ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Inspection Report: 50-482/96-008

License: NPF-42

Licensee: Wolf Creek Nuclear Operating Corporation
P.O. Box 411
Burlington, Kansas

Facility Name: Wolf Creek Generating Station

Inspection At: Burlington, Kansas

Inspection Conducted: April 8-12, 1996

Inspectors: Thomas H. Andrews, Radiation Specialist, Plant Support Branch

Michael C. Hay, Radiation Specialist, Plant Support Branch

Approved: Blaine Murray 5/1/96
Blaine Murray, Chief, Plant Support Branch Date
Division of Reactor Safety

Inspection Summary

Areas Inspected: Routine, announced inspection of audits and appraisals; training and qualifications of personnel internal exposure control; plant areas unusable as a result of operational occurrences; effectiveness of licensee controls; planning and preparation external exposure control; control of radioactive materials and contamination, surveys and monitoring; maintaining occupational exposure as low as reasonably achievable (ALARA). The inspection modules used for this inspection were 83750, "Occupational Radiation Exposure," and 83729, "Occupational Exposure During Extended Outages."

Results:

Plant Support

- Overall, the inspectors determined that the licensee's oversight of the radiation protection organization was good. Self-assessments reflected a probing and questioning attitude towards program performance. When issues were identified, the licensee took aggressive, prompt action to address them (Section 2.1).

- A good program was in place for monitoring internal exposures and maintaining internal exposures ALARA. The internal dose assessment process and respiratory protection evaluation process were valid and accurate (Section 2.3).

- A non-cited violation was identified involving radiological work practices. An adverse trend was identified in the performance of the radiation protection technician performance. The trend indicated an increased number of NRC and licensee identified violations of radiation protection program procedures. The licensee initiated a comprehensive self-assessment to identify discrepancies between management expectations, procedure scope, and technician practices (Section 2.5).

- Overall, planning and preparation for the outage were sufficient to maintain exposures ALARA (Section 3.1).

- The dosimetry and whole body counting program were satisfactorily implemented (Section 3.2).

- An effective program was established to control the release of potentially contaminated materials from the radiological controlled area. Surveys were independently verified and determined to be accurate. Postings were in place where needed and no discrepancies were noted during plant tours. The housekeeping conditions within the radiological controlled area was very good (Section 3.3).

- The licensee achieved lower than anticipated personnel exposures during the refueling outage even with longer than originally planned outage duration and increased work scope. The major dose savings was attributed to the long reactor coolant system cleanup at the beginning of the outage. The total personnel exposure for 1995 was approximately 14 rem, and considered to be very good for a non-outage year. The ALARA program was efficiently implemented and well integrated into the radiation protection program (Section 3.4).

Summary of Inspection Findings:

- Licensee-identified and corrected non-cited violations were identified (Section 2.5).
- Violation 482/9602-02 was closed (Section 4).

Attachment:

- Attachment - Persons Contacted and Exit Meeting

DETAILS

1 Plant Status

The plant was connected to the grid at approximately 11:15 P.M. on April 7, 1996, ending the eighth refueling outage. The outage began on January 30, 1996, approximately 4 weeks earlier than planned. The outage lasted approximately 68 days.

At the beginning of the inspection period, the plant was at approximately 50 percent rated thermal power. During the inspection period, reactor power was increased to 100 percent rated thermal power. There were no operational occurrences that affected the results of this inspection.

2 Occupational Radiation Exposure (83750)

2.1 Audits and Appraisals

The inspectors reviewed a selected sample of the results of audits and surveillances performed by or for the licensee since the last inspection and reviewed the adequacy of the licensee's corrective actions. Personnel performing the audits and surveillances were familiar with the radiation protection program and had experience in the performance of radiation protection related functions.

The inspectors met with representatives from the quality evaluation department and discussed observations made during the outage. The observations were consistent with information obtained from other departments regarding licensee performance during the outage.

The inspectors reviewed the licensee's program for identifying and correcting deficiencies or weaknesses related to the control of radiation or radioactive material. When problems or deficiencies were identified, the licensee initiated a "Performance Improvement Request." Licensee-identified deficiencies were properly addressed, including, as appropriate, a root cause analyses and corrective actions.

Overall, the inspectors determined that the quality evaluation oversight of the radiation protection organization was good. Reports reflected a probing and questioning attitude towards program performance. When issues were identified, the licensee took aggressive, prompt action to address them.

2.2 Training and Qualifications of Personnel

The inspectors reviewed qualification summaries of personnel in the radiation protection organization. Particular attention was given to the qualifications of senior technicians, including contractor technicians brought in to support outage work. The licensee provided qualification summaries for all of the

contractor and licensee technicians. The inspectors performed independent assessments of randomly selected summaries and confirmed the licensee's process for accrediting work experience was valid.

Training of contractor radiation protection technicians and other contractors who were hired to support the refueling outage is discussed in Section 3.1 of this report.

2.3 Internal Exposure Control

The inspectors reviewed the licensee's whole body counting program, internal exposure calculations and evaluations, and the use of respiratory protection equipment. The review process included discussions with licensee personnel, review of procedures and records, and the performance of independent calculations to verify the licensees calculation methodology was correct.

The licensee used two whole body counting devices, a Nuclear Data Model 6000, and a Whole Body Counter-8000. Both devices were calibrated using National Institute Standards and Technology traceable sources at least once every six months.

The inspectors reviewed the licensee's justification process for reducing the whole body counting time from 10 minutes to 3 minutes and verified that the reduced count time did not adversely affect the assessment results.

The inspectors randomly selected an internal dose assessment for a radiation worker who had received an intake during steam generator support activities. The assessment was performed as a result of facial contamination being discovered on the worker. The licensee conducted a whole body count within 6 hours after the radiation worker exited the radiological controlled area. The licensee used a computer program to calculate internal dose (committed effective dose equivalent).

The inspectors independently verified the licensee's results and found their assessments to be acceptable with one observation. On two of the assessment worksheets, "DAC-Hours Calculation Worksheet," and "Dose Calculation Worksheet Summary," the inspectors identified two instances where the Radiation Protection Supervisor (Support) signed both the "Performed By" and "Reviewed By" signature blocks. The inspectors determined that while this might be considered a questionable work practice, this was not a violation of the licensee's procedures. This observation was discussed with both the Radiation Protection Superintendent and the Radiation Protection Supervisor (Support) during the inspection.

The licensee maintained an effective respiratory protection program. Only 11 respirators were issued throughout the outage. During the course of the outage, only 134 millirem of exposure was assigned due to uptakes.

The inspectors selected a respirator evaluation form for review. The evaluation was conducted during the recent outage by a radiation protection technician. The evaluation included an assessment of whether use of a respirator would negatively influence the workers' efficiency and increase the job time and radiation dose. The respiratory protecton evaluation process was confirmed to be valid and accurate.

The inspectors determined that the licensee had a good program for monitoring internal exposures and maintaining internal exposures ALARA.

2.4 Plant Areas Unusable as a Result of Operational Occurrences

According to the licensee, there were no known problem areas within the plant such as those identified in NRC Information Notice 96-14, "Degradation of Radwaste Facility Equipment at Millstone Nuclear Power Station, Unit 1." During a tour of the licensee's facilities, the inspectors looked for areas of the plant that were unusable as a result of operational occurrences. Special attention was given to areas that may not be entered on a regular basis. Areas observed appeared to be well maintained.

2.5 Effectiveness of Licensee Controls

During the review of the performance improvement requests generated during the outage, the inspectors reviewed reports associated with radiation protection activities and noted examples that were related to technician practices or performance. Combined with violations identified by the resident inspectors in recent reports, the number of incidents identified was considered as a potential adverse trend. The types of incidents associated with this trend were especially highlighted in Performance Improvement Requests 885 and 1050.

In the incident associated with Performance Improvement Request 885, a technician performing routine area surveys encountered higher than expected radiation levels in the "Demin Alley Truck Bay" area. A quick investigation of the area by the technician revealed that there was a posted high radiation area surrounding a shielded drum containing a reactor coolant filter. This drum did not have shielding on the top and the top of the drum was not secured to prevent access. Based on information on the filter tag attached to the drum, the radiation level at 1 foot from the filter was 6 rem per hour. Through the licensee's procedures for radiological posting, this area should have been posted as a locked high radiation area.

The licensee's investigation revealed that the technician who changed out the filter had previously changed out two other filters that met the requirements for posting of locked high radiation area controls, but did not establish these controls. The root cause evaluation indicated the following:

- The contractor technician was not provided specific training on controls to restrict access to filters. This information was inadvertently omitted from the contractor training program for the refueling outage.

- The contractor technician was provided a "hands-on" task qualification on filter changing. However, the filter used during the demonstration did not meet the requirements for securing the drum to restrict access or posting of locked high radiation area controls. Therefore, these requirements were not discussed.

- A review by the licensee revealed that all licensee technicians were cognizant of the licensee's control process, but the process was not specifically stated in the licensee's procedures.

In the incident associated with Performance Improvement Request 1050, a contractor junior technician was instructed by the shift technician to provide coverage for a job in a locked high radiation area. The junior technician obtained the keys to the locked high radiation area from security and provided the necessary job coverage. After performing the job coverage, the licensee discovered that the individual was not authorized to receive the keys to locked high radiation areas. In violation of the licensee's access control procedures, the keys were issued to the technician by security personnel without checking to see if the technician was authorized.

According to Procedure AP-25A-200, "Access to Locked High or Very High Radiation Areas," Revision 2, "The Radiation Protection Supervisor Operations shall authorize Senior Radiation Protection Technicians to be issued locked high radiation area or very high radiation area keys by sending a memorandum to Security with a list of technician names and automated control authorization device numbers." This procedure further states, in part, "The Superintendent, Radiation Protection shall authorize non-senior radiation protection technicians for locked high radiation area key issue if the need arises, by sending a memorandum..." The technician was not listed on the memorandum from Radiation Protection to Security.

The licensee conducted a very good root cause investigation into this event. The findings indicated that:

- Management's understanding of procedural requirements was inaccurate. Management thought that there were additional requirements in the procedure calling for verifying of technician qualifications by the shift technician prior to assigning them to provide job coverage in a locked high radiation area. Shift technicians were not aware of this management expectation.

- Management expected the shift technician to be familiar with the qualifications of personnel they supervised. The shift technician had recently been working on another shift, and therefore, had not become acquainted with the qualifications of personnel on the new shift. The shift technicians were not aware of this management expectation.

- Management expected technicians to be familiar with the tasks they were allowed to perform. In this case, the contract technician was aware of the procedural limitations on junior technicians; specifically that they

were not allowed to perform personnel decontamination and to survey materials for free release from the radiological controlled area. However, the contract technician did not recall specific guidance regarding job coverage in locked high radiation areas.

- As a general rule, the licensee only allowed senior technicians to have access to locked high radiation area keys. However, this was not always the case. There were specific examples where senior technicians were not on the access authorization list, and there were examples where junior technicians could be added to the list. Therefore, mistakes could be made by assuming that a person was a senior technician, and by default, authorized to access locked high radiation areas.

- Security permitted issuance of keys to operations personnel based upon recognition. This practice was erroneously applied to the issuance of keys to locked high radiation areas to radiation protection personnel.

As a check to see if there had been other, similar occurrences regarding key issue, the inspectors requested a that the licensee review all the keys issued during the refueling outage. As a result, the licensee discovered that there was a discrepancy between Procedure AP-25A-200, "Access to Locked High or Very High Radiation Areas," Revision 2, and SEC-01-206, "High Security Key Control and Issue," Revision 20. Procedure SEC-01-206 stated "If the name of the individual requesting the key is not on the list, a radiation protection supervisor must verify the individual is authorized to be issued the key." This step is not in Procedure A-25A-200. Furthermore, this step did not specifically state that the authorization had to be via memorandum as stated in procedure A-25A-200.

In the case of the junior technician, this step in the security procedure was not performed. However, the licensee identified that there was an instance where a contract senior technician was added to the authorization memo as a result of a verbal authorization. The technician's name was hand written on the memorandum used by security. There was no annotation as to who was the authorizing individual on the memorandum or in the security logs.

The licensee has not been able to establish who was the authorizing individual within the radiation protection organization. As such, the licensee has not been able to verify that the individual who gave the verbal authorization had the authority to actually give this authorization. Furthermore, they have not been able to determine if this was an authorization to change the access memorandum or if this was a one-time-only authorization. Because the contract senior technician's name was added to the list, Security issued keys to the locked high radiation areas on three separate occasions. The licensee issued a performance improvement request to resolve the differences between Procedures AP-25A-200 and SEC-01-206.

The inspectors discussed the underlying causes associated with the trend with licensee management. Based upon knowledge of the root causes and casual factors attributed to the reports, they were aware that there was a problem

associated with technician practices. The primary casual factor was described as a disconnect between management expectations, content of procedures, and technician practices.

The licensee depended heavily upon the skills and knowledge of personnel to ensure compliance with procedures. Management expectations, general guidance and interpretations were communicated to the technicians via letters, shift meetings, etc., but were not specifically addressed in procedures. Because of the lack of specific guidance in procedures that clearly stated the licensee's interpretations and expectations, informal protocols were developed to perform various tasks and to incorporate the latest management guidance. Over time, there was enough deviation between the protocols and the procedures such that the procedures were violated.

Performance Improvement Request 1158 was issued regarding the trend in technician performance. This request recommended that a self assessment of the radiation protection program be performed, emphasizing a comparison between actual and expected practices to clearly identify disconnects between the practices and policies within the program.

These examples were violations of the licensee's procedures. They were identified by the licensee. The licensee presented information to the inspectors that demonstrated that there were no adverse affects resulting from the violation of the procedures in these incidents. The root cause of each incident was investigated and detailed in the performance improvement reports for each of these incidents. Recognizing that trend, the licensee initiated a program assessment to attempt to address the overlapping casual factors of these events. Because of the licensee's actions, these licensee-identified and corrected violations are being treated as Non-Cited Violations, consistent with Section VII.B.1 of the NRC Enforcement Policy.

3 Occupational Exposure During Extended Outages (83729)

3.1 Planning and Preparation

The outage began on January 30, 1996, about 4 weeks ahead of the planned shutdown date. Even with the early start, the licensee had made adequate preparations for the processing of contractor radiation protection technicians and contractor support personnel for the outage.

The licensee hired approximately 40 contractor senior technicians and 15 contractor junior technicians to support the outage. As part of the screening process, the licensee required all technicians to have completed the Northeast Utilities written examination since 1993. Technicians who had previously worked on site and had completed task qualification cards were not required to perform the task qualification process. All contract technicians were provided training on the licensee's procedures.

In preparation for the outage, the licensee had evaluated jobs to be performed during the outage and estimated job exposures based upon historical data. As a result, the licensee estimated that the total exposure for the outage would be approximately 160 person rem. Based upon the historical data, these goals were judged to have been challenging. As discussed in Section 3.4 of this report, substantial dose savings were recognized through good planning and longer reactor coolant system cleanup time.

According to various personnel interviewed during the inspection, there were very few instances where work coordination was a problem. There were sufficient supplies of instruments and protective clothing available to support outage activities.

Overall, planning and preparation for the outage were sufficient to help keep exposures ALARA.

3.2 External Exposure Control

The external dosimetry program was inspected to confirm proper external doses were assigned to radiation workers. This included a review of dosimetry processing and results; evaluation of exposure for lost, damaged or off scale dosimetry; and skin dose calculations following exposure from hot particles.

The licensee processed thermoluminescent dosimeters on-site. Their program was verified to be accredited by the National Voluntary Laboratory Accreditation Program in categories I-VIII.

The licensee issued digital alarming dosimeters for personnel who entered the radiological controlled area. These dosimeters provided a visual indication in microrems of external exposure and could be programmed to alarm at a preset dose rate and dose. The licensee compared the recorded exposure from the thermoluminescent dosimeters with the digital alarming dosimeters on a regular basis. A comparison conducted from January 1, 1996 through February 5, 1996 resulted in a total dose from thermoluminescent dosimeters of 2.313 rem, and 3.371 rems for digital alarming dosimeters.

The licensee stated the digital alarming dosimeters were recording a higher dose due to rounding of the dose to the nearest millirem. In the case of exposure below 1 millirem, doses that exceeded 0.5 millirem would result in an assigned exposure of 1 millirem. To correct this problem the licensee had changed the way in which the digital alarming dosimeters recorded dose. The change consisted of having the digital alarming dosimeters only record a dose when the dose rate was at 5 millirem per hour or more, coinciding with a radiation area. The results of this change were still under review by the licensee.

The inspectors reviewed Procedure RPP 03-120, "Evaluation of Exposure for Lost, Damaged or Off Scale Dosimetry" Revision 4, and noted no discrepancies. A dose evaluation was reviewed by the inspectors for a lost thermoluminescent dosimeter with no problems identified.

The inspectors reviewed Procedure RPP 03-122, "Skin Dose Calculations" Revision 4, and two hot particle dose assessments. The inspectors noted that a gamma spectrometry analysis was conducted and analyzed by the licensee to determine the hot particle isotopic abundances. This information was then used with the computer program, VARSKIN, to compute actual skin dose. The inspectors noted no discrepancies with the procedures and assessments.

3.3 Control of Radioactive Materials and Contamination, Surveys and Monitoring

The inspectors reviewed logs used by the licensee to track materials released from the radiological controlled area. Individual items were listed with a specific description of the item (where possible). One of the senior technicians assigned to survey items released from the radiological controlled area was questioned regarding the use of this log. The technician acknowledged that the primary purpose of the log was to be able to identify items that may have been released if there is a question regarding the instrument used to survey the items, proper survey practices, etc.

The inspectors observed personnel using the small article monitors for individual items and observed radiation protection personnel monitoring these activities. The technicians demonstrated good "coaching" skills in assisting workers leaving the radiological controlled area with various "hand-held" items.

Because the potential for contaminated materials and tools to leave the radiological controlled area is increased during outages, the inspector conducted a survey of various tool storage areas outside of the radiological controlled area. This was done by accompanying a licensee technician with a hand held frisker.

The technician performed a thorough check of materials stored in cabinets, drawers and shelves. The technician demonstrated good judgement in deciding what types of materials were most likely to be contaminated and focused extra attention in surveying these items. During this survey, no contaminated tools were identified outside of the radiological controlled area.

The inspectors conducted tours of the radiological controlled area verifying proper postings, survey maps, high radiation area controls, radiation work permits, and radiation worker practices. Independent radiation measurements were conducted by the inspectors to ensure that the radiological postings were adequate.

The inspectors observed a junior radiation protection technician perform routine surveys and noted good radiological practices were demonstrated by the technician. The inspectors reviewed Radiation Protection Procedure (RPP) 02-210, "Radiation Survey Methods" Revision 10, and determined that the technician's survey methods were consistent with the licensee's procedure.

The inspectors noted scaffolding was set up in the radiological controlled area and verified surveys were conducted by radiation protection personnel prior to work being performed in the overhead. Two maintenance personnel working in the overhead replacing a fan belt were questioned by the inspectors on whether or not they were working in an area that had been recently surveyed. The workers stated that prior to gaining access to the overhead they verified with access control the area was surveyed. The inspectors confirmed that such a survey was conducted by questioning radiation protection personnel at the access point upon exiting the radiological controlled area.

During tours of the radiological controlled area, the inspectors observed postings and surveys of the areas. Surveys were typically posted in a central location on each elevation of the building where workers could review them prior to entering the area. Postings were made in accordance with the licensee's procedures.

The inspectors concluded that the licensee's program to control the release of potentially contaminated materials from the radiological controlled area was effective. Surveys were independently verified and determined to be accurate. Postings were in place where needed and no discrepancies were noted during plant tours. The housekeeping conditions within the radiological controlled area did not reflect that the plant had recently been in an outage; housekeeping was very good.

3.4 Maintaining Occupational Exposure ALARA

According to the licensee, the refueling outage was planned to be 41.5 days with some projections showing the outage could be as short as 38 days. The outage actually lasted 68 days. With the original outage scope, the licensee estimated a total outage exposure to be 160 person-rem. Even with the longer than originally planned outage and increased work scope, the actual exposure was 155 person-rem.

The goal for 160 person-rem was based upon historical data and judged to be reasonably challenging by the inspectors. However, the licensee realized substantial dose savings during the outage that kept the cumulative dose below the goal. The licensee credited the dose savings to several initiatives/ actions. The major factor was the longer cleanup period for the reactor coolant system. As a result, the licensee was able to remove more activation products from the reactor coolant and lower the source term throughout the plant. According to the licensee, doses inside the bioshield were reduced as much as 50 percent, and doses on the refueling bridge were reduced from approximately 30 millirem/hour to 5 millirem/hour.

The licensee used a remote monitoring system during the outage to reduce the number of surveys required. The licensee estimated that this saved about 100 millirem per day in radiation protection technician exposure.

Out of approximately 180 radiation work permits issued for the outage, only 2 of them accrued exposure in excess of 10 rems. The majority of the radiation work permits had total exposures less than 1 rem.

During the outage, the licensee made a determined effort to reduce radioactive waste. The licensee set a goal of 5,800 cubic feet (unprocessed). The licensee estimated that approximately 5,200 cubic feet of unprocessed radioactive wastes were generated during the outage, a savings of 10 percent. This also reflects a savings in dose associated with collecting, handling, packaging and processing these wastes. The radioactive waste volumes will be substantially reduced as a result of incineration.

During the reactor startup at the end of the outage, the licensee initiated a cleanup process to remove nickel from the reactor coolant. The licensee estimated that they removed approximately 17 pounds of nickel during this process. At Wolf Creek, Cobalt-58, the product of activated nickel, makes up about 90 percent of the activation products removed at the end of cycle. Therefore, by removing nickel at the beginning of the cycle before it is activated, the licensee helped to reduce the source term for future exposures.

Over the past 5 years, the cumulative radiation exposure at the facility has been trending downward. The table below shows the comparison between personnel exposures (in rem) at Wolf Creek and the United States industry average data for pressurized water reactors (in rem).

Personnel Exposure in rem	1991	1992	1993	1994	1995	Three Year Average
Wolf Creek	276	68	167	235	14	139
Industry Average Pressurized Water Reactor	223	219	194	131	*	*

* = Not available

Based upon the above trend, the inspectors determined that the licensee was continuing to aggressively reduce doses to workers. The 1995, non-outage year exposure of 14 rem was considered to be very good.

4 Followup (92904)

(Closed) Violation 482/9602-02: Failure of radiography personnel to ensure the radiographic exclusion area was unoccupied

This item involved the discovery of technicians inside a radiography boundary, but outside the high radiation area boundary during radiography operations. Health physics personnel controlled the activity using Radiation Work Permit 95007, Revision 2, which required the radiographer to comply with Procedure AP 25B-200, "Radiography Guidelines," Revision 0. Step 5.1 of Procedure AP 25B-200 required the radiographer to ensure that the area was unoccupied after radiological postings had been established and prior to exposing the radiography source.

The radiographer and the radiographer's assistants checked accessible areas and shook locked doors as part of their verification that the posted area was unoccupied. Since the technicians in the electro-hydraulic room did not respond when the radiography personnel shook the door, they assumed that the room was unoccupied. The failure of the radiographer to ensure that the radiography area was unoccupied prior to exposing the source was cited as a violation of Technical Specification 6.11.

The inspectors reviewed the reviewed the actions taken by the licensee in response to the Notice of Violation and determined that they were adequate.

ATTACHMENT

PERSONS CONTACTED AND EXIT MEETING

1 PERSONS CONTACTED

1.1 Licensee Personnel

M. Blow, Superintendent - Chemistry
S. Burkdoll, Supervisor - Health Physics Training
T. Conley, Superintendent - Radiation Protection (RPM)
T. Damasheck, Supervisor - Regulatory Compliance
D. Erbe, Supervisor - Security Operations
C. Fowler, Manager - On Loan
R. Hammond, Health Physics Supervisor - Operations
J. Harris, Health Physics Supervisor - Support
J. Johnson, Superintendent - Security
L. Kline, Staff Health Physicist
S. Koenig, Supervisor - Quality Evaluations
W. Lindsay, Manager - Performance Assessment
O. Maynard, Vice President - Plant Operations
T. Morrill, Manager - Plant Support
J. Pippin, Manager - Integrated Plant Scheduling
C. Stone, Quality Specialist
M. Williams, Assistant to Vice President - Plant Operations

1.2 NRC Personnel

J. Dixon-Herrity, Resident Inspector
J. Ringwald, Senior Resident Inspector

The above individuals attended the exit meeting. In addition to the personnel listed above, the inspector contacted other personnel during this inspection period.

2 EXIT MEETING

An exit meeting was conducted on May 10, 1996. During this meeting, the inspector reviewed the scope and findings of the report. The licensee did not express a position on the inspection findings documented in this report during the exit meeting. The licensee did not identify information provided to, or reviewed by the inspector, as proprietary.