



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

January 13, 2014

10 CFR 50.73

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Watts Bar Nuclear Plant, Unit 1
Facility Operating License No. NPF-90
NRC Docket No. 50-390

Subject: Licensee Event Report 390/2013-005, Postulated Fire Induced Failure of Chemical and Volume Control System Centrifugal Charging Pumps

This submittal provides Licensee Event Report (LER) 390/2013-005. This LER provides details concerning a postulated fire induced failure of the Chemical and Volume Control System Centrifugal Charging Pumps and Thermal Barrier Booster Pumps, which could have challenged the Reactor Coolant Pump seals due to the loss of seal cooling at Watts Bar Nuclear Plant, Unit 1. This report is being submitted in accordance with 10 CFR 50.73(a)(2)(ii)(B), 10 CFR 50.73(a)(2)(v)(A), 10 CFR 50.73(a)(2)(v)(C), and 10 CFR 50.73(a)(2)(v)(D).

There are no regulatory commitments in this letter. Please direct any questions concerning this matter to Gordon Arent, WBN Licensing Director, at (423) 365-2004.

Respectfully,

A handwritten signature in black ink that reads 'Timothy P. Cleary'.

T. P. Cleary
Site Vice President
Watts Bar Nuclear Plant

Enclosure
cc: See Page 2

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Enclosure
cc (Enclosure):

NRC Regional Administrator - Region II

NRC Senior Resident Inspector - Watts Bar Nuclear Plant

LICENSEE EVENT REPORT (LER)

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

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 FOIA/Privacy Section (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resource@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.

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4. TITLE
Postulated Fire Induced Failure of Chemical and Volume Control System Centrifugal Charging Pumps

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
11	14	2013	2013	- 005 -	00	01	13	2014	N/A	N/A
									FACILITY NAME	DOCKET NUMBER
									N/A	N/A

9. OPERATING MODE 1	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: (Check all that apply)									
10. POWER LEVEL 100%	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)						
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)						
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input checked="" type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)						
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)						
	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)						
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)						
<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)							
<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> OTHER							
<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)(D)	Specify in Abstract below							

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME Thomas Spink, Watts Bar Site Licensing Program Manager	TELEPHONE NUMBER (Include Area Code) 423-365-3548
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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	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
<input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE)	<input checked="" type="checkbox"/> NO			

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

On November 14, 2013, Watts Bar Nuclear Plant (WBN) discovered an unanalyzed condition where a potential fire induced failure of both Unit 1 Chemical and Volume Control System Centrifugal Charging Pumps (CCPs) could occur due to a fire in the Auxiliary Building. A postulated fire in either of two fire areas in the Auxiliary Building could cause a spurious closure of CCP suction valves from the Volume Control Tank and could disable the control circuit which opens the flow from refueling water storage tank (RWST) suction valves resulting in failure of the available CCP and a loss of RCP seal injection. RCP seal cooling would also be impacted by the loss of both Thermal Barrier Booster Pumps (TBBPs) since their control cables are located in the affected fire areas. The inability to establish the RWST suction path for the CCPs, and loss of TBBPs could lead to RCP seal failure and a small break loss of coolant accident. In addition, existing operator manual action would not have been sufficient to establish RCP seal cooling from charging flow in the event of a fire in the affected fire areas. Therefore, WBN was in an unanalyzed condition that significantly degraded plant safety and this condition could have prevented the fulfillment of a safety function. Immediate action was to establish fire watches to ensure a fire in affected fire areas will not cause a spurious closure of the CCP suction valves.

The cause of this event was inadequate review for fire protection program design changes prior to commercial operation of WBN Unit 1.

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NARRATIVE

I. PLANT CONDITIONS

Watts Bar Nuclear Plant (WBN) Unit 1 was in Mode 1 at 100 percent rated thermal power (RTP).

II. DESCRIPTION OF EVENT

A. Event

On November 14, 2013, during a review of Watts Bar Nuclear Plant (WBN) Unit 2 fire protection features, it was discovered that a potential fire induced failure of Chemical Volume Control System (CVCS) [EIS code CB] Centrifugal Charging Pumps (CCPs) [EIS code P] could occur in Unit 1. This could occur due to a fire in either of two Auxiliary Building [EIS code NF] fire areas. A postulated fire in either of these fire areas could cause a spurious closure of CCP suction valves from the Volume Control Tank (VCT) [EIS code TK] and could disable the control circuit which opens the flow from refueling water storage tank (RWST) [EIS code TK] suction valves, resulting in failure of the available CCP and a loss of Reactor Coolant Pump (RCP) [EIS code P] seal injection. RCP seal cooling would also be impacted by the loss of both Thermal Barrier Booster Pumps (TBBPs) [EIS code P] since their control cables are located in the affected fire areas. The inability to establish the RWST suction path for the CCPs, and loss of TBBPs could lead to RCP seal failure and a small break loss of coolant accident. In addition, existing operator manual action would not have been sufficient to establish RCP seal cooling from charging flow in the event of a fire in the affected fire areas. Therefore, WBN was in an unanalyzed condition that significantly degraded plant safety and this condition could have prevented the fulfillment of a safety function. Immediate action was to establish fire watches to ensure a fire in affected fire areas will not cause a spurious closure of the CCP suction valves.

This event is reportable under 10 CFR 50.73(a)(2)(ii)(B), for an unanalyzed condition that significantly degraded plant safety, and 10 CFR 50.73(a)(2)(v) for any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to (A) shutdown the reactor and maintain it in a safe shutdown condition, (C) control the release of radioactive material, and (D) mitigate the consequences of an accident.

B. Inoperable Structures, Components, or Systems that Contributed to the Event

None

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C. Dates and Approximate Times of Major Occurrence

Date	Time (EDT)	Event
October 30, 1990	N/A	Design Change Number (DCN) M-12068-A was issued to prevent interactions on VCT Level Control Valves (LCVs).
May 5, 1995	N/A	Main Control Room (MCR) Operator Manual Action (OMA) was added to 1-45A897-1 for a postulated fire in the Auxiliary Building Room 757.0-A2 via DCN S-36183-A. The potential failure of the CCP was not analyzed.
August 28, 1996	N/A	MCR OMA was added to 1-45A897-1 for a postulated fire in Auxiliary Building Room 737.0-A1 via DCN S-38919-A. The potential failure of the CCP was not analyzed.
November 14, 2013	N/A	Design Engineering identified the potential unanalyzed condition. Problem Evaluation Report (PER) 809167 was entered in the Corrective Action Program.
November 14, 2013	2035	Event Notification 49541 for unanalyzed condition pursuant to 10 CFR 50.72 (b)(3)(ii)(B), and 10 CFR 50.72(b)(3)(v).

II. DESCRIPTION OF EVENT (continued)

D. Other Systems or Secondary Functions Affected

None

E. Method of Discovery

During a review of the WBN Unit 2 fire protection features, it was revealed that a fire induced failure of the WBN Unit 1 CCPs could result in loss of RCP seal cooling.

F. Operator Actions

None

G. Safety System Responses

None

III. CAUSE OF EVENT

The cause of this event was inadequate review for fire protection program design changes prior to commercial operation of WBN Unit 1.

IV. ANALYSIS OF THE EVENT

The fires in the Auxiliary Building auxiliary building room 737.0-A1 (general area for elevation 737.0) or 757.0-A2 (6.9 kV and Shutdown Board Room A) are postulated to cause spurious closure of the VCT outlet

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isolation valve. The VCT outlet isolation valve is interlocked with the RWST outlet isolation valve such that when the VCT outlet isolation valve closes, the RWST outlet isolation valve opens to ensure that net positive suction head is maintained for the CCPs. However, the postulated fires have the potential to disable the control circuit which opens the RWST outlet isolation valve. The WBN FSSD Analysis credits a MCR action to open the RWST outlet isolation flow path. This MCR action is to be performed "promptly" in accordance with site emergency procedures. WBN determined that the "prompt" MCR action could not be completed in a sufficient time duration to prevent damage to the CCPs due to loss of a suction flow path. The inability to provide RCP seal cooling via the CCPs constitutes an unanalyzed condition with respect to the WBN FSSD analysis.

Even though it is not the path relied upon in the FSSD Analysis, the evaluation also considered the possibility of providing RCP seal cooling via the CCS TBBPs. The evaluation concluded that there are control cables for both TBBPs in both of the affected auxiliary building fire areas and thus a single fire could disable both TBBPs in addition to disabling the ability to open the RWST suction path for the CCPs.

V. ASSESSMENT OF SAFETY CONSEQUENCES

There has not been an actual fire or event which affected either auxiliary building rooms resulting in a loss of RCP seal cooling. Had such a fire occurred, RCP seal injection would have been lost due to loss of CCPs. Thermal barrier booster pumps (TBBPs) are also capable of cooling the RCP seals; however, cables associated with the TBBPs would also be affected by the subject fires. Therefore, if the postulated fire occurred, the loss of RCP seal injection could potentially result in a SBLOCA through the RCP seals. However, Westinghouse Commercial Atomic Power (WCAP) WCAP-17601-P has analyzed "Extended Loss of AC Power Event", and demonstrates that the plants have 54.67 hours before core uncover occurs with loss of RCP seal cooling, TBBPs, and Residual Heat Removal System (RHR) [EIS code BP]. Therefore, the plant could have been safely shutdown for loss of both seal injection and TBC through a cooldown and depressurization. Although this analysis has not been incorporated into the WBN Unit 1 licensing basis, it is reasonable to assume that prudent operator action could be taken within 54 hours to mitigate the SBLOCA. In addition, RHR cooling is available for the postulated fire, which was not taken into consideration when determining that the plant had 54 hours prior to core uncover.

VI. CORRECTIVE ACTIONS

A. Immediate Corrective Actions

WBN has established compensatory fire watches to ensure a fire in affected rooms will not cause a spurious closure of the CCP suction valves.

B. Corrective Actions to Prevent Recurrence

This event was due to a latent design engineering error. Revisions to procedures used to evaluate plant design changes for impacts on the fire protection program have increased the challenges and rigor to proposed design changes. These revisions significantly reduce the likelihood that a similar event could occur in the future.

In addition, to address the unanalyzed condition, cables associated with the VCT outlet isolation valve and/or the RWST outlet isolation valve will be protected or rerouted such that the interlock between the subject valves is ensured in the event of a fire. This design change has been added to the corrective action program under PER 809167.

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B. Corrective Actions to Prevent Recurrence

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In addition, to address the unanalyzed condition, cables associated with the VCT outlet isolation valve and/or the RWST outlet isolation valve will be protected or rerouted such that the interlock between the subject valves is ensured in the event of a fire. This design change has been added to the corrective action program under PER 809167.

VII. ADDITIONAL INFORMATION

A. Failed Components

None

B. Previous LERs on Similar Events

On January 28, 2013, TVA submitted LER 390/2012-002 Revision 1, "Unanalyzed Condition Affecting Probable Maximum Flood (PMF) Level." This LER described an event where an updated calculation showed an increase to WBN's probable maximum flooding level. The increase was due to new rim leakage paths identified during aerial surveys for the proposed TVA Clinch River site. Therefore the event described in LER 390/2012-002 did not involve the same underlying cause or failure as the event being reported in this LER.

On April 8, 2013, TVA submitted LER 390/2013-001, "Latent Design Input Inconsistencies Adversely Affect Probable Maximum Flood Analysis." This LER described latent design input inconsistencies in hydrological computer modeling used for probable maximum flood calculations. The cause of the latent design input was due to not recognizing the potential to overtop and fail earthen embankments at area dams. Therefore, the event described in LER 390/2013-001 did not involve the same underlying cause or failure as the event being reported in this LER.

C. Additional Information

None

D. Safety System Functional Failure

This event could have resulted in a safety system functional failure in accordance with 10 CFR 50.73(a)(2)(v).

E. Loss of Normal Heat Removal Consideration

None

VIII. COMMITMENTS

None