

UNITED STATES NUCLEAR REGULATORY COMMISSION  
OFFICE OF INSPECTION AND ENFORCEMENT

REGION III

Report of Operational Radwaste Inspection

IE Inspection Report No. 050-263/77-05

Licensee: Northern States Power Company  
414 Nicollet Mall  
Minneapolis, MN 55401

Monticello Nuclear Operating Plant  
Monticello, MN

License No. DPR-22  
Category: C

Type of Licensee: BWR 1670 Mwt

Type of Inspection: Routine, Unannounced

Dates of Inspection: March 29-31, 1977

Principal Inspector: *L. R. Greger*  
L. R. Greger

4/29/77  
(Date)

Accompanying Inspector: *for W. L. Fisher*  
D. E. Miller

5/2/77  
(Date)

Other Accompanying Personnel: None

Reviewed By: *W. L. Fisher*  
W. L. Fisher, Chief  
Fuel Facility Projects and  
Radiation Support Section

5/2/77  
(Date)

## SUMMARY OF FINDINGS

### Inspection Summary

Inspection on March 29-31, (77-05): Review of radioactive effluent records and procedures, process monitor calibrations, reactor coolant radiochemistry, and standby gas treatment system operation. Two items of noncompliance concerning operability of the air ejector monitors and calibration of the reactor building vent monitor were identified.

### Enforcement Items

The following items of noncompliance were identified during the inspection:

#### Infractions

1. Contrary to Technical Specification B-2.4.4.d, the reactor building noble gas effluent monitor was not adequately calibrated quarterly during 1976. (Paragraph 7.c, Report Details)
2. Contrary to Technical Specification 3.2.D.1, both steam jet air ejector off-gas radiation monitors were inoperable for approximately fourteen hours during power operation on March 21, 1977. (Paragraph 7.b, Report Details)

#### Licensee Action on Previously Identified Enforcement Items

None reviewed.

#### Other Significant Items

##### A. Systems and Components

Unresolved Item - Inaccuracies in the conversion factor calculation for the off-gas stack monitor may have resulted in erroneous determinations of off-gas stack noble gas releases. (Paragraph 3.b, Report Details)

##### B. Facility Items (Plans and Procedures)

Unresolved Item - Containment purge sampling and analysis requirements will be resolved with NRR. (Paragraph 11, Report Details)

C. Managerial Items

None identified.

D. Deviations

None identified.

E. Status of Previously Reported Unresolved Items

The licensee's process monitor calibration procedures were found to be adequate for all of the reviewed monitors, except for the reactor building noble gas effluent monitor. (Paragraph 7, Report Details)

Management Interview

A management interview was conducted with Messrs. Eliason, Fey, Jacobson, and Nolan at the conclusion of the inspection on March 31, 1977 and further by telephone with Mr. Eliason on April 13, 1977. The following items were discussed:

- A. The inspectors reviewed the scope of the inspection and discussed the noncompliance items regarding calibration of the reactor building noble gas effluent monitor and operability of the air ejector off-gas monitor. The inspectors stated that the licensee's corrective action regarding the air ejector off-gas monitor isolation appeared adequate; therefore, no reply to this noncompliance would be required.
- B. The inspectors stated that the conversion factor calculations for the off-gas stack monitor appeared inaccurate in that the air ejector off-gas system releases were not included. The licensee acknowledged the inspectors' comments and agreed to evaluate the conversion factor calculations and the significance of any erroneous off-gas stack effluent data generated from the conversion factors. (Paragraph 3.b, Report Details)
- C. The inspectors noted that although the air ejector and off-gas stack monitors were calibrated as required by the technical specifications, the grab samples and linearity checks performed in the calibrations were not defined in the surveillance (calibration) procedures. The licensee stated that the calibration procedures would be reviewed and revised as necessary. (Paragraph 7, Report Details)

- D. The inspectors stated that, due to time constraints, it had not been determined if the required quarterly surveillance tests of the reactor building ventilation system automatic isolation function had been conducted. The licensee stated that a review of current technical specification surveillance requirements had been initiated and would be completed and available for review in the near future. (Paragraph 7.c, Report Details)
- E. The inspectors noted that the Stack/Vent Noble Gas Effluent surveillance procedure (STP 0230) required revision to correct minor errors and inclusion of the off-gas stack conversion factor calculation. The licensee stated that the procedure would be reviewed and revised as necessary. (Paragraph 8, Report Details)
- F. The inspectors noted that certain standby gas treatment system surveillance frequencies were changed in a recent technical specification revision and, although no surveillance testing was overdue at the time of the inspection, that some surveillance requirements were due in the immediate future. The licensee acknowledged the inspectors' comments. (Paragraph 9, Report Details)
- G. The inspectors requested that the licensee clarify, with NRR, the technical specification sampling requirements for containment purges. (Paragraph 11, Report Details)

## REPORT DETAILS

### 1. Persons Contacted

L. Eliason, Plant Manager  
F. Fey, Radiation Protection Engineer  
R. Goranson, Engineer  
O. Iverson, Engineer  
R. Jacobson, Engineer  
L. Nolan, Engineer  
J. Peterson, Radiation Protection Specialist

### 2. General

This inspection was conducted to examine the licensee's radwaste (gaseous, liquid, and solid) operations for compliance with NRC regulations. The licensee's derivations and records of radioactive effluents were reviewed and compared with the radioactive releases reported in the licensee's semiannual reports. Liquid and gaseous process monitor calibrations, reactor coolant chemistry measurements, and standby gas treatment system surveillance were also reviewed.

### 3. Gaseous Release

#### a. Augmented Off-Gas System

The licensee's augmented off-gas system, consisting of two recombiners and five pressurized holdup tanks added to the existing 30-minute holdup system, operated throughout calendar year 1976 with no significant problems. Occasional leakage occurred at the hydrogen analyzers; the leakage problems have been reduced by installation of moisture traps upstream of the pumps. The redesigned catalyst support bed continues to function properly. Flow control problems, caused by pressure oscillations, were resolved by replacement of the flow detectors.

According to licensee personnel and review of licensee records, the hydrogen monitors downstream of each operating recombiner have been operable during power operation and the hydrogen concentrations at the monitors did not reach the 4% trip point. Storage times in the gas decay tanks have averaged about fourteen days. No instances of less than twelve hours

holdup were noted. Condenser air inleakage, determined weekly, has averaged two to three cfm. Gas decay tank gross radioactivity is determined in conjunction with the weekly air inleakage surveillance. Review of the licensee's surveillance records of gas decay tank gross radioactivity did not reveal any discrepancies in surveillance frequencies or tank activities. According to the licensee's surveillance records, functional test and calibration frequencies for the off-gas hydrogen analyzers complied with the technical specification requirements during 1976.

b. Noble Gas Releases

Continuous monitors on the off-gas stack and reactor building vents perform alarm, isolation, and quantification functions. A technical specification change effective July 1, 1976 changed the calculational formulae for determining acceptable releases; the maximum release rates allowed by the technical specifications did not change significantly. According to the licensee's monitoring records, the maximum release rate experienced during 1976 was less than 10% of the technical specification limit and the average (quarterly and twelve consecutive months) release rates were less than 5% and 10%, respectively, of the technical specification limits.

The noble gas releases are quantified from the average release rates recorded by the off-gas stack and reactor building vent monitors. The conversion factors for these monitors are calculated routinely. The off-gas stack monitor conversion factor is calculated from the air ejector isotopic results decayed to the stack release point. Both the air ejector off-gas system and the gland seal exhaust system discharge radioactive effluents via the off-gas stack. Since the augmented off-gas system became fully operational in 1975, the majority of the off-gas stack radioactive effluents have originated from the gland seal packing exhaust system. According to licensee personnel and the licensee's records, the air ejector off-gas system effluents have not been included in the off-gas stack conversion factor calculations. Preliminary calculations indicate that off-gas stack noble gas releases may be increased by 50% to 100% when the air ejector off-gas system effluents are included in the conversion factor calculation. However, even a 100% increase in off-gas stack noble gas releases would not result in any technical specification release rate limits having been exceeded during 1976. This matter will be examined further during a subsequent inspection.

c. Particulate and Iodine Releases

Iodine and particulate samplers on the off-gas stack and reactor building vents provide continuous sampling and periodic quantification of airborne effluents. A technical specification change effective July 1, 1976 changed the calculational formulae for determining acceptable iodine and particulate releases; the maximum release rates allowed by the technical specifications did not change significantly. According to the licensee's monitoring records, the maximum and average (quarterly and twelve consecutive months) release rates experienced during 1976 were less than 10% of the technical specification limits.

No discrepancies from the technical specification surveillance requirements for radiiodine or particulate sampling were noted. Daily sampling was not required during 1976.

d. Tritium Releases

According to the licensee's surveillance records for 1976, off-gas stack and reactor building vents were sampled for tritium monthly and each containment purge was sampled. Silica gel sampling was utilized to collect the vaporous tritium.

4. Liquid Radwaste

No liquid radwaste releases were made during calendar year 1976 nor was any liquid radwaste shipped offsite for disposal. Waste liquids continue to be recycled for reuse in the reactor coolant system or used in processing of solid wastes. The licensee has not experienced significant ground water or condenser inleakage. Approximately fifteen to twenty thousand gallons of makeup water per month are required to compensate for losses via evaporation and solid radwaste consumption. The licensee's surveillance records for liquid radwaste storage activity were selectively reviewed. No discrepancies from the surveillance requirements were identified.

5. Solid Radwaste

The licensee's radwaste solidification system remains out of operation awaiting completion of modifications to the mixer-feeder and drum feed pipe to improve flushing and sealing capabilities. Additionally, video monitors will be installed on the hopper and drum feed pipe

to improve control over mixture consistency. According to licensee personnel, the solid radwaste system modifications are expected to be completed by the fall (1977) outage.

In the interim, mobile solidification services continue to be contracted from Chem Nuclear Systems, Inc. Mobile solidification operations apparently were conducted on four occasions during 1976, totaling approximately three months onsite time. According to the licensee's records, approximately 3800 curies of waste were transferred to CNSI for solidification and disposal during 1976. Radwaste activity and radionuclide composition are determined from measurements made on samples of the waste. Review of the licensee's waste disposal records did not reveal any discrepancies from the waste disposal data reported in the Effluent and Waste Disposal Semiannual Reports for calendar year 1976.

The licensee's procedures for operation of the solidification operations (transfer to CNSI) have been revised to include precautions to prevent inadvertent discharges. Additionally, the temporary hose connecting "B" hopper and the CNSI mobile solidification equipment has been replaced with permanent piping.

6. Radioactive Effluent Reports

The licensee's semiannual effluent reports covering the periods July 1, 1975 through December 31, 1976 were reviewed. The reporting format complies with the technical specification requirements. No anomalous results were noted. The effect of the off-gas stack monitor conversion factor evaluation (see paragraph 3.b) on the reported releases will be reviewed during a subsequent inspection.

7. Process Monitors

a. Off-Gas Stack Monitor

Continuous off-gas stack monitoring is provided by two scintillation detector monitors located on an isokinetic sample line. The monitors' outputs are averaged and printed out hourly by the process computer. According to the licensee's records, a conversion factor for the monitor was determined weekly during the first six months of 1976 and at least monthly during the second six months. The conversion factor is based on an isotopic analysis of six nuclides at the air ejector discharge and a computer prediction of fifteen nuclides. (See paragraph 7.b, for details.)

The inspectors reviewed surveillance test No. 0163 "Stack Monitor Quarterly Calibration," a portion of which describes the use of three solid Co-60 sources which are placed on the detector face to establish the linearity of response of the off-gas stack monitor. The combination of the use of the solid source linearity check and the isotopic analysis performed in conjunction with the conversion factor determination comprises an acceptable calibration of the monitor. The off-gas stack monitor isolation trip setpoints are determined in conjunction with the monitor calibrations. The trip setpoints were found to be consistent with the technical specification limit for the maximum noble gas release rate. According to the licensee's records, functional test and calibration frequencies during 1976 complied with the technical specification requirements. Selective review of the licensee's records did not reveal any instances of monitor inoperability during 1976.

b. Air Ejector Monitor

Continuous air ejector off-gas monitoring is provided by two off-line ionization chamber monitors. The licensee's records indicate that the air ejector monitor conversion factor (mR/hr to  $\mu$ Ci/sec) was determined weekly during the first six months of 1976 and at least monthly during the second six months. The conversion factor is based on an isotopic analysis of six nuclides at the air ejector discharge and a computer prediction of fifteen nuclides.

An electronic calibration of the air ejector monitor is performed quarterly. Solid source linearity checks are performed during refueling outages. The combination of the solid source linearity check and an isotopic analysis of air ejector discharge comprises an acceptable calibration of the monitor. The air ejector monitor isolation trip setpoints are determined in conjunction with the monitor calibrations. The trip setpoints were found to be consistent with the technical specification limit for the maximum off-gas stack noble gas release rate (120 minutes decay). Operation with the off-gas holdup system recombiners bypassed was not necessary during 1976. According to the licensee's records, functional test and calibration frequencies during 1976 complied with the technical specification requirements.

Selective review of the licensee's records did not reveal any instances of monitor inoperability during 1976. However, both

monitors were inoperable for approximately <sup>1/</sup>fourteen hours during power operation on March 21, 1977. The monitors had been isolated for maintenance during plant shutdown on March 20, 1977 and the isolation valves were erroneously left isolated at the completion of the maintenance work. Technical Specification 3.2.D.1 requires that the air ejector off-gas radiation monitors be operable during reactor power operation. The licensee's corrective action was reviewed. The results of the licensee's review of the work request procedures and the radiation monitor flow alarm operation will be reviewed during subsequent inspections.

c. Reactor Building Vent Monitors

Continuous noble gas monitoring of the reactor building ventilation exhaust is provided by an off-line continuous air monitor (CAM). The monitor output is averaged and printed out hourly by the process computer. According to the licensee's surveillance records, functional test and calibration frequencies during 1976 complied with the technical specification requirements. However, the calibrations routinely performed on the monitor utilize solid sources which apparently have not been cross calibrated to gaseous standards. Therefore, the solid source checks provide only a linearity determination of the monitor. The licensee continues to use the calibration curves supplied by the manufacturer of the vent monitor for quantification of reactor building vent releases. It was noted that the manufacturer had performed a Kr-85 calibration of the monitor and calculated the expected monitor response to additional isotopes based on the beta energies and the detector wall thickness. Attempts by the licensee to verify the manufacturer's curves have been conducted (although not quarterly); the resultant data have not been entirely consistent with the manufacturer's curves. The licensee has not fully complied with the requirements of Technical Specification B-2.4.4.d, which requires that the reactor building vent monitor be calibrated quarterly. According to licensee personnel, a scintillation detector is being evaluated as a possible replacement for the present detector. Results of the licensee's evaluation will be reviewed during a subsequent inspection.

Two GM monitors in the reactor building ventilation plenum perform isolation functions. The monitor trip setpoints were consistent with technical specification requirements. However, surveillance records were not readily available to demonstrate

<sup>1/</sup> RO 050-263/77-06, NSP to RIII, dated 4/4/77.

the quarterly isolation surveillance tests required by the technical specifications. This item will be reviewed further during a subsequent inspection.

d. Liquid Effluent Monitor and Discharge Canal Monitor

Liquid radwaste effluent and discharge canal monitoring is provided by separate, in-line, scintillation detector monitors. A review of the licensee's surveillance records indicated that functional test and calibration frequencies during 1976 complied with the technical specification requirements. The calibrations consist of an electronic calibration and the use of three solid Co-60 sources, which were cross calibrated to a Cs-137 liquid calibration performed in August 1970. No discrepancies were identified in the conduct of the calibrations or functional tests.

8. Procedures

The following Operations Manual changes were reviewed:

- B.5.11 Process Radiation Monitoring (2/6/76)
- B.7.3 Solid Radwaste (4/6/76)

The listed procedural changes were noted to have been reviewed by the Operations Committee. The changes do not appear to degrade the licensee's radioactive effluent control capabilities.

Review of the licensee's surveillance procedures revealed that the Stack/Vent Noble Gas Effluent procedure (STP 230) contained three procedural errors. The errors did not appear to have generated significant inaccuracies in the calculated data. It was also noted that the conversion factor calculation (off-gas stack monitor) included in STP 230 is not the conversion factor calculation actually used for quantifying off-gas stack releases.

9. Standby Gas Treatment System

The charcoal beds were replaced during the last refueling outage (September - October, 1975). Since that time "A" train has been operated about 1400 hours and "B" train about 500 hours. According to licensee records and discussions with licensee personnel regarding SBGT operation during calendar year 1976 and 1977 to date: (1) a minimum of one SBGT train was operable at all times; (2) whenever one train was inoperable, the operability of the other train was demonstrated; (3) in-place and laboratory testing results met the

technical specification requirements; (4) filter pressure drop, heater power output, and automatic initiation testing results met the technical specification requirements; and (5) no maintenance affecting HEPA or charcoal filter leak-tight integrity was conducted.

The licensee's surveillance records for calendar year 1976 and 1977 to date were selectively reviewed. Except as noted below, no discrepancies from the technical specification requirements were noted. A technical specification change effective September 27, 1976, changed the frequency and acceptability criteria for certain surveillance testing and added a requirement for monthly operability testing of both SBGT trains. As reported by the licensee, the operability surveillance conducted from September 27, 1976 to January 25, 1977 did not include the monitoring and recording of <sup>2/</sup> system flow rate as required by Technical Specification 4.7.B.1. The licensee was noted to have implemented the required surveillance testing effective January 25, 1977.

The current technical specifications require that certain surveillance testing be conducted at intervals not to exceed 18 months instead of the previous frequency of once per operating cycle. Within this category, charcoal laboratory tests ("B" train), filter pressure drop, and heater power output surveillance were last conducted during early October 1975. The completion of these surveillance tests within the specified frequencies will be examined during a subsequent inspection.

#### 10. Reactor Coolant Chemistry

The licensee's reactor coolant radiochemistry results for calendar year 1976 were reviewed. No discrepancies from the technical specification surveillance requirements for radioiodine sampling or monthly gamma isotopic analyses were noted. Radioiodine surveillance during 1976 was not dependent upon air ejector monitor increases. According to the licensee's records, the reactor coolant radioiodine concentrations (I-131 dose equivalent) averaged about 1 1/2% of the technical specification limit; the maximum radioiodine concentration was less than 2 1/2% of the technical specification limit. Radioiodine concentrations during the year were approximately an order of magnitude lower than during the previous year. This reduction was due, principally, to the replacement of leaking fuel elements late in 1975. Reactor coolant radioiodine concentrations are expected to continue to decrease as tramp fuel is eliminated from internal core surfaces.

2/ RO 050-263/77-02, NSP to RIII, dated 2/24/77.

11. Containment Purge

According to licensee personnel and records, all drywell purges are conducted through the standby gas treatment system. Drywell purges were conducted approximately biweekly during 1976. The radioactive effluents are quantified by the off-gas stack monitor. The technical specifications require that each purge be sampled and analyzed for tritium and principal gamma emitters. The licensee's records substantiate these analyses, except that noble gas samples and analyses are not routinely conducted. The licensee will request clarification, from NRR, of the technical specification requirements regarding noble gas sampling. This matter will be reviewed further during a subsequent inspection.