

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

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Report Nos.: 50-282/97004(DRS), 50-306/97004(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: February 3-7, 1997

Inspector: R. Glinski, Radiation Specialist

Approved by: T. Kozak, Chief, Plant Support Branch 2  
Division of Reactor Safety

## Report Details

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

#### **R1.2 ALARA Reviews and Preparation of Radiation Work Permits (RWP) for the Unit 2 Refuel Outage**

##### **a. Inspection Scope (83729)**

The inspector reviewed several ALARA reviews and RWPs, interviewed RP supervision regarding ALARA planning for the outage, attended ALARA pre-job briefs, and observed the implementation of ALARA measures.

##### **b. Observations and Findings**

The inspector noted that ALARA reviews for specific tasks were conducted by a Radiation Protection (RP) Supervisor prior to the development of the work packages and RWPs. The ALARA reviews included the following: (1) review of historical data for airborne radioactivity, contamination levels, dose rates, and lessons learned, (2) pre-job briefing material for radiological conditions and RP coverage, (3) dose reduction measures and engineering controls, (4) dosimetry requirements and hold points, and (5) appropriate review by other RP staff members. The work packages and RWPs were then developed with input from system engineers, maintenance supervisors, and experienced RP Specialists.

The inspector observed pre-job briefings for reactor head welding and steam generator (SG) repair jobs. Attendance at the briefings was mandatory for all personnel involved in the specific task. Others in attendance included RP supervisors and staff, and personnel from the site safety, security, and quality departments. The pre-job briefings consisted of a detailed review of the procedures, the radiological conditions, various ALARA measures, RP coverage, RWP requirements, safety considerations for the job, and time for questions.

The inspector observed activities for reactor head and SG work and verified that radiological controls such as temporary shielding, high efficiency particulate air (HEPA) filters, multiple badging, remote monitoring, and low dose areas were utilized by outage personnel.

##### **c. Conclusion**

The inspector determined that the licensee's ALARA reviews and RWP/job planning effectively identified and addressed radiological conditions for various outage tasks. The inspector noted that ALARA pre-job briefings were thorough and that ALARA measures were implemented by station staff.

R1.2 Observation of Outage Activities and Radiological Controls in the Containment and Auxiliary Buildings

a. Inspection Scope (83750)

The inspector observed outage activities in the containment and auxiliary buildings. The inspector interviewed RP and contract staff regarding control of radiological conditions within the plant and also reviewed radiological survey and personnel contamination data.

b. Observations and Findings

During observations of work activities, the inspector noted that postings and survey maps appropriately reflected current plant conditions. The inspector independently verified selected survey data and no incorrectly posted areas were identified. In general, housekeeping was very good and no significant radiological impediments to work activities were observed. The inspector noted that personnel dosimetry was worn as prescribed, survey meters were within calibration, and temporary shielding for dose rate control was positioned properly.

The inspector observed excellent contamination control. Potentially contaminated items were either within the designated areas or were bagged and labeled appropriately. Tools used in containment were obtained from a dedicated set of tools for this area. A review of personnel contamination data indicated that the licensee was well within the outage goal and that the contaminations generally involved very low levels of radioactivity.

RP coverage for specific jobs and routine rounds were evident. The inspector observed that RP Specialists (RPS) at the access and steam generator control points adequately briefed workers and exercised appropriate control of various tasks. The inspector also noted that RPSs requested additional shielding for the reactor head platform after the canopy welding job had begun. This shielding achieved a 40% reduction in contact dose rates and was a good example of a continuing ALARA focus.

The inspector observed that the RP department did not have a formal process of conducting further ALARA reviews when a job approached or exceeded the original dose estimate. RP supervision indicated that they monitored the status of the various jobs and RWPs through a review of daily dose reports and discussions with plant staff regarding work progress. The inspector also noted that the original dose estimates for the current Unit 2 outage were based on the previous Unit 1 outage. Despite this lack of a formal process for in-progress ALARA reviews and for stringent outage dose estimates, the RP staff have consistently conducted outage activities ALARA. Following these discussions, the licensee utilized previous Unit 2 outage data to revise the dose estimates for this current outage and the inspector noted that this revision resulted in a lower total outage dose estimate.

c. Conclusion

Overall, the RP staff exercised effective control of work practices and radiological conditions within the plant. Monitoring and control of contamination was effective as evidenced by the low number of personnel contaminations. The inspector noted that outage activities were conducted ALARA.

R1.3 Reactor Coolant System (RCS) Shutdown Chemistry Controls

a. Inspection Scope (83750)

The inspector reviewed the shutdown chemistry controls used by plant staff and reviewed the results with chemistry supervision.

b. Observations and Findings

Historically, the plant has performed early boration and hydrogen peroxide ( $H_2O_2$ ) addition to the RCS during shutdowns for refueling outages. The early boration, in the presence of about 5 parts per million hydrogen, created an acid-reducing condition which provided for cleaning of the primary system. Then, through the addition of  $H_2O_2$ , an acid-oxidizing condition was established which facilitated a large release of corrosion products (crud burst) that was subsequently removed from the RCS by the purification system.

During this outage, the time period for the acid reduction phase was extended to nearly double that of previous outages. For the acid-oxidizing phase, plant staff conducted three separate additions of  $H_2O_2$  to maintain the oxygen levels between 2000-4000 parts per billion. The RP&C staff monitored the radiochemistry data, which indicated that these shutdown controls achieved a crud burst which was larger than on prior occasions.

c. Conclusion

The inspector determined that the licensee had effectively implemented chemical additions during reactor shutdown which resulted in an overall reduction of the source term.

R2 Status of RP&C Facilities and Equipment

R2.1 Implementation of the Respiratory Protection Program

a. Inspection Scope (83750)

The inspector interviewed RP supervision and reviewed a portion of the applicable procedures, test records, air sample data, and dose assessments regarding the licensee's respiratory protection program. The inspector also observed air monitoring activities and respiratory protection equipment.

b. Observations and Findings

The inspector noted that the licensee's procedures provided adequate guidance for the testing, issuance, and use of respirators. All equipment was verified as having National Institute for Occupational Safety and Health/Mine Safety and Health Administration (NIOSH/MSHA) certification. The licensee adequately trained and fit tested plant staff for use of the equipment. The inspector noted that monthly respiratory protection checks were conducted in accordance with procedure and that the testing equipment was in good working condition. Additionally, the inspector noted that the licensee distributed "power visors" to staff for activities which did not require respirators. The power visors consisted of a face shield supplied with filtered air.

The monitoring and control of potential airborne radioactivity for the outage was effective as evidenced by the numerous air samplers and HEPA units. A constant air monitor (CAM) was positioned on the refuel floor and portable air samplers were used throughout the other areas. RP staff collected, analyzed, and evaluated air samples for tritium, radioiodine, and gamma emitting radionuclides. A review of the air sample data showed that only a small percentage of the samples contained radioactivity. The data further showed the cobalt-60 (Co-60) was the predominant contaminant present in air samples. The Co-60 concentration for the positive samples ranged from 0.01 - 6.72 Derived Air Concentrations (DACs).

During the outage, the RP staff detected facial contamination on several workers. Plant staff performed decontamination and nasal smears on the workers. In response to positive nasal smears, the licensee conducted whole body counts to determine whether the individuals had experienced an intake of radioactive material. In most cases, the whole body count data indicated personnel contamination and no internal dose. Those that received internal contamination did not receive any appreciable dose. The inspector reviewed a portion of the whole body counts and dose assessments and determined that the RP staff used appropriate methodology in these evaluations.

c. Conclusion

The inspector determined that the licensee implemented the respiratory protection program according to NRC requirements and station procedures.

R2.2 IP&C Evaluation of an Abnormal Liquid Effluent Release

a. Inspection Scope (84750)

The inspector reviewed the licensee's response and assessment of two radiation monitor trips during the release of liquid effluents from an aerated drain monitoring tank. The inspector also interviewed staff, reviewed data, and conducted a walkdown of portions of the liquid radwaste system.



b. Observations and Findings

On January 30, 1997, while releasing the aerated drain monitoring tank (121 ADT MTR TK), the liquid effluent radiation monitor (R-18) tripped and closed the downstream isolation valve. In accordance with procedure, R-18 was flushed to remove contamination and the ADT monitoring tank was recirculated and resampled. Concentrations in the 121 ADT MTR tank were similar to those obtained earlier. The 121 ADT MTR TK was then re-released and R-18 tripped almost immediately. The tank was again returned to the recirculation mode, re-analyzed, and later discharged through the steam generator blowdown monitoring system.

On January 31, 1997, RP&C staff conducted further review to determine the cause of the R-18 trip. The R-18 monitor was flushed to a floor drain and samples were obtained. The laboratory analysis indicated that concentrations and ratios of the radionuclides were similar to the Condensate Receiver Tank (CRT). The system contained a pathway from the CRT to the discharge piping. RP&C staff subsequently replaced the diaphragms in a number of valves along the pathways from the CRT to the ADT MTR tanks and to the discharge piping. The new diaphragms were constructed of a more resilient material. The licensee also reviewed ADT MTR tank releases for the previous month and determined that those activities were normal.

Chemistry supervision reviewed Emergency Response Computer System (ERCS) data and determined that the release of liquid from the CRT occurred for a total of about 100 seconds. Since the release rate was 60 gallons per minute, this release volume was 100 gallons or the equivalent of 2.2% of the 121 ADT MTR tank volume. The calculated critical organ dose from this release was significantly less than 1 millirem. The inspector reviewed ERCS data, the chemistry analyses, and the RP&C evaluation of the release and determined that the methodology was appropriate.

The Prairie Island Offsite Dose Calculation Manual (ODCM) defines an abnormal release, in part, as, "A release which results from procedural or equipment inadequacies, or personnel errors, that could indicate a deficiency". Since this release meets the definition of an abnormal release, the data from this release will be included in the Annual Radioactive Effluent Report.

c. Conclusion

The inspector determined that RP&C methodology used to evaluate the abnormal liquid effluent release were appropriate.

**R8 Miscellaneous RP&C Issues**

- R8.1 (Closed) Follow-Up Item 50-282(306)/96011-01: inconsistent RP response to electronic dosimeter (ED) alarms. An NRC inspector reviewed a record of ED alarms and noted that although the licensee's computerized ED login/logout system notified plant staff that the ED had alarmed, there was an inconsistent evaluation by the RP department regarding the cause of the ED alarm and any necessary followup action.

The RP department has initiated a practice of evaluating the cause of ED alarms by having the lead RP Specialist immediately interview the plant staff to determine the cause of the ED alarm. The RP department has also begun to print out a daily report of ED alarms. This report contains information regarding the employee, the specific task/RWP the employee was logged into, the type of alarm, the cause of the alarm, and the initial RP evaluation. These reports are then reviewed frequently by RP supervision for trends and needed actions. The inspector reviewed daily ED alarm reports for the previous several weeks and noted consistent evaluations. These actions by the RP department have adequately addressed an identified inconsistency in the RP program. This item is closed.

- R8.2 (Closed) Violation 50-282(306)/96011-02: inadequate radiological survey of the spent resin tank room. The licensee did not make an adequate survey to ensure compliance with 10 CFR 20.1701, which requires licensees to use, to the extent practical, process or engineering controls to control the concentrations of radioactive material in air. The survey of the spent resin tank room inaccurately determined loose contamination levels of 45,000 disintegrations per minute (dpm) when actual levels were 450,000 dpm.

The RP department's corrective action was to modify the smear counter printout such that any result of 100,000 dpm or greater would be conspicuously flagged with a warning. In addition, the RP staff has implemented the following program enhancements; 1) added a description of this event to RPIP 1006 "Radiation Protection Lessons Learned", 2) required discussion of ALARA reviews before conducting infrequently performed work, and 3) added a step to the Work Order ALARA Review to review RPIP 1006 and to determine whether the work is a infrequently performed task. The inspector observed the smear counter printout modification and implementation of the program enhancements. The inspector concluded that the corrective action was adequate to prevent recurrence. This item is closed.

## V. Management Meetings

### **X1 Exit Meeting Summary**

The inspector presented the inspection results to members of licensee management on February 7, 1997. The licensee did not indicate that any materials examined during the inspection should be considered proprietary.

## PARTIAL LIST OF PERSONS CONTACTED

### Licensee

A. Johnson, Radiation Protection Supervisor  
S. Lappegaard, Radiochemistry Supervisor  
D. Larimer, Radiochemistry Supervisor  
G. Malinowski, Radiation Protection Supervisor  
D. Shulke, General Superintendent of Radiation Protection and Chemistry  
J. Sorrenson, Plant Manager  
P. Wildenborg, Health Physicist

### NRC

S. Ray, Senior Resident Inspector, Prairie Island  
R. Bywater, Resident Inspector, Prairie Island

## INSPECTION PROCEDURE USED

IP 83750, "Occupational Exposure"  
IP 83729, "Occupational Exposure During Extended Outages"  
IP 84750, "Radioactive Waste Treatment, and Effluent, and Environmental Monitoring"

## LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

### Closed

50-282(306)/96011-01	IFI	inconsistent response by RP to alarming EDs
50-282(306)/96011-02	VIO	inadequate radiological survey of the spent resin tank room



## LISTING OF DOCUMENTS REVIEWED

Incore Thimble Eddy Current Testing (ECT), ALARA Review, Radiation Work Permit (RWP) #2089

Replace Power Range Monitor Detector, ALARA Review, RWP #2065

Steam Generator Manways/Diaphragms/Nozzle Dams/ECT/Plug Pulling/Tube Sleeving, ALARA Review, RWPs #2020, 2022, 2024, 2025

Pressurizer Spray Valve Preventative Maintenance (PM) and Replace Bellows Seal/Stem Assembly, ALARA Review, RWPs #2055, 2109

Internals Lifting Rig Paint, ALARA Review, RWPs #2102, 2010

Reactor Coolant Pump Motor Preventative Maintenance, ALARA Review, RWP #2101

Disassemble and Inspect 2SI-7-1, ALARA Review

Move Pressurizer Spray Valve E/P Transducer Outside Vaults, ALARA Review, RWP #2074

Prairie Island Radiation Protection Implementing Procedure (RPIP) 1214, Revision 5, "Respiratory Protection Equipment Testing"

Prairie Island RPIP 1219, Revision 8, "Respirator Issue"

Prairie Island RPIP 1225, Revision 2, "Respirator Fit Testing and Portacount Fit Tester Operation"

Prairie Island RPIP 1547, Revision 2, "Posi/check Automatic Respirator Tester Operation"

Prairie Island RPIP 1601, Revision 5, "Monthly Respiratory Protection Checks"