Omaha Public Power District
P.O. Box 399 Hwy. 75 - North of Ft. Calhoun Fort Calhoun, NE 68023-0399
402/636-2000

December 14, 1994
LIC-94-0252

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-137
Washington, DC 20555

References: 1. Docket No. 50-285
2. Letter from OPPD (W. G. Gates) to NRC (L. J. Callan) dated November 29, 1994 (LIC-94-0244)

Gentlemen:

Subject: Licensee Event Report 94-010 for the Fort Calhoun Station

Please find attached Licensee Event Report (LER) 94-010 dated December 14, 1994. This report is being submitted pursuant to 10 CFR 50.73(a)(2)(ii) and 10 CFR 50.73(a)(2)(v).

This LER reiterates the "Short Term Actions" specified in Reference 2 regarding revision of applicable plant normal, abnormal and emergency procedures. The LER also discusses conducting design evaluations and submitting a revised LER. These actions correspond to "Long Term Actions" in Reference 2 regarding conduct of design evaluations and submittal of an implementation schedule for any identified changes.

If you should have any questions, please contact me.

Sincerely,

T. L. Patterson

T. L. Patterson
Division Manager
Nuclear Operations

TLP/jrg

Attachment

c: LeBoeuf, Lamb, Greene & MacRae
L. J. Callan, NRC Regional Administrator, Region IV
S. D. Bloom, NRC Project Manager
R. P. Mullikin, NRC Senior Resident Inspector
INPO Records Center

IE22

NRC FORM 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

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

APPROVED BY OMB NO. 3150-0104
EXPIRES 5/31/95

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Fort Calhoun Station Unit No. 1	05000285	1 OF 8

TITLE (4): Potential Accident Scenario Involving Loss of Control Room Air Conditioners

EVENT DATE (5)			LER NUMBER (6)			REPORT NUMBER (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
										05000
11	14	94	94	-- 010 --	00	12	14	94	FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9): 1

POWER LEVEL (10): 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

	20.402(b)		20.405(c)		50.73(a)(2)(iv)		73.71(b)
	20.405(a)(1)(i)		50.36(c)(1)	X	50.73(a)(2)(v)		73.71(c)
	20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)		OTHER
	20.405(a)(1)(iii)		50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		(Specify in Abstract below and in Text, NRC Form 366A)
	20.405(a)(1)(iv)	X	50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)		
	20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Keith A. Voss, Shift Technical Advisor	(402) 533-6931

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
X	YES (If yes, complete EXPECTED SUBMISSION DATE)	NO		03	31	95

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

A potential accident scenario has been identified that could result in inoperability of both Control Room Air Conditioning (CR/AC) units. The scenario involves either a Large Break Loss of Coolant Accident (LBLOCA) or a Main Steam Line Break inside Containment (MSLB/IC). Evaluation indicates that under certain conditions, post-accident Component Cooling Water (CCW) temperature could rise to a point at which the CR/AC unit Freon compressors would shutdown, possibly followed by failure of rupture discs and release of the Freon from the units. Rising Control Room temperature could subsequently hinder Operations personnel and possibly result in design temperatures being exceeded for safety-related electrical equipment in the Control Room cabinets.

Two root causes have been identified. The first involves failure to specify a post-accident CCW temperature on the CR/AC unit procurement specification. The second involves reliance on an inappropriate methodology to establish a maximum post-accident CCW temperature.

Administrative controls have been implemented to address operation until this issue is resolved. Design evaluations will be conducted to identify appropriate actions to resolve this issue.

BACKGROUND

The Fort Calhoun Station (FCS) Control Room Air Conditioning (CR/AC) units (VA-46A and VA-46B) are required to be capable of providing adequate cooling to ensure that equipment operating temperature limitations are not exceeded for equipment within the Control Room envelope. No Technical Specification (TS) Limiting Conditions for Operation (LCOs) directly specify operability requirements for VA-46A/B. However, the Control Room temperature control function is addressed by TS 2.12.1, which states: "If the control room air temperature reaches 105 degrees F, immediate action shall be taken to reduce this temperature and to monitor the temperature within the control cabinets. If the temperature within the control room or the control cabinets exceeds 120 degrees F and cannot be reduced below 120 degrees F in four hours, the reactor will be placed in hot shutdown within the following six (6) hours."

The CR/AC unit Freon condenser heat exchangers are cooled by the Component Cooling Water (CCW) system, which in turn, is cooled by the Raw Water (RW) system. In addition to cooling the CR/AC units, the CCW System provides cooling for various plant heat loads during normal and accident conditions. Four RW pumps (AC-10A, AC-10B, AC-10C and AC-10D) are installed in the Intake Structure to provide river water to the RW/CCW heat exchangers. The CCW system includes three CCW pumps (AC-3A, AC-3B and AC-3C) and four RW/CCW heat exchangers (AC-1A, AC-1B, AC-1C and AC-1D).

The issue discussed in this LER involves an identified accident scenario that could cause inoperability of both CR/AC units. This scenario involves either a Large Break Loss of Coolant Accident (LBLOCA) or a Main Steam Line Break inside Containment (MSLB/IC) with subsequent Engineered Safeguards equipment actuations. Some of the automatic actuations associated with the initial plant response to these two events would include:

- available RW pumps start,
- available CCW pumps start,
- CCW inlet/outlet valves to the available RW/CCW heat exchangers open (Note: any closed RW inlet/outlet valves to these heat exchangers do not open without operator action),
- CCW inlet/outlet valves to the Containment Air Cooling and Filter Unit cooling coils (VA-1A/B) and the Containment Air Cooling Unit cooling coils (VA-8A/B) open,
- the Containment Air Cooling and Filter Unit fans (VA-3A/B) and the Containment Air Cooling Unit fans (VA-7C/D) start,
- Containment Spray pumps start and Containment Spray isolation valves open, and
- both CR/AC units start and the "Filtered Air Makeup Mode" of the Control Room ventilation system is initiated.

EVENT DESCRIPTION

During preparations for a service water system operational performance self assessment, questions were raised regarding the maximum post-accident CCW temperature and its effect on the operation of the CR/AC units. Evaluation of this issue subsequently identified a scenario involving either a LBLOCA or MSLB/IC that could result in inoperability of both CR/AC units.

In the event of a LBLOCA or MSLB/IC with full safeguards actuation, CCW temperature would begin to rise rapidly, largely due to heat input from the containment coolers. The rate and magnitude of the temperature increase would be dependent on a number of factors including: the number of in-service RW/CCW heat exchangers, the number of operating RW pumps, the number of operating CCW pumps, and the temperature of the river water utilized by the RW system. A Design Engineering Nuclear calculation indicates that under a variety of conditions, such an event could result in CCW temperature exceeding 106 degrees F within about three minutes. Depending on RW and CCW system alignments and river temperature, CCW temperature could also exceed 130 degrees F.

If CCW temperature reached 106 degrees F, the CR/AC Freon compressors would be shutdown by the Freon high pressure switches, that are set at 270 psig. The CR/AC unit fans would continue to run, and CCW would continue to be supplied to the Freon condenser heat exchangers. If the CCW temperature to the Freon condenser heat exchangers subsequently exceeded 130 degrees F, which corresponds to a 300 psig saturation pressure for Freon-22, rupture discs would fail and release the Freon into the Control Room. Release of this quantity of Freon into the Control Room was previously evaluated and was determined not to be a personnel safety concern. However, the loss of Freon would render the cooling function of the CR/AC units inoperable and unrecoverable for an indeterminate period.

With the cooling function of both CR/AC units inoperable, Control Room temperature would begin to rise. Factors potentially contributing to the rise would include heat input from: the CR/AC unit fans, fans and heaters associated with Control Room charcoal filters, and Control Room instruments, lighting and relays. Other related factors would include outside air temperature and initial Control Room air temperature. Depending on these factors, it was determined that Control Room temperature could reach or exceed 105 degrees F. The Basis of TS 2.12 indicates that there is a maximum 15 degree F temperature difference between the inside and outside of the control cabinets. Therefore, if the Control Room temperature were to exceed 105 degrees F, the possibility of a control cabinet temperature in excess of 120 degrees F would be introduced.

In this scenario it was postulated that a Control Room temperature potentially in excess of 105 degrees F could hinder Operations personnel in the performance of their duties and could result in design temperatures being exceeded for safety-related electrical equipment in the Control Room cabinets. The potential for high post-accident Control Room temperature would not be significant with respect to the operation of safeguards lockout relays that would have already performed their design function prior to the increase in Control Room temperature. However, the Offsite Power Low Signal (OPLS) might be required to actuate in the later stages of such a scenario (if degraded voltage were to occur, requiring loads to be shed and subsequently sequenced onto the emergency diesel generators), after Control Room/control cabinet temperatures had increased.

On November 14, 1994, a presentation was made to the FCS Plant Review Committee (PRC), discussing this scenario. At 1349 (with the plant in Mode 1 at 100% power), the PRC determined that, based on identification of this scenario, both channels of OPLS should be declared inoperable, requiring entry into TS 2.15(3). TS 2.15(3) specifies that the reactor be placed in a hot shutdown condition within 12 hours.

The NRC was notified of this event at 1448, pursuant to 10 CFR 50.72. A Notification of Unusual Event (NOUE) was declared at 1455, based on entry into a TS LCO requiring plant shutdown. The States of Nebraska and Iowa were notified of the NOUE by 1508 and the NRC Resident Inspector was notified at 1509. A reactor power reduction was initiated at 1630.

At 1850, the PRC accepted the technical content of a draft Safety Analysis for Operability (SAO). The PRC determined that, with the compensatory actions identified in the draft SAO and implemented by an Operations Memorandum, continued plant operation was acceptable. CCW to one of the CR/AC units was isolated, and at 1928, both channels of OPLS were declared operable, Technical Specification 2.15(3) was exited, and the power reduction was stopped. The NOUE was terminated at 1950. At 2010, the NRC was notified of the termination of the NOUE. SAO 92-02-00 was subsequently finalized and approved by the PRC on November 18, 1994. Revision 01 to the SAO (i.e., SAO 92-02-01) was approved on December 12, 1994. This LER is being submitted pursuant to 10 CFR 50.73(a)(2)(ii) and 10 CFR 50.73(a)(2)(v).

SAFETY ASSESSMENT

Probabilistic Safety Assessment was used to evaluate the risk significance of the scenario described in this LER. Based on conservative assumptions, it was concluded that the severe core damage frequency, prior to corrective actions, was less than 1 E-04 per year.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Fort Calhoun Station Unit No. 1	05000285	94	-- 010 --	00	5 OF 8

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

Analysis has determined that Control Room air temperature would remain below 105 degrees F under the following conditions: outside air temperature is below 60 degrees F, initial Control Room temperature is below 80 degrees F, one CR/AC unit fan is prevented from starting, and the operating CR/AC unit fan is secured within 20 minutes of the loss of Control Room cooling. Administrative controls were implemented to maintain Control Room temperature below 80 degrees F during normal plant operation, prevent one CR/AC unit from starting and to shutdown the operating CR/AC unit for any event involving a reactor trip.

Additional compensatory measures were a[illegible] identified to address the potential for an outside air temperature at or above 60 degrees F and to limit post-accident CCW peak temperature. These measures include: maintaining RW flow to at least three RW/CCW heat exchangers, initiating plant shutdown if river temperature exceeds 50 degrees F, restricting the allowed duration of inoperability of certain components and providing guidance to operators with respect to responding to a LBLOCA or MSLB/IC. These measures have been determined to ensure an acceptable level of risk with respect to operation for a limited period (administratively set at 250 hours) at an outside air temperature above 60 degrees F. (See Corrective Actions for additional details.)

With the implementation of these administrative controls, the core damage probability associated with this scenario has been determined not to be risk significant.

CONCLUSIONS

The equipment specification for the original CR/AC units indicated that after a reactor accident, condenser inlet water (i.e., CCW) temperature could rise to 120 degrees F, and that continued operation at reduced capacity was required for this condition. Review of available documentation indicates that the original CR/AC units would not have been capable of continued operation at even minimal load with a CCW temperature of 120 degrees F.

The original CR/AC units were replaced in 1988 under Modification MR-FC-81-51. The design portion of the MR-FC-81-51 modification package similarly identified 120 degrees F as the post-accident maximum temperature of CCW. However, a review of the procurement specification for the replacement air conditioners found no mention of a post-accident CCW temperature of 120 degrees F. Only the normal temperature range (55 to 90 degrees F) of condenser water (i.e., CCW) was listed. The procurement specification was prepared by a contractor and reviewed by OPPD personnel.

With respect to post-accident CCW temperature, it appears that the 120 degree F value has been in use since original plant construction. No documentation was located that would indicate that a calculation of maximum post-accident CCW temperature was performed as a part of the original design of the plant.

Two root causes have been identified as being associated with this event. The first involved failure to include a specific post-accident CCW temperature in the CR/AC unit procurement specification. This was attributed to an apparent oversight during preparation of the specification, and inadequate review. The second root cause was reliance on an inappropriate methodology to establish a maximum post-accident CCW temperature.

CORRECTIVE ACTIONS

Administrative controls were developed as an interim measure to establish a high level of assurance that Control Room air temperature will be maintained below 105 degrees F in the event of a LBLOCA or MSLB/IC. These administrative controls are summarized below:

- Outside air temperature can exceed 60 degrees F for a cumulative total of no more than 250 hours for the period of operation covered by the SAO.
- Control Room temperature must be maintained below 80 degrees F during plant Modes 1, 2 and 3 and with Reactor Coolant System (RCS) temperature greater than 300 degrees F.
- CCW flow to one CR/AC unit (i.e., the "protected" unit) must be isolated and the control switch for this unit must remain in "STOP".
- RW flow must be maintained through a minimum of three RW/CCW heat exchangers, during plant Modes 1, 2 and 3 and with RCS temperature greater than 300 degrees F.
- The river temperature must be less than or equal to 50 degrees F.
- The in-service CR/AC unit may be inoperable for up to 24 hours, as long as the Control Room temperature remains below 80 degrees F.
- If the "protected" CR/AC unit is determined to be inoperable (e.g., loss of Motor Control Center) for more than 8 hours, then the in-service unit shall be isolated to become the one "protected" unit.

- One of the following conditions is allowed:

  - one RW/CCW heat exchanger may be inoperable for up to 14 days, or

  - one RW pump may be inoperable indefinitely and an additional RW pump (two total) may be inoperable for up to 24 hours.

If any of the previous restrictions cannot be maintained during normal plant operation, then the action statement for TS 2.15(3) is to be followed (requiring initiation of a plant shutdown).

In addition to the previous operational restrictions, direction has been provided to Operations personnel specifying that for any event where the reactor trips or is tripped, action is to be taken to shutdown the operating CR/AC unit fan. Also, Operators have been provided guidance on how to minimize CCW temperature following an accident (LBLOCA or MSLB) and how and when to restore Control Room cooling by starting the "protected" CR/AC unit. This guidance addresses:

- maximizing RW flow through the RW/CCW heat exchangers,

- securing one of the three operating CCW pumps,

- when to secure containment coolers,

- when to use the "protected" CR/AC unit and what to do if it cannot be restored.

The plant operations staff has been trained on this issue, associated compensatory measures and the Operations Memorandum.

The following additional corrective actions have been or will be completed:

1. Applicable plant normal, abnormal and emergency procedures required to assure proper operator action will be revised and implemented by December 16, 1994.

2. a. OPPD will conduct design evaluations and supporting analyses of the Control Room air conditioners, CCW and RW systems by March 3, 1995, to identify appropriate actions to resolve this issue.

   b. A transient analysis of the CCW and RW systems will be completed to determine post-accident CCW temperature as a function of time. This analysis will be completed by March 3, 1995.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Fort Calhoun Station Unit No. 1	05000285	94	-- 010 --	00	8 OF 8

TEXT (if more space is required, use additional copies of NRC Form 366A) (17)

c. Upon completion of the design effort, OPPD will issue a revised LER detailing the specific long term corrective actions along with an implementation schedule for any identified changes. The revised LER will by submitted by March 31, 1995.

PREVIOUS SIMILAR EVENTS

LERs 90-014 and 90-025 discuss previous events involving design issues associated with the CCW system.