UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
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April 14, 2000

Otto L. Maynard, President and
Chief Executive Officer
Wolf Creek Nuclear Operating Corporation
P.O. Box 411
Burlington, Kansas 66839

SUBJECT: NRC INSPECTION REPORT NO. 50-482/00-04

Dear Mr. Maynard:

This refers to the inspection conducted on February 28 though March 17, 2000, at the Wolf Creek Generating Station facility. The purpose of this inspection was to assess the effectiveness of your controls in identifying, resolving, and preventing problems. The enclosed report presents the results of this inspection.

We concluded that you have implemented effective programs to identify, resolve, and prevent conditions adverse to quality and significant conditions adverse to quality.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and enclosure will be placed in the NRC Public Document Room (PDR).

Should you have any questions concerning this inspection, we will be pleased to discuss them with you.

Sincerely,

/RA/

John L. Pellet, Chief
Operations Branch
Division of Reactor Safety

Docket No.: 50-482
License No.: NPF-42

Enclosure:
NRC Inspection Report No.
50-482/00-04

cc w/enclosure:
Chief Operating Officer
Wolf Creek Nuclear Operating Corp.
P.O. Box 411
Burlington, Kansas 66839

Jay Silberg, Esq.
Shaw, Pittman, Potts & Trowbridge
2300 N Street, NW
Washington, DC 20037

Supervisor Licensing
Wolf Creek Nuclear Operating Corp.
P.O. Box 411
Burlington, Kansas 66839

Chief Engineer
Utilities Division
Kansas Corporation Commission
1500 SW Arrowhead Rd.
Topeka, Kansas 66604-4027

Office of the Governor
State of Kansas
Topeka, Kansas 66612

Attorney General
Judicial Center
301 S.W. 10th
2nd Floor
Topeka, Kansas 66612-1597

County Clerk
Coffey County Courthouse
110 South 6th Street
Burlington, Kansas 66839-1798

Vick L. Cooper, Chief
Radiation Control Program, RCP
Kansas Department of Health
and Environment
Bureau of Air and Radiation
Forbes Field Building 283
Topeka, Kansas 66620

Frank Moussa
Division of Emergency Preparedness
2800 SW Topeka Blvd
Topeka, Kansas 66611-1287

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ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket No.:	50-482
License No.:	NPF-42
Report No.:	50-482/00-04
Licensee:	Wolf Creek Nuclear Operating Corporation
Facility:	Wolf Creek Generating Station
Location:	1550 Oxen Lane, NE Burlington, Kansas
Dates:	February 28 though March 17, 2000
Inspectors:	Stephen L. McCrory, Senior Operations Inspector, Operations Branch Howard F. Bundy, Senior Operations Inspector, Operations Branch Frank L. Brush, Senior Resident Inspector, Projects Branch B
Approved By:	John L. Pellet, Chief, Operations Branch Division of Reactor Safety

ATTACHMENT: Supplemental Information

EXECUTIVE SUMMARY

Wolf Creek Nuclear Generating Station
NRC Inspection Report No. 50-482/00-04

Two regional inspectors and a senior resident inspector performed a routine core inspection of the corrective action program implementation at the Wolf Creek Nuclear Generating Station from February 28 through March 17, 2000. The inspectors used NRC Inspection Procedure 40500 to evaluate the licensee's effectiveness in identifying, evaluating, resolving, and preventing problems that could affect safe plant operations.

Operations

- While the licensee demonstrated improvement in most areas of operations human performance, the incidence of component mispositioning events was unchanged for the last 3 years (Section O4.1).

- The licensee implemented an effective and timely corrective action process that properly prioritized, evaluated, and resolved conditions adverse to quality and significant conditions adverse to quality. The licensee staff understood the process well, exhibited a very low threshold for identifying conditions, and communicated a strong safety focus (Section O7.1).

Report Details

Summary of Plant Status

Wolf Creek operated at approximately full power during the entire inspection period.

I. Operations

O4 Operator Knowledge and Performance

O4.1 Control Room Operator Human Performance Issues

a. Scope of Inspection

The inspectors reviewed approximately 156 performance improvement requests (PIRs) related to human performance errors, events, and issues and 7 PIRs related to operator work-arounds[1]. The inspectors also interviewed control room and in-plant operators. The inspectors reviewed the licensee's self-assessment of operations and performance indicators published by operations and the licensee's response to a third party assessment by an industry organization.

b. Observations and Findings

Overall the licensee implemented corrective actions that reduced human performance errors in operations. However, the licensee's efforts regarding component mispositioning events[2] had not resulted in a reduction in the number of occurrences over time.

As a result of an independent assessment of operations performance, the licensee initiated the following corrective action PIRs:

- 19991922 related to clearance order errors,
- 19991923 related to component mispositioning events, and
- 19991924 related to reactivity management errors.

The inspectors reviewed the PIRs related to clearance orders and noted that most of the human performance errors related to clearance orders were process errors (about 14 of 22) that involved administrative and supervisory controls. However, about 18 percent (4 of 22, all of which occurred prior to May 1999) of the human performance errors resulted in actual consequences that included:

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[1]An operator work-around is a degraded or non-conforming condition that complicates the normal operation of plant equipment and is compensated for by operator action.

[2]A component mispositioning event refers to a component being operated incorrectly during clearance order installation or removal, or to a component found in an incorrect position or condition.

- Interrupting power to a sensitive computer system (PIR 19990269),
- Challenging a power supply auto transfer function (PIR 19990386),
- Overflow out of a condenser manway (PIR 19990766), and
- A fuel oil spill (PIR 19991381).

The inspectors determined that these events had little or no safety significance.

The licensee initiated corrective actions for clearance order errors, developed as a result of PIR 19991922, that included:

- Elimination of administrative forms that contributed to administrative errors, but that were not essential to the clearance process;

- Awareness and sensitivity training for the site staff regarding clearance process and the opportunity for human error;

- An engineering review to verify the reliability of Wolf Creek drawings (still in progress at the time of the inspection); and

- Detailed review and revision of the clearance order procedure by a multi-disciplined committee that will solicit site-wide input (due date - April 14, 2000).

The inspectors observed that during the period from May through November 1999, the total number of clearance order human-related errors decreased (9 versus 13 PIRs). However, the errors that occurred after May 1999 did not result in actual consequences. Further, station personnel detected the errors earlier in the clearance order process.

The inspectors reviewed approximately 36 PIRs related to component mispositioning events, which included the 4 previous examples, and identified additional examples that included:

- Valve position indication power supply breakers to Valves EG HV 62 and 132 found open (PIR 19991234),

- The auxiliary operator opened the emergency exhaust coil power supply breaker for the wrong train of fuel building ventilation based on a misdirection from the control room operator (PIR 19993580), and

- A radwaste operator discovered Valves HB-V198 and 199 in the wrong positions while processing Floor Drain Tank B through the zero system (PIR 19993523).

The inspectors noted that there were no significant consequences resulting from any of the above events. Further the inspectors determined that no enforcement action was warranted for the events reviewed.

The licensee initiated corrective actions for component mispositioning events, developed as a result of PIR 19991923, that included:

- Recurring awareness training for plant operators,
- Creating a three-person group to monitor and assess operations corrective actions on a continuing basis, and
- Renewing the management and supervisory oversight commitments for on-going observation and re-enforcement of management expectations.

The licensee conducted a self assessment in September 1999 to followup on this and other human performance issues identified in the independent assessment conducted in March 1999. The self assessment reported a flat trend over 2½ years of about 10 component mispositioning events per year. Although the licensee had escalated the performance issue to a significant condition adverse to quality, it used deterministic criteria rather that a risk informed evaluation. The licensee based this primarily on the fact that the corrective actions taken had not lowered the number of annual occurrences. The inspectors interviewed the operations PIR coordinator regarding the trend of component mispositioning events. The coordinator acknowledged that the licensee had not assessed the nature and frequency of these events to determine the on-going risk impact. As a result of these discussions, the operations PIR coordinator stated an intent to have the data analyzed for risk impact.

The inspectors determined that the corrective actions for specific events had been effective. However, the inspectors observed that the component mispositioning events were random with regard to the affected systems or components. Further, the component mispositioning events posed a challenge to reactor safety and safety-related systems that the licensee had not yet characterized with regard to risk significance.

The inspectors reviewed the following PIRs initiated over the last year and related to reactivity management:

- Minor unintended boration (0.3 to 0.5 °F reactor coolant system temperature decrease) resulting from residual boron in piping after a flush of the demineralizers (PIR 19990279),
- Excessive dilution via the boron thermal regeneration system for 31 minutes (PIR 19990946) (resulted in a noncited violation - NRC Inspection Report 50-482/99-03),
- Letdown temperature increase causing the chemical and volume control system demineralizers to release boron into the reactor coolant system (PIR 19991178),
- Out of adjustment nuclear instrument (PIR 19992421), and
- Bank overlap counter setting out by one step (PIR 19992573).

The inspectors determined that the excessive dilution event addressed by PIR 19990946 was the only significant reactivity event during the period reviewed. The event occurred in March 1999, and was reported in NRC Inspection Report 50-482/99-03.

The licensee initiated corrective actions for reactivity management errors, developed as a result of PIR 19991924, that included a requirement that control room crew briefing be held for all planned reactivity changes including routine shift dilutions to compensate for fuel burn-up. The briefings required that a calculation be performed to verify the amount of boration or deboration needed to adjust power. The briefings also stressed the responsibility of the reactor operator to continually monitor the reactivity change evolution. Through interviews with operators and discussions with the senior resident inspector and some region-based inspectors, the inspectors determined that the licensee's policy for briefing all planned reactivity changes has been reinforced and regularly applied. The inspectors concluded that the licensee's corrective actions to prevent reactivity management errors had been effective over the last year.

The reactivity impact covered by PIR 19991178, noted above, arose from a long-standing operator work-around. The Letdown Temperature Control Valve BGTV-130 had a history of slow automatic response to temperature changes during anticipated transients (PIRs 19972641, 19980567, 19980617, 19981984, 19991178, 19992208, and 20000357). The result was that large temperature changes could occur in the chemical volume control system mixed-bed demineralizers that would cause them to absorb or release boron depending on the direction and magnitude of the temperature change. This would result in unplanned reactivity changes. As an interim corrective action, the licensee required control room operators to place Valve BGTV-130 in manual for planned evolutions that would affect component cooling water temperature or if letdown temperature varied more than a few degrees from the operating set-point.

The licensee determined that the valve installed under the original design specifications was inappropriate for the function of an automatic temperature control valve. The valve was a 6-inch butterfly valve. To achieve the desired component cooling water flow rates through the nonregenerative heat exchanger, the valve operated in the range of 5 to 20 percent open.

The Callaway Plant reactor facility which was the same design as the Wolf Creek Generating Station facility, had similar performance problems with the letdown temperature control valve. The Callaway Plant licensee replaced the butterfly valve with a globe valve of the same effective diameter (6 inches). The Callaway Plant reported improved but not fully satisfactory performance. As a result of the lack of fully effective results observed at the Callaway Plant, the Wolf Creek Generating Station licensee contracted with an engineering firm to perform an evaluation to determine the appropriate valve for the application. The evaluation recommended a 3-inch globe valve with a sliding stem. The licensee planned to install the new valve in early 2001.

The inspectors interviewed control room operators and reviewed PIRs related to operational events involving Valve BGTV-130. The operators expressed a high degree of confidence in their ability to monitor letdown temperature and take manual control of

the letdown temperature control valve with minimal impact on their overall control room responsibilities. The inspectors identified only one instance in which an operator demonstrated any difficulty operating Valve BGTV-130 in manual (PIR 19991178). The operator inadvertently closed the valve when he should have opened it due to increasing temperature. However, the operator bypassed the demineralizers before taking manual control of Valve BGTV-130, which prevented any reactivity change. The inspectors concluded that the interim corrective actions for Valve BGTV-130 were adequate and that extra evaluation to determine a replacement valve had been appropriate.

The inspectors reviewed the six remaining active operator work-arounds and determined that none presented the same potential impact as the one for Valve BGTV-130. Further, none of the operator work-arounds affected implementation of the emergency operating procedures. The inspectors concluded that the licensee's control of operator work-arounds was adequate.

c. Conclusions

The licensee applied effective corrective actions to reduce operations human performance errors in most cases. However, the corrective actions applied to component mispositioning events did not reduce the annual number of occurrences. Although the licensee escalated the classification of component mispositioning events to a significant condition adverse to quality, it did not use risk information to make the determination.

O7 Quality Assurance in Operations

O7.1 Corrective Action Program

a. Inspection Scope (40500)

The inspection consisted of a review of the licensee's programs intended to identify and correct problems discovered at the facility. The review focused on the following specific areas:

- The identification and reporting threshold for adverse conditions,
- The setting of problem resolution priorities that were commensurate with operability and safety determinations,
- Program monitoring used by the licensee to assure continued program effectiveness,
- Program measurement or trending of adverse conditions,
- The understanding of the program by all levels of station personnel,
- The ability to identify and resolve repetitive problems, and
- Resolution of noncited violations.

The inspectors reviewed plant documents, interviewed management and working level personnel, and attended licensee meetings. The inspectors reviewed, in varying detail, several hundred performance improvement requests (PIRs) to assess the effectiveness of the licensee actions in identifying, resolving, and preventing issues that degraded the quality of safe plant operations. The hardware related PIRs were selected, in part, on the basis of the risk significance of the system or components and focused on essential service water, auxiliary feedwater, emergency diesel generators, and the reactor coolant system. The inspectors also reviewed the PIRs for the disposition and evaluation of operability issues, as well as, the adequacy of the root-cause analysis. The inspectors reviewed the corrective action program interface with other lower-tier programs, such as procedure revisions and work requests, that could result in corrective action. The inspectors reviewed quality assurance audits, self assessments, and licensee response to NRC and industry generic communications.

b. Observations and Findings

The corrective action program was effective at identifying, resolving, and preventing issues that degraded the quality of plant operations. The inspectors determined that site personnel and management clearly understood the importance of this program.

b.1 Threshold of Reporting

The inspectors reviewed several hundred PIRs covering a broad cross-section of licensee activities and functional areas. The inspectors also interviewed a cross-section of the licensee's staff including:

- Control room senior and reactor operators,
- In-plant equipment operators,
- System engineers,
- Electrical, mechanical, and instrument and control technicians,
- Middle level supervisors and managers, and
- PIR supervisor and operations PIR coordinator.

The inspectors determined that the threshold for initiating a corrective action was appropriately low and that the licensee's staff exhibited a strong safety culture.

The inspectors observed a number of PIRs related to suggestions, enhancements, training requests, minor procedure or equipment problems, and minor human performance errors that were indicative of the low reporting threshold. During the interviews, the inspectors presented the individuals with various scenarios of low threshold issues. The licensee's staff expressed willingness to enter concerns of minor significance into the PIR process. The individuals provided personal examples of low-level PIRs that they had initiated that were comparable to those observed by the inspectors during PIR reviews. Additionally, the licensee staff communicated that the atmosphere at the site encouraged the identification of safety issues, and that they would pursue whatever course was necessary to get a safety issue addressed.

The inspectors concluded that the licensee's staff had an appropriately low threshold for entering issues into the corrective action process and a strong safety focus.

b.2 Priority of Resolution

The inspectors reviewed applicable administrative procedures to determine how the priority assignment process should work, interviewed individuals in the corrective action group to determine how priority was assigned, and reviewed over 100 PIRs to determine if appropriate priorities for resolution had been assigned. The inspectors determined that the licensee prioritized problem resolution appropriately.

Licensee's Procedure AP 28A-001, "Performance Improvement Request," Revision 15, set out four classification levels for PIRs. Levels I and II related to significant conditions adverse to quality; Level III related to conditions adverse to quality, and Level IV captured trending issues, suggestions and other minor issues. The inspectors reviewed the classification level, which related to priority, for selected PIRs, and observed that licensee-identified problems consistently were prioritized with their significance. The inspectors observed several instances in which the classification level of a PIR was changed after the initial screening. In most cases, the licensee downgraded the PIR to the next lower level. However, in some instances the level was raised, which usually resulted in the problem being assess as a significant condition adverse to quality. For example, PIRs 19991922, related to clearance order errors, and 19991923, related to component mispositioning events, were initiated as Level III. The licensee upgraded both to Level II during the review process. In both cases, the licensee decided that the aggregate of performance errors warranted a heightened level of focus and response. The inspectors agreed with the licensee's reclassifications in the PIRs reviewed. Additionally, the inspectors observed that the corrective action due dates were met or extended for appropriate reasons.

The inspectors also reviewed several work requests to determine the threshold for PIR initiation. The inspectors concluded that the work requests that did not result in PIR initiation met the licensee's definition of minor maintenance, which was described in Procedure AP 16C-007, "Work Order," Revision 1, which did not require initiation of a PIR.

b.3 Effectiveness of Program

The licensee implemented an effective program overall with the exception noted in Section O4.1 above, where the licensee determined that the lack of reduction in the rate of component mispositioning events constituted a continuing significant condition adverse to quality. The inspectors accepted the licensee's determination on this issue.

The licensee conducted frequent self-assessments and regularly requested third party independent assessments of the corrective action program. The inspectors reviewed approximately 10 self or third party assessments of the licensee's corrective action program. The assessments identified discrepancies related to followup effectiveness reviews, quality of root-cause evaluations, timeliness of evaluation and corrective action implementation, and inappropriate PIR closure. However, the assessments did not identify major performance issues regarding the licensee's implementation of the

corrective action program. The inspectors determined that the findings of the licensee's self assessments were consistent with those observed by the inspectors.

The system engineers performed regular trending-reviews of work requests, many of which did not individually warrant initiation of a PIR. The inspectors reviewed PIRs 20000081, 20000108, 20000113, 20000159, and 20000187 that were initiated based on trends identified during the system engineers' reviews and highlighted the following concerns:

- Repeat failures of circulating water pump pressure and flow switches,
- Numerous replacements of the waste water treatment pH probe,
- Centrifugal charging pump A vibration increasing trend,
- Evaluate the component cooling water system for microbiological activity based on through-wall cracks, and
- Circulating water pump C high overhaul frequency.

The inspectors considered these as further examples of the effectiveness of the licensee's corrective action program.

The licensee identified through their self-assessment process (PIR 19992531) that the quality of root-cause evaluations did not meet management expectations. The final quality of root-cause evaluations relied heavily on the reviews performed by the corrective action review board, who rejected many of the initial evaluations. To address this issue, the licensee determined that additional root-cause determination training should be developed and given to a limited group of individuals. The licensee set a due date of May 31, 2000. The group consisted of about 30 staff members, as opposed to the over 100 staff members that had previously led or contributed to root-cause evaluations. The licensee assigned responsibility to the dedicated group for all root-cause evaluations. The licensee intended to increase the quality of the evaluations by increasing the frequency of individual participation. The inspectors agreed with the licensee's approach because a smaller, focused group would enhance consistency and should improve quality as a result of more frequent participation. The inspectors reviewed several root-cause evaluations, that had received the approval of the corrective action review board, and determined that they adequately addressed the problems identified and recommended appropriate corrective actions. However, the licensee had no draft evaluations, not yet reviewed by the corrective action review board, for review by the inspectors. The inspectors determined that the end product of the licensee's root-cause evaluation process was adequate.

b.4 Program Measurement

The licensee tracked and reported bi-monthly on corrective action program performance indicators that included:

- Human performance,
- PIR timeliness,
- Corrective actions,
- Licensee event reports, and
- Notices of violation

The licensee supplemented these performance indicators with additional ones developed for individual organizational groups that the licensee reviewed every Thursday in the morning status meeting. Examples of the additional performance indicators included:

- Plant walkdowns,
- Rework,
- Site personnel exposure,
- Training attendance,
- Mispositioning events (by crew),
- Clearance order problems, and
- Maintenance rule functional failure evaluations.

The licensee established performance criterion thresholds denoting performance that was satisfactory, needing improvement, or a significant weakness. The inspectors reviewed the performance criteria and assessed that they were adequate for the respective performance indicators. The following PIRs exemplified the licensee's use of performance indicator information:

- Red performance indicator for PIR average age (PIR 19992497) (This was based on an average age of > 200 days. The condition had persisted for 6 weeks.),

- Red performance indicator for significant PIR evaluation quality (PIR 19992531) (This was based on a corrective action review board approval rating of < 70 percent. This condition had persisted for 5 weeks), and

- Red performance indicator for corrective action health (PIR 19992796) (This was based on the red status of PIR average age, significant PIR evaluation quality, and PIR initiation rate versus closure rate.).

Although none of the PIRs represented significant conditions adverse to quality, PIR 19992796 reinforced PIR 19992531, noted in Section b.3 above, and resulted in the upgrade to the licensee's root-cause investigation process.

The inspectors concluded that the licensee had developed appropriate performance indicators that were being effectively used to improve and maintain corrective action program performance.

b.5 Program Understanding

The inspectors interviewed personnel performing numerous functions in the plant organization including personnel, who performed maintenance work. All of the individuals interviewed gave descriptions of the licensee's corrective action process that were consistent with those found in the licensee's governing procedures for the corrective action process. All personnel interviewed were knowledgeable of and comfortable with the options for identifying and obtaining resolution of problems. The inspectors observed that there was general satisfaction among plant employees with the corrective actions implemented in response to safety-related issues.

b.6 Repetitive Problems

The inspectors observed that the licensee identified repetitive problems in PIRs and applied additional resources to analyzing the causes. The licensee furnished the inspectors with thirteen PIRs that documented corrective actions for recurring problems. The inspectors reviewed the following PIRs in detail:

- Problem with compliance to/adequacy of licensee Procedure AP 26C-004, "Technical Specification Operability (PIR 19981169)," Revision 1;
- Attachments to electrical surveillance procedures were unclear even after the procedures were updated, which caused confusion on breaker settings (PIR 19990677);
- Control of temporary equipment problems (PIR 19992153); and
- Continued operational errors when implementing clearance orders (PIR 19992177).

The licensee's in-depth review of the PIRs included:

- Analyzing the conditions that caused the repetitive problems,
- Interviewing management and supervisory personnel and workers connected with the PIRs,
- Determining the safety significance of the problems, and
- Determining the root cause of the repetitive problems.

The inspectors determined that the licensee's program to identify repetitive problems was effective. The licensee initiated PIRs to document the repeat problems and associated corrective actions. The inspectors concluded that the licensee's corrective actions were adequate based on their review of the PIRs.

b.7 Noncited Violation Followup

The inspectors surveyed the licensee's responses to 16 noncited violations. They noted that in all instances, the licensee had initiated PIRs to address the issues cited and the numbers were documented in NRC inspection reports. In most instances, the inspection reports contained the licensee's intended corrective actions and, in some instances, the inspectors had documented the review of the licensee's root-cause analysis and associated root causes. For example, the inspector's review of the root-cause analysis reflected in PIR 992789 had been documented for Noncited Violation 50-482/9914-02. This noncited violation involved a failure to perform monthly channel checks on post-accident monitoring neutron flux instruments in accordance with technical specifications.

The inspectors performed a review of licensee's corrective actions and root-cause analysis for Noncited Violation 50-482/9906-02, which was documented in PIR 19991777 initiated on May 6, 1999. This noncited violation involved not properly testing certain switch contacts on some switches at the auxiliary shutdown panel because of procedure errors. The licensee initiated Reportability Evaluation Request 98-032 and determined that a violation of Technical Specification 4.3.3.5.2 was reportable on May 21, 1999. In determining the root causes, the licensee used both barrier and change analyses effectively. The root causes all related to personnel error and the corrective action plan included a presentation focusing on the usage of human error reduction tools that could have prevented this event, which was completed on August 31, 1999. The licensee scheduled the revision of Procedure STS RP-004 to be completed by June 30, 2000, which would allow it to be revised prior to its next scheduled performance.

The licensee properly entered noncited violations in its corrective action program, determined root causes for these violations, and developed and implemented appropriate corrective action plans to correct the associated conditions.

c. Conclusions

The licensee implemented a problem reporting and corrective action program that was well understood by the licensee's staff who exhibited very low thresholds for entering information into the process and who exhibited a strong safety focus.

The licensee's classification process resulted in appropriate prioritization of reported conditions that led to timely and effective corrective actions. The licensee identified and addressed repeat problems effectively and kept the number of repeat problems small.

The licensee applied appropriate performance indicators to allow effective measurement trending, and improvement of program performance.

The licensee adequately dealt with regulatory compliance issues.

II. Maintenance

M7 Quality Assurance in Maintenance

M7.1 Maintenance Rule

a. Inspection Scope (40500)

The inspectors reviewed performance improvement requests (PIRs) and maintenance requests related to the licensee's monitoring of the structures, systems, and components that were within the scope of the maintenance rule for the selected systems previously noted. This monitoring was reviewed to determine if the corrective actions, goals, and monitoring of structures, systems, and components that were in 10 CFR 50.65(a)(1) were adequate and that components were assigned the monitoring requirements of 10 CFR 50.65(a)(1), when appropriate. The inspectors also attended a maintenance rule expert panel meeting.

b. Observations and Findings

The licensee classified approximately 45 PIRs as functional failures of systems and components in the maintenance rule program. The licensee posted a list of the Maintenance Rule Category (a)(1) systems in various locations and made performance information available on the sites computer system.

The inspectors reviewed six requests that documented concerns with Category (a)(1) components and determined that the planned corrective actions were adequate. The licensee initiated a design change following extensive analysis for the Emergency Diesel Generator A voltage regulator problems. The design change was tested and appeared to correct the voltage regulator issue.

In reviewing PIR 980097, which addressed replacing 914 nonconforming 7300 series computer cards, the inspectors noted that preventing maintenance preventable functional failure was one of the reasons cited for replacing these cards.

c. Conclusions

The licensee implemented adequate corrective actions, goal setting, and monitoring of the structures, systems, and components included in the maintenance rule. The licensee appropriately identified and tracked Category (a)(1) structures, systems, and components. The licensee also identified appropriate corrective actions for the Category (a)(1) structures, systems, and components.

III. Engineering

E7 Quality Assurance in Engineering Activities

E7.1 System Reviews

a. Inspection Scope (40500)

The inspectors reviewed performance improvement requests (PIRs) and selected work orders issued for selected plant systems. These systems included essential service water, auxiliary feedwater, reactor coolant system components, and emergency diesel generators.

b. Observations and Findings

The inspectors determined that the corrective action processes for prioritization, trending, and disposition of corrective actions for these systems were adequate. The inspectors observed that the system engineers were knowledgeable of the material condition of their assigned systems. The system engineers stated that they routinely screened all work requests for their assigned systems to assure that PIRs were initiated when appropriate (Section O7.1b.3 above contains examples). They also compiled system health reports on a continual basis and periodically presented them to plant management. The system health reports presented an overall rating for the system and sub-ratings in the following categories: chronic problems, operator work-arounds, temporary modifications, maintenance rule rating, and long-term reliability plant status. The licensee used color coding of green, white, yellow, or red with green being the best rating and red the worst rating. The licensee had assigned no yellow or red ratings for the selected systems.

Auxiliary Feedwater

The inspectors observed that the auxiliary feedwater system health indicator was green. In reviewing the PIRs, the inspectors did not identify any repetitive component operability or reliability issues, which should have been precluded by corrective actions for previous PIRs. The licensee implemented effective corrective actions to address component operability issues and to prevent recurrence. For example, the licensee initiated PIR 19991948, which identified loose bolts on the turbine driven auxiliary feedwater pump trip/throttle valve. The analysis included a determination that the pump had remained operable and a review of the industry technical information program data base, which did not result in identification of any similar events. The licensee used task analysis to determine the root cause. The licensee determined the root cause to be a lack of quality verification and validation during the assembly of the stem coupling bolts, which resulted in lack of full thread engagement. The workers did not perform a verification and validation after reassembly because of excessive focus on the bagging and tagging process for parts, which had been a prior performance issue. Additionally, neither worker could fully see the connection that was being made. The corrective actions included reviewing these findings in scheduled training and requiring an

additional tightness check of the stem coupling bolts as a post maintenance test in the preventive maintenance activity. The licensee did not observe any subsequent instances of loose bolts on the turbine driven auxiliary feedwater pump trip/throttle valve.

Although the category was rated green, the system engineer discussed modifications to improve the reliability of Room Cooler SGF02B, for the turbine-driven auxiliary feedwater pump room, under the long-term reliability plans status. During routine surveillance testing, the licensee identified reduced essential service water flow through this cooler. The licensee flushed and cleaned the cooler to restore design flow and increased the frequency of testing to verify continued satisfaction of design flow requirements. Silt and shell deposits had plugged heat exchanger tubes because the header, to which the take-off line was connected, was situated at a system low point. The licensee issued Design Change Package 7500 to move the take-off point for the essential service water line to the room cooler from the bottom to the top of the incoming header. In addition, the system engineer stated that a manual isolation valve would be installed downstream of the takeoff point to facilitate flushing of these deposits.

The inspectors walked down the portion of the system outside the radiation control area and determined that the material condition was good.

Reactor Coolant System Components

The inspectors observed that approximately 1250 work orders had been issued for reactor coolant system components over the past year. Many of these related to preventive maintenance and routine tasks performed during the refueling outage. The inspectors verified that PIRs were associated with work orders when appropriate. The inspectors observed several work orders that appeared to warrant the initiation of PIRs. The inspectors discussed these with the superintendent of planning and scheduling, who screened all work orders for problem identification. For example, it was not clear that a PIR was associated with Work Order 98-204090-055, which covered replacement of Capacitor C-105 for Flow Transmitter BBFQY0416 during performance of Procedure STS IC-504C. The superintendent of planning and scheduling referred the inspectors to PIR 980097, covering replacement of 7300 series computer cards. The licensee initiated the PIR as a corrective action in response to Industry Technical Information Program Item 03915. The inspectors concluded that the licensee appropriately initiated PIRs to identify problems and significant hardware failures in accordance with Procedure AP 28A-001, “Performance Improvement Request,” Revision 15. As discussed above, the system engineer also screened all work orders for his system to ensure PIRs were issued, when appropriate.

The inspectors did not identify any significant recurring problems associated with the reactor coolant system. The inspectors observed that the overall system health indicator was white, but that all subcategories, except one, were green. The single white indicator (which caused the overall indicator to be white) was in the area of temporary modifications. The licensee experienced a nuisance high level alarm on the Reactor Coolant Pump Motor A lower oil reservoir. The licensee verified that the oil reservoir was not high, and generated Work Request 00-019487 to troubleshoot the

alarm circuit for Switch BBTS0475B. The licensee determined that the work could not be performed until an outage occurred because work was not permitted inside the bio-shield[3] during power operation. The licensee installed Temporary Modification 99-007-BB to eliminate a nuisance alarm of Annunciator D074 caused by Reactor Coolant Pump Motor A lower oil reservoir high alarm from Switch BBTS0475B.

During an interview, the system engineer stated that he routinely addressed issues raised by NRC notices and industry technical information program items. He stated that the reactor coolant system equipment was in good overall condition and that component enhancements were made continually. Based on the interview and documentation review, the inspectors concluded that the reactor coolant system was in good material condition.

Essential Service Water System

The inspectors also reviewed the system health report and 34 PIRs for the essential service water system. The inspectors reviewed, in detail, the corrective actions for the pinhole leaks downstream of the essential service water throttle valve for component cooling Heat Exchanger A. NRC Inspection Report 50-482/99-18, Section E4.1, discussed the licensee's response to the first pinhole leak. The licensee performed nondestructive testing at that time and determined that a noncode repair was acceptable. The licensee planned on replacing the leaking pipe during the fall 2000 refueling outage.

In March 2000, a second pinhole leak occurred. The licensee performed additional nondestructive testing, which indicated a noticeable increase in pipe wall thinning. The licensee replaced the section of pipe downstream of the throttle valve. The inspectors discussed the historical performance of the essential service water system with the licensee.

The licensee stated that the section of pipe downstream of the throttle valve was replaced in the late 1980s. However, when craft personnel made the initial measurements for the pipe length, one of the hangers for the upstream portion of the pipe was not installed. The pipe was hanging lower than the final design. The new section of pipe was then shorter than required. The licensee performed a code repair to the pipe to fill in the gap. Part of the repair entailed putting a cap weld on the inside of the pipe.

[3]The bio-shield is radiation shielding installed inside the reactor containment building and around the reactor vessel and other extremely high radiation sources to permit personnel access to selected areas inside the containment building while the reactor is at power.

The recent pipe wall thinning occurred immediately downstream of the cap weld. The licensee had initiated an analysis to verify the failure mechanism. The licensee stated that there was no other location in the essential service water system that had a similar configuration. The licensee stated that it had not had any other problems with essential service water piping degradation. The licensee implemented system chemical treatment in September 1990. The licensee has also maintained a cathodic protection program to protect the piping.

Emergency Diesel Generators

The inspectors reviewed the corrective actions for various concerns on the emergency diesel generators. In 1998, the licensee modified the Emergency Diesel Generator A exciter control circuit in response to voltage fluctuations problems. The modification was ineffective in resolving the problems and contributed to periods of diesel inoperability in 1999. This issue and subsequent corrective actions were documented in NRC Inspection Reports 50-482/99-17 and 50-482/99-02. The licensee initiated appropriate corrective actions in 1999 in response to the diesel operability issue.

The inspectors reviewed the system health report and approximately 60 PIRs. The licensee identified various concerns with the diesels. These included:

- Engine oil leaks on both diesels,
- Cylinder petcock valve failure on Emergency Diesel Generator B,
- Engine lube oil temperature settings on both diesels,
- Low flow indication for the fuel oil transfer pump on Emergency Diesel Generator B, and
- Repetitive failures of instrument pressure transmitters.

The inspectors determined that there were no significant corrective action issues related to the emergency diesel generators, and that the licensee's corrective actions were appropriate for the concerns identified in the PIRs.

c. Conclusions

The licensee effectively implemented the corrective action program for the systems reviewed.

E7.2 Vendor Information and Industry Operating Experience

a. Inspection Scope (40500)

The inspectors reviewed 48 PIRs that were written as part of the licensee's industry technical information program. The inspectors reviewed the licensee's disposition of 9 PIRs from the following sources:

- NRC information notices,
- Vendor technical bulletins,
- Industry operating experience reports,
- Vendor 10 CFR Part 21 reports, and
- Industry peer assessments.

The inspectors reviewed the following PIRs related to vendor information and industry operating experience:

- Spurious shutdown of emergency diesel generators (PIR 19990006),
- New fuel is damaged while lowering into the spent fuel pool (PIR 19990007),
- 10 CFR Part 21 notification for radiographic exposure devices (PIR 19990067),
- Solid state protection system testing for P-4 field contact input (PIR 19990154),
- Air entrapment and inappropriate valve operations during maintenance and calibration of instrumentation (PIR 19990299),
- Battery short circuit when cover placed across load box terminals (PIR 19990873),
- Reactor overpower event near miss due to excessive dilution (PIR 19990874),
- Problems encountered with analog input modules on radio nuclide counting equipment (PIR 19990905), and
- High pressure coolant injection failure to manually start (PIR 19992738).

The inspectors also interviewed various licensee personnel concerning the industry technical information program.

b. Observations and Findings

The licensee initiated a PIR to track each of the documents in the industry technical information system. Licensee Procedure AP 20E-001, “Industry Technical Information System,” Revision 4, defined what type of information was to be entered in the program. The procedure also delineated the process for resolving each item.

The inspectors observed that the licensee performed reviews of the PIRs and associated documents in a timely manner. Following an initial screening, the licensee assigned a responsible person and routed the PIRs to the appropriate organization for review. The reviewer determined if any additional actions were required to address the issue and documented the resolution in the PIR.

The inspectors determined that the licensee maintained a low threshold for addressing industry issues in the industry technical information program. The inspectors determined that the licensee's evaluations were thorough and the corrective actions were appropriate. The licensee included industry issues during training and pre-evolution briefings. The personnel interviewed by the inspectors were familiar with the industry technical information program.

In reviewing corrective actions for plant systems, the inspectors noted several examples for which items provided by the industry technical information program were addressed. One example was PIR 19980097, which responded to Industry Technical Information Program 03915 and addressed 7300 series computer card defects for which a capacitor in a power supply input circuit trip might short and cause a power supply to trip, which could result in a plant trip. Six failures out of 914 cards had occurred at Wolf Creek since the beginning of commercial operation. The PIR provided a program for replacing all these cards during routine preventive maintenance.

Performance Improvement Request 19992248 addressed Industry Event OE9972, which involved auxiliary feedwater pump turbine over-speed trips. These trips were caused by the governor valve inner spring seat and block not being firmly attached to the stem. Recommended corrective actions included using two set screws for all spring seats and using Loctite® on the anti-rotation block setscrew. The licensee found the set screws for the Wolf Creek Nuclear Generating Station turbine were properly installed, but added the Loctite® in accordance with the recommendation.

c. Conclusions

The licensee staff, experienced in the industry technical information program, thoroughly reviewed industry operating experience and vendor information, and implemented the appropriate corrective actions in a timely manner, while maintaining a low threshold for initiating a review.

IV. Plant Support

P7 Quality Assurance in Emergency Preparedness Activities

a. Inspection Scope (40500)

The inspectors reviewed 148 performance improvement requests (PIRs) related to the emergency preparedness area.

b. Observations and Findings

The inspectors grouped the licensee's PIRs into the following areas:

- Equipment - 35
- Procedures - 19
- Communications - 19
- Training - 15
- Staffing - 11

Almost half (14 of 35) of the equipment related PIRs concern the estimated dose calculation program. The inspectors determined that all of the estimated dose calculation program problems were minor. Most of the problems related to software version and accessibility from various locations. The inspectors reviewed exercise and drill information and determined that estimated dose calculation had not been a performance problem for making protective action recommendations or determining emergency action levels. The inspectors determined that the remainder of the equipment problems was also minor.

The inspectors determined that the problems reported in the PIRs for procedure, communications, and training issues were minor and exhibited the licensee's low threshold for problem identification. Many of the problems identified as staffing issues related to ensuring that backup emergency responders were identified on the call-out list or the failure of some responders to report to site during a call-out drill. The inspectors determined that these cases were minor, in that, they did not affect the licensee's minimum required staffing of the emergency responder organization.

The inspectors used the results from NRC observed exercises and drills to determine that the licensee's corrective actions in the emergency preparedness area were timely and effective. The inspectors determined that additional onsite followup was not necessary.

c. Conclusions

The licensee exhibited a low threshold for problem identification in the emergency preparedness area. Even though the problems were minor, the licensee implemented timely and effective corrective actions.

V. Management Meetings

X1 Exit Meeting Summary

The inspectors discussed the progress of the inspection on a daily basis and presented the inspection results to members of licensee management at the conclusion of the inspection on March 17, 2000. The licensee's representatives acknowledged the findings presented.

The inspectors asked the licensee staff and management whether any materials examined during the inspection should be considered proprietary. Identified proprietary information is not discussed within the report.

ATTACHMENT

SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

Licensee
M. Angus, Manager, Licensing and Corrective Actions
M. Blow, Manager, Chemistry and Radiation Protection
K. Davidson, Acting Plant Manager
M. Dela Cruz, Superintendent, Mechanical Maintenance
R. Denton, Supervisor, Quality Evaluations
S. Ferguson, Shift Manager
K. Hall, Supervisor, Corrective Actions
D. Jacobs, Manager, Support Engineering
D. Knox, Manager, Maintenance
P. Martin, Superintendent, Plant Scheduling
G. Neises, Manager, System Engineering
C. Rich Jr., Superintendent, Instruments and Controls
M. Sadowski, Acting Supervisor, Corrective Actions
F. Scherffins, Industrial Hygienist
D. Williamson, Supervisor, Fire Protection
C. Younie, Manager, Operations
J. Yunk, Senior Engineering Specialist
J. Zell, Manager Engineering Performance

INSPECTION PROCEDURES USED

IP 40500	Effectiveness of Licensee Controls in Identifying, Resolving, and Preventing Problems

DOCUMENTS REVIEWED

Procedures

AP 28A-001, “Performance Improvement Request,” Revision 15
AP 16C-007, “Work Order,” Revision 1
AP 28-007, “MPAC Nonconformance Control,” Revision 0
AI 28E-005, “Guidelines for PIR Trend Coding,” Revision 6
AP 28D-001, “Self Assessment Process,” Revision 4
AP28-006, “Nonconformance Control,” Revision 5
AI 28E-006, “Common Cause Analysis,” Revision 3

Miscellaneous

LoopVue Report for Wolf Creek Nuclear BGTV130 Control Valve (by Performance Services of Fisher-Rosemount) Report 30-L, February 1, 2000

Report no. 030-1a0, Loop Audit Report for Wolf Creek Nuclear Power Plant Coffee County, Kansas, CVCS Letdown Heat Exchanger Temperature Control (by Fisher-Rosemount Performance Services), February 21, 2000

Licensing and Corrective Action Bi-monthly Performance Reports for 1999 (Five Reports)

Performance Improvement and Assessment Quarterly Performance Report, Fourth Quarter 1999

Maintenance Organization Monthly Performance Report, January 2000

Training Monthly Performance Report, January 2000

Morning Meeting Minutes for January 27, 2000 (with Human Performance Talking Points)

Currents, Article on Human Performance, January 28, 2000 (Site News Publication)

Executive Team Brief, February 17, 2000

Plant Evaluation Report Number OB 99-000, “Review of Engineering’s Oldest Open PIRs,” January 1, 1999

Plant Evaluation Program Report Number OB 99-1033, “Corrective Action for PIRs involving USQDs,” September 02, 1999

Plant Evaluation Program Report Number OB 99-1076, “Review of Selected PIRs in Support of Audit K519, ‘Corrective Action’,” October 7, 1999

Self Assessment SEL 99-27, “Post INPO Assessment of Operations Performance,” October 22, 1999

Corrective Action Review Board Charter, Revision 2

Performance Improvement Requests (PIR)

19941186, “Inadvertent Tripping of Fire Protection Deluge Valve During Testing,” July 8, 1994

19980097, “Non-Conforming 7300 Series Computer Cards,” January 12, 1998

19981169 “Compliance and Adequacy Problem with AP 26C-004, Revision 1, Technical Specification Operability,”

19990006, “Spurious shutdown of Emergency Diesel Generators,”

19990007, “New fuel is damaged while lowering into the spent fuel pool,”

19990067, “10CRF21 Notification for radiographic exposure devices,”

19990154, “Solid State Protection System testing for P-4 field contact input,”

19990214, “Correct Atmospheric Pressure not Used in Calibration of Pressure Transmitter,” January 26, 1999

19990299, “Air entrapment and inappropriate valve operations during maintenance and calibration instrumentation,”

19990377, “Investigate TDAFW Pump Tappet Design,” February 9, 1999

19990379, “Install a Drip Pot and Level Switch on TDAFW Turbine Exhaust Piping,” February 9, 1999

19990613, “Switches and Cabinets not Listed in CSARS/MPAC Databases,” February 23, 1999

19990677 “Unclear Attachments to Electrical Surveillance Procedures caused confusion on breaker settings,”

19990766, “Near-miss Event Due to Inadequate Tagout - Condenser Waterbox,” March 4, 1999

19990873, “Battery short circuit when cover placed across load box terminals,”

19990874, “Reactor overpower event near miss due to excessive dilution,”

19990905, “Problems with analog input modules on radio nuclide counting equipment,”

19991178, “Operator Error while Operating the Letdown Temperature Control Valve in Manual,” April 6, 1999

19991352, “Solenoid Linkage on Valve Operator not Properly Pinned,” April 16, 1999

19991551, “Sticking Stator Cooling Temperature Control Valve,” April 25, 1999

19991614, “Suction Valve to Spent Fuel Pool Cooling Pump B Found Closed,” April 27, 1999

19991777, “ASP Control Switch Test Could not be Performed as Written,” May 6, 1999

19991893, “Loose Bolts on TDAFW Pump Trip/Throttle Valve and Governor Housing,” May 12, 1999

19991915, “MDAFWP “B” Valve for SG “D” Closed During an Actuation,” May 13, 1999

19991922, “Clearance Errors Resulting Inadequate Boundaries, Loss of Configuration Control, and Incorrect System Removal and Restoration,” May 14, 1999

19991923, “Component Mispositioning Events Continue to Occur,” May 14, 1999

19991924, “Reactivity Management Errors in the Plant and on the Simulator,” May 14, 1999

19991925, “Operator System/Equipment Operation Errors Resulting from Failure to Use Procedures,” May 14, 1999

19991948, “Loose Bolts on TDAFW Pump Trip/Throttle Valve,” May 18, 1999

19992076, “Followup on Ineffective Corrective Actions for Mis-position/configuration Control Events,” June 3, 1999

19992077, “Valve Not Fully Closed Contaminated CST,” June 3, 1999

19992153 “Control of temporary equipment problems,”

19992177 “Continued operational errors when implementing clearance orders, “

19992248, “Investigate Auxiliary Feedwater Pump Turbine Overspeed,” May 21, 1999

19992497, “Red Performance Indicator for PIR Average Age for the last 6 Weeks,” July 19, 1999

19992531, “Red Performance Indicator for PIR Evaluation Quality for the last 5 Weeks,” July 21, 1999

19992690, “Low Oil Level on TDAFW Pump Oilers,” August 6, 1999

19992767, “Higher than Expected Steam Generator Chloride Concentration,” August 16, 1999

19992789, “No Monthly Channel Check Performed for Post Accident Monitoring Neutron Flux Instruments,” August 27, 1999

19992796, “Operations Performance Indicator for Corrective Action Health has ‘Gone Red’,” August 18, 1999

19992738, “High pressure coolant injection failure to manually start,”

20000081, "Repeat Failures of Circulating Water Pump Pressure and Flow Switches," January 12, 2000

20000108, "Numerous Replacements of the Waste Water Treatment pH Probe," January 13, 2000

20000113, "Centrifugal Charging Pump A Vibration Increasing Trend," January 13, 2000

20000159, "Evaluate CCW System for Microbiological Activity Based on Through-wall Cracks," January 18, 2000

20000187, "Circulating Water Pump C High Overhaul Frequency," January 20, 2000

20000556, "Main Turbine #11 Bearing Vibration Increasing Trend," February 24, 2000

NSRB Meeting Minutes

99-02 Amended, dated July 14, 1999
99-03, dated October 13, 1999

PSRC Meeting Minutes

907, dated February 24, 2000
906, dated February 16, 2000
901, dated January 12, 2000
897A, dated December 14, 1999
874, dated June 24, 1999
890A, dated October 14, 1999
894, dated November 11, 1999

System Health Reports

Reactor Coolant System (BB), updated March 3, 2000
Auxiliary Feedwater (AL) System, updated March 3, 2000

Work Orders

List BB System Work Orders Entered or Closed January 1, through December 31, 1999

99-209200-000, Monitor Reactor Vessel Head Vent Solenoid Valve Leakage, initiated May 8, 1999

98-204090-055, Replace Capacitor C-105 for BBFQY0416 During Performance of STS-IC-504C, initiated February 26, 1999

97-122669, Lap Seating Surface on TDAFWP Valve to SG A, initiated February 23, 1999

97-123095-003, Replace Handwheel Rotation Components on TDAFWP Discharge Line Drain Valve, initiated September 29, 1998