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

June 11, 2018

10 CFR 50.73

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

Watts Bar Nuclear Plant, Unit 2
Facility Operating License No. NPF-96
NRC Docket No. 50-391

Subject: **Licensee Event Report 391/2018-001-00, Reactor Trip on Low Reactor Coolant System Flow Due to Maintenance on Flow Instrumentation**

This submittal provides Licensee Event Report (LER) 391/2018-001-00. This LER provides details concerning a plant trip on low reactor coolant system flow. This condition is being reported in accordance with 10 CFR 50.73(a)(2)(iv)(A) as an event involving the automatic actuation of the reactor protection system and the auxiliary feedwater system.

There are no new regulatory commitments contained in this letter. Please direct any questions concerning this matter to Kim Hulvey, WBN Licensing Manager, at (423) 365-7720.

Respectfully,

Paul Simmons
Site Vice President
Watts Bar Nuclear Plant

Enclosure
cc: See Page 2

cc (Enclosure):

NRC Regional Administrator - Region II
NRC Senior Resident Inspector - Watts Bar Nuclear Plant

NRC FORM 366 (02-2018)

U.S. NUCLEAR REGULATORY COMMISSION

# LICENSEE EVENT REPORT (LER)

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 03/31/2020

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 Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001,or by 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 | 2. Docket Number | 3. Page |
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| Watts Bar Nuclear Plant, Unit 2 | 05000391 | 1 OF 5 |

**4. Title**

Reactor Trip on Low Reactor Coolant System Flow Due to Maintenance on Flow Instrumentation

| 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 |
| 04 | 12 | 2018 | 2018 | - 001 | - 00 | 06 | 11 | 2018 | | 05000 |
| | | | | | | | | | Facility Name | Docket Number 05000 |

| 9. Operating Mode | 11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: *(Check all that apply)* | | | |
|---|---|---|---|---|
| 1 | ☐ 20.2201(b) | ☐ 20.2203(a)(3)(i) | ☐ 50.73(a)(2)(ii)(A) | ☐ 50.73(a)(2)(viii)(A) |
| | ☐ 20.2201(d) | ☐ 20.2203(a)(3)(ii) | ☐ 50.73(a)(2)(ii)(B) | ☐ 50.73(a)(2)(viii)(B) |
| | ☐ 20.2203(a)(1) | ☐ 20.2203(a)(4) | ☐ 50.73(a)(2)(iii) | ☐ 50.73(a)(2)(ix)(A) |
| | ☐ 20.2203(a)(2)(i) | ☐ 50.36(c)(1)(i)(A) | ☒ 50.73(a)(2)(iv)(A) | ☐ 50.73(a)(2)(x) |
| **10. Power Level** | ☐ 20.2203(a)(2)(ii) | ☐ 50.36(c)(1)(ii)(A) | ☐ 50.73(a)(2)(v)(A) | ☐ 73.71(a)(4) |
| 100 | ☐ 20.2203(a)(2)(iii) | ☐ 50.36(c)(2) | ☐ 50.73(a)(2)(v)(B) | ☐ 73.71(a)(5) |
| | ☐ 20.2203(a)(2)(iv) | ☐ 50.46(a)(3)(ii) | ☐ 50.73(a)(2)(v)(C) | ☐ 73.77(a)(1) |
| | ☐ 20.2203(a)(2)(v) | ☐ 50.73(a)(2)(i)(A) | ☐ 50.73(a)(2)(v)(D) | ☐ 73.77(a)(2)(i) |
| | ☐ 20.2203(a)(2)(vi) | ☐ 50.73(a)(2)(i)(B) | ☐ 50.73(a)(2)(vii) | ☐ 73.77(a)(2)(ii) |
| | | ☐ 50.73(a)(2)(i)(C) | ☐ OTHER Specify in Abstract below or in NRC Form 366A | |

**12. Licensee Contact for this LER**

| Licensee Contact | Telephone Number (Include Area Code) |
|---|---|
| Dean Baker, Licensing Engineer | 423-452-4589 |

**13. Complete One Line for each Component Failure Described in this Report**

| Cause | System | Component | Manufacturer | Reportable to ICES | Cause | System | Component | Manufacturer | Reportable to ICES |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

| 14. Supplemental Report Expected | 15. Expected Submission Date | Month | Day | Year |
|---|---|---|---|---|
| ☐ Yes (If yes, complete 15. Expected Submission Date) ☒ No | | | | |

**Abstract** (Limit to 1400 spaces, i.e., approximately 14 single-spaced typewritten lines)

At 0920 Eastern Daylight Time (EDT) on April 12, 2018, the Watts Bar Unit 2 reactor automatically tripped on Reactor Coolant System (RCS) low flow in Loop 1 while operating at 100 percent power. All control and shutdown bank rods inserted properly in response to the automatic reactor trip. All safety systems including Auxiliary Feedwater actuated as designed.

The apparent cause of the plant trip was the failure to recognize the aggregate risk of minor maintenance being performed on the common drain line for the RCS Loop 1 flow transmitters. This maintenance caused a pressure perturbation on the common high side RCS reference leg, resulting in low flow on all three RCS loop 1 flow transmitters. The maintenance on the common drain line was not identified as work involving trip sensitive equipment during the planning process. Corrective actions include briefing affected personnel on this event, labeling the equipment as trip sensitive and revising the procedure on control of sensitive equipment.

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 Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001,or by 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 | 2. DOCKET NUMBER | 3. LER NUMBER | | |
|---|---|---|---|---|
| | | YEAR | SEQUENTIAL NUMBER | REV NO. |
| Watts Bar Nuclear Plant, Unit 2 | 05000391 | 2018 | - 001 | - 00 |

NARRATIVE

I. Plant Operating Conditions Before the Event

Watts Bar Nuclear Plant (WBN) Unit 2 was at 100 percent rated thermal power (RTP).

II. Description of Event

A. Event Summary

At 0920 Eastern Daylight Time (EDT) on April 12, 2018, the Watts Bar Unit 2 reactor automatically tripped due to Reactor Coolant System (RCS){EIIS:AB} low flow in Loop 1 while operating at 100 percent power. All control and shutdown bank rods inserted properly in response to the automatic reactor trip. All safety systems including Auxiliary Feedwater (AFW){EIIS:BA} actuated as designed.

This event is being reported to the Nuclear Regulatory Commission (NRC) under 10 CFR 50.73(a)(2)(iv)(A) as an automatic actuation of the reactor protection system (RPS){EIIS:JC} and the AFW system.

B. Status of structures, components, or systems that were inoperable at the start of the event and that contributed to the event

No inoperable systems contributed to this event.

C. Dates and approximate times of occurrences

| Date | Time (EDT) | Event |
|---|---|---|
| 4/12/18 | 0920 | Unit 2 Reactor Trip |
| 4/12/18 | 0921 | Entered 2-E-0, Reactor Trip or Safety Injection |
| 4/12/18 | 0923 | Transitioned to 2-ES-0.1, Reactor Trip Response |
| 4/12/18 | 0943 | Transitioned to 2-GO-5, Unit Shutdown from 30 percent Reactor Power to Hot Standby |

D. Manufacturer and model number of each component that failed during the event

Not applicable.

E. Other systems or secondary functions affected

Secondary systems functioned as expected.

F. Method of discovery of each component or system failure or procedural error

No equipment failures were found.

G. Failure mode, mechanism, and effect of each failed component

No equipment failures were found.

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NARRATIVE

H. Operator actions

Upon receipt of a reactor trip, operations personnel promptly executed the plant emergency procedures and transitioned to the normal operating procedure for a plant shutdown.

I. Automatically and manually initiated safety system responses

In response to reactor coolant system low flow, the RPS properly responded and all control rods inserted. The AFW system actuated as expected.

III. Cause of the Event

A. Cause of each component or system failure or personnel error

The apparent cause of the plant trip was the failure to recognize the aggregate risk of minor maintenance being performed on the common drain line for the RCS Loop 1 flow transmitters {EIIS:FT}. This maintenance caused a pressure perturbation on the common high side RCS reference leg, resulting in low flow on all three loop 1 flow transmitters. The maintenance on the common drain line was not identified as work involving trip sensitive equipment.

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

The cause was failing to identify that maintenance on the common drain line for the RCS flow transmitters involved trip sensitive equipment.

IV. Analysis of the Event

The Reactor Protection System will trip the reactor (insert control rods) in the event that certain protection system settings are exceeded. One of these plant trips is low RCS flow. Each of the four RCS loops is provided with three RCS flow transmitters. If reactor power is greater than 48 percent, flow of less than or equal to 90 percent of rated RCS flow on any two of the three channels in one loop will result in a reactor trip.

The flow instruments are located on the cross-under leg of each loop and are set up to measure differential pressure across a piping elbow. The three transmitters measure at the inside of the elbow and use a common high pressure tap on the outside of the elbow. A loss of pressure on the common high side pressure tap would result in all three instruments indicating low flow.

At the time of the event, maintenance was performing a task to correct a leak on the common drain line for the loop 1 RCS flow transmitters. While unable to be replicated, it is likely this maintenance activity impacted the common high side pressure line for these instruments, resulting in low flow on all three loop 1 flow instruments and a reactor trip. The maintenance work package to address the drain line leak did not indicate association with trip sensitive equipment.

V. Assessment of Safety Consequences

The event described in this report is fully bounded by the partial loss of forced reactor coolant flow analyzed in the WBN Updated Final Safety Analysis Report (UFSAR). A probabilistic risk assessment

performed for this event indicated the risk of core damage from this event was about 1.5E-07, which is very small.

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

No equipment failures were identified.

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 Tennessee Valley Authority (TVA) Corrective Action Program and is being tracked under Condition Report (CR) 1404737.

A. Immediate Corrective Actions

Operations personnel responded to the plant trip and stabilized the unit in hot standby.

B. Corrective Actions to Prevent Recurrence or to reduce probability of similar events occurring in the future

Corrective actions include briefing affected personnel on this event, labeling the equipment as trip sensitive and revising the procedure on control of sensitive equipment.

VII. Previous Similar Events at the Same Site

LER 391/2017-002-00 reported an event where a workers inadvertently depressed the local trip button for the 2A Hotwell pump, which resulted in a secondary system transient and a manual reactor trip. The workers did not display appropriate situational awareness around trip sensitive equipment.

LER 391/2016-005-00 Reported an event where a human performance error during the drain down of the 2A main feedwater pump (MFP) condenser caused a loss of vacuum on the 2B MFP condenser leading to a plant trip.

While these events are similar, the event described in this LER resulted from a failure to recognize the trip sensitive nature of this work prior to commencement.

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NARRATIVE

VIII. Additional Information

None.

IX. Commitments

None.