



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

May 12, 2015

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 390/2015-002-00, Unanalyzed Condition Related to Spurious Opening of a Pressurizer Power Operated Relief Valve During a Postulated Appendix R Fire**

This submittal provides Licensee Event Report (LER) 390/2015-002-00. This LER provides details concerning an unanalyzed condition related to the spurious opening of a Pressurizer Power Operated Relief Valve during a Postulated Appendix R fire at Watts Bar Nuclear Plant Unit 1. This report is being submitted in accordance with 10 CFR 50.73(a)(2)(ii)(B). A supplement to this report will be made by June 30, 2015 that addresses the safety significance of this issue.

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, appearing to read "Kevin T. Walsh", with a stylized flourish at the end.

Kevin T. Walsh
Site Vice President
Watts Bar Nuclear Plant

Enclosure
cc: See Page 2

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cc (Enclosure):

NRC Regional Administrator - Region II

NRC Senior Resident Inspector - Watts Bar Nuclear Plant

NRC Project Manager – Watts Bar Nuclear Plant

**LICENSEE EVENT REPORT (LER)**(See Page 2 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 and Information Collections Branch (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.

1. FACILITY NAME

Watts Bar Nuclear Plant, Unit 1

2. DOCKET NUMBER

05000390

3. PAGE

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4. TITLE

Unanalyzed Condition Related to Spurious Opening of a Pressurizer Power Operated Relief Valve During a Postulated Appendix R Fire

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
03	13	2015	2015	002	00	05	12	2015	N/A	N/A
									N/A	N/A

9. OPERATING MODE

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

1	<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)
10. POWER LEVEL	<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 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 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 type="checkbox"/> 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

LICENSEE CONTACT

Dean Baker, Licensing Engineer

TELEPHONE NUMBER (Include Area Code)

423-452-4589

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED☒ YES (If yes, complete 15. EXPECTED SUBMISSION DATE) ☐ NO**15. EXPECTED SUBMISSION DATE**

MONTH	DAY	YEAR
06	30	2015

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

On March 13, 2015, Watts Bar Nuclear Plant (WBN) determined that the 10 CFR 50 Appendix R analysis used to determine the time required to secure the spurious opening of a Pressurizer Power Operated Relief Valve (PORV) utilized a non-conservative assumption for certain fire scenarios. Specifically, the WBN analysis used a duration of 120 seconds before a Low Pressurizer Pressure Safety Injection (SI) signal would be received due to a postulated failed open PORV from an Appendix R fire outside of the Control Building. Recent analysis performed by Westinghouse indicates that an SI signal would be received in approximately 33 seconds. WBN Unit 1 procedures directed operators to isolate the PORV within 120 seconds, which would not have prevented generation of an SI signal. In addition, the procedures did not have steps to mitigate and terminate the SI. Without mitigating actions, the SI would have likely challenged the reactor coolant system boundary due to water relief through the PORV and/or safety valves.

As compensatory measures, WBN immediately established administrative equipment controls and fire watches to preclude the consequences of a spurious opening of a PORV. Subsequently, on March 13, 2015, associated fire response procedures were revised to isolate PORVs with associated block valves, and to mitigate and terminate an inadvertent SI to prevent the pressurizer from experiencing "water solid" conditions.

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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 and Information Collections Branch (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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Watts Bar Nuclear Plant, Unit 1	05000390	2015	- 002	- 00	2 OF 5

NARRATIVE**I. PLANT OPERATING CONDITIONS BEFORE THE EVENT**

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 March 13, 2015 at 1100 Eastern Daylight Time (EDT), Watts Bar Nuclear Plant (WBN) determined that the 10 CFR 50 Appendix R analysis used to determine the time required to secure the spurious opening of a Pressurizer [EIS:PZR] Power Operated Relief Valve (PORV)[EIS:PCV] utilized a non-conservative assumption for certain fire scenarios. Specifically, the WBN Fire Protection Report (FPR) analysis used a duration of 120 seconds before a Low Pressurizer Pressure Safety Injection (SI) signal would be received due to a postulated failed open PORV from an Appendix R fire outside of the Control Building. Recent analysis performed by Westinghouse indicates that an SI signal would be received in approximately 33 seconds.

This information placed WBN Unit 1 in an unanalyzed condition because the original fire protection analysis assumed that an SI would not occur from fire-induced failures in the associated fire areas. Existing WBN Unit 1 Appendix R procedures directed operators to isolate the pressurizer PORV within 120 seconds, which would not have prevented generation of the SI signal. In addition, the procedures did not have steps to mitigate and terminate the SI. Without mitigating actions, the SI would have likely challenged the reactor coolant system (RCS)[EIS:AB] boundary due to water relief through the pressurizer PORV and/or safety valves. Preliminary Westinghouse analysis showed that the pressurizer would become water solid if actions are not taken in 600 seconds to terminate the SI. The tail pipe from the Unit 1 PORVs to the Pressurizer Relief Tank (PRT) is not currently analyzed to accommodate liquid reactor coolant at the expected temperatures and pressures.

As a compensatory measure, WBN immediately established administrative equipment controls to preclude the consequences of the spurious opening of a PORV, and fire watches were established. Subsequently, on March 13, 2015, associated fire response procedures were revised to isolate pressurizer PORVs with associated block valves, and to terminate an inadvertent SI to prevent the pressurizer from experiencing "water solid" conditions.

This event is reportable under 10 CFR 50.73(a)(2)(ii)(B), "Degraded or Unanalyzed Condition That Significantly Degraded Plant Safety."

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

No inoperable structures, components, or systems contributed to this event.

C. Dates and Approximate Times of Occurrences

Date	Time	Event
06/10/93	N/A	Revision 4 of WBN-OSG4-165 issued, revising the time to isolate the PORV path to prevent inadvertent SI to 120 seconds
02/07/96	N/A	WBN Unit 1 received Operating License

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Date	Time	Event
03/13/15	1100 EDT	TVA confirms that analytical time to isolate PORV path to prevent inadvertent SI is non-conservative. Compensatory measures established.
03/13/15	1425 EDT	TVA reports this event in accordance with 10 CFR 50.72(b)(3)(ii)(B) (EN #50887)
03/13/15	N/A	Affected Unit 1 fire response procedures revised to prevent, mitigate, and terminate SI due to spurious opening of pressurizer PORV

D. Manufacturer and Model Number of Components that Failed

There were no failed components associated with this event.

E. Other Systems or Secondary Functions Affected

There were no systems or secondary functions affected by this event.

F. Method of discovery of each Component or System Failure or Procedural Error

The unanalyzed condition was identified by a team of subject matter experts established in January 2015 to review the FPR, underlying technical bases, and plant implementing procedures, as part of the development of the Dual Unit Fire Protection Program.

G. Failure Mode and Effect of Each Failed Component

There were no component failures associated with this event.

H. Operator Actions

A fire event did not occur at WBN, therefore no operator actions were taken. Upon confirming the applicability of this issue, WBN immediately established administrative equipment controls and fire watches to preclude the consequences of the spurious opening of a PORV.

I. Automatically and Manually Initiated Safety System Responses

There were no automatic or manual system responses associated with this event.

III. CAUSE OF THE EVENT

A. The cause of each component or system failure or personnel error, if known.

There were no component or system failures as a result of this event notification.

B. The cause(s) and circumstances for each human performance related root cause.

The issues described in this LER derive from latent engineering errors associated with the 10 CFR 50, Appendix R analysis performed prior to licensing WBN Unit 1.

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IV. ANALYSIS OF THE EVENT

In the event of an Appendix R fire in a fire area where pressurizer PORV cables were routed, the potential existed for the spurious opening of a PORV. While procedures were in place to isolate the impacted PORVs, these steps may not have been performed early enough to prevent the generation of an SI signal. The spurious opening of a PORV would cause the RCS to depressurize to the low pressurizer pressure SI setpoint in approximately 33 seconds. An SI would initiate the start of all ECCS pumps, including both charging pumps. In addition, the SI signal would result in the opening of both Boron Injection Tank inlet valves, providing a significant flow path to the RCS. With both charging pumps operating, the pressurizer would be expected to fill and become water solid and relieve to the PRT. Preliminary Westinghouse analysis showed that the pressurizer would become water solid if actions are not taken in 600 seconds to terminate the SI. The tail pipe from the Unit 1 PORVs to the PRT is not currently analyzed to accommodate liquid reactor coolant at the expected temperatures and pressures.

V. ASSESSMENT OF SAFETY CONSEQUENCES

- A. Availability of systems or components that could have performed the same function as the components and systems that failed during the event

A fire event did not occur at WBN. However, had the postulated event occurred prior to revision of the affected fire response procedures on March 13, 2015, this condition could have challenged the plant's ability to achieve and maintain safe shutdown in accordance with the requirements of 10 CFR 50, Appendix R. As a result, WBN is performing an analysis to determine if the PORV tail pipe could have supported loads and expected flows at anticipated plant conditions for Appendix R fire events. A supplement to this LER will be submitted related to the results of this analysis.

- B. For events that occurred when the reactor was shut down, availability of systems or components needed to shutdown the reactor and maintain safe shutdown conditions, remove residual heat, control the release of radioactive material, or mitigate the consequences of an accident

Not applicable.

- C. For failure that rendered a train of a safety system inoperable, an estimate of the elapsed time from the discovery of the failure until the train was returned to service

Not applicable.

VI. CORRECTIVE ACTIONS

This event was entered into the TVA Corrective Action Program (CAP) and is being tracked under problem evaluation report (PER) 999926.

- A. Immediate Corrective Actions

As compensatory measures, WBN immediately established administrative equipment controls and fire watches to preclude the consequences of the spurious opening of a PORV. Subsequently, on March 13, 2015, associated fire protection procedures were revised to isolate pressurizer PORVs with associated block valves, and to mitigate and terminate an inadvertent SI to prevent the pressurizer from experiencing "water solid" conditions. Revising the affected procedures restored WBN to compliance with its 10 CFR 50, Appendix R fire safe shutdown analysis.

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B. Corrective Actions to Prevent Recurrence

The procedure revisions described above restored WBN to compliance for this condition. As a part of fire protection enhancements for the Dual Unit FPR, WBN currently plans to protect cables for the pressurizer PORVs and their associated block valves to ensure the PORV flow path can be isolated from the main control room for all fire scenarios outside the Control Building. This plant modification would allow operators to prevent the low pressurizer pressure SI signal from being generated. As an additional means to address this concern, steps to mitigate and terminate the SI were added to affected fire response procedures, should the SI signal be generated. In addition, WBN is performing an analysis to determine if the PORV tail pipe could have supported loads and expected flows at anticipated plant conditions for Appendix R fire events. This analysis is being performed in support of determining the safety significance of the issue described in this LER, and as a fire safe shutdown strategy enhancement for the Dual Unit FPR.

As described above, a team of subject matter experts was established at WBN in January 2015 to investigate errors previously identified in the FPR. The issue described in this LER was identified by this team. Technical issues identified by the team are being resolved, and lessons learned will be incorporated into the Dual Unit FPR prior to submittal to the NRC.

VII. ADDITIONAL INFORMATION

A. Previous similar events at the same plant

On January 13, 2014, TVA submitted LER 390/2013-005, "Postulated Fire Induced Failure of Chemical and Volume Control System Centrifugal Charging Pumps." This LER describes 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. The event described in LER 390/2013-005 involved the same underlying cause of a latent design engineering error during initial plant licensing as the event being reported in this LER.

On December 15, 2014, TVA submitted LER 390/2014-004, "Appendix R Unanalyzed Condition Affecting the Turbine Driven Auxiliary Feedwater Pump and Pressurizer Spray Valves." This LER describes an unanalyzed condition where Operator Manual Actions (OMAs) were not correctly translated into Appendix R procedures, with the potential to lead to an unanalyzed condition during an Appendix R fire.

B. Additional Information

A supplement to this LER will be submitted by June 30, 2015.

C. Safety System Functional Failure Consideration

This condition did not result in a safety system functional failure.

D. Scrams with Complications Consideration

There was no scram associated with this report.

VIII. COMMITMENTS

None.