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U.S. Nuclear Regulatory Commission
Region II Administrator
101 Marietta Street, N.W.
Atlanta, GA 30323

Subject: Notification of a licensee identified procedural non-compliance and an administrative controls deviation in accordance with the NCSU PULSTAR Facility Technical Specification 6.7.3 (d)

Docket No.: 50-297
License No.: R-120

Dear Sir:

The PULSTAR reactor was shutdown for maintenance on 15 November 1995 when the auto ranging capability of the new Gamma Metrics (G-M) linear channel was verified to have malfunctioned. Reactor power monitoring, power reverse, reactor scram, and manual ranging capabilities of the linear channel were verified to be operable.

A detailed review of the linear and safety channel design and tests have been performed to address postulated effects of spurious range changes. Results of the review indicate that there was no degradation of the channel's protective functions during the spurious auto range malfunctions. The affected PCA card has been shipped to G-M for troubleshooting and repair.

The failure of the linear channel to auto range on 6 Nov and 15 Nov 1995 did not constitute a reportable event per Technical Specifications (TS) 6.5 and definition 1.17(f). However, the sequence of events of 6 Nov and 15 Nov 1995 have been reviewed and determined to include a procedural non-compliance and an administrative controls deviation. These two findings are reportable to the NRC within 30 days in accordance to TS 6.7.3 (d).

Discussion

The PULSTAR reactor nuclear instrumentation channels have been replaced with modern design nuclear instruments from G-M. Upgrades to the source range, intermediate, linear, and safety channels were performed under the provisions of 10CFR50.59 following review and approval by the NCSU Reactor Safety and Audit Committee and Radiation Protection Committee.

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The G-M instruments were installed following a sequential schedule which allowed the new instruments to be cross-checked with the remaining nuclear channels. On 6 November 1995, the reactor was started following a post installation test of the safety channel which was the final G-M instrument to be installed. Reactor power was being increased to 10 kW when the G-M linear channel failed to automatically up-range. The power increase was terminated and the channel was manually ranged. Reactor power was next decreased to 500 watts and the linear channel automatically down-ranged as expected. Reactor power was then increased to 10 kW and the linear channel automatically up-ranged as expected. This evolution was repeated and the auto ranging mode once again responded as expected. The observed failure to auto up-range could not be reproduced. Throughout these evolutions all required nuclear instruments were monitoring and tracking reactor power. The reactor was shut-down and the linear channel reverse and scram setpoints were verified to be correct per PULSTAR Operating Manual (POM) Section 3.1.1.

The G-M linear channel failure to auto up-range was considered to be a spurious behavior of the new equipment. The reactor was restarted and normal operation was performed until 15 November 1995 when the linear channel failed to auto up-range at 100 kW on a power increase maneuver. As on 6 November, the power increase was terminated by inserting control rods. Reactor power was decreased this time to 10 kW and the channel auto down-ranged as expected. Power was next raised to 100 kW and the channel failed to auto up-range on the 30 kW range and the power increase was terminated. The channel was successfully up-ranged and down-ranged in manual with the reactor at a constant power of 10 kW. The reactor was next shut-down, however, there was a spurious down-range on one scale during the shut-down. The auto ranging failure was considered an anomaly at this point and the reactor was secured for maintenance of the linear channel.

Compliance with License Requirements

PULSTAR Operating Manual procedural steps in 3.2.1.1 (Rev 15) describe the sequence of events performed by the operator for normal reactor start-ups. Step (3) of the procedure instructs the operator to place the linear channel "Range Select Mode" to "AUTO". POM 3.2.1.3 describes the sequence of events for increasing reactor power. This procedure does not address operating with the linear channel "Range Select Mode" in manual mode. As a result, the linear channel range select mode is left in automatic from POM 3.2.1.1.

On 6 and 15 Nov 1995 the reactor operator placed the "Range Select Mode" to "MAN" and checked manual range control when the instrument failed to automatically up-range. This manual range control constitutes a procedural non-compliance which must be reported to the NRC within 30 days in accordance with Technical Specification requirement 6.7.3(d).

The PULSTAR Operating Procedures do not provide the operator with instructions or guidance for an abnormal channel behavior such as the two experienced on 6 and 15 Nov.

As a result, abnormal instrument behavior could lead to a procedural non-compliance. POM 3.2.1.1 should also allow flexibility in selecting the linear channel ranging mode.

The PULSTAR reactor is operated in accordance with license requirements which include a detailed "Request for Reactor Operations" referred to as a "runsheet". Reactor runsheets are submitted by authorized users of the reactor and its facilities and these requests are reviewed by the Reactor Operations Manager or Associate Director and the Reactor Health Physicist. The runsheet review includes a check of project and reactor license requirements, and an ALARA evaluation.

The runsheet for 6 Nov 1995 (No. 05028-1) was under PULSTAR Project P-30 which allows, in part, for reactor surveillances. This run was intended for cross-checking the response of the installed G-M safety channel in accordance with a safety channel post installation instruction. There were no provisions made in the runsheet or in the post installation instructions for performing an evaluation of the linear channel. In addition, the purpose of the run included cross-checking the safety channel against the linear channel. The spurious behavior of the linear channel invalidated the intended evaluation. The reactor should have been secured and the linear channel tested in accordance with G-M procedures.

Similarly, on 15 Nov 1995 the runsheet submitted (No. 05034-1) was in accordance with PULSTAR Project P-40. This project does not allow for PULSTAR reactor related evaluations.

These two events constitute a deviation from administrative controls and are reportable to the NRC within 30 days in accordance to TS 6.7.3 (d). Specifically, the authorized reactor utilization on these dates should have been terminated and following a linear channel check-out, the reactor should have been re-started under P-30 with specific instructions on the new runsheet.

Control Room Operating Crew Response

The reactor operators must be commended for their attentiveness and prompt responses to maintain the power indication on scale, decrease power, and inform the Designated Senior Reactor Operator (DSRO). The procedural non-compliance discussed above can not be attributed to the operators, but rather to the operating procedures. However, a review of the sequence of events demonstrated a potential deficiency in the operating crew commencing trouble shooting activities prior to shutting down the reactor. Such activities could lead to a violation of technical specification Limiting Conditions for Operation (LCO).

Although these two events did not compromise an LCO, it is important to acknowledge the potential of exceeding an LCO and train the staff to first secure the facility and then establish a formal maintenance effort.

Corrective Actions

POM 3.2.1.1 will be changed to allow the safety and linear channels to be operated in either "AUTO" or "MAN" modes. The recommended modes will be "AUTO" for the linear channel and "MAN" on the 1 MW scale for the safety channel. In addition, a new procedure will be written to address immediate operator action following abnormal instrumentation behavior. These two POM changes will be implemented by 31 January 1996 and a special training session on these two changes will be completed by 15 January 1996.

Additionally, training will also be provided to review adherence to approved runsheet specifications and limitations for reactor evolutions. The training will also review reactor status, maintenance operations, and 50.59 design changes. This training will be completed by 31 January 1996.

Conclusions

As stated in the summary, the failure of the linear channel to auto range does not constitute a reportable event as defined in TS 1.17(f) and there were no degradation of the channel's protective functions. The procedural non-compliance and administrative controls deviation must be reported in accordance with TS 6.7.3(d). Lessons learned from the detailed reviews have provided corrective actions which will be implemented in accordance with previously presented schedule.

Should you or your staff have any questions or comments, please do not hesitate to contact me at (919) 515-4602.

Sincerely yours,

Pedro B. Perez
Associate Director,
Nuclear Reactor Program

cc: USNRC Document Control Desk
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