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U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Document Control Desk

Reference: License R-33, Docket 50-73

Gentlemen:

Enclosed are three signed copies of Annual Report No. 31 for
the General Electric Nuclear Test Reactor.

Sincerely,

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Enclosures

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GENERAL ELECTRIC
NUCLEAR TEST REACTOR

ANNUAL REPORT NO. 31

LICENSE R-33

DOCKET 50-73

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PLEASANTON, CA 94566

GENERAL ELECTRIC
NUCLEAR TEST REACTOR

ANNUAL REPORT NO. 31

I. INTRODUCTION

This report summarizes the operation, changes, tests, experiments, and major maintenance at the Nuclear Test Reactor (NTR) which were authorized pursuant to License R-33 and 10CFR50, Section 50.59, for the period January 1, 1990, through December 31, 1990.

II. GENERAL

- A. The reactor was operated at or above critical for 869.05 hours; 375 startups were made. There were three scrams during this report period. Total plant operation equaled 3.475 MW days in 1990.
- B. The average radiation exposure to facility personnel was 2.06 Rem.
- C. There were no occurrences during 1990 that required notification of the NRC.
- D. There were no notices of violation issued as the result of NRC inspections.

III. ORGANIZATION

There were no organizational changes in 1990.

IV. CHANGES, TESTS, AND EXPERIMENTS
APPROVED BY THE FACILITY MANAGER

A. Changes

Pursuant to 10CFR50.59(a), the Facility Manager authorized the following change in 1990.

Low-Flow Bypass Modification

Description: This change provided the authorization and documentation to move the primary coolant system low flow scram bypass from a switch on the Log N recorder to a spare Log N trip unit in the Log N amplifier.

Safety Analysis: The new system will be more reliable, and all postulated failures are in the conservative, unbypassed condition.

B. Tests

Pursuant to 10CFR50.59(a), there were no special tests performed during 1990 which required the approval of the Facility Manager.

C. Experiments

There were 1,016 individual experiments reviewed, approved, and performed in 1990. Three experiment type approvals were reviewed and approved. These are discussed below.

1. Transistor/Semiconductor Irradiations

Description: An experiment was authorized to expose transistors and semiconductors to a high-energy neutron environment to determine physical and functional damage of the device. These irradiations were performed on the reactor east face.

An addendum to this experiment authorized the addition of paraffin and cadmium to reduce the thermal neutron fluence to some of the components under test. The purpose was to reduce thermal neutron damage to the components.

Safety Analysis: All activities were performed in accordance with standard operating procedures. The only potential hazard associated with this experiment is direct radiation from thermal neutron activation. Radiation levels were insignificant.

For the addendum the only potential hazard was the potential for reduction of neutron flux to the ion chambers for the #2 and #3 picoammeter channels. This potential was recognized and adjustments made during the startup.

C. Experiments (Continued)

2. Fission Chamber Irradiations

Description: An addendum was made to an existing experiment type approval (approval CIC/SRM, 1987). This addendum authorized placing two miniature fission chambers in the horizontal cavity to test a ²³⁵U source and wide-range monitor amplifier and preamplifier.

Safety Analysis: Potential hazards of this test are reactivity effects and radiation hazards to operations personnel. These were analyzed and found to be acceptable.

3. Permali Shielding Irradiation

Description: Several irradiated and unirradiated samples of a plastic-impregnated wood shielding material were subjected to fast neutrons at the NTR to determine if the shielding properties had been degraded by long-term exposure to neutrons. Neutron transmission was measured by the activation of foils behind the samples.

Safety Analysis: The irradiated foils were sent to Building 103 and handled according to VNC safety practices. The reactivity of the reactor was not affected.

V. MAJOR PREVENTIVE OR CORRECTIVE MAINTENANCE

There were no major preventive or corrective maintenance activities performed in 1990.

VI. UNSCHEDULED SHUTDOWNS

There were three (3) automatic scrams during this report period:

- A. A loss-of-flow scram due to primary coolant pump cavitation from air leaked into the system through the pump seal. It was corrected by rebuilding pump. Lost time was approximately 4 hours.
- B. Two-of-three high-level pico trip. The lost time was 17 minutes.
- C. Loss of site AC power. The lost time was 1 hour and 45 minutes.

VII. RADIATION LEVELS AND SAMPLE RESULTS AT
ON- AND OFF-SITE MONITORING STATIONS

The data below are from sample and dosimeter results accumulated during 1990. Except for the NTR stack data, these data are for the entire VNC site and include the effects of operations other than the NTR.

A. NTR Stack

Total airborne releases (stack emissions) for 1990 are as follows.

Alpha Particulate, $< 0.10 \mu\text{Ci}$ (predominantly radon-thoron
daughter products)
Beta-Gamma Particulate, $< 0.76 \mu\text{Ci}$
Iodine-131, $53.0 \mu\text{Ci}$
Noble Gases, $2.33 \times 10^3 \text{ Ci}$

Noble gas activities recorded from the NTR stack integrate background readings with the actual releases which may account for 40 to 50% of the indicated release.

B. Air Monitors (Yearly average of all meteorological stations.)

Four environmental air monitoring stations are positioned approximately 90 degrees apart around the operating facilities of the site. Each station is equipped with a membrane filter which is changed weekly and analyzed for gross alpha and gross beta-gamma.

Alpha Concentration:

Maximum $< 6.4 \times 10^{-15} \mu\text{Ci/cc}$ (predominantly radon-thoron
daughter products)
Average $< 3.6 \times 10^{-15} \mu\text{Ci/cc}$

Beta Concentration:

Maximum $< 8.6 \times 10^{-14} \mu\text{Ci/cc}$
Average $< 2.59 \times 10^{-14} \mu\text{Ci/cc}$

C. Gamma Radiation

The yearly dose results for the year 1990 as determined from evaluation of site perimeter TLD environmental monitoring dosimeters showed normal background.

D. Vegetation

No alpha, beta or gamma activity attributable to activities at the NTR facility was found on or in vegetation in the vicinity of the site.

E. Water

There was no release of radioactivity in water or to the ground water greater than those limits specified in 10CFR20, Appendix B, Table II, Column 2.

F. Off-Site

Samples taken off the site indicate normal background for the area.

VIII. RADIATION EXPOSURE

The highest annual dose to NTR Operations personnel was 2.45 Rem, and the lowest was 1.52 Rem. The average dose was 2.06 Rem per person.

IX. CONCLUSIONS

The overall operating experience of the Nuclear Test Reactor reflects another year of safe and efficient operations. There were no reportable events.

GENERAL ELECTRIC COMPANY
Irradiation Processing

By DR Smith

D. R. Smith, Manager
Nuclear Test Reactor