JAN 1 4 1972

Docket No. 50-263

Northern States Power Company
ATTN: Mr. Arthur V. Dienhart
Vice President of Engineering
414 Nicollet Mall
Minneapolis, Minnesota 55401

Change No. 2
License DPR-22

Gentlemen:

Your letter dated April 1, 1971, as amended October 15, 1971 and December 10, 1971, submitted Proposed Change No. 2 to the Technical Specifications of Provisional Operating License No. DPR-22 for the Monticello Nuclear Generating Plant E-5979. The purpose of the change was to modify the design of the gaseous radwaste system and to incorporate in the Technical Specifications provisions relative to its operation.

During our review of the proposed change, we informed you that certain changes to the Technical Specifications, relating to operation of the modified system, were necessary.

On the basis of our review of your proposed change, as modified, we have concluded that the proposed gaseous radwaste system does not present significant hazards conditions not described or implicit in the Monticello Safety Analysis Report and that there is reasonable assurance that the health and safety of the public will not be endangered by operation of the Monticello Nuclear Generating Plant E-5979 in the proposed manner. A copy of our Safety Evaluation is enclosed.

Accordingly, pursuant to section 50.59 of 10 CFR Part 50, the Technical Specifications of Provisional Operating License No. DPR-22 are hereby changed as set forth in Attachment A to this letter.

Sincerely,

Original Signed by
Roger S. Boyd

Roger S. Boyd, Assistant Director
for Boiling Water Reactors
Division of Reactor Licensing

Enclosures:
See attached

LB

JAN 1 4 1972

Enclosures:
1. Safety Evaluation
2. Attachment A - Changes to Technical Specifications

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

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UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

January 14, 1972

Docket No. 50-263

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Vice President of Engineering
414 Nicollet Mall
Minneapolis, Minnesota 55401

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During our review of the proposed change, we informed you that certain changes to the Technical Specifications, relating to operation of the modified system, were necessary.

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Accordingly, pursuant to section 50.59 of 10 CFR Part 50, the Technical Specifications of Provisional Operating License No. DPR-22 are hereby changed as set forth in Attachment A to this letter.

Sincerely,

Roger S. Boyd, Assistant Director
for Boiling Water Reactors
Division of Reactor Licensing

Enclosures:
See attached

Enclosures:
1. Safety Evaluation
2. Attachment A - Changes to Technical Specifications

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

Docket No. 50-263

SAFETY EVALUATION

BY THE

DIVISION OF REACTOR LICENSING

U.S. ATOMIC ENERGY COMMISSION

IN THE MATTER OF

MONTICELLO NUCLEAR GENERATING PLANT E-5979

PROVISIONAL OPERATING LICENSE NO. DPR-22

TECHNICAL SPECIFICATIONS CHANGE NO. 2

1.0 INTRODUCTION

By letter dated April 1, 1971, as amended October 15, 1971 and December 10, 1971, Northern States Power Company (NSP) submitted Proposed Change No. 2 to the Technical Specifications of Provisional Operating License No. DPR-22 for the Monticello Nuclear Generating Plant E-5979. The purpose of the change was to modify the design of the gaseous radwaste system and to incorporate in the Technical Specifications provisions relative to its operation.

The design criterion for this modification is to reduce the plant boundary radioactive dose rate to less than the numerical values discussed in proposed Appendix I to 10 CFR Part 50. The proposed modification will increase the holdup time of the condenser air ejector non-condensable gases from 30 minutes to at least 50 hours.

The proposed system consists of redundant hydrogen recombiners and compressors, and five gas storage tanks which will hold gases at 300 psig. These holdup tanks containing compressed radioactive gases were not included in the plant design at the time of the review of the FSAR, hence the consequences of a postulated accident involving the rupture of these tanks were not evaluated during the Operating License review. On the basis of our evaluation of Proposed Change No. 2 to the Technical Specifications, as modified, we have concluded that the proposed system can be built and operated without undue risk to the health and safety of the public.

During our review of the proposed change, we informed NSP that certain changes to the Technical Specifications, relating to operation of the modified system, were necessary. Accordingly, pursuant to Section 50.59 of 10 CFR

Part 50, the Technical Specifications of Provisional Operating License No. DPR-22 will be changed as set forth in Attachment A.

2.0 DISCUSSION

There are several expected sources of radioactive gases from a boiling water reactor. These sources include those from operation of the condenser vacuum air ejector, the plant startup condenser mechanical vacuum pump, steam turbine gland seal, and plant ventilation system. Other sources include effluents from containment purging, HPCI turbine testing, and leakage from radioactive waste systems. The major sources of gaseous radioactive effluents are the non-condensable gases removed from the main condenser by the air ejector. These gases consist of air that has leaked into the condenser, hydrogen and oxygen produced by the radiolytic decomposition of water, and very small volumes of radioactive gases (primarily xenon and krypton). In the treatment system proposed, the gases initially pass through a recombiner system which will recombine the hydrogen and oxygen to form water which is then returned to the plant. The remaining gases then pass through a gas delay line which provides a delay time of approximately two hours (the equipment originally provided to produce a 30-minute delay now causes a delay of approximately two hours because most of the hydrogen and a stochiometric amount of oxygen has been removed from the gas stream) to permit those isotopes with short half-lives to decay. The gases are then compressed and stored in holdup tanks.

In designing the proposed gaseous radwaste system, the licensee has assumed an air flow rate of 28 scfm and a noble gas source term equivalent

to an off-gas release rate of 270,000 μCi/sec after a 30-minute decay time. The Monticello surface condenser has two shells. Based on Standards for Steam Surface Condensers issued by the Heat Exchange Institute (Sixth Edition, 1970) the assumed 28 scfm air inleakage flow rate is a reasonable value for this type condenser. Based on operating BWR reactor data, we are of the opinion that the assumption of an annual average off-gas release rate of 270,000 μCi/sec as a basis for the design of the gaseous radwaste system is a conservative value.

The licensee is proposing to use a recombiner which has three times the calculated amount of catalyst required. Although the particular catalyst proposed for use has been extensively tested for hydrogen-oxygen recombination efficiency and its susceptability to poisoning, the effect of a radiation field on catalysis has not been tested. Since there are other catalysts that have performed satisfactorily in actual BWR atmospheres and are readily available if there are performance deficiencies with the proposed catalyst, a substitution can be made. We have concluded that the proposed recombiner system is acceptable as proposed.

The proposed compressors are designed so as to have "zero leakage". Also, all valves used in the system are of the diaphragm type, so that the expected leakage during normal operation will be negligible.

All the equipment of the proposed waste gas system and structures in which it will be housed will be designed to withstand the design basis earthquake (0.12 g horizontal and 0.08 vertical ground acceleration), the probable maximum flood (elevation 939.2 feet above mean sea level), and the design basis tornado (300 mph rotational and 60 mph translational winds with a 3 psi pressure drop in 3 sec).

All pressure vessels, heat exchangers, pumps, valves and piping, except for the two compressors and the five storage tanks, will be designed, fabricated and installed according to ASME Code Section III, Class 3, as amended to July 1971. The compressors and storage tanks were purchased prior to July 1971. The tanks were purchased in conformance with the 1968 ASME Code Section III, Class C with addenda. The compressors were purchased in conformance with the USAS B-31.7 Class III piping and ASME Code Section VIII pressure containing vessels with 100 percent radiography per paragraph UW-2a. We find the codes and standards used for the equipment and piping appropriate for the intended service.

Even though steam is mixed with the gas stream to keep the hydrogen concentration below 4%, hydrogen analyzers will continuously monitor the hydrogen concentration upstream as well as downstream of the recombiner and instrumentation will cause valves to close automatically to stop the gas flow whenever the hydrogen concentration exceeds safe limits. Even though the instrumentation is designed to minimize the possibility of detonation, the Monticello offgas system will be designed to take a hydrogen explosion up to the suction of the compressors. The detonation pressure from a hydrogen mixture is approximately 20 times the initial pressure. To ensure that no potential shock wave could reach the air compressors, the charcoal filter element which will be installed upstream of the compressors will be designed to withstand the full 350 psig overpressure without failure.

The licensee performed an analysis to determine the shock wave attenuation in the recombiner system. This analysis shows that as a result of a

hydrogen-oxygen detonation, the pressure upstream of the compressors would be attenuated to 30 psig. We discussed this evaluation with personnel of the Bureau of Mines, Pittsburgh, Pennsylvania. It is their opinion that if the detonation starts in the 42-inch delay line, there would be very little, if any, decrease in shock wave pressure at the suction of the compressors. The rupture of the compressors would result in a dose less than the rupture of the five holdup tanks evaluated in Section 3.2, Accident Analysis of this Safety Evaluation. However, to mitigate the consequences of such an accident, redundant hydrogen analyzers will be required to monitor the concentration of hydrogen in the stream and alarm if the hydrogen concentration reaches 3%. The minimum number of hydrogen analyzers required for operation and the frequency of calibration of these instruments will be covered in the Technical Specifications.

To preclude an operator simultaneously opening the fill and discharge valves of a single tank, which could align the compressor discharge directly with the discharge header to the offgas stack, an electrical interlock will be provided, which will consist of a three-position switch. The switch has three positions (fill, isolate, and discharge) and can be set to only one mode at a time, so that the system will not energize both the fill and discharge valves at the same time. To prevent opening of a tank fill valve when the solenoid operated fail-closed discharge valve has stuck open, a second electrical interlock will be provided which will prevent opening of the fill valve unless the closed position limit switch on the discharge valve has been actuated. This will provide additional assurance that both valves

will not be opened simultaneously. In addition, to reduce the consequences of selecting the wrong tank for discharge, a bank vault type of timing device will be provided which will serve as an interlock to prevent opening of a tank discharge valve until the control switch has been in the isolate mode for at least twelve hours. Calculations indicate that twelve hours of holdup after a tank has been filled (which would give an additional twelve hours of decay time) reduces the concentration of radioactivity by a factor of 20. We conclude that adequate precautions have been taken to cope with the potential problem of venting the wrong tank.

3.0 DOSE CALCULATIONS

We have calculated the potential doses at the site boundary during normal and accident conditions of the offgas system. We have used realistic assumptions for doses from normal operation, and used our standard conservative assumptions to calculate doses from potential accidents.

3.1 Normal Operation

According to the FSAR, the worst case location is 950 meters to the south east (winds blowing from the north north west). For routine releases, we calculated the dose contributions from emission from the stack and ground level releases. Except for the turbine gland seal release where we assumed 1.75 minutes of holdup, whereas the licensee assumed three minutes of delay, we have made the same assumptions as the licensee. We have listed our calculated values with those by the licensee in Table 3.1.1.

Based on our calculations the average dose at the site boundary from gaseous radioactive effluents is 6.5 mrem/yr. We conclude that in normal

TABLE 3.1.1

Comparison of Estimated Annual Fence Post Doses

Due to Airborne Releases (in mrem/yr)

		Applicant	Staff
1.	Steam Jet Ejector Offgas	2.4	3.4
2.	Containment Purging	0.03	0.03
3.	Plant Startup and Shutdown	1.3	0.85
4.	Turbine Gland Seal	1.8	1.9
5.	HPCI Turbine Testing	Negligible	Negligible
6.	Offgas System Leakage	Negligible	Negligible
7.	Plant Ventilation	0.28	0.35
8.	Radwaste Vents	Negligible	Negligible
	Total	5.8	6.5

operation the gaseous releases from Monticello, after the proposed modifications are in operation, will be small when compared to the natural background dose rate of approximately 100 mrem/yr.

3.2 Accident Analysis

We agree with the licensee that the maximum release to the environs from the proposed offgas system would result if all five storage tanks were assumed to undergo simultaneous discharge at ground level immediately after being filled to capacity with the plant operating at the Technical Specifications activity limit (270,000 μCi/sec after 30 minutes decay) at the condenser air ejectors and with a condenser air inleakage of 28 scfm. The calculated dose is based on a tank fill time of 12 hours (the licensee assumed 15.7 hours). Release was assumed to occur immediately after filling the fifth tank, with credit taken for decay during the filling operation and for dead storage time in the first four tanks. Doses were computed using infinite cloud (the licensee assumed finite cloud dimensions), Class F stability, one meter per second wind speed, 500 meters as the distance to the exclusion area boundary, and no credit for storage building wake factor. We calculate a two-hour thyroid dose of 2.4 Rem and a whole body dose of 2.4 Rem. The calculated doses presented for this accident are well within the guideline values in 10 CFR Part 100.

4.0 CONCLUSIONS

On the basis of our evaluation of the proposed offgas system modification, we have concluded that the offgas system can be built and operated at Monticello without undue risk to the health and safety of the public,

and that after the proposed system is in operation, the plant boundary radioactive dose rate will be small when compared to the natural background dose rate. Accordingly, pursuant to Section 50.59 of 10 CFR Part 50, the Technical Specifications of Provisional Operating License No. DPR-22 will be changed as set forth in Attachment A.

Donald F. Knuth

Donald F. Knuth, Chief
Boiling Water Reactor Br. No. 1
Division of Reactor Licensing

Date: JAN 14 1972

ATTACHMENT A

Technical Specifications Changes

to Monticello Nuclear Generating Plant No. DPR-22

to be in effect after the Augmented Off-Gas System is installed

1. Change Paragraph 3.2.D to read as follows:

"D. Stack and Off-Gas Systems

1. Radiation Monitors

At least one plant stack monitoring system shall be operable at all times. The off-gas monitoring system, including both off-gas radiation monitors shall be operable or operating whenever steam pressure is available to the air ejectors. If these requirements are not satisfied, a normal orderly shutdown shall be initiated within one hour, and the reactor shall be in the hot shutdown condition within 10 hours.

2. Hydrogen Monitors

a. Except as specified in 3.2.D.2.b below, at least one hydrogen monitor upstream and two hydrogen monitors downstream of the recombiners shall be operable during power operation.

b. If the above specified required hydrogen monitors are not available, an orderly reduction of power shall be initiated to bring the activity releases within ten percent of the limits of 3.8.A.1.

2. Change the Off-Gas Isolation portion of Table 4.2.1 to read as follows:

Instrument Channel	Test (3)	Calibration (3)	Sensor Check (3)
Off Gas Isolation			
1. Radiation Monitors	Notes (1,5)	Note 6	Once/shift
2. Hydrogen Monitors	NA	Weekly	NA

3. Change Paragraph 3.8.A to read as follows:

"A. Airborne Effluents

1. The release rates of gross beta-gamma activity, except halogens and particulates with half lives longer than eight days, shall not exceed a rate Q, in curies/sec:

$$\frac{Q_1}{0.27} + \frac{QRS}{0.027} \leq 1$$

2. The release rates of gross beta-gamma activity, except halogens and particulates with half lives longer than eight days shall not exceed 16 percent of the above 3.8.A.1 averaged over any calendar quarter.

3. The activity of halogens and particulates with half lives greater than 8 days released to the environs as part of the airborne effluents shall not exceed a rate Q in microcuries/sec:

$$\frac{Q_1}{1.0} + \frac{QRS}{0.1} \leq 1$$

4. If the limits of 3.8.A.1 or 3.8.A.2 are exceeded, appropriate corrective action such as an orderly reduction of power shall be initiated to bring the releases within the limit.

5. If the hydrogen concentration in the off-gas downstream of the recombiners reaches four percent, the off-gas flow shall be stopped automatically by closing the valves upstream and downstream of the recombiners.

4. Add to Paragraph 6.6.B the following:

"4. Identify the causes if the activity release rate exceeds four percent of the limits of 3.8.A.1 during any 48-hour period, and describe the proposed program of action to reduce such release rates. Also report the flow rate of the off-gas system, and the activity measured upstream of the compressor suction and downstream of the holdup tank, at a point upstream of the stack.