



Research Reactor Center

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November 3, 2000

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

Subject: University of Missouri-Columbia Research Reactor (MURR)
Docket No. 50-186; License No. R-103
Reply to Notice of Violation: EA 00-154; EA 00-173

On October 5, 2000, the U.S. Nuclear Regulatory Commission issued a Notice of Violation to the University of Missouri-Columbia Research Reactor (MURR) regarding events that occurred on April 12, 2000 and June 12, 2000. These events were addressed in NRC Inspection Report Nos. 50-186/2000-202 and 50-186/2000-203 dated July 26, 2000 and July 27, 2000, respectively.

On September 6, 2000, a predecisional enforcement conference was conducted in Columbia Missouri to discuss these matters and other program related issues. MURR presented its views on the apparent violations and summarized many corrective actions that had been or would be put in place to address the specific issues and to prevent recurrence of similar events.

Attachment 1 provides the MURR reply to the Notice of Violation. In summary, MURR admits the violations. As discussed during the enforcement conference, appropriate corrective actions either have been taken, are being taken, or are planned in the near future to address the root causes of the events and to improve associated programs.

Please contact Ralph Butler, Chief Operating Officer, if you have any questions regarding this submittal.

Sincerely,

Edward A. Deutsch
Director

c: Mr. Alexander Adams, Jr., USNRC
Mr. Craig Bassett, NRC Region II
Dr. Jack O. Burns, MU Vice-Provost
Reactor Advisory Committee

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Attachment 1
University of Missouri-Columbia
Reply to the Notice of Violation

Reply to the Notice of Violation

I. Restatement of Violation I

During an NRC inspection conducted on April 14, June 15 and 16, and July 13, 2000, a violation of NRC requirements was identified. In accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions, "NUREG-1600, the violation is listed below:

Title 10, Code of Federal Regulations [61 FR 39300, July 29, 1996], Part 50, Section 59 (10 CFR 50.59) states, "50.59 Changes, tests and experiments. (a)(1) The holder of a license authorizing operation of a production or utilization facility may (i) make changes in the facility as described in the safety analysis report, (ii) make changes in the procedures as described in the safety analysis report, and (iii) conduct tests or experiments not described in the safety analysis report, without prior Commission approval, unless the proposed change, test or experiment involves a change in the technical specifications incorporated in the license or an unreviewed safety question. (2) A proposed change, test, or experiment shall be deemed to involve an unreviewed safety question (i) if the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the safety analysis report may be increased; or (ii) if a possibility for an accident or malfunction of a different type than any evaluated previously in the safety analysis report may be created ..."

Contrary to the above, on April 6, 2000, the licensee removed shielding from the Spent Fuel Element Irradiation Facility. This facility is described in Section 6.5.3 of the University of Missouri Research Reactor Facility Hazards Summary Report dated July 1, 1965. Removal of this shielding increased the probability and potential consequence of a radiation exposure accident or malfunction and, therefore, is an unreviewed safety question. The failure to evaluate the change to determine if prior NRC review and approval was required before implementing the change is a violation of 10 CFR 50.59.

This is a Severity Level IV violation (Supplement I)

A. Reason for the Violation

MURR admits the violation. As discussed in detail during the September 6, 2000 enforcement conference, the principal specific causes of this violation were:

- The liner inspection plan was not a formal procedure.
- Procedures allowed the fuel handling sequence change to be approved by a single licensed individual.

- Some licensed operators were unaware of this significant plant condition.
- Key personnel did not clearly understand when it was appropriate to perform a 10 CFR § 50.59 assessment.

B. Corrective Actions Taken and Results Achieved

Key immediate actions taken after MURR discovered this issue include:

- The fuel element was removed from the "Z" basket area.
- The shielding was re-installed.
- A "stand-down" was held with Operations personnel to assess the event.
- An incident Response Team was developed to investigate the event and to determine causes and recommended corrective actions.
- Non-routine activities were placed on hold.

Near-term corrective actions included:

- Establishing controls requiring that all non-routine activities and associated procedures and changes be approved by the Reactor Manager and the Health Physics Manager;
- Establishing of controls requiring that step-by step fuel movement procedures be approved by Reactor Physicist and reviewed by a Senior Reactor Operator;
- Establishing controls requiring revisions to step-by-step fuel movement procedures be approved by at least two individuals (Senior Reactor Operator(s) or Reactor Physicist);
- Instituting a formal shift turnover;
- Assigning a senior staff member to be interim Operations Engineer
- Requested that an external peer review of the event be conducted by the National Organization of Test, Research, and Training Reactors (TRTR).

Long-term Actions include:

- Development of a procedure for screening procedures to better determine what types of changes could constitute a 10 CFR 50.59 assessment.
- Using the above screening procedure to formalize what had been informal processes:
 - Addresses the determination of when to develop and use a procedure versus use of an informal process.
 - Confirms that appropriate 50.59 evaluations have been performed for reactor activities.

- Evaluating the oversight and control of non-routine maintenance activities.

The effectiveness of the above corrective actions will be confirmed through the implementation of actions discussed in the following section.

C. Corrective Actions That Will Be Taken To Avoid Further Violations

In addition to the specific actions taken in response to the subject NOVs, MURR also has carefully considered recommendations in the TRTR report and those provided by an independent common cause investigation team report, both of which addressed broader programmatic areas that should be improved. The TRTR addressed the April 12, 2000 event. The independent common cause assessment addressed programmatic issues that may be common to the April 12, 2000 and the June 12, 2000 events. The common cause team (1) re-assessed MURR-determined root causes, (2) determined cause commonalties, (3) provided recommendations for additional corrective actions. The report provided by the team was direct and critical. The team's contributing and root causes were consistent with MURR LERs and the TRTR report. However, several additional corrective actions were recommended.

The intent of the majority of these recommendations is incorporated in the MURR Performance Enhancement Plan (PEP) dated October 3, 2000. The MURR PEP is being utilized by the Chief Operating Officer to monitor progress regarding corrective action implementation. It includes those tasks, with schedules and resource assignments, necessary to implement the TRTR and common cause team recommendations. The MURR PEP categorizes the tasks into the following five programmatic areas: 1) Procedures, 2) Configuration Control, 3) Management, 4) Communications, and 5) Training. In addition, MURR has developed a corrective action procedure that will be utilized to collect, track, and assess deficiencies that could reasonably have an adverse impact on reactor safety. This procedure is being utilized on an interim basis to ensure deficiencies are identified during the PEP phase are collected, reviewed on an individual and collective basis, and assessed against ongoing efforts.

D. Date When Full Compliance Will Be Achieved

MURR is presently in compliance regarding the NOV issue.

II. Restatement of Violation II

During an NRC inspection conducted on July 11-13, 2000, two violations of NRC requirements were identified. In accordance with the "General Statement of

Policy and Procedure for NRC Enforcement Actions, "NUREG-1600, the violations are listed below as one problem:

- A. Technical Specifications (TTS) Section 6.1.b requires that written procedures be in effect for normal operations of the reactor, emergencies, radiological control, and the preparation for shipping and the shipping of byproduct material produced under the reactor license.

Maintenance Procedure P.M. No. RX-S-1, with a revision date of October 1, 1997, requires in the Plant Conditions Required and Safety Precautions Section, Part C, that the reactor and all systems be shown and two fuel elements be removed for an offset and control blade changeout.

University of Missouri - Columbia Research Reactor (MURR) Standard Operating Procedure (SOP), Revision 23, dated September 24, 1999, requires in Section II.3.1 that the core will be defueled of two fuel elements corresponding to the offset mechanism (and control blade) being removed.

Contrary to the above, on June 12, 2000, control blade B was removed from the reactor without two fuel elements being removed.

- B. TS Section 1.17 states that the reactor shall be considered in operation unless it is either shutdown or secured.

TS Section 1.20 states that the reactor shall be considered secured whenever it contains insufficient fuel in the reactor core to establish criticality with all control rods removed or whenever the following condition is met:

1. All shim rods are fully inserted.

TS Section 1.21 states that the reactor is shut down when all shim rods are fully inserted and power is unavailable to the control rod magnets.

TS Section 3.2.a requires that all control blades, including the regulating blade, be operable during reactor operation.

Contrary to the above, on June 12, 2000, while the reactor was neither secured nor shutdown, control blade B was removed from the reactor rendering the control blade inoperable during reactor operation.

This is a Severity Level IV problem (Supplement I).

A. Reason For the Violation

MURR admits the violation. As discussed in detail during the September 6, 2000 enforcement conference, the principal specific causes of this violation were:

- A combination of inadequate procedure guidance, complacency regarding the performance of infrequent activities, and inadequate reinforcement of management expectations. This cause was influenced by the following factors:
 - Inadequate interface between two related offset mechanism removal procedures.
 - No sign-off step requiring that two fuel elements be removed.
 - Inadequate communication between the two involved shifts.
 - Distraction from the leaking primary pump mechanical seal issue.
 - Management did not manage, but became involved in on-hands work.

B. Corrective Actions Taken and Results Achieved

MURR took several actions prior to plant restart and initiated several long-term efforts in response to this event. As presented in detail during the enforcement conference, corrective actions included:

Actions taken prior to restart included:

- The reactor was placed in a configuration that satisfied technical specifications
- MURR management conducted a stand-down with licensed operators to discuss safety issues associated with the event.
- Standing Order 00-09 was issued, which required, among other things, a control room briefing prior to infrequently performed operations and activities.
- Operator training was conducted regarding event details and management expectations. The focus of this training was questioning attitude and complacency.
- Reactor Operations Standard Operating Procedures. (Section I: Administrative Operating Policies; Section II: Reactor Operating Procedures; Section III: Reactor Control and Instrumentation System; and Section IV: Primary Cooling System) were reviewed for accuracy. No significant findings were identified.
- Standing Order 00-10 was issued, which required, among other things, that all oncoming crew members shall review the log book and be briefed on current operations by the crew they are to relieve.

- An Action Subcommittee was convened to review the event. This subcommittee commented that since complacency apparently was a central issue in both events, the corrective actions should be focused in that area. MURR has implemented the use of a control room status board, documented shift turnovers, and shift briefings prior to performing infrequent activities to help prevent a complacent approach to reactor activities. In addition, reactor management conducted an event briefing that included a discussion regarding the dangers of complacency to confirm that expectations were understood.
- A Safety Subcommittee was convened to review the event. The Safety Subcommittee expressed a concern that the Lead Senior Reactor Operator may be focusing on the tasks they are faced with on a particular shift rather than operating with the big picture or the entire procedure in mind. Reactor management emphasized in a memo dated July 17, 2000 to the Lead Senior Reactor Operators that their duties include thinking ahead and assessing the impact of abnormal situations and unusual conditions on the facility.
- Management re-emphasized the need for attention to detail and heightened awareness of reactivity control. The Reactor management team conducted shift briefings regarding the expectations for Lead Senior Reactor Operators, improving human performance at MURR, and the attributes of the self-check Stop Think Act Review (STAR) program.

Long-term actions include:

- Reactor management routinely briefs licensed operators on plans for "maintenance day" activities
- Increased efforts are being implemented to fill all vacant management positions at MURR. Reactor operations management team was reorganized from a Reactor Manager and Reactor Operations Engineer to a management team consisting of a Reactor Manager and three Assistant Reactor Managers. Two of the three Assistant Reactor Manager positions have been filled. An offer has been extended and accepted by an individual for the remaining third position. Additionally, five new reactor operators have been hired since June 12, 2000.
- A status board is now used in the control room to better ensure that the current shift and the on-coming shift are fully aware of key reactor configurations and system status.
- Several procedure changes have been made regarding offset mechanism maintenance procedure. These changes include relocating the offset change-out steps from the maintenance procedure to the control blade inspection Compliance Procedure, which addresses removal of a control blade offset mechanism. The Compliance Procedure now has a signoff step, which requires verifying that the core is defueled with two fuel elements and

logging this verification in the control room console log before removing the control blade offset mechanism.

- A general procedure upgrade effort is underway which will provide for the systematic revision of MURR's procedures such that they take advantage of relevant lessons learned from commercial nuclear industry practices.

C. Corrective Actions That Will Be Taken To Avoid Further Violations

See the discussion in Item I.C above.

D. Date When Full Compliance Will Be Achieved

MURR is presently in compliance regarding the NOV issue.