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Subject: Annual Report for NTR, 2010  
Reference: License R-33, Docket 50-73  
Enclosure: Annual Report No. 51

Enclosed is the Annual Report No. 51 for the GE-Hitachi Nuclear Test Reactor (NTR) located at Vallecitos Nuclear Center in Sunol, California.

If you have questions regarding this request or additional information is required, please contact me using the contact information above.

Sincerely,

*Donald R. Krause*

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cc: William B. Kennedy, NRC  
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**NUCLEAR TEST REACTOR**

**ANNUAL REPORT NO. 51  
FOR THE YEAR 2010**

**LICENSE R-33  
DOCKET 50-73**

**MARCH 2011**

## General Electric Nuclear Test Reactor

### Annual Report No. 51

This report summarizes the operations, changes, tests, experiments, and major maintenance at the General Electric Nuclear Test Reactor (NTR), which were authorized pursuant to License R-33, Docket 50-73, and 10CFR50, Section 50.59, for the period of January 1, 2010 through December 31, 2010.

#### I. General

Specific information about the operation of the NTR during the reporting period is presented as follows:

1. There were 247 reactor startups with the reactor operating at or above critical for 673 hours. Total power generation equaled 662.84 EFPH; equivalent to 2.76 MW days in 2010. The majority of this time was spent in the performance of approved radiography experiments. Additionally, experiments were conducted involving the irradiation of samples for forensic evaluations.
2. The average radiation exposure to regular full-time NTR Operations personnel was 0.524 Rem.
3. There was one unplanned shutdown of the reactor after reaching criticality caused by a disruption of power resulting in a reactor scram. This unscheduled shutdown is discussed in Section V.
4. There were no occurrences during 2010 that required notification of the NRC.

## II. Organization

The details of changes in the status of personnel, which occurred during the reporting period, are described as follows:

1. Mr. Daniel Thomas continued as Manager NTR performing licensed SRO activities and radiography NDT Level III activities in 2010. Mr. Thomas applied for a renewal of his SRO license and was informed that his license was in timely renewal on April 30<sup>th</sup> 2010.
2. Mr. Edward Ehrlich's license has remained inactive since his retirement in 2008. His license, with an October 6<sup>th</sup> 2005 effective date, was amended for medical reasons on January 13<sup>th</sup>, 2008. There are no plans on reactivating his license at this time.
3. Mr. Thomas McConnell continued performing licensed SRO activities in 2010. He also certified and worked as a radiographer, NDT Level I.
4. Mr. Dennis Smith continued as a part-time GEH employee (pensioner) performing licensed SRO activities in 2010.
5. Mr. Tim Peterson continued performing licensed RO and SRO activities in 2010 receiving his SRO license on January 6<sup>th</sup> 2010. He also continues his radiography NDT Level III activities
6. Mr. Max Paronable continued performing RO trainee and RO activities in 2010 receiving his RO license on January 6<sup>th</sup> 2010. He also continues his radiography NDT Level I activities.
7. Mr. Terry Hofer continued as a part time GEH employee (pensioner) performing radiography and non-reactor system maintenance tasks under the direction and supervision of the certified NDT personnel and licensed operations staff.
8. Mr. James Graham was contracted as a radiographer on November 8<sup>th</sup> 2010. He continues to perform radiography and non-reactor system maintenance tasks under the direction and supervision of the certified NDT personnel and licensed operations staff.
9. Ms. Carmen Holmes was contracted as a radiographer on November 15<sup>th</sup> 2010. She continues to perform radiography and non-reactor system maintenance tasks under the direction and supervision of the certified NDT personnel and licensed operations staff.

10. Mr. George Dumlao, an employee of GE Hitachi, was transferred to the NTR staff on November 15<sup>th</sup> 2010. George continues to perform radiography and non-reactor system maintenance tasks under the direction and supervision of the certified NDT personnel and licensed operations staff.
11. Mr. Stephen Neel was contracted as a radiographer assistant on December 6<sup>th</sup> 2010. He continues to perform radiography and non-reactor system maintenance tasks under the direction and supervision of the certified NDT personnel and licensed operations staff.

### **III. Facility Changes, Tests, Experiments, and Procedure Changes Approved by The Facility Manager**

In accordance with written procedures, facility manager approval is required for changes to the facility, procedures, tests, and experiments. Specific information about the reporting period is presented as follows:

#### **A. Facility Changes**

Pursuant to 10CFR50.59(a), four (4) facility changes were implemented in 2010 requiring Facility Manager, Regulatory Compliance and VTSC approval as requested.

1. An updated Criticality Safety Analysis (CSA 05-01) was adopted at NTR in 2010. Implementation of the associated controls for the CSA was tracked in Gensuite in the Audit Tracking System in Items #1426 through #1433. All controls were verified in effect by May 13<sup>th</sup> 2010.
2. Change Authorization (CA) 299 allowed for the relocation of the South Cell Door Limit Switch body. Due to the installed positioning of this limit switch, the guide wheel for the South Cell Door would roll up on the switch body to move the lever arm and activate the interlock contacts. The door had a tendency to roll back off the switch body causing the interlock contacts to reposition resulting in an inappropriate activation of the interlock system. Moving the switch body to the outside of the I-beam removes it from the path of the guide wheel and prevents inappropriate switch positioning while maintaining the functionality of the shutter interlock system. This change was implemented and the interlock was tested on June 2<sup>nd</sup> 2010.
3. CA 300 allowed for the replacement of the NTR north room east personnel door photoelectric sensor, which was not functioning properly. The sensor was replaced with a photoelectric sensor system of a type to comply with 10CFR 20.1601 (Control of access to high radiation areas). Completion of this item was tracked in Gensuite as Audit Tracking System Item #1528. All work was completed on July 22<sup>nd</sup> 2010.

4. CA 270 authorized the like-in-kind use of a new Leeds & Northrup Speedomax 2500 Series temperature recorder for Reactor Temperature readings. The new recorder was installed and tested on October 25<sup>th</sup> 2010.

**B. Tests**

Pursuant to 10CFR50.59(a), there was one special tests performed during 2010 requiring Facility Manager, Regulatory Compliance and VTSC approval as requested.

1. Mylar shims were temporarily installed on SR1 and SR4 rubber stops to test for a cause of spurious rod disconnects. Work was performed utilizing ER 10-01 as a controlling procedure.

**C. Experiments**

Pursuant to 10CFR50.59(a), there were no new experiments in 2010 requiring Facility Manager, Regulatory Compliance and VTSC approval. The two routine experiment types described as neutron radiography and Schafer slide sample irradiations were properly authorized utilizing experiment authorization forms throughout 2010.

**D. Procedure Changes**

Pursuant to 10CFR50.59, there were two procedural changes initiated during 2010 to incorporate editorial or typographical corrections, technical data, and changes to requirements, or to provide for the addition or clarification of information and reliability of performance. Changes were made with Facility Manager and Regulatory Compliance review when required. A summary of the changes is presented in the table below.

Revision	Procedure	Summary of Changes
1001	SOP 10-4, Explosive Handling	Made changes to accommodate the customer supplied In-Process hazard designation. Included a change to the Form 1001.
1002	SOP 9-5, Source, Byproduct, and Special Nuclear Material Control and Shipment	Incorporate changes to accommodate implementation of administrative controls for Criticality Safety Analysis, CSA 05-01.

#### IV. Major Preventative or Corrective Maintenance

During this reporting period, all routine preventive maintenance and surveillance checks were completed as scheduled. The following lists the noteworthy corrective maintenance activities performed in 2010.

##### Safety Rods

- Added oil to all 4 Safety Rod Drive gearboxes. Work was performed utilizing ER 10-02 as a controlling procedure.
- Replaced the drive belts on Safety Rod 2 and 3 Rod Drives. Work was performed utilizing Preventive Maintenance Procedure 12.3 as a controlling procedure.
- On January 25<sup>th</sup> 2010, Safety Rod #4 worm screw was found backed out of its normal location by about  $\frac{3}{4}$  inch. This caused the coupling at the spindle gear to become detached from the worm screw. A temporary fix was implemented by tightening the setscrew on the coupling at the spindle gear. The coupling was again found too loose to operate the drive on May 7<sup>th</sup> 2010. The setscrew was again tightened to mitigate the problem. A permanent solution to the problem was devised and implemented on July 6<sup>th</sup> 2010. The drive's worm screw was moved forward into its correct position and the end bearing was replaced. This improved the engagement of the worm screw coupling at the spindle gear allowing complete engagement. The work was completed when the safety rod limit switches were adjusted for the new worm screw position. Work was performed utilizing ER 10-11 as a controlling procedure.
- Completed inspection of rubber stops and stop rubbers for all Safety Rods on July 6<sup>th</sup>, 2010. No problems noted. Work was performed utilizing ER 10-12 as a controlling procedure.

##### Stack Gas and Particulate Monitor

- Replaced the GM tube for the stack particulate detector.

##### PICO Power Instrumentation

- Replaced the high voltage power supply in Pico #3 when noise was noted high in the scale.
- Replaced the Pico #3 selector switch when noise was noted high in the scale.
- Exchanged out the Flux Recorder for an identical shop spare Recorder.

### Radiation Area Monitoring System

- On two (2) occasions during the reporting period, made gain adjustments to the Radiation Area Monitor's (RAM) detection instruments (Victoreens).

## **V. Unscheduled Shutdowns**

During the reporting period, there was one unscheduled reactor shutdown after reaching criticality.

### **Sequence of Events**

At 1036 hours on Friday the 15th of October 2010, a power disruption at the NTR resulted in a scram of the reactor. All safety rods automatically inserted to the full-in position. All control rods drove in automatically to the full-in position. All control rods position indicators displayed normal for a shutdown condition. The reactor was secured at 1040 AM.

It was noted that Pico 1 and Pico 2 upscale trips were locked-in. Pico 3 was normal.

It was noted that reactor power indications were responding normal for a shutdown.

It was noted that a spurious Radiation Monitoring Alarm was received during the event resulting in a 105 B alarm.

### **Immediate Actions Taken**

Conducted radiation surveys in all NTR areas. All radiation levels were found consistent with the reactor being shutdown.

At 1158 AM the 105 B alarm was reset.

At 1159 AM Pico 1 and Pico 2 upscale trips were reset.

No effect was noted on stack gas and particulate readouts. Normal shutdown traces were noted on the recorder.

At 1200 PM Control Panel indications were all green.

### **Cause of Event**

The Cause of the scram was determined to be a partial loss of site power. This occurred when a squirrel, contacted a 12.5 KV transmission line. Part of the VNC site experienced a loss of power when a circuit breaker tripped. The NTR never totally lost power, but experienced a momentary disruption sufficient to cause the scram.

### **Corrective Actions**

The lines were verified clear, the breaker was reset and the site power distribution system was returned to service and determined to be fully functional. The radiation-monitoring



technician conducted a post shutdown survey, Survey (F-454) that confirmed all radiological conditions were normal.

At 13:40 PM this unplanned shutdown was declared resolved and the Manager NTR authorized the restart of the Nuclear Test Reactor.

## VI. Radiation Levels and Sample Results at On-Site and Off-Site Monitoring Stations

The data below are from sample and dosimeter results accumulated during the reporting period. 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 2010 are as follows:

Alpha Particulate: 7.40E-07 Ci (predominantly radon-thorium daughter products)  
Beta-Gamma Particulate: 1.12E-07 Ci  
Iodine-131: 1.26E-05 Ci  
Noble Gases: 2.11E+2 Ci

Noble gas activities recorded from the NTR stack integrate both background readings and the actual releases. Background readings may account for as much as 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:  
Weekly Maximum, 7.81E-14  $\mu\text{Ci}/\text{cc}$   
Weekly Average, 3.26E-14  $\mu\text{Ci}/\text{cc}$

Beta Concentration:  
Weekly Maximum, 1.30E-14  $\mu\text{Ci}/\text{cc}$   
Weekly Average, 6.60E-15  $\mu\text{Ci}/\text{cc}$

**C. Gamma Radiation**

The yearly dose results for the year 2010 as determined from evaluation of site perimeter environmental monitoring dosimeters showed no departure from normal stable backgrounds.

**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 groundwater greater than the limits specified in 10CFR20, Appendix B, Table 2, and Column 2.

**F. Off-Site**

The results of samples collected from off-site locations indicate normal background for the regional area.


**VII. Radiation Exposure**

In 2010, the highest annual dose to full time NTR Operations personnel was 0.796 Rem and the lowest was 0.310 Rem. The average radiation exposure to personnel was 0.524 Rem per person. The 2010 collective radiation exposure for NTR personnel was 2.854 Person-Rem

**VIII. Conclusion**

The General Electric Company concludes that the overall operating experience of the NTR reflects another year of safe and efficient operations. There were no reportable events.

GE-Hitachi Nuclear Energy Americas LLC  
Vallecitos Operations



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Daniel M. Thomas, Manager  
Nuclear Test Reactor