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Subject: Docket #50-184

Gentlemen:

Transmitted herewith is Operations Report No. 67 for the NBSR. The report covers the period January 1, 2014 to December 31, 2014.

Sincerely,

Robert Dimeo, Director  
NIST Center for Neutron Research

Enclosure

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**NIST**

**NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY REACTOR  
(NBSR)**

Docket #50-184

Facility License No. TR-5

**Operations Report**

-- #67--

January 1, 2014 - December 31, 2014

This report contains a summary of activities connected with the operations of the NBSR. This report fulfills the requirements of section 6.7.1 of the NBSR Technical Specifications for the period from January 1, 2014 to December 31, 2014.

The section numbers in the report (such as 6.7.1(1)) correspond to the sections in the Technical Specifications.

April 8, 2015



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Robert Dimeo  
Director, NIST Center for Neutron Research

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### **6.7.1(1) Summary of plant operations including the energy produced by the reactor and the hours the reactor was critical**

During the period January 1, 2014 through December 31, 2014 the reactor was critical for 5579 hours with an energy output of 111247.9 MWH. Major activities during this period included; replacing the emergency diesels; replacing the Main and Standby UPS units; replacing confinement ventilation units SF-2, SF-3, and EF-3; and one operator trainee received a senior reactor operator license.

### **6.7.1(2) Unscheduled shutdowns, including reasons therefore**

1. There was a reactor scram from low primary inlet flow by loss of normal main pump flow due to a commercial power dip. This was accompanied by a cold source turbine trip, which led to a high hydrogen pressure rundown, from the same commercial power dip. The reactor was returned to 20 MW within an hour.
2. The reactor was manually shutdown when a leak was discovered from a pressure transmitter on the Thermal Shield system. The reactor was returned to 20 MW approximately 35 hours later after repairs were made.
3. There was a rundown from loss of thermal column flow due to the loss of the #2 SOLA transformer. The reactor was secured in order to make repairs. The reactor was returned to 20 MW approximately 31 hours later.

### **6.7.1(3) Tabulation of major preventative and corrective maintenance operations having safety significance**

Note: Some of these items may be also listed as Engineering Change Notices (ECN).

1. Diesel generator 'A' replaced
2. DWV-22 operator repaired
3. Diesel generator 'B' replaced
4. SF-2, SF-3, and EF-3 replaced
5. #2 main D<sub>2</sub>O pump seal repaired
6. SF-1 filters replaced
7. SCV-4 replaced
8. Re-welded secondary bag filter baskets
9. Replaced FTV-23
10. Added flow restrictor by SCV-404
11. Replaced SCV-355
12. Replaced SCV-365

13. Repaired tritium blower contactor
14. Repaired #2 main D<sub>2</sub>O pump shaft
15. #1, 2, 3 CT gear box oil changes
16. Installed cartridge seal on #2 main D<sub>2</sub>O pump
17. #3 CT vibration switch repaired
18. #4 main D<sub>2</sub>O pump pedestal oil change
19. Replaced CAV-284
20. #1 CT fan vibration switch replaced
21. SF-11 & EF-27 hardwired to MCC-A5 misc. power panel
22. Storage pool booster pump contactor replaced
23. Rabbit blower flange gaskets changed
24. CO<sub>2</sub> blower copper lines re-braided
25. #3 CT dry door repaired
26. PWV-9 diaphragm replaced
27. Replaced piston cups for ACV-2
28. Aligned #2 main D<sub>2</sub>O pump
29. #2 main D<sub>2</sub>O pump coupling installed
30. Repaired process room door latch
31. Installed new UPS
32. Replaced AC-2 solenoid
33. Replaced solenoids for BT-4 & BT-5 control boxes
34. Replaced 1A and 1B sump pumps
35. Replaced COV-4
36. Repaired #1 storage pool pump coupling
37. Repaired #1 5K tank piping
38. Aligned #4 CT fan motor
39. Replaced pipe unions for ECW system
40. Flushed ECW system, installed filters and added chemicals
41. Installed new rad waste filter housings
42. Replaced #1 D<sub>2</sub>O storage tank pump contactor
43. Replaced #1 CT fan fast/slow speed contactors
44. Replaced COV-44 solenoid
45. Replaced EF-27 contactor

In addition to the mechanical and electrical The Reactor Instrumentation Group performed 45 instrument calibrations and 20 corrective maintenance operations during 2014. The calibrations were done using procedures that ensure that the sensors, indication and controls of the NBSR safety systems are accurate and fully operational. In addition, the Reactor Instrument Group with the support of the reactor operations and engineering personnel have made corrective actions to some of the instrumentation and

control systems at NBSR during 2014. These include replacing the meters with newer models and professional custom faceplates. Another console corrective action was to repairing valve position indicators, which has initiated a project to upgrade the indicator fuse holders.

**6.7.1(4) A brief description, including a summary of the safety evaluations, of changes in the facility or in procedures and of test and experiments carried out pursuant to 10 CFR 50.59**

The following facility changes were completed this year. The applicability determination of each of the Level I ECNs showed that further evaluation under section 10 CFR 50.59 was not needed. There were six Level II ECNs for which further evaluation was performed using 10 CFR 50.59. None of these required a license amendment.

There is a Level II ECN in process and is not listed in the table below since it is not complete. ECN 778, Replace T-9 and T-10 UPS, requires a TS change and the license amendment is under review by the NRC.

Level II ECN #	TITLE
849	Cartridge Style Mechanical Seal for Main Primary
835	Prevent contact in emergency power breaker logic
788	Replace Emergency Diesel Generators
730	Developing Manufacturing Procedures and Fabrication Specifications for Shim Safety Rods for NIST Reactor
559	Thermal Shield Cooling System Upgrade: Moving Coolant by Vacuum
524	Removal of ITB5-14 thru ITB6-49 In Reactor Safety System
Level I ECN #	TITLE
884	Add Isolation Valve to Bottom of #1 5K Tank in Liquid Waste Vault
876	Replace Cooling Tower Wet Door Deicing Solenoids with PVC Ball Valves
870	Remove Abandoned Conduit & Equipment from Liquid Waste Vault
869	Replacement of C-100 Lighting Panels
863	Replace Return Air Grills Around Reactor Top
860	Thermal Shield water tank level and tubes in a row software modification
857	Refurbish He and CO <sub>2</sub> gas holder I&C systems
854	ACU-14 Replacement
853	LIC-9 Transformer Rewire

851 Vibration Bracing  
 848 Corrections to Annunciator Plates in 70-007-BD  
 845 Correction of 70-LIC-09-ID to AS BUILT  
 844 Irradiated Air Alarm Repair  
 837 BT-9 Vacuum Skid Platform  
 832 Install I/P Controller on DTCV-19  
 829 Annunciator acknowledgement switch replacement  
 828 Process Room Scram Switch  
 826 Diesel Generator Auto Shutdown  
 824 Lower flow to cooling tower makeup water control valve, SCV-4  
 820 Split drawing 70-009-ED into 4 drawings  
 819 Correction to 70-EF-6(AC)-ID  
 818 Modification of the platform railing in the process room storage pool area  
 816 Change to LIA-40 AN 3-2 Dead-band Setting (ref ECN 785)  
 815 New Vacuum Skid for Peewee  
 814 Update Shim Arm Mounting Hardware Assembly Procedure  
 813 RM 4-1 Stack Monitor Alarm Repair  
 812 D<sub>2</sub>O storage tank pump pit platform installation  
 811 Replace FIA-06 transmitter  
 810 5 Element Rx Loading Configuration  
 799 Stack Monitor Alarm Repair  
 794 Add UPS for HMI & OIT Systems  
 793 Replace raceway cover plate on reactor top for recessed receptacles  
 785 Change to LIA-40 AN 3-2 Dead-band Setting  
 784 Change FI-31 XMTR to ABB Model

**6.7.1(5) Summary of the nature and amount of radioactive effluents released or discharged to the environs and the sewer beyond the effective control of the licensee as measured at or prior to the point of such release or discharge**

During 2014 the gaseous releases to the environs consisted of 1560 Curies of Argon-41, 2178 Curies of Tritium, and 0.013 Curies of other beta-gamma emitters. All NCNR gaseous radio-effluent releases were in compliance with 10 CFR 20.1101(d).

The table below summarizes the liquid radio-effluent releases to the sanitary sewer from Building 235 for calendar year 2014.

H-3 <sup>(1)</sup> (STDEV[2s%])	C-14 <sup>(1)</sup> (STDEV[2s%])	Beta <sup>(2)</sup> (STDEV[2σ])	Gamma <sup>(3)</sup> (STDEV[2σ])
3.466 Ci (0.005 Ci)	5370 µCi (70 µCi)	800 µCi (20 µCi)	3040 µCi (30 µCi)

- (1) Via Liquid Scintillation Spectroscopy (TRI-CARB).
- (2) Via Tennelec instrument (Series 5); includes contributions from gamma radionuclides.
- (3) Gamma isotopes were identified using ~750 ml samples in Marinelli beakers. The following isotopes were identified, in approximate decreasing order of importance: Co-60, Zn-65, Cr-51, Sb-124, Na-24, Cs-137.
- (4) STDEV refers the average propagated standard deviation of the instrument concentrations using an Excel<sup>®</sup> function. For Alpha and Beta activity,  $2\sigma$  is the standard sigma function. For H-3 and C-14, 2s% refers to an industry standard function defined by Packard/Perkin Elmer. 2s% is the percent uncertainty in a gross count value (with 95% confidence limits), or  $2s\% = (100 \times 2 \times \sigma) / (\text{Total Counts})$
- (5) The alpha activity detected in NCNR samples (this year, 9  $\mu\text{Ci}$ , STDEV[ $2\sigma$ ]=3  $\mu\text{Ci}$ ) is historically attributed to natural background.

All NCNR liquid radio-effluent releases were in compliance with 10-CFR-20.2003

#### **6.7.1(6) Summaries of environmental surveys performed outside the facility**

Environmental samples of the water, grass, and/or soil showed no licensed radioactive material. Results from thermo-luminescent dosimeters located at the NIST fence line showed no statistically significant dose above background levels.

#### **6.7.1(7) Summaries of significant exposures received by facility personnel and visitors**

Dosimetry results:

1. There were no significant exposures (exceeding regulatory limits) to visitors for this reporting period.
2. There were no significant exposures (exceeding regulatory limits) to facility personnel for this reporting period.