# NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY REACTOR (NBSR)

Docket #50-184

Facility License No. TR-5

Operations Report

--#41--

January 1, 1988 - December 31, 1988

This report contains a summary of activities connected with the operations of the NBSR. It is submitted in fulfillment of section 7.8(3) of the NBSR Technical Specifications and covers the period from January 1, 1988 to December 31, 1988.

Section numbers in the report (such as 7.8(3)(a)) correspond to those used in the Tecnhnical Specifications.

April 5, 1989

J. Michael Rowe Chief, Reactor Radiation Division

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## 7.8(3)(a) Summary of Plant Operations

During the calendar year 1988, the reactor was critical for 4846 hours and the energy generated was 82542 MWH. The following are highlights of significant activities during this period.

1. Guide Hall

Construction of the new guide hall adjacent to the reactor building was nearly completed. Penetrations for guide tubes will be made in 1989. Once the guide tubes are installed, the cold neutron facility, the first of its kind in the U.S. will be ready for use.

#### 2. Thermal Shield Cooling System

The National Nuclear Corporation of England developed a method for sealing leaks in inaccessible high radiation areas. The method was used successfully at several reactors around the world. It appeared to be ideal for repairing leaks in the thermal shield cooling tubes. Several applications of sealant are generally required. The method was tried in June 1988 on 40 tubes previously isolated, and again on 25 tubes in December of 1988, 21 of which were previously treated. The treatment will continue to be monitored and re-applied if necessary. So far the treatment appears to be satisfactory with the number and frequency of leaks reduced.

#### 3. Cryostat

During reactor shutdown, the vacuum to the cryostat experiment was inadvertently shut off. This resulted in the freezing and subsequent damage to the cryostat heavy and light water cooling lines which are supplied by the experimental cooling systems. The small amount of water that leaked was all contained within the confinement building.

and most of the heavy water was recovered. The cryostat was subsequently replaced and provisions were made to assure that the vacuum is not shut off inadvertently in the future.

6. Heat Exchangers

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A new addition to the process room for housing two new main heat exchangers is near completion. Procurement of new heat exchangers will be initiated in 1989 with emphasis on long term reliability. No new leaks were detected in the present heat exchangers. There is still a very small leak, on the order of 0.1 gallons per day, that is too small to be located.

## 7.8(3)(b) Unscheduled Shutdowns

- There were nine (9) scrams due to commercial power dips. On four of the occasions the reactor stayed down. The other five times power was restored immediately.
- The reactor was shutdown one time to retrieve a rabbit that would not return. The reactor returned to power on the same shift.
- The reactor scramed one time because of low flow to the bismuth tip. After correcting the flow problem power was restored.
- The reactor was shutdown when domestic water pressure was lost.
  Power was restored after the pressure returned.

7.8(3)(c) Tabulation of Major Items of Plant Maintenance

- 1. Replaced RD4-1 detector
- 2. Performed test discharge of station battery
- 3. Performed ultrasonic testing of primary system piping
- 4. Installed d/p cell for primary to secondary pressure on HE-2

- 5. Overhauled and cleaned #2 Shim Arm drive which includes replacement of bearings and lead screw. Constructed a test stand for testing Shim Arm drives outside the reactor.
- Re-piped thermal shield leak collection system into 350 gallon poly storage vessel
- 7. Replaced drive belts on EF-23
- 8. Repaired RD3-4 & RD3-5 blower controls
- 9. Regenerated Demineralized water station (twice)
- 10. Plugged leaking tubes of Exp Demin heat exchanger (4 tubes)
- 11. Replaced valve diaphram of DCV-21
- 12. Replaced #2 Exp  $D_00$  pump with new one
- 13. Changed "O" rings in RT-3 receiver
- 14. Cleaned cooling tower basin and suction screens
- 15. Replaced tricium blower with new unit
- 16. Inspected secondary side of HE-1B
- 17. Sealed leaking tubes of thermal shield ring header
- 18. Started replacing original globe valves of thermal shield ring header with brass Conbraco ball valves
- 19. Installed new fiberglass storage tank for Emergency Diesel Generator fuel oil
- 20. Replaced back-up air regulator for seals to auto closing doors
- Replaced both battery banks of "A" Emergency Diesel Generator.
  Retested satisfactorily weekly for several weeks.
- 22. Installed switchgear "C" to service new office wing and guide hall
- 23. Installed vertical riser to collect blowoff of D<sub>2</sub>O from primary system loop seal
- 24. Plant division performed sub-station breaker maintenance

25. Repaired AC line contactor on invertor/diverter controller 26. Replaced pre-filters of storage pool purification system 27. Replaced chart drive gears on weather recorder 28. Readjusted Shim Arm #2 position indicator pot Repaired stack monitor pre-amp wiring 29. Completed overhaul on Reg Rod control amplifier 30. 31. Replaced stack monitor GM tube and wiring 32. Repaired weather recorder chart drive 33. Recalibrated reactor flow recorder FR-1 Adjusted control valves DWV-28 and DWV-39 34. Repaired Exp. Demin water controller 35. 36. Replaced transmitter in thermal column level channel 37. Repaired short in HP office annunciator 38. Repaired Helium gas holder level recorder 39. Repaired DWV-22 valve position controller 40. Recalibrated radiation monitor RM1-9 41. Repaired temperature transmitter on thermal shield storage tank 42. Replaced Shim Arm #3 digital readout Recalibrated reactor level transmitters 43. 44. Replaced HE-1A outlet temperature recorder Replaced input unit in servo deviation channel 45. 46. Replaced reactor inlet temperature recorder Replaced GM tube in liquid waste monitor 47. Repaired input connector on NC-3 channel 48. 49. Recalibrated secondary inlet temperature transmitter Replaced transmitter in secondary cooling flow channel 50. 51. Replaced thermal shield storage tank temperature transmitter

52.	Replaced	alarm unit in Bismuth Tip flow channel							
53.	Adjusted	gain on recombiner outlet temp transmitter							
54.	Recalibrated N-16 monitor count rate meter								
55.	Rezeroed Barton pressure gage on Pri/Sec diff.								
56.	Recalibrated storage pool temp transmitter								
57.	Replaced	eplaced servo motor in radiation recorder							
58.	Replaced	chart drive on outlet temp recorder							
59.	Rebuilt c	vacuation alarm control circuit							
60.	Replaced .	amplifier in recombiner pressure channel							
61.	Replaced	chart drive motor in nuclear recorder							
62.	Replaced ·	+10VDC nuclear power supply							
63.	Replaced Shim #2 digital readout module								
64.	Replaced liquid waste monitor GM tube								
65.	Replaced radiation recorder print head								
66.	Repaired	tritium monitor +6VDC power supply							
67.	Replaced a	amplifier in recombiner pressure transmitter							
68.	The following instrument calibration surveillance tests were per-								
	formed:								
	TIA-40A	Reactor Delta Temperature Indicator							
	NC-8	Nuclear Power Range Channel							
	NC-7	Nuclear Power Range Channel							
	RM3-4	Irradiated Air Monitor							
	BTUR - 1	Reactor Thermal Power							
	NC-4	Nuclear Intermediate Range Channel							
	RM1 to 10	Area Radiation Monitors							
	FRC-3	Reactor Outer Plenum Flow							
	FRC-4	Reactor Inner Plenum Flow							

RM4-1	Stack Air Monitor
RM4-4 N	Criticality Monitor
RM4-4 S	Criticality Monitor
LRC-1	Reactor Level Recorder
NC-3	Nuclear Intermediate Range Channel
PC-3	Normal Exhaust Monitor
PC-27	Process Room Fan Controller
SPC-150	Emergency Fan Controller
SPS-150	Emergency Standby Controller
SPS-151	Vacuum Breaker Controller
RM3 - 5	Normal Air Monitor
NC-6	Nuclear Power Range Channel
NC-9	Nuclear Interlock Trip Test
RM3 - 2	Fission Products Monitor
TIA-40B	Reactor Delta Temperature Indicator
FIA-40	Reactor Outlet Flow Indicator

7.8(3)(d) Tabulation of Major Changes in the Facility and Procedures, and the Test and Experiments, Carried Out Without Prior Approval by the NRC pursuant to 10 CFR 50.59.

Relevant Engineering Changes are summarized below:

ECN-297 Install twin booster pumps into the secondary cooling supply line for the auxiliary heat exchangers HE-2, HE-6, and HE-7. Also added a differential pressure detector and alarm to HE-2.

This change increases the cooling flow to the auxiliary heat exchangers and does not affect the safety analysis,

reduce safety margin or increase the possibility of a failure affecting the reactor. There is no unreviewed safety question.

ECN-331 Tie Cryogenic Refrigerator Compressor into Experimental Chilled Water System. The Experimental Chilled Water System has no connection with the reactor safety system, thus there is no unreviewed safety question.

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- ECN-332 Provide 480 Volts AC uninterruptible power for the Experimental Chilled Water System. The Experimental Chilled Water System has no connection with the reactor safety system, thus there is no unreviewed safety question.
- ECN-336 Install temporary Diesel fuel tank for emergency Diesel generators during construction of Cold Neutron Research Facility (CNRF).

This temporary tank in no way reduced any margin of safety and therefore it does not involve an unreviewed safety question.

ECN-345 Replaced relays in the building evacuation alarm system. This change does not reduce any safety margin and therefore does not reflect an unreviewed safety question.

7.8(3)(e) Summary of Radioactive Material Released and Results of Environmental Surveys Performed.

The gaseous waste released was 393 curies of tritium and 900 curies of Argon-41. There were 5.1 curies of tritium and 2.6 millicuries of other beta-gamma emitters were released into the sanitary sewer.

Environmental samples of the streams, vegetation, and/or soil, and air showed no significant changes.

- 7.8(3)f Summary of Significant Exposures Received by Facility Personnel and Visitors
  - 1. None to visitors.

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 Dosimetry results for this reporting period indicated that no facility personnel received significant exposures.



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April 5, 1989

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Subject: Docket #50-184

Gentlemen:

Transmitted herewith is Operations Report No. 41 for the NBSR. The report covers the period January 1, 1988 to December 31, 1988.

Very truly yours,

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J. Michael Rowe Chief, Reactor Radiation Division

Attachment

cc: Director, Division of Reactor Licensing
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