



**HITACHI**

**GE Hitachi Nuclear Energy**

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**U.S. Nuclear Regulatory Commission  
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**Subject: GEH Annual Nuclear Test Reactor (NTR) Operating Report for the Year 2018**

**Reference: NRC License R-33, Docket 50-73 (NTR)**

**Enclosed is the Annual Operating Report No. 59 for the GE Hitachi Nuclear Test Reactor (NTR) located at the Vallecitos Nuclear Center in Sunol, California.**

**If there are any questions regarding this report or additional information required, please contact me at the number above.**

**Sincerely,**

**Jeffrey Smyly  
Regulatory Compliance Manager  
Vallecitos Nuclear Center**

**Attachments: 1) NTR Annual Operating Report Number 59 for the year 2018**

**cc: D. Hardesty, NRC NRR  
JS 19-003**



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**NUCLEAR TEST REACTOR**

**ANNUAL REPORT NO. 59  
FOR THE YEAR 2018**

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

**MARCH 21, 2019**



## **GE Hitachi Nuclear Test Reactor**

### **Annual Report No. 59**

This report summarizes the operations, changes, tests, experiments, and major maintenance at the GE Hitachi (GEH) 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, 2018 through December 31, 2018.

#### **I. General**

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

- In 2018 there were 236 reactor startups with the reactor operating at or above critical for 718.65 hours. Total power generation equaled 704.40 EFPH; equivalent to 2.935 MW days. The majority of this time was spent in the performance of approved experiments, either neutron radiography or small sample irradiations.
- The highest radiation exposure to any worker at NTR was 0.585 Rem.
- There was one unscheduled shutdown of the reactor in 2018 and four unscheduled shutdowns prior to criticality. See section V for details.
- There was one technical specification violation when an operator was not present in the control room when the reactor was not secured. See section V for details.

#### **II. Organization**

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

##### **A. Personnel**

- The Level 1 & 2, and Level 3 managers were unchanged in 2018.
- A new VNC site Regulatory Compliance Manager was hired on 7/16/18.
- One senior reactor operator resigned and left the company on 6/24/18.



**B. Operator Licenses**

- On April 23, 2018, two trainees were issued senior reactor operator licenses by the NRC. License numbers SOP-502514 and SOP-502515.
- On June 24, 2018, a senior reactor operator ended their employment with GEH thereby terminating their operator license. License number SOP-501063.

**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**

The following facility change was implemented in 2018 requiring Facility Manager and Regulatory Compliance approval.

CA-311, Fenwal Thermoswitch Replacement

- This change allowed for replacement of the primary system thermal switch with a similar, but not identical component. The new switch has an operating temperature range of -100 to 400 deg F instead of 0 to 300 deg F for the replaced switch (no longer available from the manufacturer).

**B. Tests**

Pursuant to 10CFR50.59(a), no special tests were performed during 2018.

**C. Experiments**

Pursuant to 10CFR50.59(a), there were no new experiments in 2018 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 2018.

**D. Procedure Changes**

Pursuant to 10CFR50.59, seven procedural changes were initiated during 2018 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.





<b>Revision</b>	<b>Procedure</b>	<b>Summary of Changes</b>
1047	SOP 9.3, Engineering Release	Added steps to annually review and close Engineering Releases. This change tracked by the GEH Corrective Action Program, CR 27339.
1048	SOP 9.15, Preventive and Corrective Maintenance Program	Proceduralized a process to train and document that technicians are properly trained to safely and correctly perform reactor maintenance procedures. This change tracked by the GEH Corrective Action Program, CR 24776.
1049	SOP 12.34, Preventive Maintenance – Core Delta T	Authorizes the use of either the core thermopile recorder or a millivolt meter to complete this PM.
1050	SOP 6.4, Daily Surveillance Check Sheet	Added a clarifying statement to take the picoammeter nuclear instrument out of service for the subsequent startup if it does not pass the startup surveillance source check.
1051	SOP 6.2, Control Room Entry	Added a statement to avoid the planning and staging of activities in the control room to minimize distractions to the operator. This change tracked by the GEH Corrective Action Program, CR 28168.
1052	SOP 10.4, Explosives Handling	Added a caution to carry only one tray of parts at a time when parts are not physically secured to the tray.
1053	SOP 6.1, Staffing Requirements	Added a requirement for the relieving reactor operator to “immediately make an entry in the reactor console log book reflecting this transfer of responsibility.” This change tracked by the GEH Corrective Action Program, CR 28168.

**IV. Major Preventative or Corrective Maintenance**

During this reporting period, all routine preventive maintenance and surveillance checks were completed as scheduled, with one exception. The annual PM on the Constant Air Monitor chart recorder (PM 25G) was not completed within the required timeframe due to a required test instrument being out of calibration. The chart recorder was placed out of service and ER 18-10 implemented to authorize an alternate procedure to calculate the rate

of change of reactor cell airborne activity thus allowing the required daily reactor cell entry. Maintenance was completed on 8/1/18 and the chart recorder returned to service.

The following lists the noteworthy corrective maintenance activities performed in 2018.

#### Replaced PICO #2 and #3 power supply and signal cables

- On 1/9/18, replaced picoammeter nuclear instruments #2 and #3 high voltage power supply and signal cables that run from the reactor control console in the control room to the first junction box in the reactor cell. These cables were decades old and this was a proactive step to avoid noise and other signal problems from this leg of the instrument channel.

#### Safety Rod #3 Magnet

- On 1/30/18, found safety rod #3 magnet grounded during daily surveillance checks. Replace magnet S-11 with S-8, retested and returned to service.

#### Fenwal Thermoswitch Replacement

- On 6/8/18, the prior Fenwal switch was re-installed back into the primary system. The switch had been proactively replaced with a newer switch (see CA-311 above) which caused an unscheduled shutdown (see Scram Report 18-01 below) when its trip setpoint drifted into the normal operating temperature range.

#### Stack Gas & Particulate Activity Chart Recorder

- On 8/28/18, replaced the stack gas and particulate activity chart recorder with a backup recorder due to a mechanical malfunction of the slide mechanism carrying the printhead.

#### Spurious Area Radiation Monitor Alarms

- Five area radiation detectors and associated modules monitor different areas of NTR. Received 8 spurious alarms from this system over the fourth quarter of 2018. No high radiation conditions existed. The modules immediately reset upon the lack of a valid high radiation signal, not allowing identification of the faulty equipment. CR 29656 in the GEH Corrective Action program will initiate and track the replacement of this system.



## **V. Unscheduled Shutdowns**

During the reporting period, there were four unscheduled reactor shutdowns prior to reaching criticality, one unscheduled shutdown after reaching criticality, and one technical specification violation.

### **A. Unscheduled Shutdowns**

#### **Prior to Criticality – 2/5/18**

Noise on the log N circuit caused an automatic insertion of safety rods prior to reaching critical rod height. Checked the seating of the Log N + and – high voltage and signal cable connectors in the reactor control panel. Retested with the Log N daily surveillance check - tested sat.

#### **Prior to Criticality – 3/13/18**

While pulling safety rod #3, an automatic insertion of safety rods occurred when SR #3 reached its full out position. Observed operation of the safety rod- no cause identified. Second startup attempt successful.

#### **Prior to Criticality – 3/14/18**

While pulling safety rod #3, an automatic insertion of safety rods occurred when SR #3 reached its full out position. Observed operation of the safety rod- no cause identified. Second startup attempt successful.

#### **Scram Report 18-01**

An automatic reactor scram occurred at 11:56 AM on 6/7/18. A high temperature signal provided by a fenwal thermoswitch caused the protective action. No high temperature condition existed. It was found that the trip setpoint of the newly replaced switch had drifted into the normal operating temperature range. A different thermoswitch switch was installed, tested, and placed in service.

#### **Prior to Criticality – 6/29/18**

Noise on the log N circuit caused an automatic insertion of safety rods prior to reaching critical rod height. Checked the seating of the Log N + and – high voltage and signal cable connectors in the reactor control panel. Retested with the Log N daily surveillance check - tested sat.

### **B. Technical Specification Violation**





On March 19, 2018, a violation of NEDO 32765, NTR Technical Specification Section 6.1.3.1(a) occurred when a licensed operator was not present in the control room when the reactor was not secured. Details of this event are covered in GEH follow-up letter M180071 dated April 3, 2018 to GEH Event report 53274 dated March 20, 2018. A summary of the event follows:

The reactor had been operating at 100% power for over an hour with a Senior Reactor Operator (SRO) at the panel. Five other NTR staff personnel were present in the control room in preparation for drawing a primary sample. The NTR Manager was present and acting as the Nondestructive Testing (NDT) process film reviewer.

The SRO became ill and hastily exited the control room informing the NTR manager on his way out. The manager finished his discussion with the radiographer and turned and left the control room to continue reading film. A short way down the hallway, the manager realized he shouldn't have left and immediately returned to the control room.

**Immediate Action Taken**

- event reported to NTR License Level III Manager and regulatory compliance.
- event reported to the NRC the following working day as required by NTR Technical Specification Section 6.6.2.

**Probable Cause**

- A non-conformance Assessment was performed determining that the main cause of the event was human performance error - lack of situational awareness.

**Short Term Corrective Actions**

- Condition Report #28168 was initiated in the GEH Corrective Action Program to track additional investigation findings, causes, and corrective and preventive actions.
- edited two NTR operating procedures to 1) limit personnel and distractions in the control room, and 2) require an immediate log book entry for operator reliefs.
- held training for all operators/trainees.
- performed an independent review of the event by the VTSC as required by NTR Technical Specification Section 6.2.3.





## **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 2018 reporting period. Except for the NTR stack data, the data below covers the entire VNC site and include the effects of operations other than the NTR.

### **A. NTR Stack**

Total airborne releases (stack emissions) for 2018 are as follows:

Alpha Particulate: 1.97E-08 Ci (predominantly radon-thorium daughter products)  
Beta-Gamma Particulate: 5.43E-07 Ci  
Iodine-131: 6.17E-06 Ci  
Noble Gases: 1.90E+02 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. Gamma Radiation**

The yearly dose results for the year 2018 as determined from evaluation of site perimeter environmental monitoring dosimeters showed no departure from normal stable backgrounds.

### **C. 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.

### **D. 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.

### **E. Off-Site**

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

## **VII. Radiation Exposure**

In 2018, the highest annual exposure to any fulltime radiation worker while working at NTR was 0.585 Rem and the lowest exposure for this category of worker was 0.179 Rem. The average radiation exposure for the eleven workers involved was 0.390 Rem per person.



The 2018 total radiation exposure for all workers while performing work at NTR was 4.286 Rem.

### VIII. Conclusion

GE Hitachi concludes that the NTR is staffed and organized for efficient operations. Our Corrective Action Program will continue contributing to making us a more safe and compliant operation.

GE-Hitachi Nuclear Energy Americas LLC  
Vallecitos Operations

**Thomas  
McConnell**

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Thomas J. McConnell, Manager  
Nuclear Test Reactor