

August 26, 1993

Director, Office of Enforcement  
U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, D.C. 20555

SCHOOL OF  
ENGINEERING & APPLIED SCIENCE

NUCLEAR REACTOR FACILITY  
Department of Mechanical,  
Aerospace & Nuclear Engineering

University of Virginia  
Charlottesville, VA 22903-2442

804-982-5440 FAX: 804-982-5473

Re: University of Virginia Reactor,  
Docket No. 50-62, License No. R-66


Subject: **REPLY TO NOTICE OF VIOLATION**

Dear Sir:

This reply is to the Notice of Violation and Proposed Imposition of Civil Penalty - \$2,000 (NRC Inspection Report No. 50-62/93-02) of July 28, 1993. We agree with the Commission's findings stated in the cover letter to the Notice of Violation (NOV) and in the NOV itself. As required by regulations, please find in attachment our written statement concerning the two violations of UVAR Technical Specifications. In this mailing, we also are including the "Civil Payment Letter" and a check to cover the proposed civil penalty.

Should the Nuclear Regulatory Commission have further questions about our response, I can be contacted at (804) 982-5440.

Sincerely,



Robert U. Mulder, Director  
U.VA. Reactor Facility &  
Asst. Prof. Nuclear Eng.

City/County of Albemarle  
Commonwealth of Virginia

I hereby certify that the attached document is a true and  
exact copy of a letter presented before  
(Type of document)

me this 26<sup>th</sup> day of Aug, 1993  
by Robert Mulder  
(Name of person seeking acknowledgement)

Wick E. D. Thomas  
Notary Public

My commission expires 5/22/94 <sup>VT</sup>

enc: Reply to Notice of Violation  
Civil Penalty Payment Letter  
Check

cc: Regional Administrator, US NRC Region II, Atlanta, Georgia

## REPLY TO A NOTICE OF VIOLATION

During the NRC inspections conducted on May 3, 1993 and June 3 through 4, 1993 two violations of UVAR Technical Specifications were identified, as set forth below under "A" and "B":

- A. Technical Specification 3.2, Reactor Safety System, requires that the reactor shall not be operated unless the safety system channels in Table 3.1, Safety System Channels, are operable. Some of the safety system channels listed in Table 3.1 include: one operable power to primary coolant channel, one operable primary coolant flow channel, two operable reactor power level channels, and one operable reactor period channel.

Contrary to the above, on April 28, 1993, the reactor was operated for 5.5 hours without the required scram functions of the above identified safety system channels being operable.

- (1) Admission or Denial:

The licensee admits to this violation.

- (2) Reason for Violation:

Following independent trouble-shooting performed by an electronically-skilled Senior Reactor Operator on the UVAR reactor console, the operability of the scram system was not verified post-maintenance by performance of appropriate tests given in the UVAR "Daily Checklist."

The SRO performing the trouble-shooting interchanged two mixer/driver modules in the scram logic drawer in order to determine which one might be the source of an annoying series of spurious scrams w/o annunciator indication. While the interchange of like modules is a valid trouble-shooting procedure in electronic circuits, the SRO erroneously assumed the modules to be identical. The interchange of unlike mixer/driver modules resulted in an inadvertent change to the scram system logic and the non-availability of five important automatic scram channels.

The interchange of the modules was by itself not the key reason for this TS violation. The violation occurred when the reactor was operated without a number of required scrams being available. The Reactor Administrator, in an error of judgement, authorized UVAR restart following console trouble-shooting without properly reviewing and questioning the SRO's independent work, and without requiring repetition of the Daily Checklist. Performance of this checklist would have revealed loss of the above listed scram channels prior to UVAR restart on the afternoon of April 28, 1993.

(Reply to Notice of Violation, page 2, cont.)

(3) Corrective Steps and Results Achieved:

The licensee's corrective actions were discussed during the Enforcement Conference held in Atlanta on June 29, 1993 between licensee representatives and NRC officials. At that time, the NRC was provided with a complete listing of the corrective actions. A summary of the corrective steps specific to this violation is set forth below.

The TS violations were discovered by reactor staff members during UVAR shutdown on April 28, 1993. Following discovery, the UVAR remained shut down for approximately six weeks for a thorough investigation of the event and completion of corrective actions. Timely notifications of University administration, the local community and the NRC were made. Also, the results of the investigations conducted by the reactor staff were sent to the NRC in three separate reports.

With the UVAR shutdown, the effect of the module interchange on the scram logic was carefully studied to determine which scrams channels had been affected temporarily. Next, it was verified that no damage to the console circuitry occurred with the interchange of modules in the scram logic drawer. The return of the mixer/driver units in their original positions on the bus in the drawer placed the UVAR console to its original operable condition.

A complete review of the UVAR console schematics and electronics was performed to search for console modules that might have been modified from the "off-the-shelf" state. Indeed, two modules were identified that, like the mixer/driver modules, had had internal jumpers installed to tie off unused inputs, thus rendering them non-interchangeable. On July 9 the staff submitted an analysis with a request to the Reactor Safety Committee (RSC) for permission to remove the unnecessary jumpers in these modules and return them to an identical (interchangeable) configuration. This request will be considered at the next meeting of the committee foreseen for August of 1993. Should RSC approval be obtained, the jumpers will be removed, the schematic updated and the console tested for operability prior to resumption of reactor operation.

In the case of the mixer/driver modules, the RSC had already approved removal of the unnecessary jumpers bridging unused inputs that had been installed in the early 1970's (and caused scram logic scrambling).

(Reply to Notice of Violation, page 3, cont.)

Module calibrations were performed and the availability of required scram functions was tested repeatedly prior to UVAR restart after the six-week shutdown.

The UVAR scram drawer presently has two identical mixer/driver modules, hence an accidental interchange should not affect the scram logic. However, at NRC request a cautionary sign was fixed to the UVAR console to warn operators that modules in the console drawers are not interchangeable.

An improved labelling system was adopted for the modules in the console to preclude misidentification. In addition, the official schematic was updated to correct a few minor discrepancies between it and the "as built" configuration.

The independent trouble-shooting performed by the SRO was prompted by a number of infrequent spurious scrams w/o annunciation that were observed since November 1992. In hindsight, the trouble-shooting attempt should not have been made by the SRO based on an impulse to capitalize on the opportunity offered by the manifestation of the spurious scram at mid-day on April 28. Rather, trouble-shooting (maintenance) should have been a pre-planned response taken earlier to a recognized annoyance. To resolve the spurious scram issue, a careful check of the console electronics was made. A cold solder joint was discovered and fixed in one of the mixer/driver modules. This cold joint may have been the source of the unannounced scrams, for no further unexplained scrams have occurred since UVAR return to operation. (Note: An agreement with the NRC requires U.V.A. to notify the Commission in the event two unexplained scrams occur within a 30 day period. This agreement expires 90 days following UVAR restart.)

The Reactor Safety Committee was briefed on the console event w/i 48 hours of its discovery. The committee was actively involved in oversight over the recovery efforts, and met several times in the weeks following the event to consider and approve proposed staff actions in response to the event. Following the completion of short-term corrective actions applicable to the event, the Reactor Safety Committee gave its approval to UVAR restart. The completion of corrective actions by the staff and the restart approval by the Reactor Safety Committee were reported to the NRC, and NRC agreement for UVAR restart was obtained also.

(Reply to Notice of Violation, page 4, cont.)

Improvements to the UVAR control console will be considered in the future. The DOE has been providing limited funds each year for the purchase of reactor safety-related equipment. An increased redundancy of electronic channels might be desirable, to assure that the minimum number of TS-required operable channels would be available even if some electronic failures occurred.

(4) Corrective Steps Taken to Avoid Further Violations:

The licensee made a great effort to identify and address all possible root causes for the console event. In addition, TRTR was requested to make an independent official peer review of the situation. As a result, numerous improvements to Standard Operating Procedures (SOPs) involving the areas of management controls and maintenance were made. For example, the Reactor Supervisor has been more clearly made the focal point for reactor operations. Also, definitions for trouble-shooting and maintenance have been discussed and adopted, and staff has been re-trained on the lessons learned.

A repeat of this violation is highly unlikely, given that:

- 1) The event will be a topic of discussion during staff training and re-training in the future as an example of improper reactor maintenance and operation,
- 2) There is permanent warning sign affixed to the reactor console alerting that modules are not interchangeable,
- 3) In revisions to SOPs, trouble-shooting has been classified as a form of maintenance. The SOPs now very explicitly require testing following maintenance and prior to returning affected equipment to service,
- 4) The mixer/driver modules have been made identical, so that even if they were interchanged and not tested in the new position, with high probability the TS required scrams would be available,
- 5) Revised SOPs now call for a check of the scram system operability prior to reactor restart following automatic scrams.

NRC officials have inspected the Reactor Facility in the area of reactor operations since the event and were briefed on the corrective actions taken. In addition, previous licensee reports list further details perhaps omitted here.



(Reply to Notice of Violation, page 5, cont.)

(5) Date When Full Compliance Will Be Achieved:

With the exception of improvements which may be made to the reactor console in the future (for example, increase channel redundancy), full compliance was achieved at the time the above cited corrective actions were completed (prior to UVAR restart following the six-week shutdown period).

- B. Technical Specification 4.5, Maintenance, provides that, following maintenance or modification of a control or safety system or component, it shall be verified that the system is operable before it is returned to service or during its initial operation.

Contrary to the above, on April 28, 1993, maintenance or modification of a safety system component was performed by exchanging the mixer/driver modules in the scram logic drawer of the reactor console and the system was not verified to be operable before it was returned to service.

(1) Admission or Denial:

The licensee admits the violation.

(2) Reasons for the Violation:

The SRO who performed the trouble-shooting of the console on April 28, 1993 did not consider the interchange of supposedly identical modules in the scram drawer to constitute "maintenance." This SRO also did not consult all available detailed console schematics which might have led him to realize the safety implications of not testing the scram system for operability. It is noted that the schematics did not indicated the jumpered unused inputs, perhaps because the jumpers on unused inputs were not an active part of the electronic circuit in the non-interchanged configuration.

The Reactor Administrator, in a serious error of judgement, did not review and critique the SRO's work, nor require testing of the scram system for operability. The Reactor Administrator should have recognized that work had been performed on a reactor safety system, should have reviewed the Technical Specifications, and should have required operability testing prior to authorizing UVAR restart.

(Reply to Notice of Violation, page 6, cont.)

Testing of the scram system could have been accomplished using the available "Daily Checklist." In conclusion, operator error is the reason for this violation, which then led automatically to the second violation cited under "A" above.

(3) Corrective Steps Taken and Results Achieved:

Some of the corrective steps described above under "A" also apply in part to the response for this particular violation, but they will not be repeated here. Corrective steps were taken in the administrative, hardware and operation procedure areas. A summary of the steps taken specifically for this violation is presented below.

The improper operator actions leading to violations of UVAR Technical Specifications will be considered during the annual employee performance evaluations. Lowered evaluation scores may have a negative impact on salary raises. Both staff members acknowledged their share of the responsibility for the event. They also attended the Enforcement Conference called by the NRC in Atlanta and heard and understood the concerns expressed by NRC officials.

Standard Operating Procedures were revised to explicitly describe trouble-shooting and maintenance and require greater reactor supervisor oversight over all reactor operations. The staff was retrained on the SOP changes and made aware of management expectations through a Statement of Policy issued by the Reactor Director.

The UVAR console was successfully tested following a return to the original configuration, and again upon the modification of the mixer/driver modules which returned them to an identical configuration.

SOPs now explicitly require testing of the scram system following maintenance on the console, and also prior to UVAR restart following automatic scrams, using a new checklist which is a sub-set of the more extensive "Daily Checklist."

(4) Corrective Steps Taken to Avoid Further Violations:

The console event was evaluated thoroughly for root causes. The improvements made in the area of management controls, console hardware and operating procedures described above provide reasonable assurance that further violations of this type will be avoided.

(Reply to Notice of Violation, page 7, cont.)

(5) Date When Full Compliance Will be Achieved

The licensee is presently in full compliance.

It is noted that commitment was made to the NRC by the Reactor Director in a prior report to the NRC stating that SOP 3 Personnel Responsibilities would be improved. A revised SOP 3 was presented to the Reactor Safety Committee on July 8, 1993 but was not approved on the basis that it was too detailed and prescriptive. Accordingly, a second revision to SOP 3 will be presented to the Reactor Safety Committee at its next meeting. It is expected that an improved SOP 3 may be approved within the next 60 days.

The first SOP 3 proposal was used as a basis for a Statement of Policy by the Reactor Director. Copies of this policy statement were given to all reactor staff members.