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 RECIP. NAME RECIPIENT AFFILIATION

SUBJECT: LER 91-035-00: on 911220, plant manually scrammed to complete controlled shutdown due to high reactor coolant conductivity caused by failed tube in main condenser. Condenser tube plugged. W/920115 ltr.

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January 15, 1992
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Docket No. 50-397

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Washington, D. C. 20555

Subject: NUCLEAR PLANT NO. 2
LICENSEE EVENT REPORT NO. 91-035

Dear Sir:

Transmitted herewith is Licensee Event Report No. 91-035 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.

Very truly yours,

J. W. Baker
WNP-2 Plant Manager

Enclosure:
Licensee Event Report No. 91-035

cc: Mr. J. B. Martin, NRC - Region V
Mr. C. Sorensen, NRC Resident Inspector (M/D 901A)
INPO Records Center - Atlanta, GA
Ms. Dottie Sherman, ANI
Mr. D. L. Williams, BPA (M/D 399)
NRC Resident Inspector - walk over copy

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Author: JD Arbuckle <i>John D. Arbuckle 1/15/92</i>		For Signature of: JW Baker <i>JW Baker</i>	
Section:			
For Approval of:	MP Reis	RL Webring	
Approved:	<i>MP Reis</i>	<i>RL Webring</i>	
Date:	1/15/92	1/15/92	

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WASHINGTON PUBLIC POWER SUPPLY SYSTEM

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

January 15, 1992
G02-92-012

Docket No. 50-397

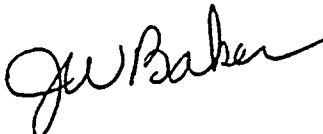
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Washington, D. C. 20555

Subject: NUCLEAR PLANT NO. 2
LICENSEE EVENT REPORT NO. 91-035

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Very truly yours,



J. W. Baker (M/D 927M)
WNP-2 Plant Manager

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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)

Washington Nuclear Plant - Unit 2

DOCKET NUMBER (2)

0 5 0 0 0 3 9 7

PAGE (3)

1 OF 5

TITLE (4)

Manual Scram Due to Reaching Technical Specification Limit For Reactor Coolant Conductivity - Main Condenser Tube Leak

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	2	09	1991	035	00	0	1	15		05000		
										05000		

OPERATING MODE (9) THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

1

POWER LEVEL (10)	0	2	0	20.402(b)	20.405(c)	<input checked="" type="checkbox"/>	50.73(a)(2)(iv)	77.71(b)
				20.405(a)(1)(i)	50.36(c)(1)		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 below and in Text, NRC Form 366A)
				20.405(a)(1)(iii)	50.73(a)(2)(i)		50.73(a)(2)(viii)(A)	
				20.405(a)(1)(iv)	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
J. D. Arbuckle, Compliance Engineer	
	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
X	SG	T B G W	1 2 0	N					

SUPPLEMENTAL REPORT EXPECTED (14).

EXPECTED SUBMISSION DATE (15)

MONTH DAY YEAR

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

ABSTRACT (16)

On December 20, 1991 at 1250 hours the Plant was manually scrambled to complete a controlled shutdown due to high reactor coolant conductivity. During the event period, Plant personnel were in the process of attempting to identify the source of a suspected Main Condenser tube leak. This troubleshooting effort was being performed as a result of two conductivity excursions that had recently occurred, but where Technical Specification limits were not reached.

During troubleshooting efforts, a leak of approximately 65 gpm developed in Section A of the Main Condenser, and conductivity levels increased. Efforts by Plant personnel to control the conductivity excursion by reducing reactor power and securing one of three Circulating Water (CW) System pumps were unsuccessful. Accordingly, Plant Control Room Operators took appropriate and timely action to shutdown the Plant and maneuver to the cold shutdown condition.

The cause of this event was a failed tube in the Main Condenser. An axial crack, approximately 8 to 12 inches in length, was later discovered on an interior tube. Corrective actions consist of 1) plugging the failed tube and performing sonic leak testing of all condenser tubes, 2) performing a Management Evaluation to resolve problems associated with conductivity excursions, and 3) performing Nondestructive Examination (Eddy Current Testing) of tubing during the Spring 1992 Maintenance and Refueling Outage. This event is reportable in accordance with 10CFR50.73 as a completion of any shutdown required by the Plant Technical Specifications.

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							9 1	0 3 5	0 0	2 OF 5	
TITLE (4) Manual Scram Due to Reaching Technical Specification Limit For Reactor Coolant Conductivity - Main Condenser Tube Leak											

This event also posed no threat to the health and safety of either the public or Plant personnel.

Plant Conditions

- a) Power Level - 20%
- b) Plant Mode - 1 (Power Operation)

Event Description

On December 20, 1991 at 1250 hours the Plant was manually scrambled during a controlled shutdown due to reaching the Technical Specification conductivity limit of 10 micro-mho/centimeter. During the event period, Plant personnel were in the process of attempting to identify the source of a suspected Main Condenser tube leak. This troubleshooting effort was being performed as a result of two recent conductivity excursions that had occurred (but where the Technical Specification limit was not reached). These excursions are discussed in the Further Evaluation section of this LER.

Prior to the event period the Plant was at 100% steady-state operation with two Circulating Water (CW) System pumps in operation (CW-P-1A and CW-P-1C). At 0841 hours, the third Circulating Water pump (CW-P-1B) was started and sulfur hexafluoride (a tracer gas) was injected into the system in an attempt to identify the source of the suspected leakage. By 1046 hours, conductivity was on an increasing trend from 0.18 to 0.30 micro-mho/centimeter, and a leak (later estimated to be approximately 65 gpm) was discovered in Section A of the condenser during the testing efforts. Pump CW-P-1B was then secured as an attempt to reduce the in-leakage. However, conductivity continued to increase and, at 1055 hours, Control Room Operators commenced a reactor downpower when the level reached approximately 1.0 micro-mho/centimeter.

Conductivity level continued on an increasing trend and Plant Control Room Operators had reduced reactor power level to 69% by the time conductivity levels reached 3.5 micro-mho/centimeter at 1121 hours. However, with a controlled Plant shutdown in progress, conductivity levels continued to increase. At 1227 hours conductivity levels reached 9.0 micro-mho/centimeter and Control Room Operators made preparations to initiate a manual scram. The reactor was manually scrambled at 1250 hours when conductivity levels reached the Technical Specification limit of 10 micro-mho/centimeter.

Subsequent cooldown efforts continued following the reactor scram and, at 2010 hours, Plant Control Room Operators placed the reactor in Operational Mode 4 (Cold Shutdown).

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TITLE (4) Manual Scram Due to Reaching Technical Specification Limit For Reactor Coolant Conductivity - Main Condenser Tube Leak														

Immediate Corrective Action

There was no additional immediate corrective action other than Plant Control Room Operators taking appropriate and timely action to shutdown the Plant and maneuver to the cold shutdown condition as required by the Technical Specifications.

Further Evaluation and Corrective Action

A. Further Evaluation

1. This event is reportable in accordance with the requirements of 10CFR50.73(a)(2)(i)(A), "The completion of any nuclear plant shutdown required by the plant's Technical Specifications." The Technical Specifications require during Operational Condition 1 that, with conductivity exceeding 10 micro-mho/centimeter, the Plant be in at least HOT SHUTDOWN within 12 hours and in COLD SHUTDOWN within the next 24 hours.

This event is also reportable in accordance with the requirements of 10CFR50.73(a)(2)(iv), "Any event or condition that resulted in manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (i.e., manual scram)."

2. There were no other systems, structures or components that were inoperable at the time of the event that contributed to the event.
3. The cause of this event was a failed tube in the Main Condenser. Following the shutdown the system was visually inspected (video camera) and an axial crack, approximately 8 to 12 inches in length, was discovered on an interior tube in the upper portion of the inlet pass of Section A (the tube also appeared to be partially filled with debris in the crack area). However, the reason for the failure is indeterminate until the tube is removed for inspection during the Spring 1992 Maintenance and Refueling Outage.
4. Extensive efforts to determine the source of a suspected Main Condenser tube leak had been ongoing during the past two months due to other conductivity excursions that occurred (but where Technical Specification limits were not reached).

On October 31, 1991 a precautionary shutdown from 100 percent power was initiated due to increasing conductivity levels in the reactor coolant water. At the time the reactor was manually scrambled as part of a pre-planned sequence on November 1, 1991 (0300 hours), conductivity had trended down to 0.36 micro-mho/centimeter from a high of 0.465 micro-mho/centimeter that occurred on October 31, 1991 (1927 hours). The

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cause of this conductivity excursion was indeterminate. Although a very small tube leak was detected (and subsequently plugged) during an inspection, the size of leak was determined to be insufficient to produce the observed conductivity increases. During the course of the root cause analysis, several possible causes were identified which included 1) a tube leak that "self cured" (plugged by debris), or 2) an intermittent tube sheet leak. Either of these may also have been exacerbated by having three Circulating Water System pumps in operation at the same time. However, a second check for leakage was performed during a subsequent shutdown for non-chemistry related problems and no tube leaks were discovered. All tubes that could not be verified to be clear by visual examination were flushed and acceptable flow rates were noted, except for three which exhibited reduced flow. As a precaution, those three tubes were plugged. It was also determined at that time that there was not a problem with operating three Circulating Water pumps simultaneously because the Plant had been in that configuration routinely since the excursion and conductivity levels remained well within Technical Specification limits.

On December 16, 1991 with the Plant at 100 percent power and three Circulating Water pumps in operation, another conductivity excursion occurred that was very similar to the event of October 31, 1991. As a precaution, one of the Circulating Water pumps was secured and conductivity trended down to normal limits from a high of 0.57 micro-mho/centimeter. As a result of this latter conductivity excursion, the decision was then made to attempt to locate the source of the suspected condenser leak by injecting sulfur hexafluoride into the circulating water path at each water box inlet.

B. Further Corrective Action

1. The failed condenser tube was successfully plugged and a sonic leak test was performed on all tubes to verify no other leakage existed.
2. A Management Evaluation is currently in progress to resolve these problems associated conductivity excursions. Included in this evaluation is the completion of a formal root cause analysis, ongoing engineering reviews and a followup assessment by the Chemistry Control Committee.
3. To-date, approximately 32 percent of the tubing in the Main Condenser has been nondestructively examined by means of the eddy current testing method. There is currently an ongoing evaluation in progress to determine if the scope of testing planned for the Spring 1992 Maintenance and Refueling Outage should be expanded.

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Safety Significance

There is no safety significance associated with this event. The water chemistry limits of the reactor coolant system are conservatively established to prevent damage to the reactor materials in contact with the coolant. When conductivity is within its normal range, other impurity measurement parameters such as pH and chlorides will also be within normal limits. These requirements provide adequate assurance that concentrations in excess of the limits will be detected in sufficient time to take corrective action.

In this particular situation, appropriate and timely action was taken to shutdown the reactor and place it in a cold shutdown condition within the time-frame required by the Technical Specifications. These actions are taken to reduce pressures and temperatures and, therefore, minimize the effect on materials in contact with reactor coolant. In addition, normal operating restrictions have been established at a fraction of the Technical Specification limits to further ensure the integrity of the fuel cladding and reactor structures/components. Accordingly, this event did not affect the health and safety of either the public or Plant personnel.

Similar Events

1. LER 84-083, "Manual Scram of Reactor due to High Reactor Coolant Conductivity." This LER described an identical event where the Plant was manually scrammed when reactor coolant conductivity exceeded the Technical Specification limit due to a failed condenser tube. Corrective action consisted of plugging the failed tube and issuing a Chemistry Guidance Letter to aid in early conductivity excursion assessment.
2. LERs 88-006-00 and 88-006-01, "Low Reactor Pressure Vessel Level Reactor Protective System Actuation as a Result of Procedural Inadequacy." This LER described an event where a manual scram was initiated due to high reactor coolant conductivity problems; however, following the scram, a series of reactor vessel level transients resulted in a Reactor Pressure Vessel low-level actuation. The high conductivity condition was the result of ruptured tubes in the Main Condenser. Corrective actions for that event included modification of a condenser baffle design and repair of the tubing.

EIIS Information

Text Reference

EIIS Reference

	System	Component
Main Condenser	SG	COND
Circulating Water (CW) System	KE	---
CW-P-1A	KE	P
CW-P-1B	KE	P
CW-P-1C	KE	P
Reactor Pressure Vessel (RPV)	SB	RPV

