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February 12, 1996

US Nuclear Regulatory Commission
Document Control Desk
Washington DC 20555
Attention: Thomas P. Gwynn, Director
Division of Reactor Safety

Docket 50-326
License R-116

Re: Reply to a Notice of Violation dated January 11th, 1995
with follow-up correspondence dated January 24th 1996

Ladies and Gentlemen:

With respect to the referenced Notice of Violation we respond as follows:

" (... contrary to Technical Specification 6.2.b.3 .....the licensee had not performed a written safety evaluation which provided the bases for the modification performed between February 7th 1994 and February 8th 1995 on the wide range logarithmic and linear monitoring channels nor determined whether the modifications constituted an unreviewed safety question."

(1) Comment: As noted in remarks to the inspector this was discussed verbally between the Reactor Supervisor and the Reactor Operations Committee(ROC) on several occasions. In addition, the bid specifications (copy enclosed for information) clearly were written in line with accomplishing the improvement modifications with no degradation of safety functions. However proper written records were not made of these events, nor was a clear committee "vote" ever recorded in the minutes.

(2) Corrective steps: A summary prepared by the Reactor Supervisor is enclosed. This will be reviewed formally by the ROC at the next meeting which will be held within the next 30 days. As noted, full implementation of phase 2 of the improvements to the console will await formal approval as required.

(3) Further action: The staff is mindful of the need for written documentation regarding such matters and will give greater attention to preparation of such matters in the future.

(4) Full Compliance: Compliance with full procedures should have been accomplished within the 30 day period from this letter.

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Additional Comment:

We are grateful for the thoroughness with which the inspection was conducted and the courtesy shown our staff by your inspectors. We note the several items of concern that were identified, but not cited, and will be improving our document procedures in a number of areas to meet those concerns.

Sincerely,

Ralph J. Cicerone

Ralph J. Cicerone
Dean

enclosure (1)

UCI TRIGA Reactor Console Upgrade
Phase I and II

Summary of Potential Safety Issues

Dr. G. E. Miller, January 1996

The attached bid specification outlines all of the proposed instrumentation. The upgrade affects the neutron monitoring channels, all of which are to be replaced, and the control rod magnet power supply. No other features are to be changed. Specifically the safety issues to be reviewed are:

1. Scram and Interlock Capability.

Each of the new channel instruments is designed to provide a normally closed (fail safe open) set of contacts initiated by a bi-stable which will provide the same scram and interlock functions as the existing equipment. Each solid state relay will have an approximately 10 volt feed signal that will operate the existing mercury wetted relays in each circuit. These in turn, operate the AC 115 volt relays in the scram bus. No changes are planned in the relay scram bus. Two additional Hg contact relays will be provided as the present circuit for the % Power scram and the High Voltage Power Supply scram did not use these, they provided direct AC Mains circuits. This is actually a modest safety improvement as the lower voltage systems are less subject to failure.

Specifically the following present (and former) functions and their new origins are identified in the following table.

Scrams	Circuit Channel Origin (Phase I, or II)
High Voltage Power Supplies	Wide Range Linear(I) Wide Range Log(I) Power (II)
High Linear Power (110% of any range)	Wide Range Linear(I)
Low Period (< 3 seconds)	Wide Range Log(I)
High Power (%)(110% of full power)	Power Channel (II)

Interlocks	
Start Up Neutrons (> 2 cps)	Wide Range Log(I)
Pulse Permissive (less than 1 kW power)	Wide Range Linear(I)

All additional scram and interlock functions remain unaffected by the changes as they are unassociated with the neutron monitoring channels.

2. Power Level Information - Neutron Levels

The most significant change is the provision of signals from the wide range logarithmic channel to both start-up monitoring and high power level monitoring. This was not possible with the older instrumentation because of circuit noise and non-linearity (of the log signals), so two channels were provided, which have now been collapsed to a single wide range instrument using a fission chamber as detector input. This represents no loss of safety function, since the low range operation provides a permissive signal, which was the ONLY function of the old "start-up" channel) and the high range provides full read out (and never did provide scram functions). In fact this unit (and others) is provided with additional bi-stable circuits that could be used to add further scram functions if so desired.

Direct replacement is made of the new two pen recorder which continues the same functions as before: providing a continuous record of linear power level (blue pen) from the Wide Range Linear Channel, and logarithmic power level (red pen) (Phase I) from the Wide Range Log Channel, and peak pulse power. This more reliable unit uses stepping motors as opposed to analog controls for greater reliability and reproducibility.

3. Control Rod Magnet Power Supply.

The other item scheduled for replacement in phase II is the control rod magnet power supply. In this case specific monitoring and continuous read-out will be provide to give greater assurance of successful scram control rod magnet operation. This will also separate the magnet power supplies from all other power functions, easing any current drain on other circuits.

4. Maintenance.

The primary objective of the upgrade was to provide greater reliability with modern circuitry, and simplicity of maintenance. Thus the new units contain more "front" measurement and adjustment points so that operator tests are more easily conducted. Thus frequent testing of high voltage, and set levels is assured, with some levels continuously read out in place of needing to be read using external instruments. For example, the high voltage and compensation voltage on the linear channel are now continuously indicated so that failure or drift on this important unit will be instantly known to the operator. The period and start-up permission set levels are indicated continuously, so that error or inadvertent adjustment of these levels would be obvious to the operator. Monitoring these is thus simple on a daily basis and thus greater assurance of operation of the reactor within legally specified parameters is obtained.

The conclusion is made that no safety related features are degraded by these upgrades, and most remain exactly as before. Those changes that are made will either not affect or improve the reliability of the safety related functions. NO UNREVIEWED SAFETY QUESTIONS ARE CREATED.

Complete Instrument package to replace some of existing instrumentation of the TRIGA Nuclear Reactor Control Console to include:

1. One each autoranging (7 decade minimum) multirange instrument channel to replace existing multi-range linear channel and range switch.
   The following specifications should be met as well as the general specifications attached.

   Output to be displayed as well as routed to 10 inch strip chart recorder to be supplied. Instrument to receive input from existing compensated ion chamber, but to provide the high voltage and compensation voltages from internal supplies. Provide adjustable level trips and high voltage fail trip to be interfaced to existing scram bus. Unit must be easy to calibrate and test (e.g: HV test) using front panel controls. Unit must interface linear power information to servo/flux controller system. Manual ranging should be an option.

2. One each wide range (10 decade) logarithmic response channel to replace existing start-up, log, and period channels using signal from existing fission counter.
   The following specifications should be met in addition to general specifications attached.

   Output of log power and period to be displayed, as well as LOG power signal routed to strip chart recorder to be supplied. Instrument should provide high voltage and preamplifier supply voltages, as well as preamplifier to replace existing unit. Adjustable trips should be provided for minimum source level, high voltage, and period. Testing and calibration should be easily done from front panel controls. Unit must interface period information to servo/flux controller system.

3. Pre-cut mounting panel for above instruments to replace existing left hand panel of console.

4. Strip chart recorder, minimum 10 inch span, to replace existing recorder. Either two pen, or two recorders to record linear and logarithmic power response. All controls to be easily operated from front of console. Any modifying panels for mounting in existing console space should be provided.

5. TWO sets (minimum) of operation, maintenance, and installation diagrams and instructions for all instrumentation detailing:
   a. items to be removed from existing system
   b. items to be modified in existing system
   c. new items to be installed and wiring changes to be made
   d. tests which should be carried out on existing items (such as detectors) in order to assure functionality within specifications to work properly with new instrumentation.

General Specifications.

- All items to be supplied should be warranted for the proposed use in reactor control systems according to appropriate Federal regulations. Copies of any certifying documentation should be provided.
- Any possible problems either physical or electronic in nature with substituting the proposed instruments for existing instrumentation at UCI should be clearly identified in the submitted bid, together with the anticipated solution.
- All systems should be proposed with the idea that future replacement of the entire console instrumentation system will be accomplished with minimal changes to the new instrumentation to be installed at this time. Thus full provision for future interface to other new systems should be standard. All units should also be compatible (as is the present instrumentation) with possible upgrade of reactor power level to at least 1 megawatt at some future date.
- All necessary cabling should be provided, except that common types of wiring may be expected to be provided by installer.
- Installation by supplier personnel is not requested. However, written procedures for final testing of the completed installation by UCI personnel should be provided.
- Technical questions may be addressed to Dr George Miller, Reactor Supervisor, Telephone: 714-856-6649 FAX: 714-856-8571.

NOTE: (Jan 1996) NO OPTIONS WERE PURCHASED BECAUSE OF BUDGET LIMITATIONS

Bids are requested for a complete instrument package to replace and upgrade existing instrumentation of the TRIGA Nuclear Reactor Control Console. OPTION items should be quoted separately to enable customer selection with respect to available budgets.

Package to include:

1. One power range channel ("Safety" or "Percent Power") with operation to 250 kilowatts steady-state and to up to 2000 megawatts in pulse mode, with peak power and integrated energy outputs. The following specifications should be used as well as the general specifications attached.

   Percent power output to be displayed on front panel during normal (steady-state) mode. Unit to contain nv and nvt circuitry for pulse mode operation. Peak power and integrated energy to be displayed in pulse mode as well as buffered or delayed peak power output routed to existing strip chart recorder. Channel to receive input from existing uncompensated ion chamber, but to provide high voltage from internal supplies. Adjustable high level trip (at 100 ±10%) and high voltage failure trip to be interfaced to existing scram bus. Unit must be easy to calibrate and test (e.g.: HV level and trip tests) using front panel controls.
   Buffering or delay will be needed in the nv circuit because of the fast pulse timing (1-100 milliseconds) with respect to the recorder pen speed (1-3 seconds).

2. One magnet power supply with Compliance Voltage Supply.
   The following specifications should be used in addition to the general specifications attached.

   Power supply , individually adjustable for up to 3 magnets (only 2 will be used in current installation), of approximately 200 ohms, to provide current for control rod magnets through a series scram bus of 7 scram relays and a single master scram latched relay. Reactor manufacturer specifications were 30 volts at up to 150 ma. Front panel or remote indicators on panel should indicate low or overcurrent conditions. Automatic shut-down should occur for any overcurrent condition. A reset control should be provided for reset following such shutdown.
   Provision for reading current and voltage either directly or with test jacks.
   Trip circuit provisions should be made to interface with existing scram logic and circuitry.

3. Pre-cut mounting panel for above instrument displays and controls to replace existing right hand panel of console. Also provide space/location for console digital clock (24 hour).

4. Mode Switch
   Replace existing mode switch with switching device and minimum circuitry to accomplish steady state (manual), steady state (servo/flux controlled) and pulse mode operations with minimum of circuit changes to avoid introducing electronic noise, especially at full operating power level in the two steady-state modes. Most existing switch contact changes will now be unused because of changes in configurations of other channels. One fuel element temperature thermocouple must be routed in pulse mode to the log recorder input so as to allow recording of peak fuel temperature during a pulse. Alternatively, some other method of displaying peak fuel temperature following a pulse may be provided in association with the fuel temperature channel (Item 6 below). Peak fuel temperature is reached on a 1-3 seconds time scale and does not need rapid response.

5. TWO sets (minimum) of operation, maintenance, and installation diagrams and instructions for all instrumentation detailing:
   a. items to be removed from existing system
   b. items to be modified in existing system
   c. new items to be installed and wiring changes to be made
   d. tests which should be carried out on existing items (such as detectors) in order to assure functionality within specifications to work properly with new instrumentation.

6. (OPTION) Temperature monitoring unit to be included in RIGHT HAND panel (or elsewhere subject to approval):

7. (OPTION) Console Scram Relay System
   Provide scram and interlock function system with modular units designed for ease of servicing. Indicator units may also need to be replaced with center console panel redesigned. Details of required logic arrangements will be discussed on request.

8. (OPTION) Operational Controls
   Provide new operating controls with modern units designed for ease of maintenance. Unit to fit in existing or modified desk panel. To include as a minimum:
   • Power key switch with SCRAM reset function.
   • Up, Down and Scram push button switches for Regulating, Shim, Adjustable Transient Rod (ATR), and one spare segment.
   • Arm switches for ATR and Fast Transient Rod(FTR) and FIRE switch for pulse mode operations.

Note on existing temperature sensors installed at the facility:

1. Inlet and Outlet and bulk water cooling system probes (3 probes):
   Lewis Engineering Co. 56 B3A nickel wire resistance probe, 90.38 ohms at 0 °C

2. Thermister pool water probe (1 probe) standard YSI 400 series probe with 3 feet long metal sheath and coax cable to console with phone plug termination.

General Specifications.

- All items to be supplied should be warranted for the proposed use in reactor control systems according to any appropriate Federal regulations for research reactors. Copies of any certifying documentation should be provided. Commercial or custom-built components may be utilized, provided spare parts are readily available.
- Any possible problems, either physical or electronic in nature, with substituting the proposed instruments for existing instrumentation at UCI should be clearly identified in the submitted bid, together with the anticipated solution. It is particularly important that electronic noise interactions be minimized at low signal levels.
- All systems should be proposed with the idea this phase represents almost complete replacement of the console instrumentation. Other provisions that might need to be made for full function of the items specified should be identified. Provision may need to be made in the bid for full integration of all separate units in the console. At this time, it is anticipated that all instrumentation can be adequately accommodated in the existing physical console structure, which would not be replaced. Some modification to accommodate sliding drawers, for example, may be appropriate. All units should also be compatible (as is the present instrumentation) with possible upgrade of reactor power level to at least 1 megawatt at some future date.
- All necessary cabling should be provided, except that common types of wiring may be expected to be provided by installer.
- Installation by supplier personnel is not requested. However, written procedures for final testing of the completed installation by UCI personnel should be provided.
- Technical questions may be addressed to Dr. George Miller, Reactor Supervisor, Telephone: 714-856-6649, FAX: 714-856-8571.