APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report: 50-482/90-18 Operating License: 50-482

Docket: 50-482

Licensee: Wolf Creek Nuclear Operating Corporation (WCNOC)
P.O. Box 411
Burlington, Kansas 66839

Facility Name: Wolf Creek Generating Station (WCGS)

Inspection At: WCGS, Burlington, Kansas

Inspection Conducted: April 23-27, 1990

Inspector: H. F. Bundy, Reactor Inspector, Test Programs Section, Division of Reactor Safety — Date: 5/9/90

Accompanied By: W. C. Seidle, Chief, Test Programs Section Division of Reactor Safety (April 26-27)

Approved: W. C. Seidle, Chief, Test Programs Section Division of Reactor Safety — Date: 5/9/90

Inspection Summary

Inspection Conducted April 23-27, 1990 (Report 50-482/90-18)

Areas Inspected: Routine, announced inspection of licensee actions on previous inspection findings, programmed enhancements in response to Generic Letter (GL) 88-17 [loss of decay heat removal (DHR)], and independent measurement of reactor coolant system (RCS) leak rate.

Results: The licensee's corrective action program for emergency diesel generator (EDG) maintenance, which was instituted in response to Violation 482/8839-02, was functioning as evidenced by self-identification of a number of maintenance problems. However, a sizable backlog of maintenance work requests was noted. The violation will remain open pending replacement of the fuel oil lines, which were the subject of the violation, with flexible tubing to avoid further vibrationally induced failures.

The licensee's programmed enhancements satisfied the intent of GL 88-17. The RCS level instrumentation was accurate and had a high level of redundancy. The operators were knowledgeable and appeared comfortable with DHR monitoring capabilities. The licensee was developing a DHR performance computer screen which should enhance monitoring capability. Previous inspector comments on procedures and training had been resolved. Lesson plans were excellent, and timely training had been accomplished. Instrumentation for monitoring residual heat removal (RHR) pump cavitation was marginal. The licensee stated an intention to evaluate the installation of improved noise monitors and low RHR pump motor current alarms.

The inspector verified the licensee's calculations for RCS leak rates for a surveillance performed on March 8, 1990.

No violations or deviations were identified.

DETAILS

1. PERSONS CONTACTED

WCNOC

*B. D. Withers, President
*J. A. Bailey, Vice President, Nuclear Operations
*F. T. Rhodes, Vice President, Engineering and Technical Support
*G. D. Boyer, Plant Manager
O. L. Maynard, Manager, Regulatory Services
*C. E. Parry, Manager, Site Quality
*M. G. Williams, Manager, Plant Support
*J. A. Zell, Manager, Training
*R. W. Holloway, Manager, Maintenance and Modifications
*J. M. Pippin, Manager, Nuclear Plant Engineering (NPE)
*J. Weeks, Manager, Operations
J. Stamm, Manager, System Engineering
*C. W. Fowler, Manager, Instrumentation and Control
*M. E. Dinglor, Manager, NPE-System
*R. S. Benedict, Manager, Quality Control
*W. M. Lindsay, Manager, Quality Assurance
*D. G. Moseby, Supervisor, Operations
*H. L. Stubby, Supervisor, Technical Training
*R. K. Lewis, Supervisor, Results Engineering
*H. K. Chernoff, Supervisor, Licensing
*S. G. Wideman, Senior Engineering Specialist
B. Smith, Supervisor, Modifications
G. R. Smith, Licensed Supervising Instructor
S. C. Hopkins, Engineering Specialist III
J. E. North, Engineering Specialist III
D. Kruse, Maintenance Engineer

OTHER

E. Weissloar, Colt Representative

NRC

*M. E. Skow, Senior Resident Inspector

The inspector also interviewed other licensee employees during the inspection.

*Denotes those attending the exit interview on April 27, 1990.

2. LICENSEE ACTIONS ON PREVIOUS INSPECTION FINDINGS (92702)

(Open) Violation 50-482/8839-02, "Failure to Take Adequate Corrective Action to Prevent Failure of an Emergency Diesel Generator (EDG) Fuel Oil Line." This violation involved failure of a fuel oil accumulator fill/vent line on EDG B on November 27, 1988. A similar failure of the identical line for EDG A occurred on December 4, 1986. There was no evidence that any actions had been taken to prevent the second failure. In addition to replacing the broken line with different material, the licensee performed walkdowns on fluid lines for both EDGs to identify further vibrational stress and fretting problems. Softeners were added to existing supports to isolate vibration and decrease the possibility of rubbing holes in tubing in accordance with an engineering evaluation. The inspector reviewed supplemental work instructions dated February 7, 1989, which included appropriate EDG acceptance criteria developed in response to Programmatic Deficiency Report OP 89-021.

The inspector reviewed Memoranda MA 89-0182 and MA 89-0281 relating to EDG training for the emergency diesel engineer at a similar facility and at the vendor's plant. The inspector reviewed successful EDG start logs for alternating quarterly 24-hour runs in accordance with Procedure STS KJ-005A. Also, data indicating successful 24-hour runs in accordance with Procedure STS MT-016 for each EDG before and after inspection during refueling Outage 4 was reviewed.

During a walkdown of EDG A, the inspector observed a work request tag on a fluid line identified for replacement and rerouting. The maintenance engineer stated that he had found fretting on the line from vibrational contact with a structural component. Also, several work request tags for leaking fluid line gaskets and connections were observed. Several of these had 1989 dates. Examples were 31012, 32033, and 45351. Extensive use of absorbent cloths was observed.

During the walkdown of EDG B, the inspector observed that the exhaust manifold had been removed. The system engineering manager stated that a fire involving RTV sealant, which had been applied to stop leaks, had occurred during a postmaintenance run on April 17, 1990. It turned out that RTV sealant was not satisfactory for that application. Subsequent to replacement of the RTV sealant, a 24-hour run had been completed on April 23, 1990. However, extensive manifold leaks were observed and the decision was made to replace all exhaust manifold seal material. The inspector observed that another extended run might be appropriate and the plant manager informed him that it was being evaluated.

The system engineering manager stated that they were going to replace the fuel oil line that was the subject of the violation on both EDGs with flexible tubing because of continued observation of high vibrational stress. He had also authorized use of Swagelock fittings, stainless tubing, and Teflon tape to reduce leakage as lines are replaced. A vendor representative was present during the walkdown and discussions and indicated his approval of licensee actions.

Although EDG maintenance problems continued to exist, the licensee's revised corrective action program appeared to be effectively resolving them. However, this violation will remain open pending installation of the flexible tubing in the fuel oil fill/vent lines.

3. PROGRAMMED ENHANCEMENTS IN RESPONSE TO GL 88-17 - LOSS OF DECAY HEAT REMOVAL (TI 2515/103)

3.1 GL 88-17 Recommendations and Inspection Scope

GL 88-17 provided recommended licensee actions to prevent and, if necessary, to respond to loss of DHR during operations with the RCS partially drained.

Recommendations were made by GL 88-17 in two categories:

- Expeditious actions, which should be implemented prior to operating in a reduced inventory condition, and

- Programmed enhancements, which should be developed in parallel with the expeditious actions and may replace, supplement, or add to the expeditious actions.

NRC's review of the licensee's expeditious actions was documented in NRC Inspection Report 50-482/89-17. The status of the licensee's programmed enhancements was also discussed. The purpose of this inspection was to follow up on NRC Inspection Report 50-482/89-17 comments and concerns and ascertain completion of programmed enhancements. For the purpose of future reference, the programmed enhancement recommendations are briefly paraphrased below (to avoid confusion, the numbers are identical to similar items contained in GL 88-17):

Programmed Enhancements

(1) Instrumentation

Provide reliable indication of parameters that describe the state of the RCS and the performance of systems normally used to cool the RCS for both normal and accident conditions. At a minimum, provide the following in the control room:

(a) Two independent RCS level indications;

(b) At least two independent temperature measurements representative of the core exit whenever the RV head is located on top of the RV;

(c) The capability of continuously monitoring DHR system performance whenever a DHR system is being used for cooling the RCS; and

(d) Visible and audible indications of abnormal conditions in temperature, level, and DHR performance.

(2) Procedures

Develop and implement procedures that cover reduced inventory operation, and that provide an adequate basis of entry into a reduced inventory condition. These include:

(a) Procedures that cover normal operation of the NSSS, the containment, and supporting systems under conditions for which cooling would normally be provided by DHR systems;

(b) Procedures that cover emergency, abnormal, off-normal, or the equivalent operation of the NSSS, the containment, and supporting systems if an off-normal condition occurs while operating under conditions for which cooling would normally be provided by DHR systems; and

(c) Administrative controls that support and supplement the procedures in items (a), (b), and all other actions identified in this communication, as appropriate.

(3) Equipment

(a) Provide equipment of high reliability for cooling the RCS and avoiding loss of RCS cooling;

(b) Maintain equipment available to mitigate loss of DHR or loss of RCS inventory should they occur including at least one high pressure injection pump and one other system, each sufficient to keep the core covered; and

(c) Provide adequate equipment for personnel communications involving activities related to the RCS or systems necessary to maintain the RCS in a stable and controlled condition.

(4) Analyses

Conduct analyses to supplement existing information and develop a basis for procedures, instrumentation installation and response, and equipment/NSSS interactions and response.

(5) Technical Specifications (TS)

Technical Specifications that restrict or limit the safety benefit of the actions identified in this letter, should be identified and appropriate changes should be submitted.

(6) RCS Perturbations

Reexamine item (5) of expeditious actions and refine operations as necessary to reasonably minimize the likelihood of loss of DHR.

3.2 Licensee's Actions in Response to GL 88-17 Programmed Enhancement Recommendations

The inspector's comments on the licensee's actions are provided below. The Attachment is a tabulation of related documents reviewed by the inspector. When a document number is cited below, it will be the number assigned in the Attachment. In addition to reviewing the listed documents and interviewing appropriate personnel, the inspector walked down recently installed RCS level instrumentation. In general, recent procedure revisions together with training conducted just prior to the current refueling outage satisfactorily resolved inspector concerns and comments discussed in NRC Inspection Report 50-482/89-17. The newly installed level instruments had the required independence and a high degree of redundancy. They were also user-friendly. Operations personnel reported that they were highly accurate when compared to the existing Tygon hose. Residual heat removal (RHR) pump cavitation monitoring capability was marginally acceptable. Operators were knowledgeable and comfortable with DHR monitoring capabilities. The inspector's comments on the licensee's actions in response to the programmed enhancement recommendation as committed to in Document 1 follow.

3.2.1 Instrumentation

The inspector walked down RCS level instruments, which were recently installed in accordance with Document 2. There were two redundant pairs of instruments. Each pair had an independent pressure tap at the RTD bypass manifold off the RCS Loop 1 hot leg. Each pair also had an independent reference pressure tap off the pressurizer. For each pair, there was a wide and narrow range level indicator. The scales were as follows:

- Narrow range: 5-55 inches
- Wide range: 5-265 inches

They were calibrated to indicate 15 inches when operating at half loop. The minimum operating level was administratively established at 20 inches. Each narrow range transmitter could actuate high and low level alarms.

The inspector noted that the principal means for monitoring RHR pump cavitation in the control room was noise monitors. This method had a shortcoming in that the microphones were known to pick up other background noise, e.g., air conditioners and work activities. The operations supervisor stated that he was working on a proposal to install more reliable noise monitors.

It was possible to monitor RHR pump motor current on computer points. However, low current alarms were not installed. Because low current is an indication of pump cavitation, the licensee stated an intention to evaluate the installation of alarms.

The DHR performance computer screen discussed in NRC Inspection Report 50-482/89-17 was not functional. The inspector was informed that development was continuing and that it would definitely be available when the new plant computer is installed in the near future. Other instrumentation capabilities were as described in NRC Inspection Report 50-482/89-17.

3.2.2 Procedures

By review of Documents 3-8 and interviews, the inspector ascertained that procedural concerns discussed in NRC Inspection Report 50-482/89-17 had been resolved and appropriate retraining had been accomplished. Lesson plans were excellent and records indicated timely training of appropriate personnel. The licensed supervising instructor stated that simulator training had been covered on a loss of cooling accident during shutdown (Braidwood event). During the review of Procedure GEN 00-007, the inspector noted that containment closure is accomplished by performance of Procedures STS GP-001 and STS GP-007 prior to going to reduced inventory. It appeared that the licensee established this requirement to avoid developing a procedure for fast containment closure. The inspector advised the training manager that the reduced inventory containment closure requirement should be emphasized during training to avoid an inadvertent opening of the containment.

3.2.3 Equipment

As discussed in NRC Inspection Report 50-482/89-17, the licensee's equipment availability appeared adequate to meet the intent of GL 88-17. The licensee processed a TS change to delete the requirement for tagging out the safety injection (SI) pump during reduced inventory operation.

3.2.4 Analyses

The inspector verified that procedural and administrative control requirements were adequately supported by analyses by reviewing Documents 9-16. These documents supported the assumptions in Procedure GEN 00-007 and technical data was appropriately translated to the procedure. Documents 9 and 16 calculations supported using either a SI pump or a centrifugal charging pump for independent inventory makeup. Document 10 provided a basis for removing the crossover leg plenum side manway prior to the hot leg side manway cover. This is counter to guidance in NRC IN 88-36, but consistent with Westinghouse WCAP-11916. The IOM states that IN 88-36 did not consider the "spill" penalty.

3.2.5 TS Changes

Documents 17 and 18 comprised the request for and issuance of TS enhancements related to loss of DHR, respectively. The TS changes implemented consisted of the following:

- Adding a note to TS 3/4.4-6 to add criterion for ensuring reactor vessel water level is above the vessel flange before the running RHR pump can intentionally be stopped while in Mode 5 with the reactor coolant loops not filled.

- Revising TS 4.9.8.1 and 4.9.8.2 to decrease required flow rate of the running RHR pump.

- Revising TS 3.5.4 mode applicability to have the SI pumps immediately available should RHR cooling be lost when reactor coolant level is below the vessel flange.

A change to delete the RHR automatic closure interlock was to be addressed in a future submittal. The above changes were appropriately reflected in Procedure GEN 00-007.

3.2.6 RCS Perturbations

By review of Documents 3-8 and interviews with operations and training personnel, the inspector ascertained that appropriate precautions had been included in the procedures to avoid RCS perturbations during reduced inventory operations. Also, training had emphasized avoidance of RCS perturbations.

No violations or deviations were identified.

4. INDEPENDENT MEASUREMENT OF RCS LEAK RATES (61728)

To verify satisfaction of TS requirements and the adequacy of the licensee's calculational technique for determining RCS leak rates, the inspector independently verified the results of the leak rate surveillance performed on March 8, 1990 (Attachment, Document 19). The inspector used the NRC computer program for determination of RCS leak rates (RCSLK9) which is discussed in NUREG-1107. The results were as follows.

	Identified	Unidentified
STSBB-004	0.6334 gpm	0.1911 gpm
RCS LK9	0.69 gpm	0.16 gpm

The results satisfied TS criteria of 10 gpm-identified and 1 gpm-unidentified. The inspection criterion for results to be within ±0.2 gpm was also satisfied.

No violations or deviations were identified.

5. EXIT INTERVIEW

The inspector met with licensee representatives denoted in paragraph 1 on April 27, 1990, and summarized the scope and findings of this inspection. The licensee did not identify as proprietary any of the materials provided to, or reviewed by, the inspector during this inspection.

ATTACHMENT

DOCUMENTS REVIEWED

1. Letter WM 89-0041, WCNOC to NRC, "GL 88-17 - Loss of DHR," dated February 2, 1989

2. Plant Modification Request (PMR) 02937, Revision 3, "Mid-Loop Independent Level Indication," dated April 11, 1990.

3. Procedure GEN 00-007, Revision 12, Procedure Change MA 90-056, "RCS Drain Down," approved April 18, 1990.

4. Procedure OFN 00-015, Revision 8, "Loss of Shutdown Cooling (RHR)," approved April 4, 1990.

5. Lesson Plan (LP) 093, Revision 000, "OFN 00-015, Revision, and Loss of Shutdown Cooling (RHR)," approved December 28, 1989.

6. LP110, Revision 000, "RHR System/Loss of Shutdown Cooling," approved January 2, 1990.

7. LP093, Revision 003, "Refueling Concerns," approved January 3, 1990.

8. LP114, Revision 000, "Half-Loop Operation," approved January 11, 1990.

9. Interoffice Memorandum (IOM) NS88-1332, T. J. Garrett to K. R. Peterson, "Response to Action Item No. 6 of NRC GL 88-17," dated October 15, 1988.

10. IOM NS 88-1181, T. J. Garrett to C. M. Estes, "Basis for Recommended SG Primary Side Manway and Nozzle Dam Removal and Installation Sequence for Mid-Loop Operations," dated November 1, 1988.

11. Calculation SA-88-026, Revision 0, "Predicted Coolant Level Variations in the RCS During Mid-Loop Operations," dated November 15, 1988.

12. Calculation SA-87-019, Revision 0, "Loss of RHR at Half Pipe Using 1979 Decay Heat Data and RCS Pressurization," dated September 4, 1987.

13. Calculation SA-87-018, Revision 0, "Loss of RHR at Half Pipe Using 1979 ANS Decay Heat Data," dated September 2, 1987.

14. Calculation SA-87-021, Revision 0, "Minimum Allowed RHR Flow to Maintain RCS less than 140°F When RCS is at Half Pipe," dated September 24, 1987.

15. Calculation SA-89-009, Revision 0, "The Minimum RHR Flow Requirements for DHR During Mid-Loop Operation," dated May 23, 1989.

16. Calculation SA-88-023, Revision 0, "Venting Requirements for Mid-Loop Operation With SG Nozzle Dams in Place."

17. Letter WM 89-0264, WCNOC to NRC, "Revision to TS 3.4.1.4.2, 3.5.4, 4.9.8.1, and 4.9.8.2 - RHR Flow Rate and SI Pump Availability," dated November 30, 1989.

18. Letter, NRC to WCNOC, "Amendment No. 35 to Facility Operating License No. NPF-42," dated February 21, 1990.

19. Procedure STS BB-004, Revision 5, "RCS Water Inventory Balance," performed on March 8, 1990.