Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381-2000

John A. Scalice
Site Vice President, Watts Bar Nuclear Plant

MAY 2 0 1996

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

Gentlemen:

In the Matter of the) Docket No. 50-390
Tennessee Valley Authority)

WATTS BAR NUCLEAR PLANT (WBN) - UNIT 1 - FACILITY OPERATING LICENSE NPF-90 - LICENSEE EVENT REPORT (LER) 50-390/96015

Enclosed is LER 50-390/96015 which details an Engineering Safety Feature (ESF) actuation (automatic startup of the Auxiliary Feedwater System). This actuation resulted from a Main Feedwater pump trip at the same time a Main Feedwater pump was out-of-service for maintenance.

Submittal of this report is in accordance with 10 CFR 50.73(a)(2)(iv).

Sincerely,

J. A. Scalice

Enclosure
cc: See page 2

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cc (Enclosure):
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Watts Bar Nuclear Plant
1260 Nuclear Plant Road
Spring City, Tennessee 37381

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Enclosure
LER 50-390/96015

NRC FORM 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 04/30/98
ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20603.

LICENSEE EVENT REPORT (LER)

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

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Watts Bar Nuclear Plant - Unit 1	05000390	1 OF 5

TITLE (4)

Main Feedwater Pump Trip Due to Low Main Feedwater Pump Turbine Condenser Vacuum

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 NAME	DOCKET NUMBER
										05000
04	21	96	96	015	00	05	21	96	FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)			
POWER LEVEL (10)	012	20.2201(b)	20.2203(a)(2)(v)	50.73(a)(2)(i)	50.73(a)(2)(viii)
		20.2203(a)(1)	20.2203(a)(3)(i)	50.73(a)(2)(ii)	50.73(a)(2)(x)
		20.2203(a)(2)(i)	20.2203(a)(3)(ii)	50.73(a)(2)(iii)	73.71
		20.2203(a)(2)(ii)	20.2203(a)(4)	X 50.73(a)(2)(iv)	OTHER
		20.2203(a)(2)(iii)	50.36(c)(1)	50.73(a)(2)(v)	Specify in Abstract below
		20.2203(a)(2)(iv)	50.36(c)(2)	50.73(a)(2)(vii)	or in NRC Form 366A

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Walt Lewellyn, Compliance Licensing Engineer	(423)-365-1812

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
B	SH	N/A	N/A	N						

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

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

On April 21, 1996, at approximately 1650 EST, with WBN Unit 1 in Mode 1 at 12% power, Main Feedwater pump turbine (MFPT) 1A tripped due to low MFPT condenser vacuum. Because MFP 1B had previously been removed from service for maintenance, an Auxiliary Feedwater (AFW) auto start (Engineered Safety Feature [ESF] actuation) initiated as required. At the time of the trip, vacuum line adjustments were in progress by operators in accordance with System Operating Instruction (SOI)-2 & 3.01, "Condensate and Feedwater System." Abnormal Operating Instruction (AOI)-16, "Loss of Main Feedwater," was entered, and reactor power was reduced to within AFW capability. The Standby Main Feedwater pump was later placed in service and the AFW was removed from service.

The cause of the pump trip was low MFPT 1A condenser vacuum which occurred while the vacuum line was being adjusted. The design of the system required a difficult manual adjustment of the flow to the condenser vacuum pump. Interim actions included placing placards on temporary vacuum gauges identifying correction factors for adjustment for elevation (head) and conducting crew briefings (prior to assuming shift) discussing the event.

Pump restart was authorized based on the addition of the operator aids in determining vacuum and based on briefing operating crews on the event. Corrective actions included installing permanent vacuum monitoring instrumentation for the MFP condensers, changing the low vacuum alarm setpoint to provide early warning prior to the trip setpoint and modifying the MFPT condenser vacuum line to connect directly to the main condenser. This modification provides a more stable and reliable vacuum source.

I. PLANT CONDITIONS:

WBN Unit 1 in Mode 1 at 12% power operation, with the Reactor Coolant System temperature and pressure of 561 degrees F and 2235 psi, respectively.

II. DESCRIPTION OF EVENT

A. Event

At 1609 EST, on April 21, 1996, MFP 1B (Energy Industry Identification System [EIIS] Code P) was removed from service (manually tripped) for maintenance, and General Operating Instruction (GO)-3, "Unit Startup from Less Than 4 Percent Reactor Power to 30 Percent Reactor Power," was in effect.

At 1630 EST, vacuum line valve (EIIS Code V) adjustments were in progress using SOI-2 & 3.01, Section 5.10, step 30. Operators were assigned the task of making the adjustment due to recurring main condenser (EIIS Code COND) vacuum back pressure problems. The vent valve was less than 1/2 turn open and the adjustment resulted in closing the valve for a period of ten seconds or less.

At approximately 1650 EST, while Unit 1 was in Mode 1, the 1A MFPT (EIIS Code TRB) tripped. Because MFP 1B had also been tripped, the Auxiliary Feedwater (EIIS Code BA) auto start logic was made up and the pumps started as required.

AOI-16 was entered, and reactor power was reduced to within AFW capability. The Standby Main Feedwater (EIIS code BA) pump was later placed in service, and the Auxiliary Feedwater pumps were removed from service and AOI-16 exited.

B. INOPERABLE STRUCTURES, COMPONENTS, OR SYSTEMS THAT CONTRIBUTED TO THE EVENT

No inoperable structures, components, or systems contributed to the event

C. Dates and Approximate Times of Major Occurrence

April 21, 1996:

- 1609 EST - MFP 1B was removed from service and GO-3 was entered,
- 1630 EST - An operator was dispatched to the 1A MFPT condenser to check the vacuum and make adjustments as required in accordance with SOI-2 & 3.01.
- 1650 EST - The 1A MFPT tripped. The trip resulted in the start of the Auxiliary Feedwater System which is an ESF actuation. Entered AOI-16.
- 1734 EST - AOI-16 was exited; the Standby MFP was placed in service, and the Auxiliary Feedwater was removed from service.

D. Other Systems or Secondary Functions Affected

No other systems or secondary functions were affected by this event.

E. Method of Discovery

The MFP 1A low vacuum trip and subsequent initiation of AFW were annunciated in the control room.

F. Operator Actions

The operators entered and performed the steps of procedure AOI-16.

G. Automatic and Manual Safety System Responses

1A MFPT tripped.

An AFW pump automatic startup was initiated, and reactor power was manually reduced to AFW capability in accordance with AOI-16.

III. CAUSE OF EVENT

A. Immediate Cause

The cause of the MFPT trip was loss of pump condenser vacuum.

B. Root Cause

The root cause was an inadequate original design which required a difficult adjustment of the flow to the condenser vacuum pump. Contributing was a failure to incorporate a Sequoyah Nuclear Plant (SQN) modification into the WBN design. A conscious decision to not consider piping modifications during a "lessons learned" review masked the needed modification which would have prevented this event. The need for this design modification was later recognized and a design change was issued on March 18, 1996, to revise the piping configuration. At the time of the event, this design change had not been implemented; however, implementation had been planned for a future date.

The initial WBN design had previously caused steam binding of the Main Condenser vacuum pumps because the MFPT condenser vacuum lines were connected directly to the suction of the vacuum pumps. This design required throttling of the MFPT vacuum lines, and this throttling operation ultimately resulted in the trip of the MFPT.

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

IV. ANALYSIS OF EVENT - ASSESSMENT OF SAFETY CONSEQUENCES

There were no safety implications to the public related to the event. The ESF actuation performed as intended.

V. CORRECTIVE ACTIONS

1. Immediate Corrective Actions

A placard was placed on the temporary gauges indicating actual scale.

The oncoming crews were briefed about this event.

2. Corrective Actions to Prevent Recurrence

Permanent vacuum monitoring instrumentation for the MFP condensers have been installed.

The low vacuum alarm setpoint was changed to provide additional early warning prior to the trip setpoint.

The MFPT condenser vacuum line was modified to connect directly to the main condenser.

A review was performed of SQN design modifications and an evaluation was made of their application to WBN. The SQN design modifications pertinent to WBN have been identified for presentation to the Change Control Board.

VI. .ADDITIONAL INFORMATION

A. Failed Components

1. Safety Train Inoperability

There were no failures that rendered a train or a safety system inoperable.

2. Component/System Failure Information

a. Method of Discovery of Each Component or System Failure:

N/A

b. **Failure Mode, Mechanism, and Effect of Each Failed Component:**

N/A

c. **Root Cause of Failure:**

N/A

d. **For Failed Components With Multiple Functions, List of Systems or Secondary Functions Affected:**

There were no secondary functions affected.

e. **Manufacturer and Model Number of Each Failed Component:**

N/A

B. Previous Similar Events

LER 96009 - On February 29, 1996, condensate supply and discharge valves had been closed during maintenance on the MFPT 1B. Later, on March 13, 1996, inlet isolation valves closed which resulted in isolating the condensate flow to the condenser. With condensate isolated, the gland seal steam was no longer being condensed and was pulled into the suction of the main condenser vacuum pumps. The condenser pumps were then unable to remove non-condensables, which resulted in the loss of vacuum to the main condenser. A manual turbine trip and a manual reactor trip resulted. Corrective action included operating procedure revisions (SOI-2 & 3.01), verification of proper operation of automatic MFPT condenser flow switch and setpoint isolation logic, and providing a modification to install a vacuum flow path from the MFPT condensers directly to the main condenser to prevent steam binding of the main condenser vacuum pumps. This modification was scheduled to be completed during a subsequent outage, prior to commercial operation.

VII. COMMITMENTS

All actions are complete; there are no commitments.