysis was judged by the NRC SOPI inspection team to represent a reduction in the margin of safety over the previous analysis reviewed by the NRC Staff resulting in an unreviewed safety question.

The NRC SOPI inspection team also questioned the previous NPSH analyses performed for Monticello ECCS pumps under LOCA conditions. The team later determined that the amount of containment overpressure that could be credited in NPSH design calculations was not clearly established in the original licensing basis of the plant. This was identified as an unresolved item in the SOPI inspection report.

Northern States Power Company has evaluated the proposed changes to Appendix A of the Monticello operating license. Based on the criteria for defining a significant hazards consideration established in 10 CFR Part 50, Section 50.92, we have concluded that:

1) <u>The proposed amendment will not involve a significant increase in the probability</u> or consequences of an accident previously evaluated

These changes do not affect the physical configuration of the plant or how it is operated. These changes:

- Document the acceptability of the limiting mode of long-term post-LOCA containment heat removal that has been analyzed and found to be acceptable.
- Document the acceptability of the use of a limited amount of post-LOCA containment overpressure to assure adequate NPSH for ECCS pump operation.

The changes clarify the Technical Specification Bases to correctly describe the design and licensing basis for containment spray/cooling equipment and ECCS pump NPSH following a loss of coolant accident.

The original Monticello FSAR identified the most degraded condition for containment spray/cooling equipment availability. This condition could occur following a postulated loss of offsite power and loss of one diesel generator. One RHR pump and one RHRSW pump would be available under these conditions. An update of the containment pressure and temperature analysis following completion of the Mark I Containment Long-term Program in the early 1980's inadvertently assumed the availability of two RHR pumps and two RHRSW pumps. The Bases of the Monticello Technical Specifications also

appears to have been written based on the availability of two RHR pumps and two RHRSW pumps for containment spray/cooling. This error in the containment pressure and temperature analysis was identified during the Monticello design basis reconstitution program and was corrected by a revised analysis.

This analysis has been revised to meet NRC Staff r quirements and is being submitted for review and approval in conjunction with the Technical Specification changes proposed in this License Amendment Request. The proposed changes will correct the Bases of the Monticello Technical Specifications to clearly describe the design basis of the plant for the post-LOCA containment spray/cooling function. One RHR pump and one RHRSW pump are fully adequate for this function.

The use of containment pressure to provide a portion of the NPSH required by ECCS pumps following a loss of coolant accident was not adequately documented in the original design and licensing basis for the Monticello plant. Detailed ECCS pump NPSH analyses have been completed and submitted for NRC Staff review and approval. It is proposed that the Bases of the Technical Specifications also be corrected to document the acceptability of taking credit for a limited amount of containment overpressure for ECCS pump NPSH.

The proposed changes do not introduce new accident scenarios. These changes have no impact on the protection of the health and safety of the public. There is a small reduction in margin, as discussed in (3) below, resulting from new analyses of loss of coolant accident containment temperature and pressure response and ECCS pump NPSH requirements.

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

These changes are administrative in nature and do not affect the physical configuration of the plant or how it is operated.

The changes will revise the Technical Specification Bases to correctly describe the design basis of the Monticello plant for performing the post-LOCA containment spray/cooling function and for satisfying ECCS pump NPSH requirements. They are based on new analyses submitted to the NRC Staff for their review and approval.

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

The minimum number of RHR and RHRSW pumps assumed to be operable for long-term containment heat removal analysis has been reduced from the number assumed to be operable in earlier licensing documentation provided to the NRC for review.

In addition, analyses of ECCS pump NPSH requirements take credit for containment pressure under some conditions. The original Monticello licensing basis documentation reviewed by the NRC Staff did not clearly state that containment pressure was necessary to assure adequate ECCS pump NPSH.

The reduction in the number of RHR and RHRSW pump used for containment cooling results in an increase in suppression pool temperature. This temperature increase, and the limited dependence on containment pressure to ensure adequate ECCS pump NPSH, are considered to be reductions in margin.

The new containment long-term heat removal and ECCS pump NPSH analyses provided with this License Amendment Request use input assumptions which conservatively model the phenomena involved. An updated computer code and decay heat model are used in a conservative manner at an assumed power level of 112.5% (1880 Mwt) of license reactor power in the new analyses. Appropriate baseline and benchmark analyses have been performed. An increase in long-term peak suppression pool temperature from 182 °F to 194.2 °F is predicted for the limiting configuration of one RHR and one RHRSW pump. A reanalysis of torus attached piping, RHR room temperature, and environment qualification considerations for operation with the higher suppression pool temperature was completed with satisfactory results. It is concluded that one RHR pump and one RHRSW pump provide adequate margins for long-term containment cooling.

Analyses were performed to evaluate the NPSH adequacy for Monticello ECCS pumps for a broad range of pump combinations and failure modes. The minimum containment pressure available and the containment pressure required to satisfy NPSH requirements was calculated for each limiting combination of pumps. It was concluded that proper operation of the ECCS pumps is assured under all conditions following a loss of coolant accident.

Environmental Assessment

Northern States Power Company has evaluated the proposed change and determined that:

- The changes do not involve a significant hazards consideration,
- 2. The changes do not involve a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or
- The changes do not involve a significant increase in individual or cumulative occupational radiation exposure.

Accordingly, the proposed changes meet the eligibility criterion for categorical exclusion set forth in 10 CFR Section 51.22(c)(9). Therefore pursuant to 10 CFR Section 51.22(b), an environmental assessment of the proposed changes is not required.