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SANTA BARBARA · SANTA CRUZ

2567 Boelter Hall

SCHOOL OF ENGINEERING AND APPLIED SCIENCE
LOS ANGELES, CALIFORNIA 90024

26 December 1979

Mr. Robert W. Reid, Chief
Operator Reactors Branch #4/NRR
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Docket No: 50-142
License R-71

Dear Mr. Reid:

An abnormal occurrence at the UCLA nuclear reactor took place on 19 December 1979 at 16:30 hours. A telephone report to the NRC Region V on the following day described the incident as "an uncontrolled or unanticipated reactivity change" (UCLA Technical Specifications, Section L.2.b). The occurrence led to a high flux scram, all safety systems operated correctly.

This preliminary report describes the event, the staff analysis of the occurrence, the actions that have been taken to reduce the likelihood of reoccurrence, and invites comments and/or suggestions from the Radiation Use Committee and the UCLA Office of Environmental Health and Safety. Because the required 10 day reporting period overlaps the UCLA inter-quarter vacation period it is not possible to assemble that committee to review and critique the contents of this statement within the required reporting period. A final report will be submitted not later than January 15, 1980.

The Event

During the course of a routine operation, involving the use of the pneumatic sample transfer system, two strip chart recorders simultaneously ceased inking. The reactor was nominally on automatic control at 10 kw. The operator proceeded to refill the inkwells. A high flux scram occurred before the refilling operation was completed. All operations were suspended pending an analysis of the cause of the event.

Preliminary Analysis

The logarithmic power (Log N) recorder had been re-inked and recorded the power history immediately prior to the scram. The absence of prompt-jump excluded the possibility of excessive reactivity insertion via a pneumatically inserted sample. The chart was more typical of a ramp insertion of reactivity and suggested failure of a rod drive mechanism. Checks of the individual drives indicated normal operation.

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Chief Reid, page two

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Debriefing revealed that the operator had turned off the linear recorder while refilling the inkwell. Concentrating upon restoring that recorder trace, and perhaps distracted by questions from an interested student, he failed to see the behavior of Log N recorder. More important, he overlooked the fact that the linear recorder, via a self-balancing potentiometer, provides the error signal that drives the automatic rod control system. By turning off the chart drive, he disabled the self-balancing potentiometer. Halted in a position demanding more reactivity and unable to self-position, the constant (erroneous) error signal continued to demand more reactivity. Full scram occurred at 125 kw.

This preliminary analysis attributes the scram to two principal causes: 1) operator error, possibly due to a training deficiency, and 2) an instrument-related inadequacy. The two are somewhat related.

The instrument is of a kind widely used in industry and is highly reliable. No event of this kind is known to have occurred in the prior history of the reactor. However, it is usually called a recorder-controller to emphasize its dual function. The abbreviated name, linear recorder, used in operator training at UCLA fails to reflect/emphasize the dual function.

The instrument itself did not fail; the controller function was disabled by operator intervention. Clearly the disabling switch could be interlocked with scram or inhibit circuits, the latter preventing rod withdrawal (increasing reactivity).

Immediate Actions

Operator debriefing commenced on the afternoon following the scram, and the cause determined that evening. On the following morning, supervisory personnel decided to convene a meeting of reactor operators to review the event, describe the causes, discuss the importance of the controller function, and stipulate the following procedural instructions:

1. Recorder inkwells to be checked and replenished prior to each start-up;
2. In the event of ink flow failure, the operator is to call for assistance; and
3. No instruments are to be turned off during operation.

In addition, the obligation and authority of the reactor operator to reject or eliminate distractions was reaffirmed.



Chief Reid, page three

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26 December 1979

Recommendations to the Radiation Use Committee

Aside from seeking committee approval of the previous procedural instructions, no specific recommendations are immediately offered. General recommendations will be to:

- a) strengthen the operator training program; and
- b) review interlock-inhibit-scrum options for improving the safety of the automatic power controller and possibly other instruments.

The full import of these options, their implementation, and their interaction with other system circuitry is yet to be analyzed.

This is a preliminary report, subject to review by the Radiation Use Committee and the UCLA Office of Environmental Health and Safety. That committee and EH&S are invited to review this report and to prepare questions and/or comments for a meeting to be held on January 9, 1980. A confirmed report will be submitted to the NRC on or before January 15, 1980.

Sincerely,

A handwritten signature in cursive script, appearing to read 'A. Zane'.

A. Zane, Reactor Supervisor

A handwritten signature in cursive script, appearing to read 'Neill C. Ostrander'.

N. C. Ostrander, Manager
Nuclear Energy Laboratory

AZ/NO/jb

cc: Radiation Use Committee

I. Catton
V. Dhir
J. Hornor
G. Pomraning
A. Zane
Environmental Health & Safety
W. Wegst
Robert H. Engleken, USNRC - Region V
J. Hobson, Vice Chancellor (for information only)