

MAR 14 1974

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 Plant  
Modification for  
Fuel Cycle 3

Gentlemen:

We have reviewed your submittal dated January 23, 1974, entitled "Permanent Plant Changes to Accommodate Equilibrium Core Scram Reactivity Insertion Characteristics". The proposed plant changes described involve:

1. removal of the four existing spring-loaded safety valves and installation of at least two new safety/relief valves in addition to the four safety/relief valves installed prior to the initial plant startup (total of six safety/relief valves).
2. installation of a conceptually new prompt relief trip (PRT) system to open as many as all six safety/relief valves, before pressure self-actuation, by signal from fast closure of main turbine control valves or closure of the main turbine stop valves.
3. installation of four new blowdown lines between the two new safety/relief valves that are to be connected to the PRT system and two other locations where safety/relief valves can be installed and the torus suppression pool.

You have noted that:

1. The purpose of the PRT system is to compensate for equilibrium core scram reactivity insertion functions by reducing the peak pressure and fuel thermal effects resulting from pressurization caused by abnormal operational transients.
2. The PRT is designed to anticipate the pressure transient resulting from a turbine or generator trip with the assumed failure of the turbine bypass valves to open, and

C/P

MAR 14 1974

3. The PRT is not considered an overpressure protection function.

We informed your representatives by telephone within two weeks after receiving your submittal that we could not complete our evaluation of your analytical methods or the PRT system that you have proposed in time to approve the planned modifications before they are completed. As a result, we met in Bethesda(1) on February 20 and 21, 1974, with NSP representatives to clarify certain aspects of the analytical results included in your January 23, 1974 submittal and to discuss our additional interim requirements that must be satisfied to allow plant modifications to proceed on schedule.

On the basis of your submittal and the understandings reached during the meeting, namely that:

1. Existing total pressure relief capacity through safety and/or safety/relief valves will be maintained, and
2. New scram reactivity curves will be provided with the associated analysis to permit reactor operation at rated power level for a specified period at the beginning of fuel cycle 3 without dependence on the PRT or reduction in conservatism factors,

we have concluded that you may proceed with the plant modifications as planned and in the manner you have described prior to the completion of our review of the changes proposed by your January 23, 1974 submittal.

Since the plant will be shut down and depressurized for simultaneous refueling, there are no significant hazards considerations and there is reasonable assurance that the health and safety of the public will not be endangered by the modifications as you have described them.

Further analysis must be performed by NSP and submitted for our approval along with proposed technical specification changes prior to startup of Monticello with the modifications in place. A copy of the meeting minutes and safety evaluation are included for your information as Attachments 1 and 2.

Sincerely,

Original Signed by  
D. J. Skovholt

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

|                                  |                              |                    |                      |  |  |
|----------------------------------|------------------------------|--------------------|----------------------|--|--|
| Enclosures and cc. See next page |                              |                    |                      |  |  |
| OFFICE                           | (1) Directorate of Licensing | Minutes of Meeting | February 20-21, 1974 |  |  |
| SURNAME                          |                              |                    |                      |  |  |
| DATE                             |                              |                    |                      |  |  |

MAR 14 1974

Enclosures:

1. Meeting Minutes
2. Safety Evaluation

cc w/enclosures:

Arthur Renquist, Esquire  
 Vice President - Law  
 Northern States Power Company  
 414 Nicollet Mall  
 Minneapolis, Minnesota 55401

Anthony Z. Roisman, Esquire  
 Berlin, Roisman and Kessler  
 1712 N Street, N. W.  
 Washington, D. C. 20036

Gerald Charnoff  
 Shaw, Pittman, Potts, Trowbridge & Madden  
 910 - 17th Street, N. W.  
 Washington, D. C. 20006

Howard J. Vogel, Esquire  
 Knittle & Vogel  
 1154 East Grain Exchange Building  
 412 South 4th Street  
 Minneapolis, Minnesota 55415

Steve Gadler, P. E.  
 2120 Carter Avenue  
 St. Paul, Minnesota 55108

Mr. Daniel L. Ficker  
 Assistant City Attorney  
 647 City Hall  
 St. Paul, Minnesota 55102

Warren R. Lawson, M. D.  
 Secretary & Executive Officer  
 State Department of Health  
 717 Delaware Street, S. E.  
 Minneapolis, Minnesota 55440

Sandra S. Gardebring, Esquire  
 Minnesota Pollution Control Agency  
 1935 W. County Road B2  
 Roseville, Minnesota 55113

Environmental Library of Minnesota

Distribution

- Docket File
- AEC PDR
- Local PDR
- ~~RP Reading~~
- Branch Reading
- JRBuchanan, ORNL
- DJSkovholt, L:OR
- TJCarter, L:OR
- ACRS (16)
- RO (3)
- OGC
- DLZiemann, L:ORB #2
- JJShea, L:ORB #2
- RMDiggs, L:ORB #2
- SVarga, L:ORB #2
- NDube, L:OPS
- MJinks, DRA
- VStello, L:RS

*J. Pello, ORC*

*(given same distribution as attached meeting minutes)*

|           |                   |          |           |            |         |  |
|-----------|-------------------|----------|-----------|------------|---------|--|
| OFFICE ▶  | L:ORB #2<br>X7403 | L:ORB #2 | L:ORB #2  | L:OR       | L:RS    |  |
| SURNAME ▶ | JJShea:sjh        | RMDiggs  | DLZiemann | DJSkovholt | VStello |  |
| DATE ▶    | 3/12/74           | 3/12/74  | 3/14/74   | 3/14/74    | 3/14/74 |  |

DOCKET NO: 50-263

DATE: MAR 14 1974

LICENSEE: Northern States Power Company

FACILITY: Monticello Nuclear Generating Station

MINUTES OF MEETING - PROMPT RELIEF TRIP (PRT) AND REPLACEMENT OF SPRING-LOADED SAFETY VALVES WITH SAFETY/RELIEF VALVES - MONTICELLO BWR

Representatives of Northern States Power Company (NSP), Bechtel, General Electric Company (GE), and AEC Regulatory met in Bethesda, Maryland, on February 20 and 21, 1974, to review the proposal submitted by NSP's letter dated January 23, 1974, to:

1. replace spring-loaded safety valves by pilot-operated safety/relief valves.
2. install four new 10" pressure relief lines between the four new safety/relief valves and the torus suppression water.
3. install a conceptually new prompt relief valve trip (PRT) system.
4. adopt more realistic control rod scram times and change the Technical Specifications to reflect the change.
5. consider reduction of analytical uncertainty factors; i.e., substitute Operational Conservatism Factors (OCF) for Design Conservatism Factors (DCF).

A list of attendees is enclosed.

It had been established by the participants, prior to the meeting, that priority attention should be given during the meeting to decisions affecting the proposed Monticello plant modifications that are to be made during the next plant outage currently scheduled to begin on March 15, 1974. Accordingly, since items 4 and 5 above relate to calculational input assumptions and technical specification changes, matters that need not be decided within the next two weeks, discussion related to these items was incidental. Our evaluation of the PRT system, initiated

|           |  |  |  |  |  |  |
|-----------|--|--|--|--|--|--|
| OFFICE ▶  |  |  |  |  |  |  |
| SURNAME ▶ |  |  |  |  |  |  |
| DATE ▶    |  |  |  |  |  |  |

following the January 23, 1974 NSP submittal that proposed installation of a PRT system on the Monticello nuclear power plant, and of the analytical methods used in the same submittal but described in greater detail in a GE topical report (NEDO-10802, "Analytical Methods of Plant Transient Evaluations for the General Electric Boiling Water Reactor", dated February 1973), is tentatively scheduled to be completed in approximately six months.

The PRT system is designed to electrically open relief valves before pressure activation at a nominal 1080 psig pressure, following closure of the turbine stop valves or fast closure of the turbine control valves, to prevent pressure transients in excess of ASME Code allowances (1375 psig) and/or nuclear excursions that could result in excessive fuel clad temperature (MCHFRTs less than the design limit of 1). Anticipatory signals to open relief valves earlier during an over-pressure transient cannot be approved at this time, pending completion of our evaluation of PRT system and calculational methods, to justify reduction of reactor coolant system overpressure relief capacity. NSP had proposed (NSP submittal dated January 23, 1974) that the four safety valves at Monticello be removed and that full power operation be allowed with the four existing safety/relief valves and two new safety/relief valves for a total of six valves where eight (four safety/relief and four safety valves) are presently required by Technical Specifications. It was emphasized by GE representatives, with supportive references to the NSP submittal dated January 23, 1974, "Permanent Plant Changes to Accommodate Equilibrium Core Scram Reactivity Insertion Characteristics", that the PRT modification was necessary to satisfy the fuel clad thermal design requirement whereby the minimum critical heat flux ratio must be greater than 1.0 with the input assumptions specified in the report. It was stated that additional pressure activated relief valves would not satisfy this thermal design criterion assuming worst case control rod scram reactivity insertion (curve D) with design conservatism factors (DCF).

After a discussion of calculational input parameters other than the scram reactivity, such as Doppler and void coefficients and review of selected analytical results, the meeting participants agreed to the following as a basis for a timely AEC-Licensing evaluation that could allow the proposed modifications to proceed on schedule:

1. Existing safety valve flow capacities will be maintained as a minimum by either:
  - a. retaining two of the existing four safety valves in addition to the six safety/relief valves,

|           |  |  |  |  |  |  |
|-----------|--|--|--|--|--|--|
| OFFICE ▶  |  |  |  |  |  |  |
| SURNAME ▶ |  |  |  |  |  |  |
| DATE ▶    |  |  |  |  |  |  |

- b. installing four safety/relief valves during the outage, if they can be obtained, in addition to the four existing safety/relief valves presently installed - but removing all four presently installed safety valves, or
  - c. installing at least three new safety/relief valves during the outage, one less than plan (b) above, if this is all that can be obtained at this time. (Three safety/relief valves each rated at 800,000 lb/hr flow capacity are equivalent to the four safety valves which have individual flow capacities of 600,000 lb/hr.)
2. An analysis for fuel cycle 3 with DCFs as assumed in the NSP proposal using scram reactivity curve "Curve B" will be provided for reactor operation which is expected to allow operation at rated conditions without dependence on PRT to prevent excessive fuel thermal cycle during a "turbine trip without steam bypass to the condenser" transient. It was noted that the "B" curve would only be applicable at BOC 3 and for a limited period of operation, to be determined by GE, after which further changes to calculational input assumptions (use OCFs instead of DCFs if AEC review of this change is completed and accepted) or new power restrictions may be required unless the Directorate of Licensing has approved the January 23, 1974 NSP proposal to rely on the PRT and six safety/relief valves to prevent excessive reactor coolant pressure and/or fuel thermal duty.

The preference of those present at the meeting, pending completion of the Directorate of Licensing evaluation of the NSP January 23, 1974 submittal, was to install four new safety/relief valves in addition to the four valves originally installed and remove the four safety valves. However, at the time of the meeting, there was only assurance that two of the valves would be delivered in time for installation and limited optimism that one or possibly two more could be delivered and installed prior to plant startup in May 1974.

It was noted that, providing reactor safety is not compromised, authorization to activate the PRT system upon completion of the installation need not await final evaluation of system performance by the Directorate of Licensing, currently scheduled for September 1974, but should be granted as soon as possible. Approval to connect and activate the PRT system prior to need would permit confirmation of design adequacy and component reliability to prevent overpressurization or excessive fuel thermal duty during the most severe but infrequent operational transients that can occur. This matter, it was agreed, can be resolved before the PRT

installation is completed.

|           |  |  |  |  |  |
|-----------|--|--|--|--|--|
| OFFICE ▶  |  |  |  |  |  |
| SURNAME ▶ |  |  |  |  |  |
| DATE ▶    |  |  |  |  |  |

All of the stresses in the existing steam lines and the 10" relief line piping between the new safety/relief valves and the torus suppression pool are claimed to be within acceptable code values and steam line movement resulting from reactive forces during safety/relief valve opening is negligible due to the large mass of the steam line and the short distance in the relief line piping to the first pipe bend. Computer results, discussed by Bechtel, to support this claim will be provided by NSP in a supplement to the January 23, 1974 submittal. According to present analytical results, three new snubbers are required on the steam line but further stress calculations with various numbers and arrangement of snubbers could alter this number.

The adequacy of the torus to withstand relief valve operation over the 40-year licensed lifetime of the plant was discussed. GE representatives committed that design adequacy will be demonstrated selectively by installing instrumentation to measure torus responses during relief valve openings at selected typical plants. The concern relates to the 40-year license and the possibility that the lifetime is shorter than 40 years, based on revised calculational input data. It is not a problem immediately related to reactor safety.

The consequences of MCHFRs  $\leq 1$  following "turbine trip without bypass" were discussed since this is the basic justification for PRT; i.e., to prevent MCHFR  $< 1$ . Since the period following turbine trip when MCHFR  $< 1$  is relatively short and the core remains flooded, it is possible that clad temperatures do not reach damage thresholds even though MCHFR  $< 1$ . When queried to establish the importance of maintaining MCHFRs greater than 1 during this transient, GE responded that they were not prepared at this time to go into details such as transient clad temperatures while below MCHFR of 1.

Steady state calculational methods have been verified by measurements at many BWRs, but transient performance has not been demonstrated adequately to date due to the infrequency of planned transient tests and unplanned circumstances during such tests that have marred the interpretation of results. Because of the severity of the abnormal transients, tests are necessarily not of a repetitive type. Fast data acquisition systems with memory units to capture data during unplanned transients have been considered and are being considered by GE, but there are no firm plans to move in this direction at this time. Confirmation of design adequacy by plant measurements could reduce some of the uncertainties in the GE calculational methods that are currently under review within the Directorate of Licensing.

|           |  |  |  |  |  |  |
|-----------|--|--|--|--|--|--|
| OFFICE ▶  |  |  |  |  |  |  |
| SURNAME ▶ |  |  |  |  |  |  |
| DATE ▶    |  |  |  |  |  |  |

The meeting was concluded with the following summary of the understandings:

1. Existing pressure relief steam flow capacity will be maintained until the Directorate of Licensing evaluation of the NSP proposal to reduce total relief capacity is completed.
2. Initial operation during cycle 3 will be without dependence on the PRT system.
3. Initial operation during cycle 3 may be with or without the PRT system in service, but Directorate of Licensing approval is required to activate the proposed system and it must be established that activation will not reduce the reliability of other systems.
4. NSP will provide additional information, prior to completion of plant modifications in May 1974, to satisfy the primary conditions (items 1 and 2 above) necessary for Directorate of Licensing approval to resume power production up to rated power level.

13

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

Enclosure:  
List of Attendees

|           |                             |                               |  |  |  |  |
|-----------|-----------------------------|-------------------------------|--|--|--|--|
| OFFICE ▶  | L:ORB #2                    | L:ORB #2                      |  |  |  |  |
| SURNAME ▶ | <i>JJShea</i><br>JJShea:sjh | <i>DLZiemann</i><br>DLZiemann |  |  |  |  |
| DATE ▶    | 3/12/74                     | 3/14/74                       |  |  |  |  |

Distribution

Docket File

AEC PDR

Local PDR

M. Voth, NSP

L Reading

~~RP Reading~~

RP/TR Assistant Directors

T. J. Carter, L:OR

RP/TR Branch Chiefs

J. M. Hendrie, L:TR

J. J. Shea, L:ORB #2

R. Bevan, L:EP-4

J. Gallo, OGC

RO (3)

ACRS (16)

D. L. Basdekas, L

C. E. Bailey, L

H. J. Richings, L

R. F. Audette, L

D. Fieno, L

S. Salah, L

R. W. Reid, L

LIST OF ATTENDEES

MONTICELLO - PRT AND RELIEF VALVE ADDITIONS MEETING

FEBRUARY 20, 1974

| <u>Name</u>      | <u>Affiliation</u>            |
|------------------|-------------------------------|
| J. J. Shea       | AEC-L                         |
| D. L. Basdekas   | AEC-L                         |
| C. E. Bailey     | AEC-L                         |
| H. J. Richings   | AEC-L                         |
| R. F. Audette    | AEC-L                         |
| D. Fieno         | AEC-L                         |
| S. Salah         | AEC-L                         |
| D. Ziemann*      | AEC-L                         |
| D. J. Skovholt*  | AEC-L                         |
| R. W. Reid       | AEC-L                         |
| D. W. James      | Northern States Power Company |
| M. Voth          | Northern States Power Company |
| G. H. Neils      | Northern States Power Company |
| L. H. Frauenholz | GE                            |
| E. L. Strickland | GE                            |
| T. R. Augello    | GE                            |
| E. C. Eckert     | GE                            |
| H. R. Forbes     | GE                            |
| B. P. Grim       | GE                            |
| B. E. Lawler     | GE                            |
| J. L. McCready   | GE                            |
| R. Garner        | GE                            |
| C. B. Hogg       | Bechtel                       |

\*Part time

UNITED STATES ATOMIC ENERGY COMMISSION

SAFETY EVALUATION BY THE DIRECTORATE OF LICENSING

DOCKET NO. 50-263

NORTHERN STATES POWER COMPANY

PLANT MODIFICATIONS - PROMPT RELIEF TRIP (PRT) AND  
ADDITIONAL SAFETY/RELIEF VALVE BLOWDOWN CAPACITY

Introduction

Northern States Power Company (NSP) by letter dated January 23, 1974, described plans to modify the Monticello plant during the refueling outage scheduled to begin on March 15, 1974. The major modifications identified are:

1. Installation of a conceptually new relief valve trip system to open the valves before the pressure increases sufficiently to cause the valves to open by self-actuation as is the current practice.
2. Replacement of spring safety valves with combination safety/relief valves and installation of four new blowdown lines connecting the steam lines with the torus suppression pool through safety/relief valves. These changes provide blowdown capability to the torus during abnormal pressure transients in addition to that provided by the existing four safety/relief valves and blowdown lines installed when the plant was built. Although four blowdown lines are specified in the planned modifications, only two would be connected to new safety/relief valves.

Evaluation

According to the NSP analytical results, with two new safety/relief valves operative in addition to the 4 existing safety/relief valves, pressure peaks during abnormal transients will remain within the 1375 psig ASME Pressure Vessel Code overpressure limit for the core coolant

pressure boundaries, i.e., the reactor vessel, associated piping and components. The Directorate of Licensing evaluation of the proposed PRT system and the GE analytical methods (1) used to justify the change in overpressure protection cannot be completed prior to the scheduled shutdown or return to power operation in May 1974. Therefore approval of the operating changes as described by NSP in the January 23, 1974 submittal, cannot be granted at this time.

To allow the major modifications described by NSP to proceed as scheduled, in the Spring of 1974, before the Directorate of Licensing evaluation of the PRT system and GE analytical methods are complete, various alternatives were explored. At a meeting (3) of NSP and AEC representatives on February 20 and 21, 1974, it was stated by Directorate of Licensing representatives that existing overpressure relief capacity must be retained and the proposed dependence on PRT delayed at least until our evaluation is successfully completed, estimated to take about six months. GE and NSP representatives indicated that these Directorate of Licensing conditions could be satisfied and that a supplemental analysis would be provided for AEC evaluation prior to plant startup in May 1974.

The GE analytical results for the worst abnormal transient, turbine trip without bypass and no PRT, showed a 123 psi margin, or a peak transient pressure of 1252 psig compared with the design transient limit of 1375; however fuel thermal design limits are exceeded (MCHFR < 1). With the proposed PRT operative the peak pressure would be 74 psi lower, according to the GE analysis, and the overpressure design margin would be correspondingly larger, i.e., 197 psi compared with 123 psi. The corresponding MCHFR would be 1.35 with 5 or 6 relief valves functioning. The importance of the PRT system in reducing the pressure transient and preventing fuel clad temperatures in excess of design limits is evident in this analysis.

Safety/relief valve capacity based on closure of all main steam isolation valves with failure of the valve closure reactor scram signals, as in previous analysis (2) where delayed reactor scram results when neutron flux reaches its trip set point, is sufficient, according to GE analysis with a total of 6 safety/relief valves operative. Peak transient pressure assuming that the 6 safety/relief valves open when pressure reaches the 1080 psig nominal set point is calculated to be 90 psi below the transient design limit of 1375 psig.

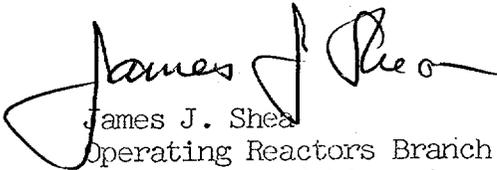
The transient analysis included in the January 23, 1974, NSP submittal assumed credit for the PRT. Since no credit is to be taken for the PRT system, a revised abnormal transient analysis and resultant changes to the Technical Specifications must be submitted by NSP and approved by the Directorate of Licensing prior to plant startup after completion of the modifications. Design conservatism factors, DCFs, have been used in the analysis of Monticello abnormal operating transients and will be used in the forthcoming analysis. Therefore, it is not necessary to determine at this time the acceptability of the less conservative operational conservatism factors (OCF) that have been described in the reference NSP document.

We have concluded that the design basis identified for the four new safety/relief steam dump lines to the torus suppression pool and the quality assurance requirements for the modifications are acceptable and that the peak pipe stresses and pipe deflection calculated by Bechtel are not excessive.

#### Conclusion

On the basis of the conditions for operation that have been imposed on NSP whereby there will be no reduction in total coolant system transient overpressure protection capacity, no dependence on the PRT system until the Directorate of Licensing evaluation of the system is completed, and that we have concluded by the time the modifications are complete that safety has not been compromised by connections to existing safety systems, the plant modifications are acceptable and the planned modifications as described by NSP letter may proceed as planned.

Since the plant will be shutdown and depressurized to refuel the reactor during the blowdown and PRT system modifications, there are no significant hazards considerations or unreviewed safety considerations and there is reasonable assurance that the health and safety of the public will not be endangered during the installation of the proposed modifications.

  
James J. Shea

Operating Reactors Branch #2  
Directorate of Licensing



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

Date: MAR 14 1974

#### REFERENCES

1. "Analytical Methods of Plant Transient Evaluations for General Electric Boiling Water Reactor". GE Topical Report NEDO-10802 dated February 1973.
2. NSP submittal dated October 10, 1973. EOC 2 Transient Analysis and Directorate of Licensing - Approval of End of Cycle 2 Operation - dated October 18, 1973.
3. Minutes of Meeting with NSP representatives regarding abnormal pressure transients - Memo to File March 1974.

**MEMO ROUTE SLIP**

Form AEC-93 (Rev. May 14, 1947) AECM 024

See me about this.  
Note and return.

For concurrence  
For signature.

For action.  
For information.

|   |              |   |
|---|--------------|---|
| TO (Name and unit)<br><u>DJ Skovholt</u>      | INITIALS     | REMARKS<br><u>MR. Skovholt - Should this</u>  |
|   | DATE         | <u>f/signature</u> <u>go to OGC?</u>  |
| TO (Name and unit)<br><u>PZ</u><br>SHill      | INITIALS     | REMARKS   |
|   | DATE         | <u>No</u> <u>OP 3-14</u> <u>Liba 3/14</u>   |
| TO (Name and unit)                            | INITIALS     | REMARKS   |
|   | DATE         | <u>f/processing</u>   |
| FROM (Name and unit)<br>DLZiemann<br>(JJShea) | INITIALS     | REMARKS   |
|   | DATE         | <u>Ltr to Northern States approving plant modifications for</u><br><u>fuel cycle 3.</u> |
| PHONE NO.<br>7380                             | DATE<br>3-12 |   |

USE OTHER SIDE FOR

89

**URGENT**