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OFFICE OF THE CHANCELLOR  
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January 26, 1984

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Facility Licensing Branch  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Reference: Docket 50-433, License R-124

Sirs:

Enclosed are twenty-one copies of the Annual Report of Operations for 1982 for the L-77 training reactor at the University of California-Santa Barbara. I regret the late submission. Although the report was prepared earlier, through an oversight it was not transmitted to NRC.

Sincerely,

*Robert J. Kroes*  
Robert J. Kroes  
Vice Chancellor  
Administrative Services

Enclosures

cc: A.E. Profio  
F.E. Gallagher

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UNIVERSITY OF CALIFORNIA, SANTA BARBARA

L-77 REACTOR

ANNUAL REPORT OF OPERATIONS

January 1, 1982 through December 31, 1982

License R-124

Docket No. 50-433

A.E. Profio

Reactor Director

~~Date 8/20/82~~ 8/20/82

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Operating Experience, Changes and Tests

This is the eighth annual report for the 10 watt, L-77 training reactor at the University of California, Santa Barbara. The reactor is operated mainly for instruction in nuclear engineering and for occasional neutron activation irradiations.

The reactor is the principal facility for the NE125 Neutronics Laboratory course. The course is required of all B.S. degree majors in nuclear engineering, and may be taken as an elective by graduate students or majors in other fields. In 1982, ten students took the course for credit. Experiments include power calibration by flux plotting, control rod reactivity calibrations by sub-critical multiplication and supercritical period measurements, reactivity-worth (importance) of neutron absorbing and scattering samples at different positions within the through-core tube, approach to critical, and neutron activation. Students operate the reactor under the supervision of a licensed operator (A.E. Profio). The lab is offered in the spring quarter, once or twice per week depending on enrollment. Senior Operator A.E. Profio is the only currently licensed operator, but a staff employee (Victor Thomas) is being trained as a reactor operator, and normally performs the weekly alarm checks as well as the maintenance on the reactor and instruments.

There were no significant changes in the facility in 1982. A new laboratory to house a free electron laser was constructed adjacent to the reactor facility, and shares the east wall (with no penetrations), except for the area near the east emergency exit. There should be no influence of the free-electron laser lab on the reactor facility, or vice versa, except for appropriate changes to the reactor emergency plan to reflect the new lab and occupancy. The equipment was still being installed in 1983.

The annual power calibration was performed on 5-24-82. The annual control rod worth and speed tests were performed on 6-3-82. The control rod mechanisms were inspected and serviced on 12-10-82. The annual radiation monitor and air monitor calibrations and servicing were carried out on 12/17/82-12/22/82. The seismic trip calibration was done on 11-18-82. The tank and console inspection and maintenance was done on 1-5-83 (previous maintenance on 11-10-81). All items were in good condition and all tests passed.

The semiannual rod drop time tests were performed on 7-7-82 (previously on 11-13-81 and later on 2-16-83). Rod drop times were within specifications. The core-recombiner pressure scram test and pressure gage calibration were performed on 1-27-82 and 9-7-82 and were passed. The shield water level scram was tested on the same dates. The flux instrumentation and recorder were calibrated and serviced on 12-22-81 and on 8-12-82. It should be noted that the original Varian single-pen chart recorder was replaced by a new Leeds and Northrup dual pen (log and linear flux channels) chart recorder on 5-5-82. The new recorder is more reliable and easier to read than the old recorder, and was calibrated against the flux instrument meters which in turn were calibrated against a standard current source. The radiation level and contamination surveys were carried out by Campus Radiation Safety Officer Frank Gallagher and staff on 3-9-82 and 11-3-82; readings were satisfactory.

Alarms were checked weekly.

#### Unscheduled Shutdowns and Scrams

3-23-82: Scram on linear picoammeter range switching, reactor subcritical.

5-10-82: Scram on spurious period from electrical transient on rod drive switch.

Generally very sensitive to transients.

5-17-82: Scram on period or low level linear from switching transients.

10-25-82: Scram on leveling off at 10W from switching transient. Not a high level trip.

11-3-82: Instrument chackout and operation to investigate spurious scram problem.

Not solved in 1982, still had spurious scrams.

#### Preventive and Corrective Maintenance Operations

Routine preventive and corrective maintenace operations were performed according to the Operations Manual. The main corrective maintenance needed was related to the spurious scram problem. Relays were cleaned or replaced, switch contacts cleaned, electrical isolation from power line improved, and a new scram test circuit designed (put into operation in 1983) because it appeared that switching transients might be coupled to input of log n and period meter by the test circuit. Eventually the spurious scram problem was alleviated.

There were a number of radiation and security alarms, all false. In one there was a major equipment failure.

3-3-82: Alarm on power failure.

3-18-82: Alarm on power outage (momentary).

4-23-82: Radiation alarm, false, from failed power supply.

5-28-82: Electrical fire in area radiation monitor chassis tripped smoke and radiation alarms. No damage to reactor. A spare radiation monitor was installed. Because the failed system was old and obsolete (vacuum tube type) it was decided to replace it with a new solid-state system rather than attempting to repair the old system.

6-18-82: Intrusion alarm, no entry, probably caused by construction next door.

8-2-82: False intrusion (security) alarm from workman hitting gate.

9-21-82: False intrusion alarm.

9-25-82: False intrusion alarm, probably caused by rainwater in transmission line to Police Dispatch.



11-12-82: False intrusion alarm. Problem with system. The system to Police Dispatch has since been reworked.

One other maintenance change was replacement of lock on cover of vacuum gage and valves on the reactor tank, because of worn out lock.

Changes Under 10 CFR 50.59

None.

Radioactive Effluents Discharged

Liquid wastes: none

Solid wastes: Very low level contaminated gloves and similar items disposed off-site by Environmental Health and Safety contractor.

Gaseous wastes: Not discharged during operation as core-recombiner vessel is sealed. However, the core-recombiner vacuum (pressure) gage is recalibrated and the loss-of-vacuum alarm and trip are tested semiannually by admitting air. Then the vessel is reevacuated into a holdup tank for decay over 6 months or to the next test. Short lived activities in the vessel gas space decay between tests, but some 10.4 year half-life  $^{85}\text{Kr}$  is discharged to the atmosphere, mixed with room exhaust, when the holdup tank is evacuated. Calculations based on watt-hours of operation, fission yield of  $^{85}\text{Kr}$ , and conservatively neglecting radioactive decay give: 0.15 microcuries discharged in 1982. This is negligible for health effects.

Environmental Surveys Done Outside Facility: none

Significant Radiation Exposure: none

Energy Output in 1982: 24.0 watt-hours.

Hours critical in 1982: 12

Energy Output Since Initial Criticality: 324 W-h or 13.5 watt-days.