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April 25, 1996

Regional Administrator, Region II
U.S. Nuclear Regulatory Commission
101 Marietta Street, N.W., Suite 2900
Atlanta, GA 30323

14 Day Report:
Potential Tech Spec Violation--
Failure in Safety Channel 2
High Voltage Sensing Circuit

Dear Sir:

Re: University of Florida Training Reactor
Facility License: R-56, Docket No. 50-83

Pursuant to the reporting requirements of paragraph 6.6.2 (3)(a) and (g) of the UFTR Technical Specifications, a description of a potential violation of the technical specifications was reported by telephone on April 5, 1996 with a following fax (telecopy) on April 5, 1996 (Attachment I) and a so-called 14 day written report is submitted with this letter including occurrence scenario, NRC notification, evaluation of consequences, corrective action and current status. The potentially promptly reportable occurrence involved failures in the Safety Channel 2 high voltage sensing circuit which resulted in a Safety 2 trip on April 4, 1996. This 14 day written report is delayed one week per agreement with Mr. Craig Bassett of Region II in a telephone conversation discussing the event and the report delay on April 17, 1996.

Scenario/Corrective Action

On March 27, 1996, the Quarterly Scram Checks (Q-1) were being performed as scheduled after last having been successfully performed on January 26, 1996. Upon performance of step 6b (Neutron Chamber High Voltage Reduction for Safety Channel 2), Safety Channel 2 failed to effect a water drop and blade drop full trip as required so the Reactor Manager was informed. Since insufficient schematics for the High Voltage Power Supply (HVPS) Circuit were found, the circuitry was traced and evaluated under Maintenance Log Page (MLP) #96-09. While no faults were detected in the circuitry components, a downstream trip bistable for the loss of high voltage comparator circuit required a minor adjustment. The circuitry was then retested twice to assure the trip was operable and the Q-1 Scram Checks were completed satisfactorily. Had a neutron chamber high voltage reduction occurred, a trip would have resulted at some lower value. This setpoint was evaluated to be only slightly lower since only a small adjustment to the bistable circuitry was performed. Since periodic surveillances are performed to detect and

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correct such anomalies, this incident was not considered to represent any significant reduction in safety margins. In the subsequent week there were one or two spurious Safety Channel 2 trip annunciations during the night or otherwise when the reactor was not operating. At the time, this was thought to be due to power transients.

On April 4, 1996, while ascending power on a 70 second period for a laboratory exercise and following nearly 2½ hours of low power operation, a full trip at 2 watts resulted from a Safety 2 trip annunciation. Maintenance Log Page (MLP) #96-12 was then opened and troubleshooting commenced. Since the "SAFETY 2" annunciator functions as an indication for the 125% Overpower Trip as well as the Loss of High Voltage trip, the high voltage to Safety Channel 2 was verified to be correct at 841 VDC. Since the reactor was at 2 watts when the trip occurred, this was evaluated not to be an overpower trip. The comparator circuit for the Loss of High Voltage trip was then evaluated.

The comparator circuit for the HVPS compares the HVPS through a sensing circuit and a reference voltage. If the two voltage input signals are equivalent, a trip signal will result. Voltage checks at the input to the comparator revealed the reference voltage and the HVPS voltage signal were very close. This condition would effect a trip signal if any line voltage transients should increase the noise variations.

The High Voltage Sensing Circuit used a bank of four 1 MΩ resistors and one 22.1 KΩ resistor to reduce the high voltage from the HVPS (841 VDC) to a much smaller value (~5 VDC), as well as a 221 KΩ test resistor to simulate a 10% voltage loss. Two of the 1 MΩ resistors had reduced in value to approximately 175 KΩ, which in turn placed a higher voltage on the comparator inputs. This material failure would have prevented a "normal" high voltage reduction signal from initiating a trip. When the trip was found to be inoperable on March 27, the Loss of High Voltage trip was less conservative in that a greater than normal voltage reduction would have been required to match the reference voltage on the comparator circuit. This reduction in protection could have been in effect since the last performance of the Quarterly Scram Checks (Q-1) on January 26, 1996. However, since only a slight bistable adjustment was performed to correct the trip, the trip setpoint was barely lower than normal. Additionally, the Technical Specifications require a trip if the high voltage to the detector reduces by 10%, but the circuitry is normally conservatively set to trip at approximately 8.5%. Therefore, the slight bistable adjustment performed may have still been within tolerance. After the bistable was adjusted on March 27, the 10% trip was once again operating in the normal range (~8.5% reduction required), although with a much higher sensitivity to line voltage transients.

The 1 MΩ resistors in the voltage sensing circuit were not readily available from the original manufacturer. Under 10 CFR 50.59 #96-03, the four 1 MΩ resistors were replaced with equivalent resistors from an alternate manufacturer on April 9, 1996. This restored the proper

resistances in the sensing circuit, but the difference in the comparator inputs was still very low, maintaining the high sensitivity to line voltage transients. Subsequently, the "SAFETY 2" trip annunciator again actuated overnight indicating the problem was not corrected. Review of the Maintenance Log Page (MLP #73-12) from the circuit installation some 23 years ago revealed the original circuitry had four 800 KΩ resistors, one 22.1 KΩ resistor and a 221 KΩ test resistor to deliver a higher voltage to the comparator circuit. At some time later, the 800 KΩ resistors were replaced with 1 MΩ resistors, but the 22.1 KΩ resistor and 221 KΩ test resistor were not changed. This placed a smaller voltage on the comparator input. Under 10 CFR 50.59 #96-04, the 22.1 KΩ and 221 KΩ resistors were replaced with 28 KΩ and 280 KΩ resistors, respectively on April 11, 1996. This restored the circuit design to the original design, while allowing a sufficient safety margin for line voltage transients although the voltage on the comparator seemed somewhat low at ~40 mVDC.

Although voltage checks on the high voltage sensing circuit were satisfactory, the comparator remained unstable continuing to give spurious Safety 2 annunciations on April 12 as tests on the circuit showed intermittent noise on the bias power supply. The Safety Channel 2 high voltage power supply was temporarily replaced with an exact duplicate on April 12, 1996. Although the noise was still present, it was thought this might eliminate the spurious trips due to some intermittent fault. However, after the weekend, the "SAFETY 2" annunciator was again found to be actuated on April 15, 1996. At this point the first HVPS was replaced and verified to be giving the same voltage as before removal. Subsequently, troubleshooting on April 15 finally identified a feedback resistor on the comparator with a faulty solder joint. This resistor was soldered in place and the voltage on the comparator measured to be satisfactory at ~60 mVDC. At this point the loss of high voltage sensing circuit bistable trip was adjusted and tested to be satisfactory.

It is noteworthy that the high voltage to Safety Channel 2 has been normal at every check during all this maintenance activity. It has only been the sensing and comparator circuit which became nonconservative. Additionally, it should be emphasized that the overpower trip for Safety Channel 2 has not been affected in any way by these maintenance actions or modifications.

Following successful checking of the Safety Channel 2 HVPS circuit on April 15, 1996, the problem with the Safety Channel 2 HVPS sensing circuit was considered corrected. However, the system was to be allowed to sit overnight to assure the "SAFETY 2" annunciator would not actuate. In the meantime, the reactor was considered ready for restart subject to a successful daily checkout. During the daily checkout at the end of the day on April 15, 1996, however, the Safety-3 control blade would not withdraw. Under MLP #96-13, a loose connection was repaired and a successful daily checkout completed on April 16, 1996 with no spurious Safety 2 actuation in the interim. Therefore, on April 16, 1996, the reactor was approved for restart. The only operation on April 16, 1996 was a low power foil irradiation. Subsequently, the reactor has been run on a number of occasions with no problems noted.

Therefore, the source of the spurious Safety 2 trip actuations is considered corrected. In addition, the updated drawing for the Safety 2 high voltage sensing circuit has been produced and is on file to assure updated drawings are available as of April 9, 1996. The inadequate drawings that were available for the HVPS sensing circuit may also be considered a potential violation of tech specs per Section 6.7.3(4) requiring that updated drawings for the facility be maintained, though this is considered a minor item.

NRC Notification

After the Safety 2 trip occurred on April 4, 1996, and initial evaluations were completed on April 5, 1996, the Reactor Safety Review Subcommittee (RSRS) Executive Committee met to discuss the reportability of this event as well as the planned replacement of resistors in the sensing circuit for the high voltage in Safety Channel 2. The trip event was reviewed as was the adjustment made on March 27 to assure proper voltage drop would initiate a trip. Because the failure sometime between January 26 and March 27, 1996 may have resulted in operation with a trip setting on loss of high voltage somewhat above the 10% loss of voltage required by technical specifications, the RSRS Executive Committee recommended prompt reporting of the event. Therefore, NRC Region II was informed of this event per a telephone conversation with Mr. Al Gooden on April 5, 1996 relative to the potential violation of technical specifications. Subsequently on April 5, the event was further discussed with Mr. Bruce Mallett and Mr. Tom Decker of NRC Region II. The event was also discussed with NRC Project Manager Ted Michaels on April 9, 1996. The independence of the 125% overpower trip in Safety Channel 2 and the 10% loss of detector high voltage was discussed further with Mr. Craig Bassett on April 9, 1996 basically emphasizing the independence and the fact that the high voltage to Safety 2 has been normal throughout this event. It has only been the high voltage sensing circuit which became non conservative with the Safety Channel 2 overpower trip not affected. In addition, the event was again discussed with Al Gooden of NRC Region II twice on April 11, 1996 when he was informed of the circuit modification in progress. The complete event was summarized for Mr. Craig Bassett when the extension was requested for the 14 day report on April 17, 1996. On April 18, 1996, the sequence of repairs was again discussed with Mr. Bassett.

Current Status/Consequences

Following successful checking of the Safety Channel 2 HVPS circuit on April 15, 1996, the system was allowed to sit for over 24 hours to assure the "SAFETY 2" annunciator would not actuate. On April 16, 1996, the reactor was approved for restart. The reactor was considered ready for restart subject to a successful daily checkout. During the daily checkout, the Safety-3 control blade failed to withdraw. Under MLP #96-13, a loose connection was repaired and a successful daily checkout was completed on April 16, 1996. The only operation on April 16, 1996 was a low power foil irradiation. Subsequently, the reactor has been run on a number of occasions with no problems noted.

As indicated, the RSRS Executive Committee met on April 5, 1996 to review this event and approve restart subject to successful post-repair checks. The Executive Committee essentially agreed with actions taken and with the initial staff evaluation that the occurrence did represent a potential violation of the UFTR Technical Specifications and should be treated as promptly reportable which was accomplished. The full RSRS reviewed this entire event (to its conclusion on April 16 with successful restart) at its regular meeting on April 25, 1996. Reactor Management and the RSRS agree that this occurrence is not considered to have involved any significant reduction in reactor safety margins and it is not considered to have involved any significant effect, potential or real, on the health and safety of the public. This occurrence is now considered closed.

If further information is needed, please advise.

Sincerely,

William G. Vernetson
Director of Nuclear Facilities

WGV/dms
Attachment

Copies: U.S. NRC Document Control Desk
Ted S. Michaels, NRC Project Manager
Reactor Safety Review Subcommittee
D. Simpkins, Reactor Manager

Sworn and subscribed this 25th day of April, 1996.

Notary Public

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MY COMMISSION # CC302416 EXPIRES
August 27, 1997
BONDED THRU TROY FAIN INSURANCE, INC