WOLF CREEK
NUCLEAR OPERATING CORPORATION

Matthew W. Sunseri
Vice President Operations and Plant Manager

January 11, 2010

WO 10-0005

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

Reference: Letter WM 09-0065, dated December 9, 2009, from R. A. Muench, WCNOC, to USNRC

Subject: Docket No. 50-482: Licensee Event Report 2009-008-00, Potential for Containment Fan Coolers to Not Have Automatically Started in Slow Speed

Gentlemen,

The enclosed Licensee Event Report (LER) is being submitted in accordance with 10 CFR 50.73, "Licensee event report system," paragraph (a)(2)(v)(D) as an event or condition that could have prevented fulfillment of a safety function needed to mitigate the consequences of an accident. The LER involves the potential for the containment fan coolers to not have automatically started in slow speed from fast speed for post accident operation.

The enclosed LER 2009-008-00 is being submitted based on the November 10, 2009, Nuclear Regulatory Commission (NRC) Integrated Inspection Report 2009004. This inspection report identified a green severity level IV noncited violation of 10 CFR 50.73, with three examples for failure to submit LERs within 60 days following discovery of events or conditions meeting the reportability criteria. One of the examples documented was insufficient evidence to show that the containment coolers could accomplish their safety function. The NRC stated that this example should have been reported under 10 CFR 50.73(a)(2)(v). WCNOC completed further evaluation of this event and has determined that this event does not meet the criteria for reporting under 10 CFR 50.73(a)(2)(v). The Reference provided the results of the additional evaluation and requested the NRC review the evaluation and provide WCNOC with an assessment of their review.

Based on the results of the NRC review, WCNOC will supplement this LER with additional information from the NRC review.

IE22
NRR

The Attachment provides a list of regulatory commitments. If you have any questions concerning this matter, please contact me at (620) 364-4008, or Mr. Richard D. Flannigan, Manager Regulatory Affairs at (620) 364-4117.

Sincerely,

M W Sunseri

Matthew W. Sunseri

MWS/rlt

Attachment
Enclosure

cc: E. E. Collins (NRC), w/a, w/e
G. B. Miller (NRC), w/a, w/e
B. K. Singal (NRC), w/a, w/e
Senior Resident Inspector (NRC), w/a, w/e

LIST OF REGULATORY COMMITMENTS

The following table identifies those actions committed to by WCNOC in this document. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments. Please direct questions regarding these commitments to Mr. Richard Flannigan at (620) 364-4117.

REGULATORY COMMITMENT	DUE DATE/EVENT
Based on the results of the NRC review, WCNOC will supplement this LER with additional information from the NRC review.	06/30/2010

NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 08/31/2010

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)

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4. TITLE

Potential for Containment Fan Coolers to Not Have Automatically Started in Slow Speed

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
										05000
04	02	2008	2009	- 008 -	00	01	11	2010	FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE

Defueled

10. POWER LEVEL

000

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

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☒ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
Richard D. Flannigan, Manager Regulatory Affairs	(620) 364-4117

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
06	30	2010

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

On April 2, 2008, as a result of operating experience from another plant, it was identified that with the containment fan coolers running in fast speed, certain small break loss-of-coolant accidents (SBLOCA) harsh environment scenarios may result in the fan coolers not starting in slow speed on an safety injection (SI) signal.

On April 10, 2008, this event was reported in accordance with 10 CFR 50.72(b)(3)(ii)(B) as an event or condition that results in the nuclear power plant being in an unanalyzed condition that significantly degrades plant safety (Event Number 44131).

An analysis was performed for a spectrum of SBLOCA scenarios and limiting main steam line break (MSLB) scenarios with the assumption that the fan coolers were not available to perform their specified function. In addition to the analysis, a review of plant data for the period January 1, 2005 through June 10, 2008 was performed to identify those periods of time when the fan coolers were in high speed operation concurrent with containment and cooling water conditions conducive to high loading that could potentially cause the fast speed thermal overloads to trip.

The event notification was retracted on June 20, 2008 based on the evaluation determining that an unanalyzed condition did not exist.

LICENSEE EVENT REPORT (LER)

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NARRATIVE

PLANT CONDITIONS PRIOR TO EVENT:

Defueled
Power - 000

EVENT DESCRIPTION:

On April 2, 2008, Performance Improvement Request (PIR) 2008-001307 (subsequently renumbered as Condition Report (CR) 00009375) was initiated as a result of discussions with another plant that identified concerns with the containment fan coolers [EIIS Code: BK] running in fast speed, that certain small break loss-of-coolant accidents (SBLOCA) harsh environment scenarios may result in the fan coolers not starting in slow speed on an safety injection (SI) signal. On April 10, 2008, this event was reported in accordance with 10 CFR 50.72(b)(3)(ii)(B) as an event or condition that results in the nuclear power plant being in an unanalyzed condition that significantly degrades plant safety (Event Number 44131). The notification indicated that investigation and analysis as of the date of the notification (evaluation and analysis) was still ongoing. It also indicated that in the case of a main steam line break (MSLB), the fan coolers could trip while running in fast speed and not be able to be automatically started by the sequencer in slow speed due to the electrical design configuration. At the time of the notification the plant was defueled for Refueling Outage 16 and the issue would be resolved prior to entry into MODE 4.

A modification was implemented in Refueling Outage 16 that changed the control circuit on the cooling fan motors to allow the cooling fan to start in slow speed, in the event the fast speed thermal overloads have tripped.

The evaluation for CR 00009375 performed an analysis for a spectrum of SBLOCA scenarios and limiting MSLB scenarios with the assumption that the fan coolers were not available to perform their specified function. This analysis determined that for the SBLOCA scenarios, the potential failure of the fan coolers, due to harsh environmental conditions, would not challenge the containment integrity. The bases for this determination was that as the passive heat sinks within the containment, along with the actuation of the containment spray system [EIIS Code: BE], would function to suppress the containment pressure and temperature surge. For the MSLB scenarios, the analysis determined that the highest peak containment pressure would exceed the analysis of record peak pressure by approximately 5 psig but was still within the design pressure limit.

In addition to the analysis, a review of plant data for the period January 1, 2005 through June 10, 2008 was performed to identify those periods of time when the fan coolers were in high speed operation concurrent to when containment and cooling water conditions were conducive to high loading that could potentially cause the fast speed thermal overloads to trip. The review determined that the conditions were present for a period of 48 days and a trip of the containment cooler did not occur.

Based on this evaluation, WCNOC concluded that it had reasonable assurance that the containment fan coolers were designed to operate at elevated pressures with higher-density steam/air mixtures and that the coolers would have performed their specified function. WCNOC retracted the event notification (event number 44131) on June 20, 2008 based on the evaluation determining that an unanalyzed condition did not exist. Wolf Creek Nuclear Operating Corporation's (WCNOC's) Reportability Evaluation Request 2008-011 was closed on June 20, 2008. An action plan associated to the CR was initiated to determine the most limiting environmental conditions to which the fan cooler could be subjected, assess the resulting brake horsepower when the fan cooler is in fast speed, and assess whether this brake horsepower would cause a fan cooler to overload on fast speed.

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BASIS FOR REPORTABILITY:

This event is being reported per 10 CFR 50.73(a)(2)(v)(D) based on the NRC characterizing this event in NRC Integrated Inspection Report 2009004 as an example of a violation for failure to submit an LER within 60 days following discovery of an event meeting the reportability criteria. The inspection report indicated this event should have been reported under 10 CFR 50.73(a)(2)(v) based on insufficient evidence to show that the containment coolers could accomplish their safety function.

Subsequent to the October 14, 2009 NRC quarterly integrated inspection exit meeting, WCNOC completed further evaluation of the event to determine if the event met the reporting criteria of 10 CFR 50.73(a)(2)(v). Provided below is a summary of calculation WCN003-PR-01, "Worst Case Brake Horse Power Requirements on Containment Air Cooler (CAC) Fan Motors." This calculation concluded that with the most limiting environmental conditions in containment, the thermal overloads would not actuate with the containment fan coolers operating in fast speed.

Calculation WCN003-PR-01, Rev. 0, "Worst Case Brake Horse Power Requirements on Containment Air Cooler (CAC) Fan Motors"

This calculation included a determination of the brake horsepower requirements of the containment fan coolers prior to a safety injection signal (SIS) and a comparison of the motor current for the containment fan cooler motors under the worst-case brake horsepower to the minimum trip current for the thermal overload.

The fan coolers will be operating until the SIS completes the component load shed. Once the fan coolers have been de-energized, the sequencer will then restart them in slow speed. A review of the design specification for the fan coolers (Specification Number 10466-M-620, Rev. 14) was performed. From that review it was determined that the fan coolers were designed to produce airflow of 140,000 CFM at a vapor/air mixture density of 0.075 lbm/ft3 through each of the fan coolers while operating in fast speed. In addition, the water flow under the same conditions would be 1,100 gpm through each of the fan coolers.

The attributes of the vapor/air mixture entering the fan coolers and other operating conditions just prior to the SIS, based on the design specification and Calculation Change Notice (CCN) AN-05-016-000-CN001, "Containment Pressure and Temperature Response of the Limiting MSLB Scenarios, Assuming No Fan Coolers Operation," and the above assumptions, are as follows:

Containment Pressure – 20.7989 psia (6.1 psig)
Containment Temperature – 203.712 degrees F
Total Vapor Mass – 31,454.2 lbm
Total Air Mass – 161,271 lbm
Mixture Density – 0.077 lbm/ft3
Service Water Flow Rate – 1210 gpm
Service Water Temperature – 33 degrees F
Containment Cooler Air Flow Rate – 154,000 cfm
Containment Cooler Tube Fouling Factor - 0 %

A 10% factor has been added to the containment fan cooler air and service water flow rates for conservatism.

Based on the information provided by the vendor and using the design inputs listed above, the wet bulb and dry bulb temperatures of the vapor/air mixture at the fan inlet are as follows:

Wet Bulb 149.0 degrees F
Dry Bulb 151.4 degrees F

Based on the wet/dry bulb temperatures provided by the vendor, the density of the vapor/air mixture entering the fans inlet is 0.076 lb/ft3.

A Containment Air Cooler Duct Pressure Loss Calculation (Attachment 1, Table 7-1 of WCN003-PR-01) shows that the worst-case brake horsepower requirements will occur in the train "A" fan cooler (SGN01A) due to that train having the highest total ductwork pressure loss at rated flow. Therefore, the worst-case brake horsepower for train "A" was determined, which envelopes the other 3 fan coolers.

Table 1, below, provides data points from the fan curve of total pressure (TP_T) and brake horsepower (BHP) provided in the Witness Test Report contained in drawing M-12GN01, "Piping and Instrumentation Diagram Containment Cooling System," along with the calculated total ductwork pressure loss (TP_C), versus flow rate.

Table 1 – Total Pressure, Duct Pressure and BHP at Various Flow Rates Flow Rate

Flow Rate (CFM X10E3)	TP_T (in wg)	TP_C (in. wg)	BHP
100	6.8	6.13	158
110	6.6	7.02	160
120	6.3	7.99	159
130	5.75	9.05	155
140	4.96	10.19	150
150	3.85	11.41	142
160		12.72	
170		14.11	
180		15.59	
190		17.15	
200		18.80	

Note 1: TP_T and BHP were not determined in the Test Report at a flow of 160,000 CFM and above.

Figure 1, below, is a graphical plot of the above values listed in Table 1:

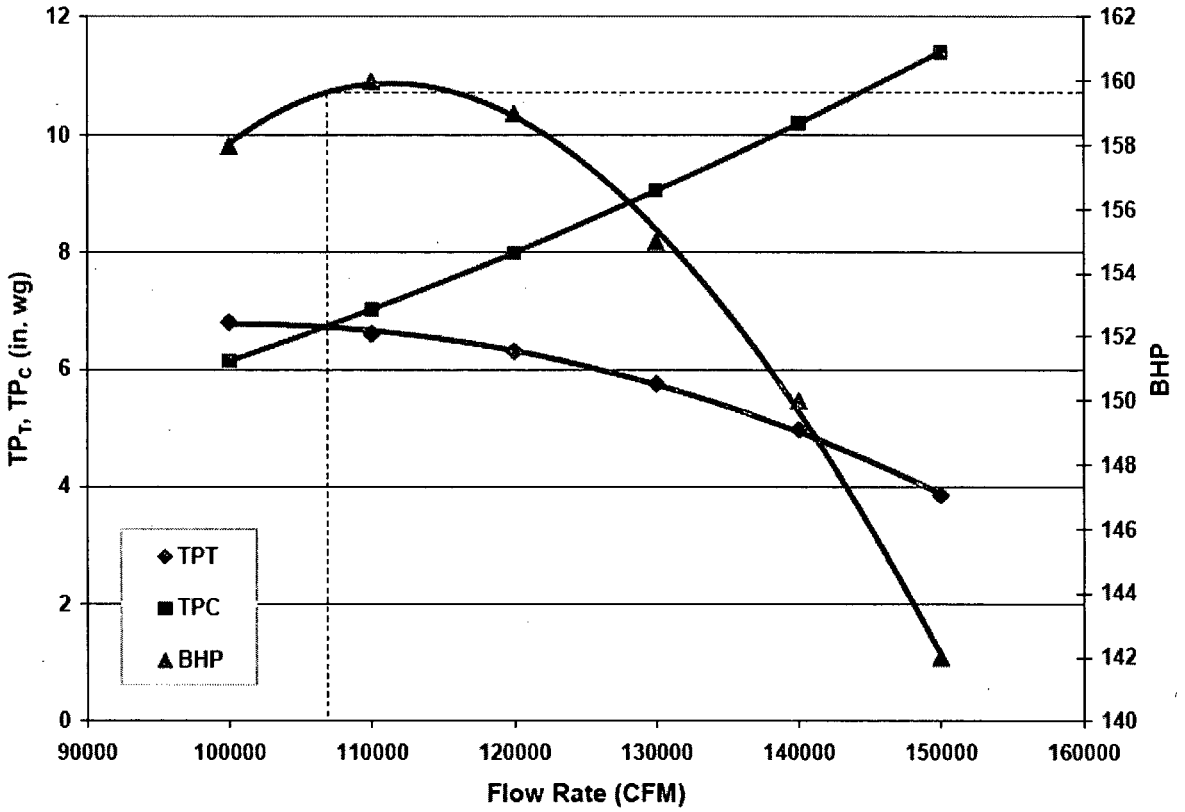

Figure 1 – Graph of Table 1 Values

The operating point of the containment fan cooler (flow and required BHP) is determined by where the fan cooler curve (TP_T) and the system resistance curve (TP_C) intersect. The BHP requirement of the train "A" fan cooler is less than 160 at the flow rate of approximately 107,000 CFM just prior to the Safety Injection Signal. Therefore, the worst-case BHP requirement on the containment fan cooler motors is less than 160 Hp.

Utilizing the worst-case BHP requirement from above, a comparison of the motor current for the containment fan cooler motors to the minimum trip current for the thermal overload was performed.

The worst-case full load amps at 100% loading is 171 Amps per the Reliance test sheet attached to design change package (DCP) 05856, "Heater Size Change, Containment Cooling Fan Motor Starters." Prorating the 150 Hp current to the worst-case 160 Hp current yields:

171 Amps x 160/150 = 182.4 Amps

The motor control center cubicles for the containment fan coolers have adjustable ambient compensated thermal overloads. According to drawing E-11NG20, "Low Voltage System Class IE Motor Control Center Summary," the fan cooler motors are 150/75Hp, the starters are Size 5, and T34 thermal elements (overload heater) are installed for these motors. Vendor manual E-018-00190, "Instruction Manual for Motor Control Centers," indicates that the

current at which the T34 heater will trip the thermal overload is 1.25 times the minimum current of 174 Amps. From drawing E-11NG20, the thermal overloads are set at 100%. This means that the thermal overloads are expected not to trip until 100% of 125% of the minimum trip current:

174 Amps x 1.25 x 100% = 217.5 Amps

The adjustable ambient compensated thermal overloads do not operate at their exact setpoint, as they have a defined plus/minus tolerance. Time-Current Characteristic Curve of drawing E-018-00847 indicates that the lowest possible value the thermal overloads could trip would be at 88% of its setting, and then only if a long-term overload condition existed for greater than 15 minutes (900 seconds).

In addition, the thermal overloads have a standard rating temperature of 40 degrees C (104 degrees F). The overloads are located within motor control centers NG001T through NG004T, which are located in the Auxiliary Building (Rooms 1409 and 1410). The maximum Design Basis Accident temperature for these rooms is 106 degrees F. The Ambient Temperature Correction Curve for these thermal overloads, provided by drawing E-018-00845, indicates that the slightly elevated temperature will reduce the trip point of the thermal overload by less than 1%, which requires multiplying the final trip value by a maximum of 0.99%.

The above two factors must be applied to the minimum trip current of 217.5 Amps:

217.5 Amps x 0.88 x 0.99 = 189.5 Amps

Based upon the above, the thermal overloads will not trip with a current less than 189.5 Amps. The maximum postulated motor current of 182.4 Amps, during the worst-case fast speed BHP conditions, would not result in the thermal overload tripping the containment fan cooler.

Conclusion

At the time WCNOC retracted the 10 CFR 50.72 notification, WCNOC believed that the containment fan coolers were designed to operate at elevated pressures with higher-density steam/air mixtures and that the coolers would have performed their specified function. A calculation to determine the break horsepower requirements of the containment fan coolers prior to a SIS and a comparison of the motor current for the containment fan cooler motors under the worst-case brake horsepower to the minimum trip current for the thermal overload was finalized subsequent to the October 14, 2009 NRC quarterly integrated inspection exit meeting. This calculation concluded that the containment fan coolers would have operated in fast speed under the worst-case environmental conditions and that upon a Safety Injection Signal would have started in slow speed as assumed in the analysis of record. As a result, WCNOC concludes that the condition is not reportable under 10 CFR 50.73(a)(2)(v) since the containment fan coolers were capable of performing their specified function.

CAUSE:

The initial evaluation of reportability focused on criterion 10 CFR 50.73(a)(2)(ii)(B), an event or condition that results in the nuclear power plant being in an unanalyzed condition that significantly degrades plant safety and did not specifically consider criterion 10 CFR 50.73(a)(2)(v).

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ACTIONS TAKEN:

A modification was implemented in Refueling Outage 16, as an enhancement to the defense-in-depth capability of the system, that changed the control circuit on the cooling fan motors to allow the cooling fan to start in slow speed, in the event the fast speed thermal overloads have tripped.

SAFETY SIGNIFICANCE:

As part of the condition report evaluation, an analysis was performed for a spectrum of SBLOCA scenarios and limiting MSLB scenarios with the assumption that the fan coolers were not available to perform their specified function. This analysis determined that for the SBLOCA scenarios the potential failure of the fan coolers, due to harsh environmental conditions, would not challenge the containment integrity, as the passive heat sinks within the containment, along with the actuation of the containment spray system, would function to suppress the containment pressure and temperature surge. For the MSLB scenarios, the analysis determined that the highest peak containment pressure would exceed the analysis of record peak pressure by approximately 5 psig but was still within the design pressure limit. Therefore, this did not result in an unanalyzed condition that significantly affected nuclear safety.

The calculation completed on October 22, 2009, demonstrated that the containment fan cooler design, prior to the Refueling Outage 16 modification, allowed the fan coolers to perform their specified function, confirming no adverse safety significance.

OPERATING EXPERIENCE/PREVIOUS EVENTS:

On May 15, 2008, an operator attempted to start containment fan cooler "B" (SGN01B) in fast speed. The fan cooler started in slow speed and when shifting to fast speed the fan cooler tripped off. Troubleshooting revealed an open circuit on coil 42F causing the fan cooler not to shift to fast speed. The cause of fan cooler trip on May 15, 2008, is unrelated to this event.