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March 18, 1994

U.S. Nuclear Regulatory Commission
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Subject: Docket #50-184

Gentlemen:

Transmitted herewith is Operations Report No.46 for the NBSR. The report covers the period January 1, 1993 to December 31, 1993.

Sincerely,

J. Michael Rowe
Chief, Reactor Radiation Division

Enclosure

cc: Project Scietist
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NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY REACTOR (NBSR)

Docket #50–184

Facility License No. TR–5

Operations Report

--#46--

January 1, 1993 – December 31, 1993

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, 1993 to December 31, 1993.

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

March 18, 1994

J. Michael Rowe

Chief, Reactor Radiation Division

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7.8(3)(a) Summary of Plant Operations

During 1993 reactor operations continued at reduced power level of 15MW since one of the main heat exchangers was taken out of service. Form January 1, 1993 through December 31, 1993 the reactor was critical for 6664 hours and the energy generated was 98690 MWH.

The discovery of an unlatched element was the subject of a special report to the NRC dated September 22, 1993. Since the report, additional checks were performed and further steps were taken. The detent in the grid under the unlatched position was examined with a borescope and it looked good, with no evidence of wear. The orientation of the latching bar on all elements was also checked. In three instances, even though the element was latched, the bar was found not to be fully rotated. As a result, a special tool was developed that can only be rotated in the locking direction and will be used to confirm that the latching bar is in the proper orientation. The tool was tried during a shutdown with excellent results. This method will be used in future refueling since it provides the best assurance that the latching bar is in the detent of the grid.

An extended outage is scheduled for the middle of 1994 in order to replace the main heat exchangers and to install a new liquid hydrogen cold source among other projects.

7.8(3)(b) Unscheduled Shutdowns

1. There were four (4) scrams due to a commercial power dip. The reactor returned to power.
2. The reactor was shutdown in order to shift Critical Power and Rod Drive Power from the T–9 to the T–10 system when the Static Inverter failed. The reactor returned to power the next day after xenon decay.
3. The reactor was manually scramed because of apparent decreasing power on all channels. Investigation revealed that Shim Arm #1 had dropped a small amount. The output card for the #1 clutch current was replaced. The reactor returned to power the next day after xenon decay. This was the subject of a special information letter to the NRC dated April 9, 1993.
4. The reactor was shutdown during a startup when oscillations were observed on all nuclear channels. Investigations subsequently reveled an unlatched element in the core. This event is discussed more fully in section (a) above.

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

1. Replaced SCV-4 and SCV-48 (Cooling Tower make-up valves).
2. Installed new diaphragm in Secondary chemical addition pump.
3. Replaced 4 cells in the station battery.
4. Changed diaphragm in HEV-40 (Helium inlet to Rx vessel).
5. Adjusted #4 Shim arm clutch.
6. Changed diaphragm in DCV-1 (Exp Demin pressure controller).
7. Replaced spool piece downstream of DCV-1 due to pinhole leak.
8. Greased diaphragm shaft of Helium gas holder.
9. Replaced one strip heater in Helium sweep system.
10. Refurbished #1 & #4 Secondary pump motors (Redipped, baked, balanced, new bearings and motor leads).
11. Refurbished #2 & #5 Secondary pump motors (Redipped, baked, balanced, new bearings and motor leads).
12. Replaced time delay in #2 Secondary pump motor controller.
13. Removed, disassembled, cleaned, lubricated, reassembled #2 Shim arm clutch mechanism and gapped clutch clearance to spec. Replaced position indicator pot.
14. Replaced FTV-3 shut indicator.
15. Replaced diaphragm in DCV-52
16. Refurbished #3 & #6 Secondary pump motors (Redipped, baked, balanced, new bearings and motor leads).
17. Replaced Storage pool after filters.
18. Replaced relay in BT-9 shutter controller.
19. Overhauled Wilden Pump M-4 (air operated to pump storage pool water over weir to pump pit).
20. Replaced air pilot sensor from Cooling Tower deluge system to make-up valve SCV-4.
21. Replaced AC filter capacitors in Static Inverter.
22. Repaired leak in #3 Main D2O pump by cutting small grove into shaft sleeve to accommodate rubber "O" ring.
23. Installed new AC input breaker for 200 amp battery charger.
24. Changed storage pool IX pre-filters
25. Replaced diaphragms of valves DCV- 40 & 46 (filter isolation valves of Experimental Demin system).

26. Replaced flexible coupling of #2 Storage Pool pump.
27. Replaced "O" ring on DWV-3 position indicating shaft to stop air leak. Lubricated stem and adjusted open/close limit switches.
28. Replaced pre & after filters of storage pool IX.
29. Replaced bonnet and diaphragm of storage pool IX outlet valve SPV-49.
30. Replaced upper bearing of D-5 fuel element transfer arm.
31. Replaced drain valve of storage pool after filter.
32. Replaced 2 cells of station battery.
33. Continued treating leaking Thermal Shield tubes as necessary.
34. Performed regularly scheduled Tech Specs and plant PM's.
35. Replaced Magnetic Amplifier on NC-6 Input Card.
36. Repaired ground on BTUR Recorder servo motor.
37. Replaced radiation alarm unit on BT 4.
38. Replaced GM tube on RD 3-1.
39. Replaced Thermal–Shield Tank Level indicator.
40. Replaced Criticality Monitors.
41. Replaced batteries for Tritium Monitor.
42. Replaced RD 1-1.
43. Repaired FRC-1.
44. Replaced Ganged Potentiometers on NC-6, -7, and -8.
45. Replaced AN-1, -2, -3, and -5 Annunciators.
46. Replaced FIA-5 flow transmitter.
47. Replaced plungers in RAD Isolation Valve solenoids.
48. The following instrument calibration surveillance tests were performed:

Channel	Title
FRC-3	Reactor Inner Plenum Flow
FRC-4	Reactor Outer Plenum Flow
FIA-5	D2O to Purification HE-2 Flow Indicator
FCA-7	Thermal Column Flow Indicator Control
FIA-14	Storage Flow I.X. Flow Indicator
FIA-40	Reactor Flow
LIA-3	D2O Storage Tank Level
LRC-1	Reactor Vessel Level
LCA-19	Storage Pool Pump Pit Level Control

NC-1	Nuclear Source Range Start Up
NC-2	Nuclear Source Range Start Up
NC-3	Reactor Intermediate Power Range
NC-4	Reactor Intermediate Power Range
NC-5A	Linear Power Range and Regulating Rod Controller
NC-6	Nuclear Power Range
NC-7	Nuclear Power Range
NC-8	Nuclear Power Range
NC-9	Nuclear Safety System
PC-3	Normal Air Exhaust Pressure Controller
PC-27	Process Room Air Exhaust Pressure Controller
RM 1-1-10	Reactor Building Area Monitors
RM 1-15	C001 Rabbit Lab Radiation Area Monitor
RM 3-1	Secondary Cooling N-16 Monitor
RM 3-2	Fission Product Monitor
RM 3-3	Secondary Cooling N-16 Monitor
RM 3-4	Irradiated Air Monitor
RM 3-5	Building Exhaust High Activity Alarm
RM 4-1	Stack Monitors
RM 4-2	Emergency Ventilation Stack Monitor
RM 4-3	Liquid Waste Monitor
RM 4-4N	Criticality Monitor
RM 4-4S	Criticality Monitor
SPC-150	Emergency Fan Controller
SPS-150	Emergency Standby Fan Controller
SPS-151	Vacuum Breaker Controller
TRA-2	Reactor Outlet Temperature
TIA-12	Cooling Tower Temperature Indicator
TIA-40A	Reactor Delta-T
TIA-40B	Reactor Delta-T

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.

1. Started replacing the Control Room annunciator panels for modernization.
2. Replaced the Inverter/Diverter with a 20KVA UPS system.
   Both of these changes involved replacement of equipment with equal or superior equipment.

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

The gaseous waste released was 425 curies of tritium and 879 curies of Argon–41. There were 1.5 curies of tritium and 0.2 millicuries of other beta–gamma emitters 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.

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