NSP

NORTHERN STATES POWER COMPANY

MINNEAPOLIS, MINNESOTA 55401

Regulatory File Cy.

August 21, 1973

Mr. J F O'Leary, Director
Directorate of Licensing
United States Atomic Energy Commission
Washington, D C 20545

Dear Mr. O'Leary:

MONTICELLO NUCLEAR GENERATING PLANT
Docket No. 50-263 License No. DPR-22

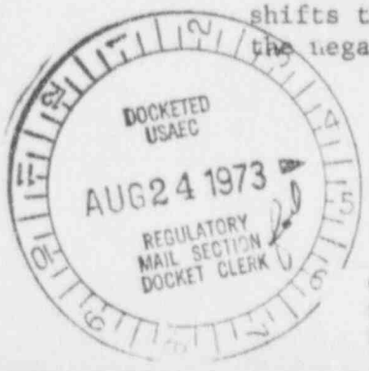
Planned Reactor Operation From
2000 MWD/T to the End of Cycle 2

I. Introduction

We are herein stating our plans for operation of the Monticello reactor during the period from the limiting exposure threshold to the end of cycle 2 as requested in the July 2, 1973 letter from Mr. D J Skovholt. Previous letters have discussed recent transient reanalyses done for Monticello end of cycle conditions. See references 1 to 6. Analyses show that late in cycle 2 following a turbine trip without bypass, the limiting transient used for relief valve sizing, the peak vessel pressure will fall within the 25 psi design margin to the lowest safety valve set point. Operation can safely continue to the end of cycle 2 if a power limitation is imposed late in the cycle; no changes in the Technical Specification are required. However, changes to plant equipment and Technical Specifications are being evaluated which will minimize or eliminate the power restriction.

II. End of Cycle Consideration

Calculations show that operations can safely proceed throughout an initial portion of cycle 2, but beyond which special restrictions must be implemented. As control rods are continually being withdrawn to compensate for fuel depletion, the negative scram reactivity available decreases. At the same time the natural power shape of a BWR depletes the bottom and middle sections of the core with respect to the top of the core; this further shifts the scram reactivity curve. The effect of the shift is to delay the negative reactivity insertion on scram.



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The most limiting transient with respect to governing criteria is the turbine trip without bypass. The General Electric recommended design criteria has been that the peak vessel pressure must not come within 25 psi of the lowest safety valve set point. The scram reactivity required to meet this requirements is then determined. The control rod pattern for rated power as a function of exposure is then compared to the required scram reactivity to determine the exposure threshold to which full power operation can safely continue. If power is reduced after reaching the threshold exposure, the transients are less severe and operation can proceed safely. The most limiting condition comes at the end of cycle when all control rods are fully withdrawn. Through a series of scoping calculations, the power level is determined at which the 25 psi margin is maintained for the turbine trip without bypass transient. The exposure threshold for full power operation and the all-rods-out exposure and power points fall on a locus of allowable operating conditions shown in the attached figure. Operation below and to the left of the locus is acceptable.

As shown in the figure, one allowable option is to operate to the calculated exposure threshold at rated power. At that point, one could maintain a constant control rod pattern and coast down in power until reaching the all-rods-out power threshold after which additional control rods could be withdrawn until reaching the all-rods-out condition. To meet system power requirements, the next refueling outage is not scheduled until late in February, 1974; we plan to coast down the all-rods-out curve until that date.

Calculations are done using the same assumptions, techniques and acceptance criteria presented in the FSAR and in references 2 and 6. It should be noted that these analyses incorporate conservative multiplying factors on the void and Doppler coefficients and apply a conservative reduction factor on the scram worth.

III. Present Evaluations

Evaluations of the locus of allowable end of cycle conditions center around safety valve set point changes, relief valve modifications and improved scram times. Relief valve modifications will reduce peak vessel pressure following transients for the end of cycle 2 as well as subsequent cycles. Safety valve setting increases will maintain or improve the margin between vessel pressure and valve set points. A modified Technical Specification scram time is being evaluated as an interim step for the remainder of cycle 2 until more major changes, such as installation of additional relief valves can be implemented. The nature of near term improvements are as follows:

A. Safety Valve Set Point Change

The end of cycle concern is only that of peak vessel pressure approaching safety valve set points, not over-pressurization of the reactor vessel. One solution is to raise all safety valves above the present 1210 and 1220 psi settings. The criteria used for safety valve sizing is the MSIV closure event with failure of direct scram initiation on MSIV position but an indirect scram on high neutron flux. Analyses show that the allowable peak vessel pressure will not be exceeded if this unlikely event were to occur from rated power at the end of cycle 2 with all-rods-out and all safety valves set at 1240 psi. With this higher safety valve set point, there is less potential for lifting a safety valve during operational transients such as the turbine trip without bypass and therefore a power level nearer rated power can be attained in the all-rods-out condition. Since this set point change requires a cold shutdown, it is planned for a fall outage. A safety evaluation and proposed Technical Specification changes are presently in preparation and review.

B. Relief Valve Opening Time

Reference 6 states that the time required for initial opening of the relief valves is approximately 0.8 sec rather than the 0.2 sec design opening time. As reported, the slower than expected operation results from steam condensation in the area above the main piston. A modification to alleviate this problem has been tested and found acceptable. The modification consists of machining a small groove in the valve sleeve to provide a gravity drain where the condensate collects. A second groove is machined to introduce steam at a high point in the chamber to drive the steam out the drain port. This modification also requires a cold shutdown and is planned for a short fall outage.

C. Scram Times

Transient analyses and scram reactivity calculations are based on the Technical Specification control rod scram times. The measured scram times over hundreds of data points have consistently been faster than Technical Specification scram times. We are, therefore, studying the effects of shorter scram times on transient analyses. If analyses show significantly improved results, we may propose interim Technical Specification changes to that effect. While we do not consider faster scram times to be attainable for the life of the plant, we believe the past performance is indicative of at least the remainder of cycle 2 and, therefore, a reasonable basis for

consideration of an interim Technical Specification for the remainder of cycle 2. We have recently modified our control rod drive system to operate at the GE '67 product line scram valve air supply pressure which is known to improve scram times. While we have not had time to collect sufficient data following this modification upon which to support an additional decrease in scram time, it will give us assurance of repeating or improving the data observed in the past, thereby increasing the conservatism in the transient analysis.

IV. Present Need For Technical Specification Changes

The need for changes to the Technical Specifications has been evaluated. Assuming no changes are made to the safety valves, relief valves or scram times, the plant can operate to a conservatively calculated full power exposure threshold of 2000 MWD/T after which the control rod pattern would remain fixed while coasting down to 84% power. Power operation would continue at 84% until reaching the all-rods-out condition. This power restriction would be administratively controlled in the same way operation not exceeding 100% power is presently controlled. The need for reducing trip settings has been evaluated. It was found that events initiated from the restricted operating levels will be no more severe than previously analyzed.

V. Future Alternatives

With the safety valve set points at 1240 psi, relief valve delay times close to their design value and modified control rod scram times, the effects of the limiting transients are expected to be at or near the conservative General Electric recommended 25 psi margin to the safety valve set point for the remainder of the cycle. With such changes, a less restrictive locus for allowable operating power levels exists which lies above and to the right of that shown in the attached figure.

Additional information including Technical Specification changes will be forthcoming to address these areas. Future alternatives to eliminate the end of cycle scram reactivity effects for the present and future cycles are being formulated and will be reported as they are established.

Yours very truly,

L O Mayer

L O Mayer, PE
Director of Nuclear Support Services

LOM/MHV/br

cc: B H Grier
G Charnoff
Minnesota Pollution Control Agency
Attn. Ken Dzugan

REFERENCES

1. L O Mayer (NSP) to A Giambusso (USAEC), "Report of a Change in the Transient Analysis as Described in the FSAR," dated August 14, 1972

2. L O Mayer (NSP) to A Giambusso (USAEC), "Supplemental Report of a Change in the Transient Analysis as Described in the FSAR," dated February 13, 1973

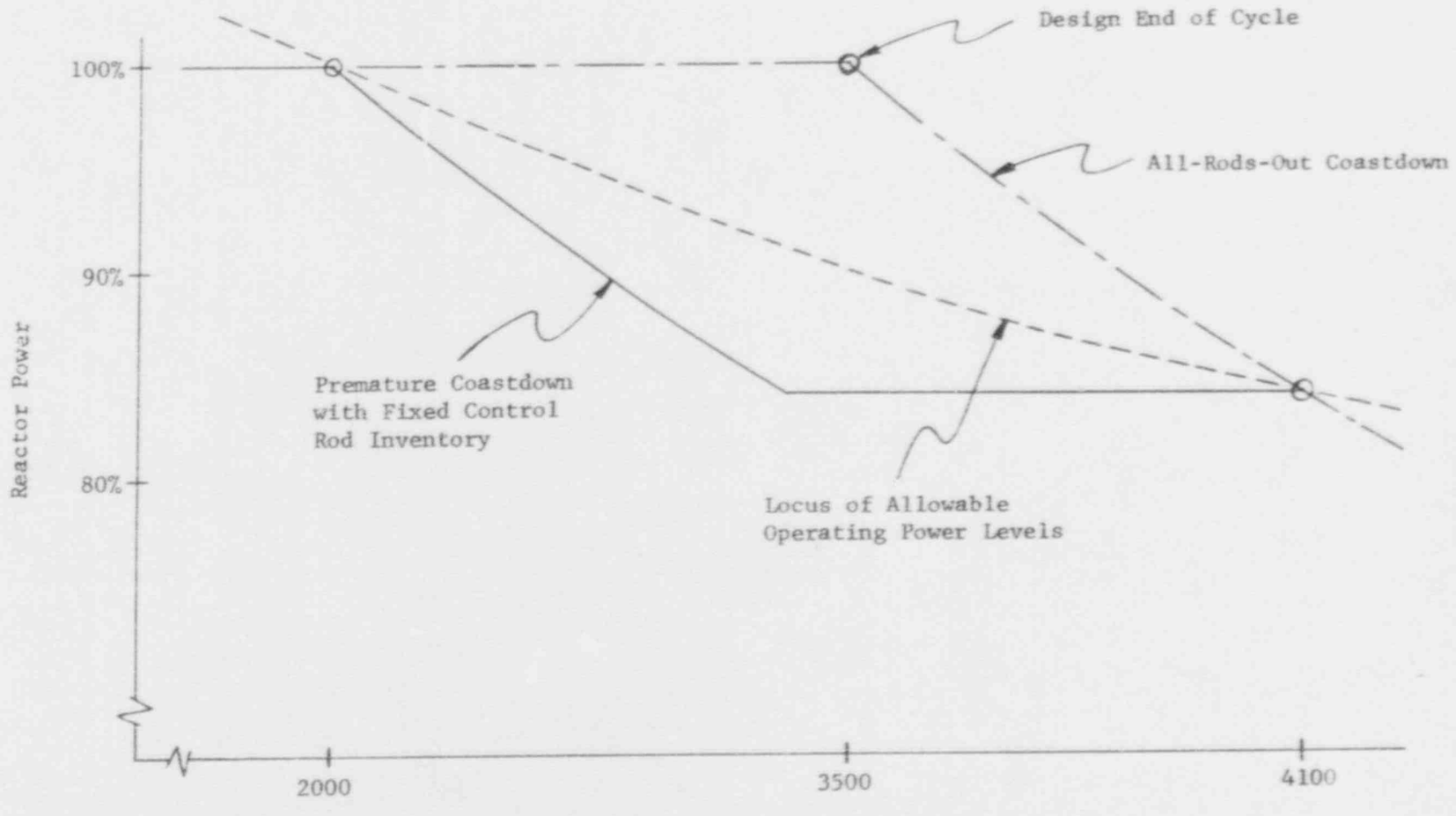
3. L O Mayer (NSP) to J F O'Leary (USAEC), "Change Request Dated June 1, 1973," dated June 1, 1973

4. D J Skovholt (USAEC) to L O Mayer (NSP), (Issuance of Technical Specification Change No. 8), dated July 2, 1973

5. L O Mayer (NSP) to J F O'Leary (USAEC), "Submittal of Cycle 2 Startup Report," dated July 12, 1973

6. L O Mayer (NSP) to J F O'Leary (USAEC), "Observed Relief Valve Opening Times Different Than Those Assumed in the Transient Analysis," dated August 1, 1973

MONTICELLO NUCLEAR GENERATING PLANT



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DESCRIPTION:
Ltr re our 8-2-73 ltr...furnishing planned reactor operation from 2000 MWD/T to end of Cycle 2....

ENCLOSURES:

ACKNOWLEDGED

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PLANT NAME: Monticello

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