



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

NORTHERN STATES POWER COMPANY

DOCKET NO. 50-282

PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 128
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 29, 1997, as supplemented February 11, 12, March 7, 10, 11, 19, and 20, 1997, 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 adding paragraph 2.C.(5) to Facility Operating License No. DPR-42 to read as follows:

(5) Additional Conditions

The Additional Conditions contained in Appendix B, as revised through Amendment No. 128, are hereby incorporated into this license. The licensee shall operate the facility in accordance with the Additional Conditions.

* Pages 4 and 5 are attached, for convenience, for the composite license to reflect this change.

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PDR ADOCK 05000282
PDR

9/15/97

Mr. Roger O. Anderson, Director
Licensing and Management Issues
Northern States Power Company
414 Nicollet Mall
Minneapolis, Minnesota 55401

SUBJECT: PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT NOS. 1 AND 2 -
ISSUANCE OF AMENDMENTS RE: COOLING WATER SYSTEM EMERGENCY INTAKE
DESIGN BASES (TAC NOS. M97816 AND M97817)

Dear Mr. Anderson:

The Commission has issued the enclosed Amendment No. 128 to Facility Operating License No. DPR-42 and Amendment No. 120 to Facility Operating License No. DPR-60 for the Prairie Island Nuclear Generating Plant, Unit Nos. 1 and 2, respectively. The amendments consist of changes to the Technical Specifications in response to your application dated January 29, 1997, as supplemented February 11, 12, March 7, 10, 11, 19, and 20, 1997.

The amendments authorize you to continue operation of Prairie Island Units 1 and 2 on an interim basis, through the incorporation of three license conditions into your licenses, until a seismically qualified emergency cooling water source is provided that will provide the basis to extend the time for operator post-seismic cooling water load management. This could be done either through a seismic evaluation of the intake canal, physical modifications to the intake canal or plant, or some combination of the two.

As an administrative action by the Nuclear Regulatory Commission (NRC), which only involves the format of the licenses and does not authorize any activities outside the scope of your application and supplements, the NRC has amended the licenses to include an Appendix B which lists additional license conditions. Approval of these amendments through license conditions has been discussed with your staff in a meeting with NRC on March 12, 1997, and your staff has agreed to the license conditions.

A copy of our related Safety Evaluation is also enclosed. The notice of issuance will be included in the Commission's biweekly Federal Register notice.

Sincerely,

Orig. signed by

Beth A. Wetzel, Project Manager
Project Directorate III-1
Division of Reactor Projects - III/IV
Office of Nuclear Reactor Regulation

Docket Nos. 50-282 and 50-306

- Enclosures: 1. Amendment No.128 to DPR-42
2. Amendment No.120 to DPR-60
3. Safety Evaluation

cc w/encl: See next page

DISTRIBUTION: See attached page

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DOCUMENT NAME: G:\WPDOCS\PRAIRIE\PI97816.AMD *See previous concurrence
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OFFICE	PM:PD31	E	LA:PD31	E	*BC:SPLB	*BC:ECGB	*BC:HHFC	OGC	D:PD31
NAME	BWetzel: <i>BW</i>		CJamerson		LBMarsh	GBagchi	COThomas	<i>3/25/97</i>	JHannon
DATE	03/24/97		03/24/97		03/21/97	03/21/97	03/21/97	3/25/97	3/25/97

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OFFICIAL RECORD COPY

DATED: March 25, 1997

AMENDMENT NO. 128 TO FACILITY OPERATING LICENSE NO. DPR-42-PRAIRIE ISLAND UNIT 1
AMENDMENT NO. 120 TO FACILITY OPERATING LICENSE NO. DPR-60-PRAIRIE ISLAND UNIT 2

Docket File

PUBLIC

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DF01
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270047

Mr. Roger O. Anderson, Director
Northern States Power Company

Prairie Island Nuclear Generating
Plant

cc:

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Northern States Power Company
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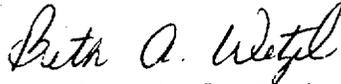
Kris Sanda, Commissioner
Department of Public Service
121 Seventh Place East
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St. Paul, Minnesota 55101-2145

Site Licensing
Prairie Island Nuclear Generating
Plant
Northern States Power Company
1717 Wakonade Drive East
Welch, Minnesota 55089

November 1996

3. This license amendment is effective as of the date of issuance, with implementation of License Condition 1 prior to Unit 2 entering Mode 2, with implementation of the requirements of License Condition 2 by July 1, 1997, and December 31, 1998, and with implementation of License Condition 3 at the next USAR update following completion of License Condition 2, but no later than June 1, 1999.

FOR THE NUCLEAR REGULATORY COMMISSION



Beth A. Wetzel, Project Manager
Project Directorate III-1
Division of Reactor Projects - III/IV
Office of Nuclear Reactor Regulation

Attachments: 1. Pages 4 and 5 of License
2. Appendix B - Additional Conditions

Date of Issuance: March 25, 1997

(3) Physical Protection

The licensee shall fully implement and maintain in effect all provisions of the Commission-approved physical security, guard training and qualification, and safeguards contingency plans including amendments made pursuant to provisions of the Miscellaneous Amendments and Search Requirements revisions to 10 CFR 73.55 (51 FR 27817 and 27822) and to the authority of 10 CFR 50.90 and 10 CFR 50.54(p). The plans, which contain Safeguards Information protected under 10 CFR 73.21, are entitled: "Prairie Island Nuclear Generating Plant Physical Security Plan," with revisions submitted through November 30, 1987; "Prairie Island Nuclear Generating Plant Guard Training and Qualification Plan," with revisions submitted through February 26, 1986; and "Prairie Island Nuclear Generating Plant Safeguards Contingency Plan," with revisions submitted through August 20, 1980. Changes made in accordance with 10 CFR 73.55 shall be implemented in accordance with the schedule set forth therein.

(4) Fire Protection

Northern States Power Company shall implement and maintain in effect all provisions of the approved fire protection program as described and referenced in the Updated Safety Analysis Report for the Prairie Island Nuclear Generating Plant, Units 1 and 2, and as approved in Safety Evaluation Reports dated February 14, 1978, September 6, 1979, April 4, 1980, December 29, 1980, July 28, 1981, September 12, 1984, June 25, 1985, October 27, 1989, and October 6, 1995, subject to the following provision:

The licensee may make changes to the approved Fire Protection Program without prior approval of the Commission only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire.

(5) Additional Conditions

The Additional Conditions contained in Appendix B, as revised through Amendment No. 128, are hereby incorporated into this license. The licensee shall operate the facility in accordance with the Additional Conditions.

2. D. This license is effective as of the date of issuance and shall expire at midnight August 9, 2013.

FOR THE ATOMIC ENERGY COMMISSION

Original Signed by
Roger S. Boyd

A. Giambusso, Deputy Director
for Reactor Projects
Directorate of Licensing

Attachments:

1. Appendix A - Technical Specifications
2. Appendix B - Additional Conditions

Date of Issuance: APR 5 1974

APPENDIX B

ADDITIONAL CONDITIONS

FACILITY OPERATING LICENSE NO. DPR-42

Northern States Power Company shall comply with the following conditions on the schedules noted below:

<u>Amendment Number</u>	<u>Additional Condition</u>	<u>Implementation Date</u>
128	1. NSP will provide a licensed operator in the control room on an interim basis for the dedicated purpose of identifying an earthquake which results in a decreasing safeguards cooling water bay level. This operator will be in addition to the normal NSP administrative control room staffing requirements and will be provided until License Condition 2 is satisfied.	Prior to Unit 2 entering Mode 2.
128	2. NSP will submit dynamic finite element analyses of the intake canal banks by July 1, 1997 for NRC review. By December 31, 1998, NSP will complete, as required, additional analyses or physical modifications which provide the basis for extending the time for operator post-seismic cooling water load management and eliminating the dedicated operator specified in License Condition 1.	July 1, 1997, and December 31, 1998, as stated in Condition 2.
128	3. Based on the results of License Condition 2, NSP will revise the Updated Safety Analysis Report to incorporate the changes into the plant design bases. These changes will be included in the next scheduled revision of the Updated Safety Analysis Report following completion of License Condition 2 activities.	At the next USAR update following completion of Condition 2, but no later than June 1, 1999.



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

NORTHERN STATES POWER COMPANY

DOCKET NO. 50-306

PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 120
License No. DPR-60

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Northern States Power Company (the licensee) dated January 29, 1997, as supplemented February 11, 12, March 7, 10, 11, 19, and 20, 1997, 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 adding paragraph 2.C.(5) to Facility Operating License No. DPR-60 to read as follows:

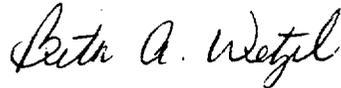
(5) Additional Conditions

The Additional Conditions contained in Appendix B, as revised through Amendment No. 120, are hereby incorporated into this license. The licensee shall operate the facility in accordance with the Additional Conditions.

* Pages 4 and 5 are attached, for convenience, for the composite license to reflect this change.

3. This license amendment is effective as of the date of issuance, with implementation of License Condition 1 prior to Unit 2 entering Mode 2, with implementation of the requirements of License Condition 2 by July 1, 1997, and December 31, 1998, and with implementation of License Condition 3 at the next USAR update following completion of License Condition 2, but no later than June 1, 1999.

FOR THE NUCLEAR REGULATORY COMMISSION



Beth A. Wetzel, Project Manager
Project Directorate III-1
Division of Reactor Projects - III/IV
Office of Nuclear Reactor Regulation

Attachments: Pages 4 and 5 of License
Appendix B - Additional Conditions

Date of Issuance: March 25, 1997

(3) Physical Protection--continued

1987; "Prairie Island Nuclear Generating Plant Guard Training and Qualification Plan," with revisions submitted through February 26, 1986; and "Prairie Island Nuclear Generating Plant Safeguards Contingency Plan," with revisions submitted through August 20, 1980. Changes made in accordance with 10 CFR 73.55 shall be implemented in accordance with the schedule set forth therein.

(4) Fire Protection

Northern States Power Company shall implement and maintain in effect all provisions of the approved fire protection program as described and referenced in the Updated Safety Analysis Report for the Prairie Island Nuclear Generating Plant, Units 1 and 2, and as approved in Safety Evaluation Reports dated February 14, 1978, September 6, 1979, April 4, 1980, December 29, 1980, July 28, 1981, September 12, 1984, June 25, 1985, October 27, 1989, and October 6, 1995, subject to the following provision:

The licensee may make changes to the approved Fire Protection Program without prior approval of the Commission only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire.

(5) Additional Conditions

The Additional Conditions contained in Appendix B, as revised through Amendment No. 120, are hereby incorporated into this license. The licensee shall operate the facility in accordance with the Additional Conditions.

2. D. This license is effective as of the date of issuance and shall expire at midnight October 29, 2014.

FOR THE ATOMIC ENERGY COMMISSION

Original Signed by
A. Giambusso

A. Giambusso, Deputy Director
for Reactor Projects
Directorate of Licensing

Attachments:

1. Appendix A - Technical Specifications
2. Appendix B - Additional Conditions

Date of Issuance: OCT 29 1974

APPENDIX B

ADDITIONAL CONDITIONS

FACILITY OPERATING LICENSE NO. DPR-60

Northern States Power Company shall comply with the following conditions on the schedules noted below:

<u>Amendment Number</u>	<u>Additional Condition</u>	<u>Implementation Date</u>
120	1. NSP will provide a licensed operator in the control room on an interim basis for the dedicated purpose of identifying an earthquake which results in a decreasing safeguards cooling water bay level. This operator will be in addition to the normal NSP administrative control room staffing requirements and will be provided until License Condition 2 is satisfied.	Prior to Unit 2 entering Mode 2.
120	2. NSP will submit dynamic finite element analyses of the intake canal banks by July 1, 1997 for NRC review. By December 31, 1998, NSP will complete, as required, additional analyses or physical modifications which provide the basis for extending the time for operator post-seismic cooling water load management and eliminating the dedicated operator specified in License Condition 1.	July 1, 1997, and December 31, 1998, as stated in Condition 2.
120	3. Based on the results of License Condition 2, NSP will revise the Updated Safety Analysis Report to incorporate the changes into the plant design bases. These changes will be included in the next scheduled revision of the Updated Safety Analysis Report following completion of License Condition 2 activities.	At the next USAR update following completion of Condition 2, but no later than June 1, 1999.



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NOS. 128 AND 120 TO

FACILITY OPERATING LICENSE NOS. DPR-42 AND DPR-60

NORTHERN STATES POWER COMPANY

PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT NOS. 1 AND 2

DOCKET NOS. 50-282 AND 50-306

1.0 INTRODUCTION

By letter dated January 29, 1997, as supplemented by letters dated February 11 and 12, March 7, 10, 11, 19, and 20, 1997, Northern States Power Company (NSP or the licensee) submitted a license amendment request for the Prairie Island Nuclear Generating Plant, Units 1 and 2. The initial request was submitted in accordance with the provisions of 10 CFR Part 50, Sections 50.59 and 50.90 to address an unreviewed safety question (USQ) related to the cooling water system emergency intake line flow capacity. The emergency intake line is described in the Updated Safety Analysis Report (USAR) as having the capacity to be the sole source of water from the Mississippi River (the ultimate heat sink or UHS) to the intake bay for the cooling water system pumps following a design-basis seismic event. The cooling water system pumps are necessary for safe plant shutdown under all postulated conditions including seismic events.

In 1995, the licensee performed a self-assessment service water system operational performance inspection (SWSOPI) and determined that the actual emergency intake line flow capacity could be less than the design assumptions used in its original licensing basis analysis. As a result of its determination, the licensee requested changes to the Bases for the plant technical specifications (TSs) and to the licensing basis for both units as described in the USAR. Specifically, the proposed changes would allow credit for the volume of water in the intake canal (previously assumed to be totally blocked at time zero into the seismic event) to the extent that dependence of the emergency intake line would not be required until about 3 1/2 hours after a seismic event. During this 3 1/2-hour time period the licensee proposed to take operator action to reduce the cooling water system flow demand (by isolating non-essential loads) to the extent that system flow would be less than the existing capacity of the emergency intake line. As the event progresses, the cooling water pumps' flow rate is determined by the cooling water system demand.

In support of the proposed changes the licensee performed stability analyses of the intake canal during a seismic event in order to show that the intake canal will not become blocked as a result of any postulated seismic event. The results of the licensee's analysis is intended to demonstrate that the volume of water contained within the intake canal will be available to the

cooling water system pumps for up to 3 1/2 hours following a design-basis seismic event. After 3 1/2 hours, the intake canal inventory is calculated to be depleted, but system flow demand will have been reduced (by operator action) to the extent that pump flow rates are less than the capacity of the emergency intake line. Water flows through the emergency intake line as a result of the height difference between the river and the cooling water bay (safeguards bay) where the cooling water pumps take suction. Thus, the level in the river determines the available flow rate through the emergency intake line. The cooling water demand must be reduced to less than the emergency intake line capacity to ensure adequate net positive suction head (NPSH) for the pumps. Staff review of the licensee's seismic analyses and seismic capability of the intake canal is presently ongoing and could result in further seismic analyses and/or plant modifications.

The amendments involve a USQ and, therefore, a license amendment is necessary to allow plant startup. In the March 11, 19, and 20, 1997, submittals, the licensee supplemented the initial amendment requests in accordance with the provisions of 10 CFR Part 50, Section 50.91(a)(6) by requesting that the amendments be issued under exigent conditions to allow startup of Unit 2. In the March 11, 1997, submittal, the licensee provided a revised analysis to support operator actions without taking credit for the intake canal following a seismic event. In that same submittal, the licensee also proposed three license conditions to support the issuance of the amendments. The proposed license conditions were revised by the March 19, 1997, submittal to read as follows:

License Condition 1) NSP will provide a licensed operator in the control room on an interim basis for the dedicated purpose of identifying an earthquake which results in a decreasing safeguards cooling water bay level. This operator will be in addition to the normal NSP administrative control room staffing requirements and will be provided until License Condition 2 is satisfied.

License Condition 2) NSP will submit dynamic finite element analyses of the intake canal banks by July 1, 1997 for NRC review. By December 31, 1998, NSP will complete, as required, additional analyses or physical modifications which provide the basis for extending the time for operator post-seismic cooling water load management and eliminating the dedicated operator specified in License Condition 1.

License Condition 3) Based on the results of License Condition 2, NSP will revise the Updated Safety Analysis Report to incorporate the changes into the plant design bases. These changes will be included in the next scheduled revision of the Updated Safety Analysis Report following completion of License Condition 2 activities.

This evaluation addresses the licensee's March 11, 1997, supplemental amendment requests, as revised by the March 19 and 20, 1997, submittals, which are intended to provide a short-term resolution of the USQ. The staff's

safety evaluation for the long-term resolution of the issue will be provided in future license amendments addressing NSP's resolution of proposed License Condition 2.

2.0 DISCUSSION/SYSTEM DESCRIPTION

The Mississippi River (UHS) is the source of normal and emergency cooling water for the plant during all modes of operation. It is also the source of fire water for the plant. Normal and emergency heat loads for both units are supplied cooling water from the shared cooling water (CL) system via five (5) CL system pumps, three of which are safety-related and take suction from the "safeguards bay" within the seismic Category I plant screenhouse. The two nonsafety-related CL pumps take suction directly from the "intake bay" which is also located within the plant screenhouse and normally feeds into the safeguards bay via two sluice gates. The intake bay can only be supplied water from the circulating water intake canal (or intake canal). The safeguards bay can either be supplied water from the intake canal via the intake bay (through sluice gates) or it can be supplied directly from the emergency intake line (or a combination of the two). The intake line is a 36-inch pipe buried about 40 feet below the intake canal water level in nonliquefiable soil, connecting the safeguards bay to a submerged intake crib in the UHS. Thus, the emergency intake line provides continuous communication between the safeguards bay and the UHS. Normally, makeup flow to the safeguards bay is from the intake bay via two sluice gates, either of which is capable of supplying enough flow to maintain sufficient NPSH on the CL system pumps under maximum flow demand events. The water inventory in the intake canal and thus, the intake bay, is maintained with flow from the UHS through a nonsafety-related "intake screenhouse" located between the river and the intake canal. Therefore, water normally flows from the river, through the intake screenhouse, through the intake canal, and into the intake bay in the plant screenhouse. The supply to the safeguards CL pumps continues through the intake bay into the safeguards bay via the two normally open sluice gates.

The current licensing analysis in the USAR assumes that a seismic event causes the failure of a downstream dam with an immediate reduction in the UHS to its lowest level (666.5 feet) in addition to assuming the instantaneous loss of the intake canal water source (due to blockage in the canal) to the plant screenhouse. These two bounding assumptions result in the emergency intake line being the only credited source of water to the screenhouse following a design-basis seismic event. The instantaneous lowering of the river level assumption results in the minimum assumed design basis flow through the intake line since the flow rate is determined by the differential head (gravity flow) between the river and the safeguards bay. The licensee's assumptions in the USAR analysis were intended to be bounding conditions based on the belief that the flow capacity of the emergency intake line, with the river at its minimum level, was more than the maximum flow demand from the CL system.

As discussed above, recent calculations and tests have shown that the emergency intake line's flow capacity is lower than originally assumed in the licensing basis analysis. The recent calculations have shown that the results of 1974 preoperational tests were not interpreted correctly with respect to the intake line capacity at the minimum river level. The results of the

preoperational tests when interpreted correctly show that at the minimum river level of 666.5 feet, the capacity of the intake line was only 15,000 gallons per minute (gpm). This was actually lower than the USAR stated minimum design capacity of 18,000 gpm at a river level of 666.5 feet. The recent intake line tests showed that the existing capacity of the line, when extrapolated to the minimum river level of 666.5 feet, was only 11,600 gpm. Therefore, operator action would be needed to reduce the cooling water system demand to below this flow rate. However, as discussed below, the licensee has demonstrated by analysis that the river level will not begin to drop below 669 feet for at least 3 hours following the failure of the downstream dam. At 669 feet, the minimum flow through the emergency intake line would be 13,700 gpm. Therefore, the licensee's short-term analysis is based on reducing the flow demand of the CL system to less than 13,700 gpm in less than 20 minutes. The licensee has performed cleaning operations in an attempt to restore the pipe to its original tested capacity of 15,000 gpm with the river level at 666.5 feet. However, the effectiveness of that cleaning has not been demonstrated with testing. Because of this cleaning the actual existing capacity of the emergency intake line should be greater than what is assumed in the licensee's current analysis (11,600 gpm) which is based on the as-found flow rates.

The licensee's proposed long-term changes (described in the January 29, 1997, submittal) to the design basis would take credit for the gradual lowering of the UHS level resulting from the downstream dam failure and would also take credit for the volume of water contained in the intake canal (no makeup from river) at the time of the seismic event. These assumptions would allow up to 3 1/2 hours for operator action to reduce the flow demand of the CL system such that it would be less than the actual capacity of the emergency intake line at the minimum river level, i.e., less than 11,600 gpm.

As described in the March 11, 1997, submittal, the licensee's revised analysis would not take credit for the volume of water in the intake canal. Credit for the gradual lowering of the river water level (affecting flow through the intake line) would still apply and credit for a volume of water in the intake bay (within the plant screenhouse) in addition to the back flow of water to the intake bay from portions of the circulating water system piping would also be applied. The revised analysis applies conservative assumptions regarding the water sources available and shows that there are at least 17.9 minutes for the operators to manage cooling water system loads. The 17.9 minutes can be considerably extended once the operator initiates the procedure to isolate loads. Each isolation of a cooling water load reduces the rate of water loss from the safeguards bay thereby extending the time available for isolation of the remaining loads.

It is the licensee's position that taking credit for operator actions with the use of a dedicated operator as described in License Condition 1 resolves this USQ for the short term and provides a reasonable interim basis for safe operation of the plant. Resolution of the USQ on a long-term basis is proposed to be dealt with in License Conditions 2 and 3. In accordance with License Condition 2, the licensee will provide long-term resolution of the USQ which takes credit for operator actions within a more relaxed time frame such that use of a dedicated operator is not required. The long-term resolution could be a seismic evaluation of the intake canal, physical modifications to

the intake canal or to the plant, or some combination of the two which assures that the operators will have sufficient time to manage cooling system loads in a relaxed or unhurried fashion following a design-basis earthquake. License Condition 3 requires incorporating the long-term measures into the plant design basis through revision of the USAR.

3.0 EVALUATION

3.1 System Considerations

Following a seismic event, the CL system flow must be reduced to match the capacity of the emergency intake line. The length of time available to reduce the CL flow is dependent on whether the intake canal banks will remain stable or whether they will fail in a manner that would block the plant screenhouse from the intake canal inventory. Currently, the licensee is performing dynamic finite element analyses of the intake canal banks. The output of those analyses will be used to further assess the behavior of the intake canal banks during a design-basis seismic event.

As an interim short-term resolution, operator action is proposed to reduce CL system demand in a limited time frame. To support this operator action, the licensee established a clear boundary for calculating available water volumes by assuming no makeup at all is available from the intake canal into the plant screenhouse. This assumption is limiting but is necessary to allow the performance of precise, justifiable calculations. The assumption is limiting because it takes the conservative approach that beginning at time zero of the earthquake, complete blockage occurs and there is absolutely no makeup flow from the canal into the screenhouse. Therefore, the licensee's available water inventory evaluation, which results in at least 17.9 minutes of water available, can be considered a bounding minimum time to perform the required operator actions.

Following blockage of the inventory in the intake canal, the only available water supplies to the safeguards bay are from the volume of water in the intake bay within the plant screenhouse and the flow through the emergency intake line from the UHS. Water flows through the intake line as a result of the height difference between the river and the safeguards bay. Thus, the level in the river determines the available flow rate through the emergency intake line. The CL system demand must be reduced to less than the emergency intake line capacity to ensure adequate NPSH for the CL pumps before the water in the intake bay is exhausted.

The intake bay inventory depletion rate is based on the maximum expected flow demand (29,750 gpm) from the CL system plus the flow rate of the diesel-driven fire pump which is 2000 gpm. There are three fire pumps (two motor-driven and one diesel-driven) that take suction from the intake bay and thus could affect the drawdown rate of the intake bay. The two motor-driven fire pumps are not powered from the safeguards busses and, therefore, are assumed not to be available as a result of loss of offsite power (LOOP) due to the postulated seismic event. The staff believes these are reasonable and conservative assumptions because the diesel-driven fire pump and the fire protection system are seismic Class II and can be expected to survive the seismic event, while

it is not reasonable to assume that offsite power is still available following a seismic event of sufficient magnitude to fail the downstream dam and block makeup flow from the river to the intake canal.

The volume of water available inside the plant screenhouse is 365,875 gallons. This is the free volume of the intake bay plus the safeguards bay. Water level is assumed to be at the normal level of 674.5 feet. Only the water volume above 664 feet was used in the calculation to ensure an adequate head for full flow through the sluice gates (top of gate is at 666 feet and bottom of gate is at 662 feet). The licensee also assumed that an additional 69,850 gallons would be available to gravity drain back from the circulating water system (CWS) piping into the intake bay after the CWS pumps stop running. This provides a total available water volume of 455,725 gallons of water available in the screenhouse to the CL pumps and the fire pump.

At the postulated depletion rate of 31,750 gpm, the calculated volume of water in the screenhouse would provide 14.4 minutes of pump operation. However, there are two factors that extend this time frame: The first is operator action to reduce cooling system flow demand. The second is the flow through the emergency intake line from the UHS to the safeguards bay. The flow rate through the emergency intake line depends on the difference between the river level and the safeguards bay level.

The licensee has conservatively assumed that the river water level immediately drops from the normal level of 674.5 feet to 669 feet at time zero into the event. With the initial intake bay level of 674.5 feet, there will be some flow of water from the safeguards bay out through the emergency intake line to the river. As the water level in the safeguards bay decreases to less than 669 feet, the intake bay supply into the safeguards bay will be augmented by flow from the emergency intake line. At a water level of 669 feet in the safeguards bay, the water level in the intake bay is approximately 670 feet to support adequate flow through the sluice gates into the safeguards bay. The time to drain the screenhouse (intake bay) level to 670 feet (not including the water volume in the CWS piping) at a drawdown rate of 31,750 gpm is 5 minutes. With the augmented flow from the emergency intake line it takes 10.7 minutes to further drain the safeguards bay from 669 feet to 662 feet. Thus, the time available without credit for the CWS piping backflow is 15.7 minutes. If credit is given for gravity draining the CWS piping, an additional 2.2 minutes can be assumed for a total of 17.9 minutes. The staff agrees with the licensee's assumptions regarding the CWS piping. Even if one of the four CWS pipes were to sustain a break as a result of the seismic event, most of the water (at least three-fourths of the total volume) would still drain back into the intake bay having a minimal effect on the licensee's volume and available time analysis.

The calculated 17.9 minutes assumes no reduction in cooling water loads during the event. As the cooling water demand is reduced by isolating unnecessary loads, the time to drawdown the safeguards bay is extended by an amount dependent on the size of each load that is isolated. The two largest unnecessary loads on the CL system are the turbine building supplies to Units 1 and 2. Therefore, they are the first loads isolated by the emergency procedure. A maximum flow of 5000 gpm was assumed to each turbine

building. Therefore, isolation of these loads would reduce the drawdown rate to 21,750 gpm. If it is assumed that this isolation takes place at 5 minutes into the event, the time available would be extended to 25.6 minutes. Similarly, the additional flow reductions would continue to extend the total available time. Therefore, the staff believes that during an actual seismic event requiring load isolation, the time available to reduce CL system demand to below the capacity of the emergency intake line would be considerably greater than the 17.9 minutes assumed in the analysis.

The licensee's assumption that the river level does not immediately drop to its minimum level of 666.5 feet following failure of the downstream dam is based on actual physical conditions that prevent such an unrealistic occurrence. An estimate by the Army Corps of Engineers (COE) indicates that it will take roughly 50 hours for the volume of water upstream of the plant to flow downstream. Only then can the river level drop to the minimum level assumed in the original analysis. The COE also estimated that it would take approximately 3 hours for upstream and downstream pools to equalize, resulting in a river level of 669 feet for about 50 hours while the upstream volume of water flowed past the plant. Only after this time could the river level decrease to the postulated low level of 666.5 feet. The assumption of gradual lowering of the river water level to the minimum level is in accordance with the guidance in Regulatory Guide (RG) 1.27, "Ultimate Heat Sinks For Nuclear Power Plants." RG 1.27 specifically identifies that "For example, the consequences of a postulated rupture of a dam (including the time-related effects of forces imposed at the time of rupture) should be assumed; however, it is not necessarily required that one assume that the dam disintegrates instantaneously with total loss of function. Thus, the assumption that river water level will not immediately drop to its minimum water level based on actual physical conditions that determine the volumetric flow rate following dam failure is in accordance with the guidance given in RG 1.27. The licensee has still made the conservative assumption that the dam instantaneously fails such that the river flow rate immediately reaches its maximum at time zero into the event. The licensee has also conservatively assumed that the river water level immediately drops to 669 feet when in fact, the decrease to 669 feet is also gradual, taking about 3 hours to occur. Based on the conservatisms used in the licensee's inventory analysis, and the guidance of RG 1.27, the staff concludes that the licensee's assumptions regarding the river water level and available sources of water following a seismic event are acceptable.

3.2 Operator Actions

As previously stated in this evaluation, Supplement 5 (dated March 11, 1997), as modified by Supplement 6 (dated March 19, 1997), to NSP's License Amendment Request of January 29, 1997, proposed three license conditions to allow Prairie Island Unit 2 to resume power operations. These license conditions were proposed because NSP has not completed the dynamic finite element analysis required by the staff to support NSP's assumption of crediting the intake canal as a viable source of water during a seismic event. In the interim, NSP is proposing operator action to reduce cooling water system demand in a limited time frame (17.9 minutes versus 3.5 hours that now must be substantiated by the dynamic finite element analysis).

One of the license conditions being proposed is that "NSP will provide a licensed operator in the control room on an interim basis for the dedicated purpose of identifying an earthquake which results in a decreasing safeguards cooling water bay level. This operator will be in addition to the normal NSP administrative control room staffing requirements and will be provided until License Condition 2 is satisfied." NSP describes in its submittals why taking credit for operator actions using a dedicated operator provides a reasonable interim basis for safely operating Prairie Island.

In its January 29, 1997, letter, NSP indicated that, following a seismic event, operator action is necessary to reduce cooling water system flow demand to less than or equal to the capacity of the emergency intake line (maximum capacity of the line is 13,700 gpm at the assumed initial post-seismic river level of 669 feet). To help assess the operator actions required to reduce flow demand, NSP has used guidance from the Seismic Qualification Utility Group (SQUG) Generic Implementation Plan and results from procedure validation exercises performed on the Prairie Island simulator with plant operating crews.

NSP developed a plant procedure (AB-03, "Earthquakes") to instruct operators on how to reduce cooling water system flow demand following a design-basis earthquake. The procedure (Rev.12) specifically requires that "flow reduction can be achieved in fifteen minutes," which is within NSP's calculated 17.9 minutes that are available solely from inventory in the plant screenhouse and flow from the emergency intake line before reducing cooling water system demands must begin. This procedure was submitted to the staff (March 20, 1997) and found to acceptably include instructions necessary to ensure that operators can reduce flow demand to accommodate the capacity of the emergency intake line identified in Supplement 5 (March 11, 1997) to NSP's amendment request.

As described by NSP, using a dedicated licensed operator, in addition to the normal administrative control room staffing, will expedite entering the earthquake procedure. The dedicated operator provides a means for timely recognition of the seismic annunciator and immediate notification to the shift supervisor. Also, using a dedicated operator and steps in the procedure will allow for isolating the turbine building loads first in the cooling water load management sequence, which accounts for about one-third of the cooling water system flow required. Isolating these loads early, and subsequent isolation of flow loads to remaining components, should allow further time for the operator to reduce flow if needed.

As NSP indicates in Supplement 6, dated March 19, 1997, though the principal duty of the additional licensed operator is to identify and assist in mitigating an earthquake event, this operator will participate in other control room duties while on shift, such as review work packages and surveillance procedures, prepare isolations for work packages, and assist the Shift Manager in reviewing alarm and daily log printouts. However, these duties can be immediately terminated and do not interfere with his principal responsibility.

In addition, NSP has evaluated the effects of a single failure event on the operators' ability to reduce cooling water system flow demand. This event would involve a safeguards bus lockout or a diesel generator failure. The result of the single failure is that multiple valves cannot be operated from the control room with the most limiting combination of valves including the motor valve which isolates flow to a turbine building. In the event of this failure, the dedicated operator can be dispatched from the control room to manually close the appropriate turbine building cooling water isolation valve. The turbine building cooling water supply valves are located in switchgear rooms inside the seismically qualified corridor between the turbine buildings of each of the units. Qualified scaffolding and emergency lighting are present to support manual closure of the valves.

For all actions taken from the main control room, instrumentation is accessible from bench boards which span about 20 feet, with related alarms located on the vertical panels above the required instrumentation. All associated instrumentation required to manage the emergency cooling water system under the postulated accident conditions is seismically qualified or safety related except for bay level indicators which will fail in a conservative direction to support appropriate operator actions and are closely monitored by the dedicated operator. A seismically qualified auditory alarm is also present in the control room to alert the dedicated operator (and crew) to a seismic event in addition to the expected consequences of such an event (i.e., ground tremors, etc.).

In Supplement 5, using the plant simulator, NSP described results of testing the operators' ability to implement the earthquake procedure with the normal complement of crew members and the dedicated operator. Using a scenario consisting of several simultaneous events (design-basis seismic event, loss of offsite power, loss of normal river water intake capability, total loss of available condensate to the auxiliary feedwater pumps, and loss of instrument air), NSP conducted 12 trials with separate crews composed of the normal complement of operators (plus one dedicated operator)¹. Results of the trials indicated that operators required an average time of about 7 minutes to reduce cooling water loads to less than 11,600 gpm (the capacity of the intake line at the assumed minimum river level of 666.5 feet), with times ranging from 4 to 9 minutes.

In addition, NSP conducted 21 walkdown exercises to assess operators' performance of manually closing the motor valve which isolates flow to a turbine building². Ten exercises were conducted on the Unit 1 valve and 11 on the Unit 2 valve. Operators simulated closing the valve by taking 156 turns on the handwheel. The average time required by operators to complete the local valve manipulation (including the time required to traverse to the

¹This sample represents approximately 34 percent of NSP's licensed operators. Though a larger sample size is desirable, the sample is judged acceptable because, actual NSP operators were used in the test exercises and, therefore, should be representative of the population of NSP operators to the extent that crew members are similar to each other in dimensions such as age, experience, and training.

² This sample represents approximately 55 percent (21/38) of licensed operators who are eligible to perform as a dedicated operator.

valve from the control room) was 3 minutes, 37 seconds, with the range from 2.6 to 4.5 minutes. NSP performed a sensitivity study of the postulated scenario (conservatively assuming certain operator actions were taken at certain times during the event) which demonstrated that there are 23.1 minutes available from the time the turbine building motor valve is found to be inoperable from the control room until the manual operator action must be taken before the safeguards bay inventory is drained.

Previously, as described in Supplement 2 (February 12, 1997), NSP tested a draft of the earthquake procedure using the normal NSP administrative control room staffing level and two scenarios. Scenario A, involved multiple earth tremors of increasing magnitude causing several plant system malfunctions leading to a condition where the river water flow to the plant through the normal intake was impeded, and Scenario B consisted of several simultaneous events (design-basis seismic event, loss of offsite power, loss of normal river water intake capability, total loss of available condensate to the auxiliary feedwater pumps, and loss of instrument air).

Five separate trials were performed on the simulator using crews comprised of 10 licensed operators who were randomly selected to represent the normal complement of control room staff for a single unit (two licensed operators on the control boards, one senior licensed operator as Shift Supervisor, and one Senior licensed operator as Shift Manager (Shift Technical Advisor)). It is noted that the crew composition used is NSP's minimal crew composition for a single unit according to its administrative and technical specifications requirements.

In the trials, NSP considered other plant conditions and operator actions that would be required to be performed by operators during a seismic event as represented in these scenarios. For example, dual unit trip conditions and expected operator actions, as would be expected to occur under an actual seismic event, were role-played by operators though the simulator is not capable of simulating a dual unit trip. Although the operators had some familiarity with a previous revision to the earthquake procedure, they were not given the opportunity to review the revised procedure prior to the trials.

Scenario A was performed twice and Scenario B three times. NSP stated that, for both Scenario A trials, operators were able to reduce flow to <11,600 gpm within 8 minutes. For Scenario B, flow was reduced to <11,600 gpm within 8 minutes for two trials and 9 minutes for the third trial.

The performance times demonstrated by NSP operators in all tests were less than the minimum response times recommended by ANSI/ANS-58.8, "Time Response Design Criteria for Safety-Related Operator Actions" (1994). For example, in the scenario that requires manually closing the turbine building motor valves located outside the control room, NSP operators performed in 3.6 minutes versus the minimum 30 minutes plus recommended by ANSI/ANS 58.8. However, the staff believes that NSP's results take precedence. The data provided by NSP are, in large part, empirically based, with results derived from implementing a standardized validation method using subjects who were NSP operators.

In addition, as stated elsewhere in this evaluation, the assumptions bounding the engineering analyses conducted by NSP are conservative. In the very unlikely event of a design-basis earthquake occurring concurrently with a single failure that affects the operators' ability to reduce cooling loads from the main control room, the actual time available for the required manual operator actions may be significantly more than NSP has credited.

To further support its position for taking credit for manual operator actions to isolate cooling water loads, NSP provided an analysis of potential operator acts of omission and commission related to the load isolation. NSP's analysis determined that potential credible operator acts of omission and commission would not cause failure in properly reducing cooling water system flow within the capacity of the emergency cooling water intake line.

Additionally, NSP provided a preliminary Human Reliability Analysis (HRA) which indicated that possible operator acts of omission and commission will not adversely affect safe operation of the plant. The purpose of the analysis was to compare the human error probability (HEP) of a previously evaluated operator action associated with the auxiliary feedwater (AFW) system with the HEP associated with the cooling water system load management. NSP viewed this comparison as appropriate because both procedures are performed using the same control room staff under the same event conditions. The HEP for implementing the cooling water system load management procedure was calculated at $1.1E-2$; the HEP associated with the AFW event operator action was $6.8E-2$. Compared to the HEP for the AFW operator action (reestablishing AFW pump operation with suction from cooling water), the HEP for the cooling water system load management procedure was lower.

Also, NSP indicates that all licensed operators will be trained on the earthquake procedure (Rev.12) prior to assuming licensed duties after Unit 2 exceeds Mode 3 (Hot Shutdown). Further, NSP stated that each operating crew had been provided special training on the earthquake procedure before assuming shift duties immediately after the procedure was issued. Training on the earthquake procedure was included in the normal operator requalification training during 1996 and additional operator training is scheduled for 1997, with training on this procedure being incorporated into NSP's continuing training for operators.

The staff has evaluated the analyses provided by NSP related to taking credit for operator actions to manage cooling water loads during a design-basis earthquake event. The staff believes that NSP has adequately justified the need for and satisfactorily demonstrated that the interim compensatory operator actions using a dedicated operator to manage cooling water loads can be accomplished in sufficient time so as not to compromise plant safety.

Therefore, the staff finds acceptable NSP's license amendment request dated January 29, 1997, with License Condition 1: "NSP will provide a licensed operator in the control room on an interim basis for the dedicated purpose of identifying an earthquake which results in a decreasing safeguards cooling water bay level. This operator will be in addition to the normal NSP

administrative control room staffing requirements and will be provided until License Condition 2 is satisfied."

3.3 Summary

Based on its evaluation as described above, the staff concludes that with proposed License Condition 1, the licensee has demonstrated that adequate time is available for operator action following a design-basis earthquake to reduce the CL system demand to within the capacity of the emergency intake line in the event of complete blockage of the circulating water intake canal. The staff's conclusion is based in part on a determination that the licensee's analysis to calculate the time available for operator actions was performed in accordance with the guidance of RG 1.27, and the analysis was based on adequately conservative assumptions regarding water available from the intake canal and from the UHS through the emergency intake line. The staff's conclusion is also based in part on the licensee's demonstration that the operators are capable of performing the required actions in the time available. The staff, therefore, concludes that, for the short term, the licensee has adequately resolved the USQ related to the emergency intake line capacity and the ability to perform a safe plant shutdown following a design-basis earthquake. The staff also concludes that License Conditions 2 and 3 provide adequate assurance that the emergency cooling water issue will be further resolved in the long term to provide the operators with an expanded, more relaxed time frame to reduce CL system flow demand to within the capacity of the emergency intake line. Thus, the staff finds the licensee's license amendment request for short-term resolution of the USQ is acceptable.

4.0 EXIGENT CIRCUMSTANCES

The Commission's regulations, 10 CFR 50.91, contain provisions for issuance of amendments where the Commission finds that exigent circumstances exist, in that a licensee and the Commission must act quickly and that time does not permit the Commission to publish a *Federal Register* notice allowing 30 days for prior public comment. The exigency exists in this case in that the proposed amendments are needed to allow Prairie Island Unit 2 to resume power operation and time does not permit the Commission to publish a notice allowing 30 days for prior public comment. The licensee was unable to make a more timely application because it was not determined until recently that additional analyses are required to be completed in order to seismically qualify the intake canal. The staff has determined that the licensee used its best efforts to make a timely application.

Accordingly, the Commission has determined that exigent circumstances exist pursuant to 10 CFR 50.91(a)(6), the submittal of information was timely and could not have been avoided, and that the licensee did not create the exigency.

5.0 FINAL NO SIGNIFICANT HAZARDS CONSIDERATIONS DETERMINATION

The Commission's regulations in 10 CFR 50.92(c) state that the Commission may make a final determination that a license amendment 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) result in a significant reduction in the margin of safety. The NRC staff has made a final determination that no significant hazards consideration is involved for the proposed amendments and that the amendments should be issued as allowed by the criteria contained in 10 CFR 50.91. The NRC staff's final determination is presented below.

- (1) The proposed changes would not involve a significant increase in the probability or consequences of an accident previously evaluated.

The proposed changes deal with the ability to provide an adequate amount of emergency cooling water to cooling water loads following a design-basis earthquake. The changes do not increase the probability of occurrence of a design-basis earthquake. The proposed changes do not significantly increase the consequences of a design-basis seismic event because the licensee has demonstrated that adequate time is available for operator action following a design-basis earthquake to reduce the cooling water load demand to within the capacity of the emergency intake line. The proposed changes do not pertain to any other accident previously evaluated. Therefore, the changes do not involve a significant increase in the consequences or probability of a previously evaluated accident.

- (2) The proposed changes would not create the possibility of a new or different kind of accident from any accident previously evaluated.

The proposed changes deal with the ability to provide an adequate amount of cooling water to cooling water loads following a design-basis earthquake. The proposed changes take credit for the implementation of manual operator actions to manage cooling water loads following a design-basis earthquake. The licensee performed an analysis of potential operator acts of omission and commission related to the load isolation. The staff agrees with the results of the licensee's analysis which determined that potential credible operator acts of omission and commission would not cause failure to adequately reduce cooling water loads to within the capacity of the emergency cooling water intake line. Therefore, the proposed changes would not create the possibility of a new or different kind of accident from any accident previously evaluated.

- (3) The proposed changes would not result in a significant reduction in the margin of safety.

The proposed changes allow the licensee to take credit for the implementation of manual operator actions to manage cooling water loads following a design-basis earthquake. The licensee's analysis to calculate the time available for operator actions was based on adequately conservative assumptions regarding water available from the intake canal and from the

ultimate heat sink through the emergency intake line. The licensee also demonstrated through verification and validation of the procedure that the operators are capable of performing the required actions in the time available. Therefore, the proposed changes would not result in a significant reduction in the margin of safety.

6.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Minnesota State official was notified of the proposed issuance of the amendments. The State official had no comments.

7.0 ENVIRONMENTAL CONSIDERATION

Pursuant to 10 CFR 51.21, 51.32, and 51.35, an environmental assessment and finding of no significant impact was published in the *Federal Register* on March 21, 1997 (62 FR 13726).

Accordingly, based upon the environmental assessment, the Commission has determined that the issuance of these amendments will not have a significant effect on the quality of the human environment.

8.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (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 amendments will not be inimical to the common defense and security or to the health and safety of the public.

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