MIT NUCLEAR REACTOR LABORATORY

AN MIT INTERDEPARTMENTAL CENTER

Thomas H. Newton, Jr.
Director of Reactor Operations

Mail Stop: NW12-116a
138 Albany Street
Cambridge, MA 02139

Phone: 617 253-4211
Fax: 617 253-7300
Email: tnewton@mit.edu

7 September, 2011

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Re: Massachusetts Institute of Technology; License No. R-37; Docket No. 50-20; Reportable Occurrence 50-20/2011-4: Work Involving Reactivity with Possibly Fewer than the Required Number of Nuclear Safety Channel Period Alarms; NRC OPS Center Log #47-229

Dear Sir or Madam:

The Massachusetts institute of Technology hereby submits a report of an occurrence at the MIT Research Reactor (MITR) in accordance with paragraph 7.7.2 of the Technical Specifications. An initial report was made by telephone to the U.S. Nuclear Regulatory Commission Headquarters Operations Center on 1 September 2011.

The format and content of this report are based on Regulatory Guide 1.16, Revision 1.

1. Report No. 50-20/2011-4; Ops Center No. 47-071

2a. Report Date: 7 September 2011

2b. Date of Occurrence: 12 August 2011

3. Facility: MIT Nuclear Reactor Laboratory

4. Identification of Occurrence:

An in-core experiment was inserted and work was conducted on a single control blade at the MIT Research Reactor on 12 August 2011, with possibly only one operable nuclear safety channel period alarm. Technical Specification No. 3.2.3-2 requires that there be at least two such operable channels prior to work involving reactivity being performed in core.

5. Condition Prior to Occurrence:

The <100 kW startup checklist had been completed in preparation for replacement of a drive for control blade #5. In order to facilitate access to this drive, the in-core

A020
NRR

sample assembly (ICSA) was removed from the core on Thursday 11 August at 1141. At about 2100 on 11 August, as part of a check of the functionality of the electromagnet for the control blade undergoing maintenance, the Assistant Superintendent observed that all six safety channels were properly connected. (Note: Channel #1-3 are the period safety channels which are each connected to a Keithley picoammeter. Channel 3, an ion chamber, is not considered to be operable at this low range.)

On Friday 12 August, the drive was replaced, the ISCA tube was reinserted in core, and routine blade drop time measurements were made on control blade #5.

6. Description of Occurrence:

After completion of the drive work and testing on 12 August, the operator proceeded to perform the full power startup checklists in preparation for operating the reactor at full power. As part of this test, all three period channels were checked and it was observed that although Channel 1 showed a period response on the Keithley amplifier, there was no corresponding period on the safety channel or a resulting scram. Subsequent investigation showed that the cable normally connecting Channel 1 Keithley to the scram circuit was disconnected from the back of the Channel 1 safety amplifier.

7. Description of Apparent Cause of Occurrence

The control room had been continuously attended by licensed personnel for the entire time in question. All licensed operators and supervisors have stated that there was no work being done on any of the safety channels between 2100 Thursday 11 August, and ~2115 on Friday 12 August, when the disconnection was discovered. Thus, it is surmised that the BNC cable connection was not properly latched in place and eventually vibrated loose some time on 12 August.

8. Analysis of Occurrence:

As noted above, although Channel No. 1 Keithley was continuously indicating the reactor period, it was not capable of alarming at its setpoint of 10 seconds as of the time it became disconnected. Safety Channel No. 2 was observed to be operating properly at all times and would have caused an alarm if the period had exceeded the setpoint of 10 seconds. In addition, the D_2O reflector was dumped as a normal part of the procedure thereby adding approximately negative 10.2 beta of additional reactivity. Thus, the reactor was far subcritical at all times and none of the activities concerned could have even brought K_{eff} up to 0.9.

In addition to the uncertainty in the time at which Channel No. 1 became disconnected, there is also considerable uncertainty as to whether the maintenance

activities in question fall into the technical specification category of "work involving reactivity performed in core." It was this debate that delayed classification of this event as reportable. Modification of the wording of the technical specification is under consideration.

9. Corrective Action:

The immediate corrective action consisted of replacing the connection and retesting the period trip.

The long-range corrective action consists of initiating a log sheet for changing the state of all connections in the back of the control panel, with verification and checking by a second licensed person prior to declaring a channel operational. This log sheet also has a section to ensure information is recorded on the Reactor Bypass Log. The Reactor Bypass Log is reviewed by the Instrumentation Supervisor, Shift Supervisor, and Superintendent. (Action completed, 2 September 2011.)

10. Failure Data

A related occurrence took place in July 2011. Refer to ROR 50-20-2011-3 dated 28 July 2011.

Sincerely,

John P. Foster
Superintendent
MIT Research Reactor

Thomas H. Newton, Jr., Ph.D, PE
Director of Reactor Operations
MIT Research Reactor

cc: MITRSC

USNRC - Senior Project Manager
Research and Test Reactors
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

USNRC - Senior Reactor Inspector
Research and Test Reactors
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation