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RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 93-031-00:on 931109,determined that MCR HVAC sys will not maintain CR temp below design basis limit of 104 F following DBA due to inadequate design margin in original desing.PER written.W/931209 ltr.

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WASHINGTON PUBLIC POWER SUPPLY SYSTEM

P.O. Box 968 • 3000 George Washington Way • Richland, Washington 99352

December 9, 1993
G02-93-286

Docket No. 50-397

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

Subject: NUCLEAR PLANT WNP-2, OPERATING LICENSE NPF-21
LICENSEE EVENT REPORT NO. 93-031

Transmitted herewith is Licensee Event Report No. 93-031 for the WNP-2 Plant. This report is submitted in response to the report requirements of 10CFR50.73 and discusses the items of reportability, corrective action taken, and action taken to preclude recurrence.

The event reported by this LER does not presently affect plant operability. A supplemental response to this LER will be submitted.

Sincerely,

J. V. Parrish (Mail Drop 1023)
Assistant Managing Director, Operations

JVP/KRL/cgeh
Enclosure

cc: Mr. B. H. Faulkenberry, NRC - Region V
Mr. R. Barr, NRC Resident Inspector (Mail Drop 901A, 2 Copies)
INPO Records Center - Atlanta, GA
Mr. D. L. Williams, BPA (Mail Drop 399)

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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Washington Nuclear Plant - Unit 2	0 5 0 0 0 3 9 7	1 OF 5

TITLE (4)
MAIN CONTROL ROOM HVAC HIGH TEMPERATURE CONDITION DURING A DBA

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBERS(S)
1 1	0 9	9 3	9 3	0 3 1	0 0	1 2	0 9	9 3		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	1 0 0	20.402(b)	20.405(C)	50.73(a)(2)(iv)	77.71(b)
		20.405(a)(1)(i)	50.36(c)(1)	X 50.73(a)(2)(v)	73.73(c)
		20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	below and in Text, NRC
		20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	Form 366A)
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
K. B. Lewis, Technical Specialist	AREA CODE 5 0 9 3 7 7 - 4 1 4 5

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		1	07	94

ABSTRACT (16)

At 1200 hours on November 9, 1993, with the reactor at 100% power, an engineering evaluation determined that the Main Control Room HVAC system will not maintain control room temperature below the design basis limit of 104 degrees Fahrenheit following a Design Basis Accident (DBA). This postulated event involves warm-weather conditions with only the Standby Service Water system available for heat removal. The potential to exceed this design temperature limit is based on current knowledge of Standby Service Water system fouled cooling coil UA values.

Upon discovery, a PER was written to document the potential design analysis concerns. Further corrective actions include revising the applicable procedure to maintain control room temperature below its design limit and reviewing other components utilizing service water to ensure appropriate fouling and cooling water temperatures have been considered.

The root cause of this event was inadequate design margin in the original design including a failure to account for cooling-coil fouling. A contributing cause was a less than adequate process for factoring fouling considerations into the original and subsequent design calculations.

Although this condition does not presently affect plant operability, the design basis temperature could have been exceeded during past summers coincident with design basis accident conditions.

Plant Conditions

Power Level - 100%
Plant Mode - 1 (Power)

Event Description

At 1200 hours on November 9, 1993, with the reactor at 100% power, an engineering evaluation determined that the Main Control Room HVAC system will not maintain control room temperature below the design basis limit of 104 degrees Fahrenheit following a Design Basis Accident (DBA). This postulated event involves warm-weather conditions with only the Standby Service Water system available for heat removal. The potential to exceed this design temperature limit is based on current knowledge of Standby Service Water system fouled cooling coil UA values. New calculations indicate that Main Control Room temperature could exceed 104 degrees Fahrenheit 22 hours into the postulated accident and that its temperature could peak at 106.1 degrees Fahrenheit.

Calculations show that a standby service water temperature of 85.7 degrees Fahrenheit can maintain the Main Control Room at or below the 104 degrees Fahrenheit design limit. As shown by calculation ME-02-93-12, for a postulated DBA during the months of October through April, the maximum service water temperature does not exceed 80.8 degrees Fahrenheit; therefore, with significant margin, control room operability is not compromised by this event during those months. Only during warm-weather months would reduced heat load be needed to preclude the potential to exceed the 104 degrees Fahrenheit design limit.

Immediate Corrective Action

Upon discovery, a PER was written to document the potential design analysis concerns. Because this postulated event does not currently affect plant operability, no additional immediate corrective action was necessary.

Further Evaluation, Root Cause, and Corrective Action

Further Evaluation

1. On November 9, 1993, at approximately 1408 hours, this event was reported to the NRC by telephone in accordance with 10CFR50.72(b)(2)(iii)(D) which requires the Licensee to notify the NRC within four hours of "any event ... that alone could have prevented the fulfillment of the safety function of structures of systems that are needed to mitigate the consequences of an accident". This event is also being reported to the NRC in accordance with 10CFR50.73.(a)(2)(v)(D) "... mitigate the consequences of an accident".

2. There were no structures, components, or systems inoperable at the time of this report submittal that contributed to this hypothetical problem.

3. The Main Control Room HVAC system includes two divisional air handlers, WMA-AH-51A1 and 51B1. Each air handler is provided with normal and emergency cooling coils. Emergency coils WMA-CC-51A-1 and 51B-1 which include connections with the Standby Service Water system and an Emergency Chiller system provided for control room habitability. As stated, the potential to exceed the Main Control Room design temperature limit is based on current knowledge of Standby Service Water system fouled cooling coil UA values. These items are now discussed.

   a. The original 1971 Burns and Roe calculation (BRI 9.32.0 and its two subsequent revisions) which calculated Main Control Room, Cable Spreading Room, and Critical Switchgear Room HVAC system temperatures demonstrated that the Main Control Room would remain below 104 degrees Fahrenheit with a service water temperature of 85 degrees Fahrenheit, fixed load values and appropriate safety factors, and a UA value corresponding to 100% efficiency.

   b. Following the original 1971 Burns and Roe calculation, utilities began to receive industry documents describing biofouling problems associated with service water cooling coils and heat exchanger tubes. Specifically, NRC Generic Letter GL 89-13, "Service Water System Problems Affecting Safety-Related Equipment (July 1989)" included recommended actions to mitigate the effects of biofouling. In compliance with NRC GL 89-13, the Supply System implemented by R7 (1991) differential pressure and thermal performance testing on water-to-water heat exchangers in the plant, and differential pressure testing on cooling coils served by service water.

      As performance concerns developed from the water-to-water testing, it was decided to expand the thermal performance testing to cooling coils. In the spring of 1992, cooling coil performance was measured and found to be below acceptable levels; cooling coils were then cleaned during the R8 outage. Monitoring of the coils has continued through two summers, and it has been found that a performance level above 65% UA (manufacturer's predicted value is 100%) can be assured with current water treatment methods.

   c. During the months of January and February 1992, the NRC conducted Electrical Distribution System Functional Inspection EDSFI 92-02. This inspection identified the need to update maximum temperatures associated with Engineered Safety Feature (ESF) equipment rooms and maximum service water temperatures during warm-weather conditions. Results of calculations driven by this inspection and results of ESF room cooler performance monitoring indicating degraded UA values due to fouling prompted recognition of the need to revise room temperature calculations including those for the Main Control Room.

d. Due to the substantial amount of electrical engineering work required to determine the value of each individual control room heat load, mechanical engineering alternatively performed a test to conservatively determine the Main Control Room HVAC heat load in March 1993. This test was performed with normal control room heat loads active to provide a conservative bounding load for use in analyses of the control room HVAC system during DBA conditions.

1) Support of the R8 Outage initially delayed analysis of this test data.

2) In June 1993, initial review of test data showed a control room heat load similar to that used in previous calculations which resulted in an acceptable control room temperature.

3) On November 9, 1993, further evaluation of reduced UA values confirmed that the 104 degrees Fahrenheit design limit could be exceeded during periods of peak service water temperatures during warm-weather conditions with existing measured heat loads. Specifically, the maximum control room temperature could reach 106.1 degrees Fahrenheit during this postulated event.

Root Cause

The root cause of this event was inadequate design margin in the original design. Specifically, service water cooling coils installed with the Main Control Room HVAC air handlers were not designed with sufficient margin to account for fouling, as well as increases in Main Control Room load and service water temperature over the design life of the plant. Additionally, initial calculations involving control room temperatures used a UA value of 100%, which reflects an early failure to consider biofouling of heat exchanger tubes and cooling coils transporting spray pond water. A contributing cause was a less than adequate process for factoring fouling considerations into the original and subsequent design calculations.

Further Corrective Action

1. Abnormal Condition Procedure PPM 4.4.5.2 (Service Water System Operation without Tower Makeup), was deviated on November 12, 1993, to provide instructions for ensuring service water spray pond temperature does not preclude service water from maintaining control room temperature below its design limit.

2. Further corrective action will be identified in a supplemental LER due to the NRC by January 7, 1994.

Safety Significance

This event has safety significance because the control room design temperature limit could have been exceeded if this postulated event had occurred. Exceeding the design limit could have possibly degraded control room equipment. The Main Control Room temperature is calculated to reach 106.1 degrees Fabrenheit during this postulated event. Further analysis of the safety significance of this event will be discussed in a supplement to this LER.

Similar Events

There are no LER events similar to this event.

EIIS Information

Text Reference

This section will be discussed in a supplemental LER.

EIIS Reference

System

Component