

June 12, 2023

U.S. Nuclear Regulatory Commission
Document Control Desk
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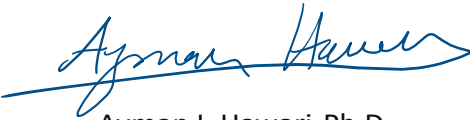
**SUBJECT Report for Event Number 56553 "Technical Specification Violation" License No. R-120
Docket No. 50-297**

As required by Technical Specification (TS) 6.7.1, attached is a written report of Event Report Number 56553 regarding a Technical Specification violation that occurred at the North Carolina State University (NCSU) PULSTAR research reactor on June 2, 2023.

If you have any questions regarding this report or require additional information, please contact Gerald Wicks, Acting Manager of Engineering and Operations, at (919) 515-4601 or wicks@ncsu.edu.

I declare under penalty of perjury that the forgoing is true and correct. Executed on 12 June 2023.

Sincerely,



Ayman I. Hawari, Ph.D.
Director, Nuclear Reactor Program

Enclosures: Written response to Event Report Number 56553

Report for Event No. 56553

Event Description and Discussion

An unscheduled shutdown of the reactor occurred on June 2, 2023 at 08:18 due to an abnormal response of the Safety Power Level channel during the approach to 1 Megawatt (MW) power.

The Reactor Operator (RO) observed a discrepancy in power indications by the Linear Power Level and Safety Power Level channels during power ascension. The discrepancy was noticed by the RO after the Linear Power Level channel auto-ranged from the 300 kW scale to the 1 MW scale. The Safety Power Level channel is set to remain on the 1 MW scale and does not auto-range. Auto-range occurs at 85 percent of full scale, or 255 kW on the 300 kW scale for the Linear Power Level channel. Once on the same scale, the RO observed a Safety Power Level channel instrument reading and recorder trace were below those for the Linear Power Level channel. At the time this was noticed the Safety Power Level channel was at approximately 150 kW and the Linear Power Level channel was at 400 kW. The RO stopped power ascension and immediately informed the Designated Senior Reactor Operator (DSRO). The inoperable light on the Safety Power Level channel was then observed to be lit by the RO and DSRO and a normal reactor shut down was initiated. Following shut down, the reactor was secured.

Actions required by procedure NRP-OP-105 "Response to SCRAMS, Alarms, and Abnormal Conditions" once the discrepancy in the power indications were noticed were followed. These included an immediate reactor shut down, securing the reactor, and immediate notification of the DSRO. The DSRO informed the Acting Manager of Engineering and Operations (MEO) immediately after shutdown.

The events leading to the unscheduled shutdown were then discussed with the Acting MEO, DSRO, and RO. The Safety Power Level channel checks were satisfactory during the reactor startup checklist performed prior to reactor start up on June 2, 2023. Based on the Safety Power Level channel response during power ascension it was determined to be inoperable during reactor operation at 400 kW. The Safety Power Level channel is required to be operable by Technical Specification (TS) 3.3.b Table 3.3-1 while the reactor is being operated. The Safety Power Level channel is part of the reactor safety system and has two automatic shutdowns (SCRAMs) associated with it. Reactor power was correctly monitored by all other operable power monitoring channels which have redundant SCRAM capabilities. No SCRAM occurred or was needed due to the power level of the reactor.

Following the reactor shutdown, the reactor staff investigated and determined that the high voltage power supply in the Safety Power Level channel was faulty. The voltage being supplied was approximately 180 volts instead of the necessary 500 volts. An overheated component was noticed upon examination of the power supply circuit board. The power supply was replaced with an approved spare that was repaired and tested in 2021. Following a warm up period, a channel calibration of the Safety Power Level channel was performed using procedure PS 1-05-03A:S1 to verify that the repaired Safety Power Level channel is operable. The failure and replacement of the power supply to the Safety Power Level channel have been recorded under Maintenance Log number 0888 and file number PS 1-05-3A:S1.

This unscheduled shutdown is a reportable event per TS 6.7.1 based on the circumstances and as defined in the facility TS 1.2.24d for reportable events from operation in violation of Limiting Conditions for Operation (LCO) established in TS. There were no safety issues with this event. Procedures were followed during reactor operation, shutdown, and the investigation. Even though the RO actions were appropriate

and immediate, TS 1.2.24d for reportable events does not allow for an exception for taking prompt remedial action.

The Director, Nuclear Reactor Program (NRP) was informed of the unscheduled shut down, TS violation, and repair and re-calibration of the Safety Power Level channel by the Acting MEO. Information was reviewed for filing a reportable event with the Nuclear Regulatory Commission (NRC) required by TS 6.7.1 by telephone on June 2, 2023. The NRC Operations Center was called on June 2, 2023 at 13:17 to report this event. NRC Event Number 56553 was issued. The attached narrative of the event description was read during the phone call and was also sent by email to the NRC Operations Center on June 2, 2023 at 13:32. Email receipt was confirmed at 13:34.

Corrective Actions

This event is similar to Event No. 55747 which occurred on February 17, 2022 (written report issued on March 1, 2022) regarding the Nitrogen-16 channel for the PULSTAR reactor. The conclusions in the written report for Event No. 55747 stated the following as a corrective action:

“In consultation with and approval from NRC, and consistent with the guidance given in ANSI 15.1-2007, update the definition of 'Reportable Occurrence' in TS Section 1 and add provisions to TS Section 3 'Limiting Condition for Operation', that would allow credit for operator action in responding to and correcting abnormal channel behavior.”

ANSI 15.1-2007 is titled “The development of technical specifications for research reactors” and is generally followed in the NC State PULSTAR research reactor TS. TS for the facility were written in 1997 and the current TS 1.2.24d followed the previous wording. ANSI 15.1-2007 was written in 2007 and was reaffirmed in 2013.

The TS change identified in the written report for Event No. 55747 dated March 1, 2022 has not been made. A TS amendment is being prepared and will be submitted after internal approvals have been received to prevent recurrence of a need to report similar event.

Report provided the NRC Operations Center on Jun 2, 2023 for Event No. 56553

MEMORANDUM

Date: 2 Jun 2023
To: Distribution
From: Gerry Wicks, Manager of Engineering and Operations (acting)
SUBJECT: **Unscheduled Shutdown – Friday, June 2, 2023 at 08:18 am.**

An unscheduled shutdown of the reactor occurred on 6/2/23 at 08:18 due to an abnormal response of the Safety Power Level channel during the approach to power of 1 MW at 150 kW. The Reactor Operator observed a discrepancy in power indications by the Linear Power Level and Safety Power Level channels and took immediate actions required by procedure NRP-OP-105 Response to SCRAMS, Alarms, and Abnormal Conditions. The reactor was shut down and secured immediately. The Designated Senior Reactor Operator was immediately notified.

The Safety Power level channel is required to be operable per Technical Specification 3.3.b Table 3.3-1 while the reactor is being operated. During the startup checklist, the channel performed satisfactorily. The Safety channel is part of the reactor safety system and has two automatic shutdowns (SCRAMs) associated with it. Reactor power was correctly monitored by all other operable power monitoring channels which have redundant SCRAM capabilities. No SCRAM occurred or was needed due to the power level of the reactor. Following the reactor shutdown, the reactor staff investigated and determined that the high voltage power supply in the Safety Power channel was faulty. The power supply was replaced and a channel calibration of the Safety Power channel will be performed using procedure PS 1-05-03A:S1 to verify the channel is operable. Maintenance Log #0888 has been opened. There was no safety issue with this event. Procedures were followed during reactor operation, shutdown, and the investigation.

This unscheduled shutdown is a reportable event per TS 6.7.1 based on the circumstances and as defined in the facility Technical Specification (TS 1.2.24 d) for reportable events from operation in violation of Limiting Conditions for Operation (LCO) established in TS. TS 1.2.24 d does not allow for an exception for taking prompt remedial action.

A report to the NRC is required within one working day and will be made by 5:00 pm by phone on 6/2/23 as required by TS 6.7.1. Also as required by TS 6.7.1, a written report to the NRC is due in 14 days (6/16/23).

Distribution:

A. Hawari, PhD, Director NRP
RSAC
RSC