

OCT 18 1973

Docket No. 50-263

Northern States Power Company
ATTN: Mr. L. O. Mayer, Director of
Nuclear Support Services
414 Nicollet Mall
Minneapolis, Minnesota 55401

License No. DPR-22
Approval of EOC-2 Operation

Gentlemen:

We have reviewed your request dated October 10, 1973, to remove the 1200 MWD/STU control rod inventory restriction which has resulted in reduced electric power output from the Monticello Nuclear Power Plant. Based on your revised calculations using the increased safety valve set points (1240 psig) approved by our letter dated October 2, 1973, and 0.4 second relief valve response times based on modifications to the relief valves during the September 28, 1973, Monticello plant shutdown, and response times based on GE test measurements, you have determined that normal reactor operation can continue at rated power level or less to a 2680 MWD/T fuel exposure threshold in Cycle 2. As shown in Figure 2 of your submittal, further withdrawal of control rods must be prohibited at that exposure threshold until power level has decreased to 91% or less with the fixed control rod inventory for 2680 MWD/T at rated power. Reactor operation may continue thereafter, according to your calculations, at a maximum power level of 91% by continuing to withdraw control rods until all rods are completely withdrawn.

We have reviewed your analysis and the revised EOC-2, C-2, Scram Reactivity Curve as shown in Figure 1 of your submittal and have concluded that the changes in calculational assumptions should be identified and justified, e.g., the combination of relief/safety and safety valves assumed to open, the pressure set points, and pump conditions. The design and operational conservatism factors (DCF and OCF) should be quantified and justified. The basis for the Generic 72 B curve improved exposure threshold and the shift from C₁ to C₂ curve should be provided as well as the measures to be taken by NSP to assure that scram reactivity effects considering actual operating history fall within the C₂ curve. This supportive information should be submitted to the Directorate of Licensing prior to reaching the 2680 MWD/T exposure threshold where your August 1973 calculations result in a scram reactivity curve equivalent to the Generic 72 B scram reactivity curve.

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However, we have concluded that in the interim period, as shown in Table 2 of your submittal, (1) the margin between peak transient pressure following a turbine trip without steam bypass and the safety valve set point of 1240 psig will be greater than the GE design margin of 25 psi and (2) the 1375 psig design (code) overpressure limit will not be exceeded.

On this basis, we agree that a turbine trip without steam bypass will not cause primary coolant steam to be released into the containment drywell and the worst pressure transients (following simultaneous closure of all four MSIVs with delayed scram) will not damage the primary coolant boundary.

If, after attaining the Generic 72 B Curve Reactivity Scram Shape at 100% power level or equivalent fuel depletion in Monticello Cycle 2 core, the control rod inventory is maintained (i.e., no further withdrawal of control rods) until power level decreases to 91%, we further agree that control rod withdrawal can be resumed with maximum power level limited to 91% for the remainder of Cycle 2 operation (i.e., control rods are completely withdrawn) provided the additional information you are to submit is supportive.

On this basis, we have concluded that reactor operation to the end of fuel Cycle 2 does not present a significant hazards consideration and there is reasonable assurance that the health and safety of the public will not be endangered by operation of the reactor in the manner you have described.

Accordingly, the 1200 MWD/STU fixed control rod inventory restriction for operation of the Monticello Nuclear Power Plant is hereby removed and you are authorized to resume reactor operation at conditions up to and including rated power level until the "Generic 72" scram reactivity curve "B" is achieved (at 2680 MWD/T according to your calculations) at which time the control rod inventory will be fixed until

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reactor power level has dropped to 91%. At this time, control rods may be withdrawn until all rods are completely withdrawn but the maximum reactor power level must remain below 91%.

Our Safety Evaluation is included for your information.

Sincerely,

Original Signed by
D. J. Skovholt

Donald J. Skovholt
Assistant Director for
Operating Reactors
Directorate of Licensing

Enclosure:
Safety Evaluation

cc w/enclosure:
Donald E. Nelson, Esquire
VP and GC
Northern States Power Company

Gerald Charnoff
Shaw, Pittman, Potts, Trowbridge & Madden

Howard J. Vogel, Esquire
Knittle & Vogel

Steve Gadler, P. E.

Harriett Lansing, Esquire
Assistant City Attorney
City of St. Paul

Ken Dzugan
Minnesota Pollution Control Agency

Warren R. Lawson, M. D.
Secretary & Executive Officer
State Department of Health

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 JJShea, L:ORB #2
 RMDiggs, L:ORB #2
 MJinks, DRA (4)

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SURNAME ▶	JJShea:sjh	RMDiggs	DLZiemann	DJSkovholt	VSeello	
DATE ▶	10/16/73	10/17/73	10/17/73	10/18/73	10/18/73	

UNITED STATES ATOMIC ENERGY COMMISSION

SAFETY EVALUATION BY THE DIRECTORATE OF LICENSING

NORTHERN STATES POWER COMPANY

DOCKET NO. 50-263

MONTICELLO NUCLEAR POWER PLANT

OPERATION FROM 1640 MWD/T TO THE END OF CYCLE 2

Northern States Power Company (NSP) by letter dated October 10, 1973, requested removal of the operating restriction approved by our letter of October 2, 1973, (1) which fixed the control rod inventory to that which existed at 1200 MWD/STU and that reactor operation at power levels up to 100% be permitted until the "Generic 72" Scram Reactivity Curve "B" (Figure 1 of the NSP October 10, 1973 submittal) is attained at 2680 MWD/T according to NSP calculations. At that time the control rod inventory would be fixed (i.e., no further control rod withdrawal permitted) until power level decreased to 91% of rated. With reactor power level limited at 91% for the remainder of Monticello fuel Cycle 2, control rod withdrawal could be resumed until all rods are completely withdrawn. Figure 2 of the October 10, 1973 NSP submittal illustrates graphically this program of reactor operation for the remainder of Cycle 2. The fixed control rod inventory restriction based on full power level conditions at 1200 MWD/T has resulted in reactor power level being decreased to about 90% of rated power at approximately 2000 MWD/T average fuel depletion in Cycle 2.

Modification of the four safety/relief valves to reduce valve opening response times from 0.8 to 0.4 second and increasing the four safety valve trip points to 1240 psig from 1210-1220 psig provided additional margin between peak transient pressure following turbine trip without steam bypass and the safety valve set points. According to NSP these changes permit removal of the current reactor operating restrictions (1). Withdrawal of control rods can be resumed for reactor operation at rated conditions until the calculated scram reactivity curve shape matches the Generic 72 B Curve calculated by NSP to occur at the 2680 MWD/T Cycle 2 exposure threshold. The previously accepted (1)

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limits, i.e., the GE design margin of 25 psi between the peak transient pressure following turbine trip without steam bypass and the peak pressure of less than the 1375 psig design overpressure for the primary coolant system will not be exceeded following simultaneous closure of the four MSIVs and high flux reactor scram.

By holding or exceeding the core control rod inventory at the 2680 MWD/T fuel exposure limit until reactor power with this limiting rod configuration decreases to 91% and then continuing to withdraw control rods while maintaining the 91% power level limit, the required peak transient pressure margins will be retained to the end of Cycle 2.

We have completed our review of the information presented by the NSP letter dated October 10, 1973, and note that:

1. Attainment of "B" curve conditions was conservatively estimated by NSP to occur at 2250⁽²⁾ MWD/T in Cycle 2. A later refinement⁽³⁾, based on projected plant operation, resulted in an increased exposure threshold to 2400 MWD/T. According to the October 10, 1973 NSP submittal, a more precise calculation based on actual operating history resulted in an adjustment to 2680 MWD/T to achieve a Scram Reactivity Curve shape equivalent to the Generic 72 B curve shown on Figure 1 of the NSP report. The calculations appear to be very sensitive to reactor operating history. NSP should indicate their intentions for further calculational refinements to assure that the Generic 72 B curve exposure threshold is not exceeded prior to reaching 2680 MWD/T.
2. Recalculation of the end of Cycle 2 scram reactivity curve resulted in a slower reactivity insertion rate than had been calculated previously as indicated by the differences between Curve C₁ and C₂ of the NSP October 10, 1973 submittal. The methods for assuring that the most recently calculated and most restrictive EOC Curve C₂ limits are not exceeded should be reviewed.
3. The scram reactivity curves for fuel exposure at 1640, 2680 MWD/T, and end of Cycle 2 are presented in Figure 1 of the NSP submittal with design and operational conservatism factors (DCF and OCF) and the transient pressure analytical results have been listed in Table 2 of the same report using DCF and OCF. The conservatism factors should be quantified and justified.

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4. The MSIV closure pressure transients presented in Figures 5, 6, 10, and 15 are based on opening four relief valves in 0.4 second and all four safety valves with relief valves opening at 1070, 1075, and 1080 psig + 1X and safety valves opening at 1240 psig + 1X. Previous analyses⁽⁴⁾ were based on opening three of the four relief valves in 0.2 second and only two of the four safety valves. Relief and safety valve opening pressures assumed for analytical purposes in reference (4) were not specified but according to the FSAR-4-4.4A, the four relief/safety valve set points were originally simulated to be 1080, 1085, 1090, and 1095 psig with the actual set point to be < 1080 psig and the safety valves were set at their upper limits of 1210 and 1220 psig. The assumed recirculating pump conditions were not specified in earlier analysis⁽⁴⁾, although core inlet flow remained above 100% at the 5 second time increment for the turbine trip transient and continued to increase above 100% for the 16 second time period shown for the MSIV closure transient. The most recent calculations presented in the NSP October 10, 1973 submittal show a faster core flow drop off but still slower than would be expected for a pump trip, and the indicated flow rate remains above 100% for the MSIV closure transient. These apparent conflicts should be clarified.

We have concluded, however, that there is sufficient conservatism in the NSP calculations to justify removal at this time of the control rod inventory restriction currently imposed on the Monticello operation because there is adequate time for NSP to provide additional supportive information before reaching a limiting exposure threshold.

We also have considered the necessity for lowering the overpower trip set points when the operating power level limit is reduced to 91% and have concluded that for the transients under consideration such a reduction would not enhance safety and there are no changes in safety considerations or accident considerations, including loss-of-coolant accidents, that would justify changes to the existing Technical Specifications requirements.

On the basis of our review we have determined that the control rod inventory restriction that is currently limiting Monticello power production⁽¹⁾ may be removed and that continued operation of the Monticello nuclear power plant should be limited in the manner described by NSP with the provision that additional supportive information is submitted by NSP to the Directorate of Licensing on a timely basis. We

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have concluded that operation of the plant for the remainder of Monticello fuel Cycle 2 in the manner described does not present an unreviewed safety consideration or significant hazards considerations and there is reasonable assurance that the health and safety of the public will not be endangered.

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James J. Shea
Operating Reactors Branch #2
Directorate of Licensing

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Dennis L. Ziemann, Chief
Operating Reactors Branch #2
Directorate of Licensing

Date: OCT 18 1973

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REFERENCES

1. AEC Directorate of Licensing letter and Safety Evaluation dated October 2, 1973.

2. NSP letter to Directorate of Licensing dated June 1, 1973.

Preliminary calculations show Scram Reactivity Curve B to be limiting at 2250 MWD/STU.

3. NSP letter to Directorate of Licensing dated September 13, 1973.

The NSP letter included proposed changes to the Technical Specifications and a General Electric report that described pressure transients caused by turbine trip and main steam isolation valve closure.

4. NSP letter to Directorate of Licensing dated February 13, 1973.

Supplemental Report of a change in the transient analysis as described in the FSAR.

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