

10 CFR 50.73

June 21, 2021
BW210042

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

Braidwood Station, Unit 1
Renewed Facility Operating License No. NPF-72
NRC Docket No. STN 50-456

Subject: Licensee Event Report 2021-001-00 – Train A and B Source Range Neutron Flux Trip Functions Bypassed During Plant Startup

The enclosed Licensee Event Report (LER) is being submitted in accordance with 10 CFR 50.73, "Licensee Event Report System."

There are no regulatory commitments contained in this letter. Should you have any questions concerning this submittal, please contact Mr. Kevin Lueshen, Regulatory Assurance Manager, at (815) 417-2800.

Respectfully,

Keenan, John P.

Digitally signed by Keenan, John
P.
DN: cn=Keenan, John P.
Date: 2021.06.18 11:14:35 -05'00'

John Keenan
Site Vice President
Braidwood Station

Enclosure: LER 2021-001-00

cc: NRR Project Manager – Braidwood Station
Illinois Emergency Management Agency – Division of Nuclear Safety
US NRC Regional Administrator, Region III
US NRC Senior Resident Inspector (Braidwood Station)
Illinois Emergency Management Agency – Braidwood Representative



LICENSEE EVENT REPORT (LER)

(See Page 3 for required number of digits/characters for each block)
(See NUREG-1022, R.3 for instruction and guidance for completing this form
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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, Library, and Information Collections Branch (T-6 A10M), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollections.Resource@nrc.gov, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk air: oir_submission@omb.eop.gov. The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless the document requesting or requiring the collection displays a currently valid OMB control number.

1. Facility Name

Braidwood Station, Unit 1

2. Docket Number

05000456

3. Page

1 OF 5

4. Title

Train A and B Source Range Neutron Flux Trip Functions Bypassed During Plant Startup

5. Event Date

Month	Day	Year
4	23	2021

6. LER Number

Year	Sequential Number	Revision No.
2021	001	00

7. Report Date

Month	Day	Year
06	21	2021

8. Other Facilities Involved

Facility Name	Docket Number
N/A	N/A
Facility Name	Docket Number
N/A	N/A

9. Operating Mode

MODE 2

10. Power Level

000

11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply)

<input type="checkbox"/> 10 CFR Part 20	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)(A)	10 CFR Part 73
<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.69(g)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(4)
<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.71(a)(5)
<input type="checkbox"/> 20.2203(a)(2)(i)	10 CFR Part 21	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(1)(i)
<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 21.2(c)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(i)
<input type="checkbox"/> 20.2203(a)(2)(iii)	10 CFR Part 50	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	<input type="checkbox"/> 73.77(a)(2)(ii)
<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	
<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)	
<input type="checkbox"/> OTHER (Specify here, in abstract, or NRC 366A).				

12. Licensee Contact for this LER

Licensee Contact

Kevin Lueshen, Regulatory Assurance Manager

Phone Number (Include area code)

(815) 417-2800

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

Cause	System	Component	Manufacturer	Reportable to IRIS	Cause	System	Component	Manufacturer	Reportable to IRIS
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

14. Supplemental Report Expected

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

15. Expected Submission Date

Month	Day	Year
N/A	N/A	N/A

16. Abstract (Limit to 1560 spaces, i.e., approximately 15 single-spaced typewritten lines)

On April 23, 2021 at 1216 hours, with Unit 1 in Mode 2 during reactor startup activities, control room personnel identified that both Train A and Train B source range neutron flux reactor trip functions were bypassed, and immediately restored by taking the bypass switches to normal. The condition existed since April 21, 2021 at 0738 hours with the unit in Mode 5. In accordance with Technical Specification (TS) Limiting Condition for Operations (LCO) 3.3.1, Reactor Trip System (RTS) Instrumentation, the source range neutron flux channels are required in Modes 2, 3, 4 and 5 in accordance with TS Table 3.3.1-1. A review determined periods where TS 3.3.1 Conditions were not met, and of mode changes not in accordance with TS LCO 3.0.4.

The cause of the event was failure of the Operations crew to adequately track equipment status in accordance with operating procedures and processes.

This event is being reported as any operation or condition which was prohibited by Technical Specifications in accordance with 10 CFR 50.73(a)(2)(i)(B), and as any event or condition that could have prevented the fulfillment of the safety function needed to shut down the reactor and maintain it in a safe shutdown condition in accordance with 10 CFR 50.73(a)(2)(v)(A).

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

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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Braidwood Station, Unit 1	05000456	2021	- 001	- 00

NARRATIVE**A. Plant Operating Conditions Before the Event:**

Event Date: April 23, 2021

Unit: 1

MODE: 2

Reactor Power: 000

Unit 1 Reactor Coolant System (RCS) [AB]:

Normal operating temperature and pressure

B. Description of Event:

No structures, systems or components were inoperable at the start of this event that contributed to the event.

In accordance with Technical Specification (TS) Limiting Condition for Operations (LCO) 3.3.1, Reactor Trip System (RTS) Instrumentation, the source range neutron flux channels are required in Modes 3, 4 and 5 with rod control system capable of rod withdrawal or one or more rods not fully inserted, and in Mode 2 when below the source range block permissive interlock. A review determined periods where TS 3.3.1 Conditions were not met, and two instances of mode changes not in accordance with TS LCO 3.0.4 Applicability during entry into Mode 4 and Mode 2 when both source range neutron flux reactor trip functions were inoperable.

On April 23, 2021, Unit 1 was completing refueling outage A1R22, and was starting up the reactor in Mode 2. At 1216 hours, control room personnel identified that Train A and Train B source range [IG] neutron flux reactor trip functions were bypassed, and immediately restored by taking the bypass switches to normal. TS 3.3.1 Conditions A, H, and I for both source range neutron flux functions inoperable were entered and exited accordingly.

A review determined that on April 21, 2021 at 0738 hours with Unit 1 in Mode 5, both source range neutron flux trips were placed in bypass per procedure in support of switchyard activities. These activities included opening or closing disconnects and could have caused electrical interference with the source range indication. Switching activities were subsequently delayed for approximately four hours. At the completion of the switching activities, the restoration of the source range neutron flux trips was not performed, and the trip functions remained in bypass until discovery on April 23, 2021.

Applicable TS Conditions

- TS 3.3.1 Condition A (One or more Functions with one or more required channels or trains inoperable) requires immediate entry into the Condition referenced in TS Table 3.3.1-1 (Reactor Trip System Instrumentation) for the channel(s) or train(s).
 - For the source range neutron flux trip function in Mode 2 below the source range block permissive, the table directs entry into Conditions H and I.
 - For the source range neutron flux trip function in Modes 3, 4 and 5 with the Rod Control System capable of rod withdrawal or one or more rods not fully inserted, the table directs entry into Conditions I and J.
- TS 3.3.1 Condition H (One Source range Neutron Flux channel inoperable) Action H.1 is to immediately suspend operations involving positive reactivity additions.
- TS 3.3.1 Condition I (Two Source range Neutron Flux channels inoperable) Action I.1 is to immediately open the reactor trip breakers.

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NARRATIVE

- TS LCO 3.0.4 does not permit entry into a Mode when an LCO is not met without meeting specific limitations.

The periods when TS 3.3.1 Required Actions were not met or an LCO was not met prior to a mode change in accordance with TS LCO 3.0.4:

- April 21, 2021, 1509 hours to April 22, 2021, 0124 hours – reactor trip breakers [AA] were closed for testing of the digital rod position indication (DRPI) system and were opened following a rod drive motor generator parallel failure. Required Actions A.1 and I.1 to immediately open the reactor trip breakers were not met.
- April 21, 2021 at 2221 hours, Unit 1 entered Mode 4 with both source range neutron flux trip functions inoperable. TS 3.3.1 was not met prior to mode change. Required Actions A.1 and I.1 to immediately open the reactor trip breakers were not met. The mode change was not in accordance with TS LCO 3.0.4.
- April 22, 2021 at 1354 hours to 1621 hours – Reactor trip breakers were closed for trip checks. Required Actions A.1 and I.1 to immediately open the reactor trip breakers were not met.
- April 22, 2021 at 1829 hours to 2207 hours – 11 instances when reactor trip breakers were cycled closed for rod drop testing. Required Actions A.1 and I.1 to immediately open the reactor trip breakers were not met.
- April 23, 2021 – Three instances when reactor trip breakers were closed. At 0122 hours reactor trip breakers closed as part of the reactor startup. At 0204 hours the reactor trip breakers were opened twice and then re-closed per the startup procedure and remained closed. Required Actions A.1 and I.1 to immediately open the reactor trip breakers were not met.
- April 23, 2021 at 11:54 hours, Unit 1 entered Mode 2 with both source range neutron flux trip functions inoperable. TS 3.3.1 not met prior to mode change. Required Actions A.1 and I.1 to immediately open the reactor trip breakers were not met. Required Action H.1 to immediately suspend operations involving positive reactivity additions was not met. The mode change was not in accordance with TS LCO 3.0.4.

This event is being reported in accordance with 10 CFR 50.73(a)(2)(i)(B), "any operation or condition which was prohibited by the plant's Technical Specifications," and 10 CFR 50.73(a)(2)(v)(A), "any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to shut down the reactor and maintain it in a safe shutdown condition".

Train A and Train B source range neutron flux reactor trip functions being bypassed in Modes 3, 4 and 5 with the Rod Control System capable of rod withdrawal or one or more rods not fully inserted represents a Safety System Functional Failure.

C. Cause of Event

The cause of the event was determined to be failure of the Operations crew to adequately track equipment status in accordance with operating procedures and processes. This was due to gaps in procedure use and adherence.

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NARRATIVE**D. Safety Consequences:**

There were no actual safety consequences impacting plant or public safety as a result of this issue. The safety function of the source range neutron flux trips is to provide core protection for the following events:

1. Chemical and Volume Control System (CVCS) malfunction.

CVCS malfunction results in a decrease in boron concentration in the Reactor Coolant System (RCS). In Modes 3, 4, and 5, a boron dilution event is mitigated by crediting operator action to respond to the dilution. For all but two scenarios the primary indication is the Volume Control Tank (VCT) level alarm. For a slow dilution event or a dilution during an RCS cooldown, the VCT level alarm won't alert the operators in time to mitigate the event. For those scenarios, multiple equivalent signals are available to the operators including the source range detectors, boric acid/blended flow rate alarms, CVCS/reactor makeup pump lights. Since the source range detectors are not the primary or sole means to mitigate a boron dilution event in any scenario during Modes 3, 4, and 5, the analyses remain bounding and applicable without the source range reactor trip function available.

2. The uncontrolled rod cluster control assembly bank withdrawal from a subcritical or low power startup condition.

For this event, abbreviated as RWFS (Rod Withdrawal from Subcritical), the limiting analysis outlined in the Braidwood UFSAR occurs during Mode 2 operation and credits the Power Range High Neutron Flux Reactor Trip (low setting) to mitigate the event.

In Modes 3, 4, and 5, the source range reactor trip functions are credited for this event. Therefore, there was a loss of safety function for the periods in Modes 3, 4, and 5 when the source range neutron flux trips were bypassed while the Rod Control System was capable of rod withdrawal or one or more rods not fully inserted.

There were no safety consequences resulting from this event as there were alternate means of ensuring a RWFS event in Modes 2, 3, 4, and 5 remained within the analysis. Standard practice is to ensure there is sufficient RCS boron concentration during Modes 3, 4, 5, and 6 that even if a full set of rod control banks or shutdown banks are withdrawn from the core, there is sufficient shutdown margin to avoid criticality while maintaining shutdown margin requirements. A review of required and actual RCS boron concentration throughout the event confirmed that RCS boron concentration remain above its minimum requirement. At no time while the source range reactor trip functions were bypassed in Modes 2, 3, 4, and 5 would a RWFS be able to achieve criticality, ensuring that the limiting RWFS event remained bounding.

E. Corrective Actions:

Corrective actions include addressing accountability with the individuals involved and implementing an observation plan to improve the quality of control board walkdowns.

F. Previous Occurrences:

No previous, similar Licensee Event Reports were identified at the Braidwood Station in the past three years.

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NARRATIVE**G. Component Failure Data:**ManufacturerNomenclatureModelMfg. Part Number

N/A

N/A

N/A

N/A