



**HITACHI**

GE Infrastructure  
Energy, Nuclear

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Subject: Annual Report for NTR, 2009  
Reference: License R-33, Docket 50-73  
Enclosure: Annual Report No. 50

Enclosed is the Annual Report No. 50 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

AD20  
NRR



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**NUCLEAR TEST REACTOR**

**ANNUAL REPORT NO. 50  
FOR THE YEAR 2009**

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

**MARCH 2010**

## General Electric Nuclear Test Reactor

### Annual Report No. 50

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, 2009 through December 31, 2009.

#### I. General

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

1. There were 246 reactor startups with the reactor operating at or above critical for 604 hours. Total power generation equaled 589.88 EFPH; equivalent to 2.46 MW days in 2009. The majority of this time was spent in the performance of approved radiography experiments. Additionally, experiments were conducted involving the irradiation of samples for forensics evaluations and the irradiation of isotopes for the research and development of production processes.
2. The average radiation exposure to regular full-time NTR Operations personnel was 0.550 Rem.
3. There were no reactor scrams and only one unscheduled shutdown of the reactor by the operator after reaching criticality. The unscheduled shutdown is discussed in Section V.
4. There were no occurrences during 2009 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 2009.
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 2009. He also certified and worked as a radiographer, NDT Level I.
4. Mr. Dennis Smith continued as a part-time GE employee (pensioner) performing licensed SRO activities in 2009.
5. Mr. Tim Peterson continued performing licensed RO and radiography NDT Level III activities in 2009. In December, he applied for and was tested to advance his qualifications to the SRO level. (Results transmitted after the end of 2009)
6. Mr. Max Paronable continued performing RO trainee and radiography NDT Level I activities in 2009. In December, he applied for and was tested to advance his qualifications to the RO level. (Results transmitted after the end of 2009)
7. Mr. Terry Hofer continued as a part time GE employee (pensioner) performing 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), three (3) facility changes were made in 2009 requiring Facility Manager, Regulatory Compliance and VTSC approval as requested.

1. Change Authorization (CA) 294 installed a retaining plate on the south opening to the Horizontal Facility to enable experiments in the facility to be axially positioned and secured from inadvertent movement during the irradiation. CA 295 installed a stop plate on the north opening to the Horizontal Facility for the same purpose. These changes were made to facility experiments pursuant to CA 297, Isotope Irradiation Experiment Type Approval (ETA) (Horizontal Facility).
2. CA 296 authorized the use of the Isotopic Seed Irradiation System (ISIS) for experiments pursuant to CA 297, Isotope Irradiation ETA (Horizontal Facility). The ISIS system was designed to work with the retaining and stop plates to securely position the isotope package in the desired location in the Horizontal Facility.
3. CA 275A authorized a configuration change in the effluent path for photo chemicals to the photo waste tank providing automatic silver recovery and backup alarm functions for the system.

#### B. Tests

Pursuant to 10CFR50.59(a), there were three special tests performed during 2009 requiring Facility Manager, Regulatory Compliance and VTSC approval as requested.

1. Concerning the safety rod system, it was determined that the increased friction presented by issues with the Housing-to-Anvil alignment was not isolated to Safety Rod 1 alone. CA 285 allows the operation of Safety Rods with the housing bolts  $\frac{1}{2}$  turn loosened to mitigate this alignment issue making the Housings self-aligning. This condition was replicated to all safety rods. The surveillance program instituted by Engineering Release (ER) 08-13 showed that the bolting on Safety Rod 1 remained in the  $\frac{1}{2}$  turn loosened condition throughout the surveillance period. ER 09-03 was issued to require inspections on the tightness of the Housing mounting hardware for all safety rods on a monthly basis.

2. Tests were performed on Safety Rod 1 and 4 in an attempt to isolate the cause of spurious disconnects which occur on the first pull of these safety rods for the day. Once exercised, these safety rods perform without additional spurious disconnects. This condition is an operational nuisance only and does not affect the safety function of the safety rod. ER 09-15 procedurally supported this test.
3. A survey and inspection was performed on the Horizontal Facility in anticipation of its use as an isotope irradiation facility. ER 09-04 procedurally supported this test.

**C. Experiments**

Pursuant to 10CFR50.59(a), there were three new experiments in 2009 requiring Facility Manager, Regulatory Compliance and VTSC approval as requested.

1. CA 293 authorized an irradiation of iridium in the Horizontal Facility to map the reactivity effects of iridium. ER 09-01 procedurally supported this experiment.
2. CA 297 served as the ETA for isotope irradiation in the Horizontal Facility. ER 09-10 procedurally supported this experiment.
3. CA 298 served as the ETA for isotope irradiation in the CHRIS Facility. ER 09-11 procedurally supported this experiment.

**D. Procedure Changes**

Pursuant to 10CFR50.59, there were five procedural changes initiated during 2009 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
996	SOP 9-12, Security	Made changes to the security procedure to accommodate new facets of the badging system. (Card Readers)
997	SOP 6-2, Control Room Entry	Made changes to remove reference to security related matters. These have been added to SOP 9-12 as deemed appropriate utilizing revision 996.
998	SOP 10-4, Explosives Handling	Made changes to incorporate Site CA 09-09, Vallecitos Site Plan for the Handling of Explosives into the SOP.
999	SOP 1-3, Primary Coolant Water Chemistry	Changed sample size from 125 ml to 250 ml to conform to current calibration standards.
1000	SOP 6-7 Startup Summary	Changed the selection of location for Manuel Poison Sheet (MPS) insertion during an abnormal reactivity event. This change became necessary when the MPS configuration was changed.

#### 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 2009.

##### Safety Rods

- Replaced the Rubber Stops in January on all four Safety Rods. Work on this corrective maintenance item was performed under the procedures found in ER 08-27.
- Replaced the Rod Follower Bushing (outer) on Safety Rod #1. Work on this corrective maintenance item was performed under the procedures found in ER 08-27.
- Re-attached the Rubber Stop on Safety Rod #4 on September 10<sup>th</sup>, 2009. It was noted that the rubber stop had come loose during the performance of monthly preventive maintenance. The likely cause of this event was improper adhesion when the stop was last replaced in January. The rubber stops were found secure for all the other safety rods. Work on this corrective maintenance item was performed under the procedures found in ER 09-13.

##### Secondary Cooling

- Replaced the industrial drain piping downstream of the NTR. This piping provides the flow path for the discharge of the secondary cooling water and was root bound.

##### Stack Gas and Particulate Monitor

- Replaced the Stack Gas recorder amplifier to correct a problem erratic behavior with the recorder indication circuit.
- Refurbished the alarm module for the Stack Gas monitor to correct a condition that allowed the set point to drift.

##### Reactor Cell Auxiliary Systems

- Replaced the Reactor Cell sump pump.

##### PICO Power Instrumentation

- Excessive noise on the Log-N power instrumentation channel forced the replacement of the compensated Ion chamber (CIC) detector and cables.
- Identified and repaired a cold solder joint in Pico #3 power supply which was causing erratic indications on one range of the multi-range selector switch.

- Replace a vacuum tube in the amplifier for the Flux Deviation recorder to correct erratic output.
- Change the location of the CIC for Pico #2 approximately 2 inches further into it's tube to return the output of the detector within range of the fine adjust potentiometer at 100% indicated power.

#### 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).
- Installed an RM-16 with gamma detector and alarm function to substitute for the Control Room RAM.

#### Continuous Air Monitor (CAM)

- Replaced the detector in the control room CAM.

#### Reactor Temperature Monitoring System

- Replaced two vacuum tubes in the amplifier for the Temperature Monitor recorder to correct erratic output.

### **V. Unscheduled Shutdowns**

During the reporting period, there was one unscheduled reactor shutdown after reaching criticality conducted on July 16<sup>th</sup>, 2009. Water was seen issuing from an industrial drain cleaning-trap downstream of the NTR outside Building 105 indicating a blockage in the drain line. The industrial drain provides the downstream flow path for the NTR secondary cooling water. When the blockage was noted, radiography experiments were suspended and the reactor was shutdown. The drains were cleared the same day and a second startup was authorized by the NTR manager to complete the scheduled experiments. This unscheduled shutdown involved no safety system and had no safety consequences.

It was determined that root incursion into the piping was the root caused the industrial drain blockage. The piping run in the effected area was replaced.



## 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 2009 are as follows:

Alpha Particulate: 8.05E-07 Ci (predominantly radon-thoron daughter products)  
Beta-Gamma Particulate: 1.51E-06 Ci  
Iodine-131: 3.83E-06 Ci  
Noble Gases: 1.69E+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, 7.36E-13  $\mu\text{Ci/cc}$   
Weekly Average, 5.59E-14  $\mu\text{Ci/cc}$

Beta Concentration:  
Weekly Maximum, 7.29E-13  $\mu\text{Ci/cc}$   
Weekly Average, 9.30E-14  $\mu\text{Ci/cc}$

### C. Gamma Radiation

The yearly dose results for the year 2009 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 2009, the highest annual dose to full time NTR Operations personnel was 0.644 Rem and the lowest was 0.507 Rem. The average radiation exposure to personnel was 0.550 Rem per person. The 2009 collective radiation exposure for NTR personnel was 2.552 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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Nuclear Test Reactor