U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos:	50-282; 50-306
Licenses No:	DPR-42; DPR-60
Reports No:	50-282/97014(DRS); 50-306/97014(DRS)
Licensee:	Northern States Power Company 414 Nicollet Mall Minneapolis, MN 55041
Facility:	Prairie Island Nuclear Generating Plant
Location:	1717 Wakonade Dr. East Welch, MN 55089
Dates:	July 14-18, 1997
Inspector:	R. Glinski, Radiation Specialist
Approved by:	Gary L. Shear, Chief, Plant Support Branch 2 Division of Reactor Safety

EXECUTIVE SUMMARY

Prairie Island Nuclear Generating Plant
NRC Inspection Reports 50-282/97014; 50-306/97014

This inspection included various aspects of the licensee's radiation protection program, with emphasis on the following areas:

- Liquid and Gaseous Radwaste Systems and Releases
- Offsite Dose Assessment
- Area, Process, and Environmental Radiation Monitoring
- Control Room and other Special Ventilation Systems
- Plant Personnel Performance in Selected Areas

The following conclusions were reached:

- The operation of the liquid and gaseous radwaste systems was effective in ensuring that radiological effluent concentrations were well below regulatory requirements. Gaseous effluent sample collection techniques ensured that samples were representative and that sample integrity was maintained (Sections R1.1 and R2.3).

- Offsite dose was assessed in accordance with the Offsite Dose Calculation Manual and verified by NRC calculations; the offsite dose to the public was well below regulatory requirements (Section R1.1).

- The number and locations of the radiation monitors and the continuous recording equipment were consistent with the USAR description. In general, the area, process and environmental radiation monitors were calibrated in accordance with station procedures. However, several problems were identified which indicated a weakness in the calibration of the area and process radiation monitors (Section R2.1).

- Surveillance testing of filter performance and air flow demonstrated that the control room and other special ventilation systems functioned properly (Section R2.2).

- The inspector identified several minor errors in the 1996 Annual Radioactive Effluent and Waste Disposal Report and with some radiation monitor calibration records. These items, together with licensee self-assessment findings regarding the failure to prepare composite samples in accordance with the Offsite Dose Calculation Manual, were considered problems with attention to detail by plant personnel. In particular, the failure to prepare the composite samples was considered a Non-Cited Violation of Offsite Dose Calculation Manual sampling frequency requirements (Sections R1.1, R2.1, and R4.1).

IV. Plant Support

Report Details

R1 Status of Radiation Protection and Chemistry (RP&C) Controls

R1.1 Implementation of the Gaseous and Liquid Effluents Program

a. Inspection Scope (84750)

The inspector reviewed 1997 effluent data, effluent procedures, the Offsite Dose Calculation Manual (ODCM), Technical Specifications (TS), and the 1996 Annual Radioactive Effluent and Waste Disposal (AREWD) Report. In addition, interviews were conducted with staff regarding the effluent program and the methodology for calculating the offsite radiation dose to members of the public.

b. Observations and Findings

The methodology for determining the radioactivity content of the gaseous effluents utilized collection monitors located at the continuous effluent points within the plant (shield building vents, containment vents, auxiliary buildings vents, and the spent fuel pool vent) to obtain air samples. Batch releases were quantified by analysis of grab samples prior to release from the waste gas treatment tanks or containment. The inspector observed that gaseous effluent sample collection techniques ensured that samples were representative and that sample integrity was maintained. The inspector did not identify any material condition concerns with the sampling equipment. Past operability problems were addressed by the recent replacement of pulleys and belts in several collection monitors which improved the operability.

Analyses and quantification of airborne releases were conducted in accordance with procedures. The noble gases, iodine isotopes, and particulates present in the gaseous effluent releases and their corresponding concentrations were determined by gamma spectrometry analysis of grab samples collected during each release. Quarterly composites of the air filters were analyzed by a contract laboratory for strontium-89/90 and iron-55. For tritium determination, air was passed through a silica gel which was subsequently analyzed by liquid scintillation counting. The air volume of the release was determined from the rated flow of the ventilation system (or atmospheric relief from steam generators) and the time duration of the release.

In 1996, the plant conducted 33 gaseous batch releases. These releases consisted of two waste gas decay tank releases, one containment purge, and 30 atmospheric steam releases from the steam generators. Releases from the various building vents were considered continuous releases. The total activity released to the atmosphere in 1996 was 44.3 curies, of which 43.2 curies were tritium. The gaseous activity released in 1996 was approximately one-third of the 1995 values. There was no airborne release of iodine isotopes. The site practice of continually moving radioactive gas throughout the waste gas treatment system to facilitate decay enabled the plant to maintain gaseous releases significantly below the Updated Safety Analysis Report (USAR) source terms. The gaseous radionuclide concentrations and the offsite doses were well below both regulatory and TS limits.

Plant staff conducted 180 liquid batch releases from a variety of storage tanks in 1996. Steam generator blowdown, condenser, and turbine building sump discharges to the river were considered continuous releases. The radiological content of the liquid releases was less than 628 curies and was almost entirely tritium. The total 1996 liquid release activity was 20% less than the 1995 value. As with the gaseous radwaste system, the radiation protection (RP) staff effectively utilized the liquid radioactive waste (radwaste) system to continually maintain the liquid effluents below the USAR source terms. The liquid radionuclide concentrations (including entrained or dissolved gases) and the offsite doses were well below both regulatory and TS limits.

Calculations for the dose to the offsite public were conducted in accordance with the ODCM methodology. Plant staff utilized a computer program developed by RP staff for the offsite dose calculations and assessment. The RP staff verified this dose assessment software with hand calculations after revisions to the program. This dose calculation software had not been revised for the past several years. The inspector confirmed selected dose assessments by hand calculations using ODCM equations.

The inspector obtained data for a 1997 batch liquid effluent release from a chemical and volume control system monitoring tank and conducted a comparison of the RP dose calculation to the NRC's PCDose program. The results were in reasonable agreement. RP staff calculated 1997 monthly dose projections as required by TS, and these dose projections were well below the TS and 10 CFR 50, Appendix I limits.

The ODCM was revised in May 1996 in accordance with the TS, but there were no significant changes. The 1996 AREWD report was submitted in a timely manner, however RP staff plan to submit a supplemental 1996 effluent report to correct minor errors identified by plant staff in the original report. In addition to these self-identified errors, the inspector noted other minor mistakes in the report. As an example, the 1996 AREWD identified that the maximum offsite dose organ reported from liquid releases was the gastrointestinal-lower large intestine; however, the inspector noted that the 1996 effluent data demonstrated that the liver was the organ that received the maximum offsite dose. RP staff indicated that all the identified errors would be corrected in the supplemental 1996 effluent report and that additional computer software would be developed to aid assembly of the report. The need to correct several mistakes in the 1996 AREWD report indicated a lack of attention to detail by RP staff.

c. Conclusions

The effluents program utilized appropriate sample collection and analysis methodology, and was effectively implemented in accordance with the site TS and ODCM. Dose assessment calculations were accurate and offsite radiation dose to the public was well below regulatory limits. However, the 1996 Annual Radioactive Effluent and Waste Disposal Report contained several errors which indicated a lack of attention to detail by RP staff.

R2 Status of RP&C Facilities and Equipment

R2.1 Calibration and Maintenance of the Radiation Monitoring System

a. Inspection Scope (84750)

The inspector reviewed the USAR, calibration records, and source check data for the area radiation monitors (ARM), the process radiation monitors, and the environmental radiation monitors. The inspector also interviewed personnel responsible for calibrations and observed representative radiation monitors and the readouts in the control room and rod drive rooms.

b. Observations and Findings

Various source checks, functional tests, and calibrations for the radiation monitors indicated that plant personnel performed these activities in accordance with the required, annual frequency. Plant personnel indicated that past calibration data will be reviewed to determine whether the calibration frequency can be changed to eighteen month intervals. The plant radiation monitoring system utilized ion chamber, Geiger-Mueller, and scintillation detectors.

The number and locations of the ARM detectors, as well as the continuous recording equipment in the rod drive rooms, were consistent with the USAR description. Results of electronic calibrations, radiation source checks, and interviews indicated that operability problems were infrequent. As an example, during the last calibration source test of these ARMs, only one monitor failed. Plant records indicated that this ARM was subsequently repaired and tested in a timely manner. The inspector did not observe any material condition concerns.

The inspector noted that three monitors (1R22, R27, and R36) had increases in the Hi-Hi alarm setpoint of 40-60 percent from electronic drift. A review of calibration cards for these monitors showed that this drift had not occurred in 1994 or 1995. These increases were above the 25 percent allowable tolerance for the radiation source checks. The system engineer concluded that, based on his perception of the logarithmic scale readout, the actual tolerance should be approximately 40 percent. Subsequently, the engineer determined that the Hi-Hi alarms were not required (i.e. non-safety related) and that the associated relays were not physically connected to any plant annunciators. Therefore, these alarms served no useful function. The engineer was evaluating these findings and planned to develop corrective actions.

The acceptance criteria for the station monitor calibrations varied from +15 to -45 percent up to +60 to -80 percent, depending upon each detector's response scale. As noted above, this tolerance range was determined by a visual inspection of the logarithmic scale readout and was subject to different interpretations by plant personnel. Based on the unusually large tolerances, the inspector was concerned with the ability of these tests to alert staff to degraded performance before the detector response was significantly altered.

The inspector also noted some discrepancies in the calibration records. For example, the Hi-Hi alarm set point for the R26 monitor was found at 80 percent below the desired level, and was subsequently adjusted. Although this problem had not occurred in the previous three years, station records did not document the reason for the large discrepancy. In addition, the latest annual calibration for monitor R33 indicated a source check response that was eight times higher than the desired response (well above the acceptance tolerance). The licensee's staff attributed the discrepancy to a recording error and a repeat of this source check during the inspection demonstrated that this response was within the tolerance range. The inspector did not identify any concerns with the other calibration records or with the Hi alarm setpoints.

Based on the above findings, the inspector was concerned about the management of the area and process radiation monitors. In particular, the observed deficiency with the Hi-Hi alarm setpoints and the subsequent discovery that they served no function suggested a weakness in the staff's understanding of system operation. The variance in the monitors' acceptable tolerance range, owing to differences in visual perception of the scale readout, was also considered a weakness with the radiation monitoring calibration program. The number of discrepancies and the tolerance errors in monitor calibration records were examples of a lack of attention to detail by the plant staff. The licensee's actions to address these findings will be reviewed during a future inspection (IFI 50-282/97014-01; 50-306/97014-01).

Based on a random sample of alarm set point determinations, the inspector verified that process and environmental radiation monitor alarm set points were determined in accordance with ODCM methodology. The actual alarm set points were below the calculated values and ensured these functions would activate well below 10 CFR Part 20 concentration limits or 10 CFR Part 50 Appendix I release requirements. Station personnel have not changed any alarm set points in the past year.

c. Conclusions

Overall, the calibration and periodic test program for the area, process, and environmental radiation monitors was adequate, and there were no material condition concerns. However, several problems were identified which indicated a weakness in the overall oversight of the area and process radiation monitors.

R2.2 Radiological Performance of Various Ventilation and Exhaust Systems

a. Inspection Scope (84750)

The inspector reviewed surveillance test data and portions of the TS, interviewed engineering staff regarding operability and performance, and conducted a walkdown of the filtration trains for the following ventilation systems:

- Control Room Special Ventilation
- Auxiliary Buildings Special Ventilation
- Shield Buildings Ventilation
- Spent Fuel Pool Special/In-Service Purge Ventilation

- Radwaste Building Exhaust
- Hot Chemistry Laboratory Exhaust

b. Observations and Findings

The filtration trains were primarily located in the Auxiliary Buildings, and each train consisted of a prefilter, charcoal absorbent filters, and high efficiency particulate air (HEPA) filters. The inspector examined several systems, and no material condition concerns were identified.

Review of 1995 and 1996 data indicated that the various surveillance and performance tests were conducted in accordance with the frequencies and conditions required by the Technical Specifications. The in-place dioctyl phthalate (DOP) tests for the HEPAs and the in-place halide (Freon) tests for the charcoal filters were conducted by a corporate laboratory which was independent of the Prairie Island Nuclear Generating Plant. The methyl iodide efficiency testing of the charcoal canisters was conducted by a vendor laboratory. The surveillance test data demonstrated that all the filters tested met the TS acceptance criteria. In addition, the inspector noted that the 1996 test results for control room ventilation system fan operation and pressure drop across the filters were acceptable.

c. Conclusions

The surveillance testing programs for the various special ventilation systems were well implemented and indicated excellent operability and performance.

R2.3 Performance and Material Condition of the Gaseous and Liquid Radwaste Systems

The inspector conducted a walkdown of compressors and the explosive gas monitoring equipment for the waste gas system, portions of the liquid radwaste system (holdup, collection, and monitoring tanks), and the control panels associated with these radwaste systems. No material condition concerns were identified. A review of operator logs showed that the hydrogen recombiner portion of the explosive gas instrumentation continually maintained the oxygen levels below 2%, as required by TS and the ODCM. The inspector determined that the radwaste equipment was in accordance with the USAR and was effectively operated and maintained to minimize offsite releases.

R4 Staff Knowledge and Performance in RP&C

R4.1 Problems with the Preparation of Composite Liquid Radwaste Samples and Leakage from the Waste Gas System

a. Inspection Scope (84750)

The inspector interviewed RP staff, and reviewed station assessments and a revised procedure regarding recent errors in the preparation of composite liquid effluent samples. The inspector also reviewed the recent identification of a leak in the waste gas system by plant personnel.

b. Observations and Findings

From August 1996 to April 1997, plant staff noted that sample aliquots from steam generator and other liquid waste tanks which had been set aside for preparation of composite samples were mishandled by the chemistry staff. These composites are assembled from aliquots from a number of tanks and are required by the ODCM for strontium-89/90, iron-55, and gross alpha analyses. The radioanalytical results are then used to determine the quantity of these isotopes in the liquid effluent and are subsequently employed in the offsite dose assessments. Historically, the steam generator blowdown and other waste tank composites had little or no activity, and there were no plant evolutions that would have caused any unusual radiological concentrations. Therefore, the loss of these sample aliquots did not have a significant impact on the plant effluent dose assessments.

In response to this finding, the RP staff implemented the following corrective actions:

- The labeling of these samples was revised to simplify the identification of the appropriate compositing period, and the chemistry software was upgraded to preclude staff from entering sample data into the wrong compositing period;

- The composite preparation procedure was revised to require a review of sample listings, an inventory of the following month's samples, the use of different colored labels for monthly and quarterly composite aliquots, and an initialing after each step of composite preparation;

- The composite preparation report was revised to contain a list of sample bottles which was to remain in the laboratory for use in other composites; and

- The report was to be reviewed, signed, and archived by document control.

The inspector reviewed a composite report and verified the sample bottle listing. This licensee-identified and corrected violation of ODCM requirements for sampling frequency described in Table 2.1 is being treated as a Non-Cited Violation, consistent with Section VII.B.1 of the NRC Enforcement Policy (NCV 50-282/97014-02; 50-306/97014-02).

During interviews, various plant personnel could not recall any past problems associated with the preparation of monthly or quarterly liquid radwaste composite samples. These recent errors in preparation of composite samples indicated a lack of attention to detail by RP staff.

In June 1997, a station engineer reviewed the daily waste gas inventory and determined that there was a leak in the waste gas system. After further examination of the system, a small leak was detected on the 122 Waste Gas Compressor. An evaluation of gas inventory logs indicated a loss of up to 1709 cubic feet of gas into the Auxiliary Building. This gas was exhausted through the Unit 2 auxiliary normal vent. Review of effluent monitor readings and grab samples

did not identify an increase in airborne radioactivity. The RP staff performed a conservative estimate of the radioactivity that was released by using the radioanalytical results from a gas decay tank and the estimated volume released. The estimated activity for this release into the Auxiliary Building was a very small percentage of the annual station gaseous releases.

The inspector reviewed the licensee's assessments of these occurrences and determined that the methodology was appropriate.

c. Conclusions

The inspector concluded that the errors in composite sample preparation constituted a Non-Cited Violation of ODCM sampling frequency requirements and were due, in part, to a lack of attention to detail by plant personnel. Daily review and close attention to system parameters enabled a waste gas engineer to determine the existence of a small leak in the system.

X1 Exit Meeting Summary

The inspector presented the inspection results to members of licensee management during an exit meeting on July 18, 1997. The licensee did not indicate that any materials examined during this inspection should be considered proprietary.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

K. Albrect, Acting Plant Manager
J. Friedrich, Senior Production Engineer
K. Holmstrom, System Engineer
D. LaLone, System Engineer
D. Larimer, Radicchemistry Supervisor
S. Schaefer, System Engineer
D. Shuelke, General Superintendent, Radiation Protection and Chemistry

NRC

R. Bywater, Resident Inspector, Prairie Island

INSPECTION PROCEDURE USED

IP 84750: Radioactive Waste Treatment, and Effluent and Environmental Monitoring

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-282,306/97014-01	IFI	Licensee actions to address NRC inspection findings with oversight of the area and process radiation monitors (Section R2.1)
50-282,306/97014-02	NCV	Failure to prepare composite samples in accordance with ODCM (Section R4.1)

Closed

50-282,306/97014-02	NCV	Failure to prepare composite samples in accordance with ODCM (Section R4.1)

LIST OF DOCUMENTS REVIEWED

Updated Final Safety Analysis Report; Sections 7.5 - Plant Radiation Monitoring System and 9.1-9.3 regarding Plant Radioactive Waste Control Systems

Technical Specifications; Sections 4.14, 4.15, 6.5

1996 Annual Radiation Effluent and Waste Disposal Report

Offsite Dose Calculation Manual, Rev. 14

Radiation Protection Implementing Procedure (RPIP) 4002, Rev. 12, "Effluent Surveillance Requirements"

RPIP 4007, Rev. 10, "Effluent Release Spectrum Analysis"

RPIP 4526, Rev. 7, "Composite Sample Preparation"

Surveillance Procedure (SP) 1027, Rev. 15, "Radiation Monitoring Annual Calibration"

SP 1028, Rev. 31, "Radiation Monitoring Monthly Source Test"

SP 1243, Rev. 0, "Radiation Monitoring Quarterly Source Test"

SP 1783.1, Rev. 4, "Westinghouse Radiation Monitor Electronic Calibration"

SP 1783.2, Rev. 3, "NMC Rad Monitor Electronic Calibration"

Periodic Test Procedure (TP) 1783.2, Rev. 3, "Victoreen Area Radiation Monitor Electronic Calibration"

TP 1740, Rev. 5, "Victoreen Area Radiation Monitor Quarterly Test"

TP 1743, Rev. 6, "Victoreen Area Radiation Monitor Calibration Test"

SP 1055.1, Rev. 4, "121 Control Room Special Ventilation System Removal Efficiency Test"

SP 1055.2, Rev. 4, "122 Control Room Special Ventilation System Removal Efficiency Test"

SP 1185, Rev. 5, "Control Room Special Ventilation Flow Verification"

SP 1140.1, Rev. 4, "121 Spent Fuel Pool Special and In-Service Purge Ventilation System Filter Removal Efficiency Test"

SP 1140.2, Rev. 3, "122 Spent Fuel Pool Special and In-Service Purge Ventilation System Filter Removal Efficiency Test"

SP 1762, Rev. 1, "Radwaste Building Exhaust Filter Removal Efficiency Test Procedure"

SP 1761, Rev. 0, "Hot Chemistry Laboratory Exhaust Filter Removal Efficiency Test Procedure"

SP 1081.1, Rev. 3, "121 Auxiliary Building Special Ventilation System Removal Efficiency Test"

SP 1081.2, Rev. 3, "122 Auxiliary Building Special Ventilation System Removal Efficiency Test"

SP 1080.1, Rev. 4, "11 Shield Building Special Ventilation System Removal Efficiency Test"

SP 1080.2, Rev. 4, "12 Shield Building Special Ventilation System Removal Efficiency Test"

SP 2080.1, Rev. 4, "21 Shield Building Special Ventilation System Removal Efficiency Test"

SP 2080.2, Rev. 4, "22 Shield Building Special Ventilation System Removal Efficiency Test"

Internal Operating Experience Assessment, Error Reduction Task Force Report 97-04, dated June 10, 1997

Generating Quality Services Observation Report No. 1997233, dated June 27, 1997, "Prairie Island Radioactive Effluent Monitoring"

LIST OF ACRONYMS USED

ALARA	As Low As is Reasonably Achievable
AREWD	Annual Radiation Effluent and Waste Disposal
ARM	Area Radiation Monitor
HEPA	High Efficiency Particulate Air
ODCM	Offsite Dose Calculation Manual
RP	Radiation Protection
TS	Technical Specifications
USAR	Updated Safety Analysis Report