WOLF CREEK
NUCLEAR OPERATING CORPORATION

Russell A. Smith
Plant Manager

May 12, 2011

WO 11-0025

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Subject: Docket No. 50-482: Licensee Event Report 2011-003-00, "Diesel Generator Declared Inoperable Due to Inadequate Reinstallation of Pipe Connection Resulting in Excessive Governor Oil Coolant Leak"

Gentlemen:

The enclosed Licensee Event Report (LER) is being submitted in accordance with 10 CFR 50.73, "Licensee event report system," paragraph (a)(2)(i)(B) as a condition prohibited by the plant's Technical Specifications. The LER involves a jacket water cooling system leak that was identified on March 12, 2011, during the performance of procedure STS KJ-011A, "EDG NE01 24 Hour Run." This event is being reported per the above criteria as the "A" diesel generator may have been inoperable as the guidance in NUREG-1022, Rev. 2, "Event Reporting Guidelines 10 CFR 50.72 and 50.73," regarding the use of a dedicated operator to fill the jacket water expansion tank during a loss of offsite power in determining past operability is in question.

Consistent with the guidance in NUREG-1022, Section 5.1.1, additional time to submit this LER was discussed with the appropriate NRC regional office. The agreed upon submittal date was May 13, 2011. This letter contains no commitments. If you have any questions concerning this matter, please contact me at (620) 364-4156, or Mr. Gautam Sen at (620) 364-4175.

Sincerely,

Russell A. Smith

RAS/rlt

Enclosure

cc: E. E. Collins (NRC), w/e
J. R. Hall (NRC), w/e
G. B. Miller (NRC), w/e
Senior Resident Inspector (NRC), w/e

IE22
NRR

NRC FORM 366 (10-2010) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2013

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
WOLF CREEK GENERATING STATION	05000 482	1 OF 7

4. TITLE

Diesel Generator Declared Inoperable Due to Inadequate Reinstallation of Pipe Connection Resulting in Excessive Governor Oil Coolant Leak

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
03	12	2011	2011	003	00	05	12	2011		05000
									FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE

1

10. POWER LEVEL

100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: *(Check all that apply)*

- ☐ 20.2201(b)
- ☐ 20.2201(d)
- ☐ 20.2203(a)(1)
- ☐ 20.2203(a)(2)(i)
- ☐ 20.2203(a)(2)(ii)
- ☐ 20.2203(a)(2)(iii)
- ☐ 20.2203(a)(2)(iv)
- ☐ 20.2203(a)(2)(v)
- ☐ 20.2203(a)(2)(vi)
- ☐ 20.2203(a)(3)(i)
- ☐ 20.2203(a)(3)(ii)
- ☐ 20.2203(a)(4)
- ☐ 50.36(c)(1)(i)(A)
- ☐ 50.36(c)(1)(ii)(A)
- ☐ 50.36(c)(2)
- ☐ 50.46(a)(3)(ii)
- ☐ 50.73(a)(2)(i)(A)
- ☒ 50.73(a)(2)(i)(B)
- ☐ 50.73(a)(2)(i)(C)
- ☐ 50.73(a)(2)(ii)(A)
- ☐ 50.73(a)(2)(ii)(B)
- ☐ 50.73(a)(2)(iii)
- ☐ 50.73(a)(2)(iv)(A)
- ☐ 50.73(a)(2)(v)(A)
- ☐ 50.73(a)(2)(v)(B)
- ☐ 50.73(a)(2)(v)(C)
- ☐ 50.73(a)(2)(v)(D)
- ☐ 50.73(a)(2)(vii)
- ☐ 50.73(a)(2)(viii)(A)
- ☐ 50.73(a)(2)(viii)(B)
- ☐ 50.73(a)(2)(ix)(A)
- ☐ 50.73(a)(2)(x)
- ☐ 73.71(a)(4)
- ☐ 73.71(a)(5)
- ☐ OTHER

Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
Gautam Sen, Manager Regulatory Affairs	(620) 364-4175

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED

☒ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☐ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR
08	31	2011

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

On March 12, 2011, with the plant at 100 percent power in Mode 1, a jacket water cooling system leak was identified during the performance of procedure STS KJ-011A, "EDG NE01 24 Hour Run." Procedure STS KJ-011A is performed to satisfy Technical Specification Surveillance Requirement 3.8.1.14, endurance and margin test. A leak in excess of the 9.1 ml/min limit resulted in declaring the "A" diesel generator (DG) inoperable at 0419 Central Daylight Time (CDT). Performance of procedure STS KJ-011A commenced on March 11, 2011 at 1300 CDT.

The "A" DG was returned to service at 1815 CDT on March 12, 2011 after the leaking threaded pipe connection supplying the "A" DG governor oil cooler was reassembled. The "B" DG and both offsite circuits were operable while the "A" DG was inoperable on March 12, 2011. The "A" DG may have been inoperable from December 2, 2010 to March 12, 2011, when the inlet pipe connection to the governor oil cooler had not been properly reinstalled after being removed to support a foreign material inspection during the 7 day DG maintenance outage.

PLANT CONDITIONS PRIOR TO EVENT

Mode 1
100 percent power
No inoperable structures, systems, or components, other than the "A" Diesel Generator (DG) [EIIS Codes: EK, DG], contributed to this event on March 12, 2011. The "B" DG was also inoperable during four intervals between December 2, 2010 and March 12, 2011, as shown in the Basis for Reportability.

EVENT DESCRIPTION

Performance of procedure STS KJ-011A, "EDG NE01 24 Hour Run," commenced on March 11, 2011 at 1300 Central Daylight Time (CDT). On March 12, 2011, with the plant at 100 percent power in Mode 1, a jacket water cooling system [EIIS Codes: LB] leak was identified during the performance of procedure STS KJ-011A. Procedure STS KJ-011A is performed to satisfy Technical Specification Surveillance Requirement 3.8.1.14, endurance and margin test. A leak in excess of the 9.1 ml/min limit resulted in declaring the "A" DG inoperable at 0419 (CDT). The 9.1 ml/min leakage limit is based on operating for 7 days with the minimum expansion tank water only. DG governor [EIIS Codes: EK, 65] temperature readings were taken at 0500 CDT indicating 210 degrees F +/- 3 degrees F with about a 10 ml/min leak. Governor temperature remained stable as the leak progressed to 49 ml/min by 0634 CDT. The DG governor is a Woodward Hydraulic Actuator model EGB50P. The decision was made to shutdown the DG to make repairs.

Following the shutdown of the DG, the System Engineer and System Engineering Supervisor examined the leak. The leak had slowed as the DG had been secured, but remained active due to the jacket water keep warm pump [EIIS Codes: LB, P] flow. The System Engineer physically pushed and pulled on the governor oil cooler inlet piping to determine if it was structurally sound. There was no movement or flexure of the piping and the leak did not worsen.

Work Order 11-338729-000 was generated to correct the leak. Upon disassembly, it was noted by the Wolf Creek Nuclear Operating Corporation (WCNOC) mechanic and documented in the work order, the pipe nipple at the inlet of the governor oil cooler was hand tight. As is common on National Pipe Threads (NPT), Neolube 100, a sealing paste, had been used on the pipe threads. Upon visual inspection, the threads of both the oil cooler inlet flange and the pipe were in good condition. There was no physical damage that would prevent the connection from sealing properly. The components were reassembled and the connection remained leak free during the subsequent reperformance of the 24 hour run (STS KJ-011A) on March 12-13, 2011.

While the pipe was found hand tight, the threads were fully engaged such that a rigid connection was established. This was confirmed prior to disassembly, noting no pipe movement occurred with the application of external force. This indicates, while the threads were not tight and sealed against leakage, the piping was restrained from movement. The pipe was restrained such that no further tightening or loosening could occur without disassembling other components (See Figure 1).

The "A" DG was returned to service at 1815 CDT on March 12, 2011 after the leaking pipe nipple supplying the "A" DG governor oil cooler was reassembled and completion of post maintenance testing. The "B" DG and both offsite circuits were operable while the "A" DG was inoperable on March 12, 2011. Operability of the "A" DG was last demonstrated before this event on February 23, 2011 during performance of procedure STS KJ-005A, "Manual/Auto Start, Sync and Loading of EDG NE01."

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REV NO.	
WOLF CREEK GENERATING STATION	05000 482	2011	003	00	3 OF 7

The DGs are Colt-Pielstick / Fairbanks-Morse model 14PC2.5 engines. DGs "A" and "B" are dedicated to Engineered Safety Feature (ESF) buses NB01 and NB02 [EIIS Codes: EB, BU], respectively. A DG starts automatically on a safety injection (SI) signal or on an ESF bus undervoltage signal. In the event of a loss of preferred power, the ESF electrical loads are automatically connected to the DGs in sufficient time to provide for safe reactor shutdown and to mitigate the consequences of a design basis accident (DBA), such as a loss of coolant accident (LOCA).

BASIS FOR REPORTABILITY

A review of recent work activities determined that the inlet pipe connection to the governor oil cooler had been removed and reinstalled on December 2, 2010 to support a foreign material inspection during the 7 day DG maintenance outage. The "A" DG may have been inoperable from December 2, 2010 to 1815 CDT on March 12, 2011 because the inlet pipe connection to the governor oil cooler had not been properly reinstalled. The guidance in NUREG-1022, Rev. 2, "Event Reporting Guidelines 10 CFR 50.72 and 50.73," Section 3.2.7, states, in part: "A system must operate long enough to complete its intended safety function as defined in the safety analysis report. Generic Letter 91-18 provides guidance on determining whether a system is operable." Regulatory Issue Summary (RIS) 2005-020, Rev. 1, "Revision to NRC Inspection Manual Part 9900 Technical Guidance, "Operability Determinations & Functionality Assessments for Resolution of Degraded or Nonconforming Conditions Adverse to Quality or Safety,"" replaced Generic Letter 91-18. Alarm response procedure ALR 501, "Standby Diesel Engine System Control Panel KJ-121," specifies the use of a dedicated individual for manual makeup to the expansion tank using essential service water [EIIS Codes: BI] in the event of a loss of offsite power. Consistent with the guidance in RIS 2005-020, utilization of a dedicated individual in the event of a loss of offsite power to provide makeup to the expansion tank would have maintained the operability of the DG to perform its specified function.

Technical Specification (TS) 3.8.1, "AC Sources – Operating," requires two DGs capable of supplying the onsite Class 1E power distribution subsystem(s) [EIIS Codes: EB, ED, and EF] be operable in Modes 1, 2, 3 and 4. With the "A" DG considered inoperable from December 2, 2010 to March 12, 2011 and the "B" DG being inoperable as shown in the table below, multiple TS Conditions / Required Actions were not completed within the specified Completion Times. The use of a dedicated individual to fill the jacket water expansion tank during a loss of offsite power in determining past operability is in question. Therefore, this event is being reported as a condition prohibited by TS in accordance with 10 CFR 50.73(a)(2)(i)(B).

During this time period, the "B" DG was also inoperable as shown below:

Out of Service	Returned to Service	Reason for Removal from Service
01/17/2011, 0400 CST	01/22/2011, 0940 CST	Seven-day equipment outage for planned maintenance
01/22/2011, 1946 CST	01/23/2011, 0703 CST	Planned maintenance on left-bank air start valve
02/10/2011, 0400 CST	02/11/2011, 1315 CST	Planned DG and Essential Service Water System equipment maintenance outage
02/17/2011, 1127 CST	02/19/2011, 0135 CST	"B" DG Fuel Oil Storage Tank out of compliance with limit on fuel cloud point

A review of this event determined that it did not meet the criteria for reporting under 10 CFR 50.73(a)(2)(v) as an event or condition that could have prevented the fullfillment of a safety function. As stated in NUREG-1022, Section 3.2.7, "The level of judgment for reporting an event or condition under this criterion is a reasonable expectation of preventing fulfillment of a safety function." To evaluate the inlet pipe connection leak rate, a test was performed to emulate actual conditions and experimentally quantify the maximum or equilibrium leakage rate using a spare governor. The maximum or equilibrium leakage rate for the as-found condition was rounded up to a rate of 100 ml/min. The evaluation determined that the "A" DG jacket water expansion tank would have had sufficient water reserve for at least 24 hours with the subject water leak. However, operator action would be required to meet the 7 day mission time. At the 100 ml/min leakage rate, approximately 7 hours is available from the jacket water expansion tank low level alarm to empty. Alarm response procedure ALR 501 provides guidance for manual makeup to the expansion tank using essential service water in the event of a loss of offsite power. This procedure provides a dedicated individual to perform relatively simple actions for makeup to the expansion tank. Training on the alarm response procedure was provided to non-licensed operators during requalification cycle 11-01 that began in November 2010. Appendix C.5 of RIS 2005-020 contains guidance on use of a dedicated operator, that includes written procedures and training on those procedures prior to use, in support of operability determinations.

There is sufficient time to implement the alarm response procedure with approximately 7 hours available from the jacket water expansion tank low level alarm to empty. The operation of the DG for the 7 day mission time would be assured through the relatively simple actions of the alarm response procedure. NUREG-1022 states, "If either the offiste power or onsite emergency power is unavailable to the plant, it is reportable regardless of whether the other system is available." Therefore, since a reasonable expectation exists that the "A" DG would have been available to perform its specified function with operator action, the event is considered not reportable under 10 CFR 50.73(a)(2)(v).

ROOT CAUSE

The direct cause of this event is inadequate reinstallation of the inlet pipe connection to the governor oil cooler when it had been disconnected and reinstalled to support a foreign material inspection during the 7 day DG maintenance outage in early December 2010. An apparent cause evaluation of this condition is in progress. A supplement report will be submitted to discuss the causes(s) and circumstances of this human performance- related cause in accordance with 10 CFR 50.73(b)(2)(ii)(J).

CORRECTIVE ACTIONS

Work Order 11-338729-000 was generated to correct the leak. The components were reassembled on March 12, 2011 and the "A" DG was restored to operable status at 1815 CDT on March 12, 2011 following completion of post maintenance testing. The connection remained leak free during the subsequent reperformance of the 24 hour run (STS KJ-011A) on March 12-13, 2011.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REV NO.	
WOLF CREEK GENERATING STATION	05000 482	2011	003	00	5 OF 7

SAFETY SIGNIFICANCE

The "A" DG may have been inoperable from December 2, 2010 to 1815 CDT on March 12, 2011 because the inlet pipe connection to the governor oil cooler had not been properly reinstalled during the 7 day DG maintenance outage in early December 2010. During this time period, the "B" DG was also inoperable as shown below:

Out of Service	Returned to Service	Reason for Removal from Service
01/17/2011, 0400 CST	01/22/2011, 0940 CST	Seven-day equipment outage for planned maintenance
01/22/2011, 1946 CST	01/23/2011, 0703 CST	Planned maintenance on left-bank air start valve
02/10/2011, 0400 CST	02/11/2011, 1315 CST	Planned DG and Essential Service Water System equipment maintenance outage
02/17/2011, 1127 CST	02/19/2011, 0135 CST	"B" DG Fuel Oil Storage Tank out of compliance with limit on fuel cloud point

When the "A" and "B" DGs are inoperable, there are no remaining stand-by AC sources. Thus, with an assumed loss of offsite electrical power, sufficient stand-by AC sources are not available to power the minimum required ESF functions. Both offsite circuits were operable from December 2, 2010 to March 12, 2011. The Sharpe Station generators, which can provide more than 16 megawatts of power to one ESF bus and train, were also available from December 2, 2010 to March 12, 2011.

The "A" DG was operated under load for approximately 4.5 hours on December 5, 2010. Additionally, the "A" DG load run test for Surveillance Requirement 3.8.1.3 was performed satisfactorily three times and the "A" DG was started an additional 10 times between December 5, 2010 and March 12, 2011. No leakage was detected during those runs. The jacket water leak was identified 5 hours and 4 minutes into the 24 hour run on March 12, 2011.

Each jacket water cooling system consists of an engine-driven pump, a jacket water heat exchanger, an electric motor-driven keep-warm pump, an electric keep-warm heater, piping, valves, controls, and instrumentation. The engine-driven pump circulates water through the cylinder jackets and the jacket water heat exchanger, where the extracted heat is transferred to the Essential Service Water System. One expansion tank is provided in the jacket water cooling system to accommodate volumetric changes in the jacket cooling water and intercooler cooling water systems due to thermal transients or leakage. The expansion tank serves to absorb any pump pulsations. The tank is a horizontal cylindrical type and is located at a suitable elevation to provide adequate suction head to the engine-driven pumps. The makeup to the expansion tank is from the demineralized water storage and transfer system. The makeup quantities are controlled automatically by level switches. The capacity of the expansion tank is based on providing sufficient reserve capacity for operation of the diesel at its continuous rating for at least 7 days.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REV NO.	
WOLF CREEK GENERATING STATION	05000 482	2011	003	00	6 OF 7

To evaluate the inlet pipe connection leak rate, a test was performed to emulate actual conditions and experimentally quantify the maximum or equilibrium leakage rate using a spare governor. The maximum or equilibrium leakage rate for the as-found condition was rounded up to a rate of 100 ml/min. The evaluation determined that the "A" DG jacket water expansion tank would have had sufficient water reserve for at least 24 hours with the subject water leak. However, operator action would be required to meet the 7 day mission time. At the 100 ml/min leakage rate, approximately 7 hours is available from the jacket water expansion tank low level alarm to empty. Alarm response procedure ALR 501, "Standby Diesel Engine System Control Panel KJ-121," provides guidance for manual makeup to the expansion tank using essential service water in the event of a loss of offsite power. This procedure provides a dedicated individual to perform the manual makeup to the expansion tank. Training on the ALR procedure was provided to non-licensed operators during requalification cycle 11-01 that began in November 2010.

OPERATING EXPERIENCE / PREVIOUS EVENTS

LER 2011-002-00: On February 22, 2011, with the plant at 100 percent power in Mode 1 and the "A" DG in stand-by condition, a WCNOC engineer on a system walk down identified that a control pin on the fuel rack for the "A" DG was not completely inserted and not secured by a washer and cotter pin in accordance with the design. The "A" DG was declared inoperable at 1537 Central Standard Time (CST) on February 22, 2011 and returned to service at 0520 CST on February 23, 2011 after the control pin, washer and cotter pin were properly installed.

LER 2010-004-00: On December 6, 2010, the plant entered Mode 3 in accordance with Required Action H.1 of TS 3.8.1, "AC Sources - Operating." The TS required shutdown was due to inoperability of the "A" DG, which was removed from service on November 29, 2010, for planned maintenance. The cause of the TS required shutdown was the inability to return the DG to operable status within the seven-day completion time of Required Action B.4.2.2 of TS 3.8.1. The extended out-of-service time was due to excessive emergent work activities, including a drop in peak firing pressure in one cylinder during the surveillance run of the DG.

On August 24, 2010, Maintenance installed a non-traceable fitting on the "B" DG because personnel failed to verify that the part was listed on the bill of materials before installation. The non-traceable fitting was identified by Maintenance after it leaked during a post-maintenance test and was replaced before the "B" DG was restored to operation. The incorrect installation and subsequent rework extended a Technical Specification Equipment Outage.

LER 2007-001-00: On July 5, 2007, the "A" DG was declared inoperable to perform a scheduled surveillance. During the surveillance test, increased leakage was detected on the engine-driven intercooler pump shaft seal in excess of the leakage limit of 9.1 ml/min. During repairs to the intercooler pump shaft seal, the pump impeller, wear rings and shaft bearing were replaced. Post maintenance checks discovered a leak on the jacket water pump seal and that the gear box that drives both the intercooler and engine-driven jacket water pumps was abnormally hot. After the pump was disassembled, it was found that the sleeve bearing and shaft were damaged and needed to be replaced.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REV NO.	
WOLF CREEK GENERATING STATION	05000 482	2011	003	00	7 OF 7

Figure 1