



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

August 21, 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 391/2018-003-00, Reactor Trip Due to Main
Generator Differential Relay Actuation**

This submittal provides Licensee Event Report (LER) 391/2018-003-00. This LER provides details concerning a plant trip as a result of an electrical issue with a main generator differential current relay circuit. This condition is being reported in accordance with 10 CFR 50.73(a)(2)(iv)(A) as an automatic actuation of the Reactor Protection System and the Auxiliary Feedwater Systems.

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,

A handwritten signature in black ink, appearing to read "Paul Simmons", is written over a horizontal line.

Paul Simmons
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



LICENSEE EVENT REPORT (LER)

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

Watts Bar Nuclear Plant, Unit 2

2. Docket Number

05000391

3. Page

1 OF 4

4. Title

Reactor Trip Due to Main Generator Differential Relay Actuation

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
06	22	2018	2018	003	00	08	21	2018	N/A	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	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
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)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
96	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(1)
	<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)(D)	<input type="checkbox"/> 73.77(a)(2)(i)
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(ii)
		<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> OTHER	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 ICES	Cause	System	Component	Manufacturer	Reportable to ICES

14. Supplemental Report Expected

☐ Yes (If yes, complete 15. Expected Submission Date) ☒ No

15. Expected Submission Date

Month	Day	Year

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

At 0841 Eastern Daylight Time (EDT) on June 22, 2018, the Watts Bar Unit 2 reactor automatically tripped while operating at 96 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 reactor automatically tripped due to a main turbine trip. The turbine trip was caused by an electrical issue with the main generator differential current trip signal. No actual fault occurred.

The most probable cause of the event was an intermittent equipment failure in the A phase signal loop between the neutral side current transformer of the main generator and the digital protection relays which led to actuation of the A phase main transformer differential current relay. Initial corrective actions implemented a temporary modification to relocate the neutral side differential trip signal to a different neutral side current transformer, thus providing equivalent protection while preventing a trip from the identified likely cause of the June 22, 2018 trip. Additional work will be performed during the next Unit 2 refueling outage to correct and determine the cause of the identified intermittent equipment failure.



LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
Watts Bar Nuclear Plant, Unit 2	05000391	YEAR 2018	SEQUENTIAL NUMBER - 003	REV NO. - 00

NARRATIVE

I. Plant Operating Conditions Before the Event

Watts Bar Nuclear Plant (WBN) Unit 2 was at 96 percent rated thermal power (RTP).

II. Description of Event

A. Event Summary

At 0841 Eastern Daylight Time (EDT) on June 22, 2018, the Watts Bar Unit 2 reactor automatically tripped while operating at 96 percent power. All control and shutdown bank rods inserted properly in response to the automatic reactor trip. All safety systems including Auxiliary Feedwater (AFW){EIIIS:BA} actuated as designed. The reactor automatically tripped due to a main turbine trip. The turbine trip was caused by a main generator electrical trip.

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) 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
6/22/18	0841	Received Annunciator 2-D, GEN PROT MULTIFUNCTION RELAY OPERATED. Nine Seconds later received Electrical Trouble first out and Unit 2 Tripped. Operations personnel entered procedure 2-E-0, Reactor Trip or safety Injection
6/22/18	0842	Transitioned to 2-ES-0.1, Reactor Trip Response.
6/22/18	0845	Check of relay room identified a phase differential relay actuation.
6/22/18	0915 (approx.)	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

No failed components have been identified at this time.

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

The spurious signal issue within the differential current protection scheme was identified after the plant trip.

**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

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Watts Bar Nuclear Plant, Unit 2	05000391	YEAR	SEQUENTIAL NUMBER	REV NO.
		2018	- 003	- 00

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

The likely failure mode of equipment associated with this event is an intermittent equipment failure between the neutral side current transformer of the main generator and the protection relays which led to actuation of the A phase main transformer differential current relay.

H. Operator actions

Operations personnel promptly stabilized the plant following the plant trip

I. Automatically and manually initiated safety system responses

The turbine trip resulted in a reactor trip. Safety systems responded as expected, including reactor trip and automatic initiation of AFW.

III. Cause of the Event**A. Cause of each component or system failure or personnel error**

The troubleshooting performed following the event did not definitively identify the cause of the trip. The most probable cause of the event is an intermittent equipment failure in the A phase signal loop between the generator neutral current transformer (251 CT loop) {EIS:XCT} and the digital protection relays (2-RLY-244-S300G3/1 and 2-RLY-244-M3425A/2 relays) which led to actuation of the A phase main transformer differential current relay (287T){EIS:87}. The source of the intermittent equipment failure will be further investigated during the Spring 2019 Unit 2 refueling outage.

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

No human performance root causes are attributed to this event.

IV. Analysis of the Event

On June 22, 2018, an intermittent electrical equipment issue of slightly over one cycle (16.7 milliseconds) was measured on the A phase of the main transformer which caused an actuation of the digital protective relays, resulting in a generator trip. The automatic Unit 2 reactor trip that occurred on June 22, 2018 is generally comparable to the Updated Final Safety Analysis Report (UFSAR) description of the Loss of External Electrical Load and/or Turbine Trip described in UFSAR Section 15.2.7. Following the trip, Operations entered 2-E-0, Reactor Trip or Safety Injection, and subsequently transitioned to 2-ES-0.1, Reactor Trip Response, to place Unit 2 in Mode 3 using procedure 2-GO-5, Unit Shutdown from 30 percent Reactor Power to Hot Standby. This reactor trip is considered uncomplicated.

V. Assessment of Safety Consequences

As described in the previous section, the trip that occurred was uncomplicated and is bounded by the loss of external electrical load event described in the UFSAR. A probabilistic risk analysis performed for this event indicates the conditional core damage probability from this event is very small.



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Watts Bar Nuclear Plant, Unit 2	05000391	YEAR	SEQUENTIAL NUMBER	REV NO.
		2018	- 003	- 00

NARRATIVE

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

Not applicable.

- 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) 1425231.

A. Immediate Corrective Actions

Operations personnel promptly stabilized the plant in Mode 3. A short term corrective action was taken to relocate the 287T differential trip signal to a different CT loop such that the one out of two taken twice logic and circuit protection is maintained. Future A phase current drop events on the 251 CT loop will be able to be monitored without causing a direct unit trip.

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

The intermittent equipment failure between the neutral side current transformer (251 CT loop) of the main generator and the digital protection relays (2-RLY-244-S300G3/1 and 2-RLY-244-M3425A/2 relays) will be fully investigated and corrected during the Unit 2 Spring 2019 refueling outage.

VII. Previous Similar Events at the Same Site

LER 391/2016-008 describes a unit trip that occurred on August 20, 2016 as a result of an internal fault on the 2B Main Bank Transformer. This event was most likely caused by an inadequate internal bus clearance as a result of either a latent design issue or initial installation error. While the event is associated with the main transformers, the equipment causes are different than this event.

VIII. Additional Information

None.

IX. Commitments

None.