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OAK RIDGE NATIONAL LABORATORY

MARTIN MARIETTA

Bulk Shielding Facility Quarterly Report April, May, and June 1988

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ORNL/TM-10891

Research Reactors Division
Reactor Operations Section

BULK SHIELDING FACILITY QUARTERLY REPORT APRIL, MAY, AND JUNE 1988

T. L. Fancher
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SPONSOR: A. L. Lotts
Research Reactors Division

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BULK SHIELDING FACILITY QUARTERLY REPORT
APRIL, MAY, AND JUNE 1988

SUMMARY

The Bulk Shielding Reactor (BSR) remained shut down during April, May, and June. Water-quality control in both the reactor primary and secondary cooling systems was satisfactory.

The Pool Critical Assembly (PCA) is shut down for shim-safety rod magnets and associated electronic components upgrading.

BULK SHIELDING FACILITY

OPERATIONS

Core loading 103 is shown in Fig. 1. However, the shim-safety rod calibrations are not complete due to a reactor shutdown ordered by the Department of Energy on March 26, 1987.

The BSR remained down during the quarter as ordered by the Department of Energy. The basic operating data are shown in Table 1.

The Low-Temperature Neutron Irradiation Facility (LTNIF) functional testing and facility upgrading continues.

Shutdowns

The reactor remained shut down during the quarter. Table 2 gives an analysis of the scheduled and unscheduled shutdowns.

Maintenance and Changes

Maintenance and changes to the instrumentation components in the complex are listed in Table 3.

Maintenance and changes of the process systems are listed in Table 4.

Maintenance and changes of the mechanical systems are listed in Table 5.

Operational Activities

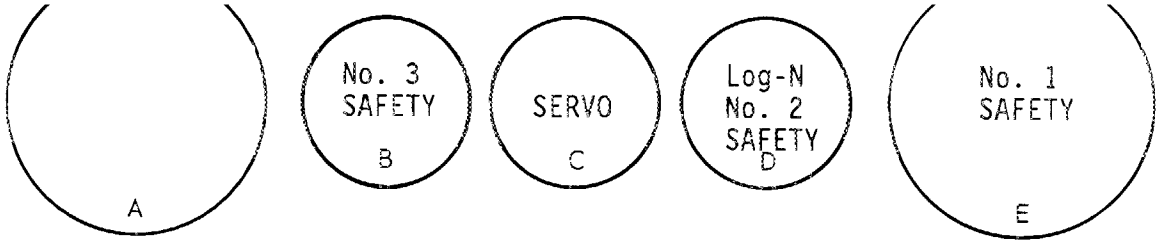
The operational activities for the quarter are listed in Table 6.

Experiments

Work relating to LTNIF is listed in Table 7.

ORNL/DWG 87-10730

BSR CORE



81	82	83	84	(C) 85	AL 86	AL 87	AL 88	AL 89
71	72	73	74	AL 75	AL 76	AL 77	AL 78	AL 79
61	62	EAST 63	64	OR-98-F 193 65	BSF-S-17 63 66	BSF-A10 182 67	BSF-S-18 64 68	B-83-1 201 69
51	52	D_2O 53	54	BSF-T6 211 55	M-111-F 174 56	YZP-0049 196 57	BSF-T2 176 58	BSF-T5 211 59
41	42	TANK 43	44	BSF-S-T2 107 45	BSF-T3 190 46	BSF-S-T4 107 47	B-83-2 201 48	(a) 49
31	32	33	34	M-110-F 176 35	M-59-H 194 36	M-102-F 190 37	M-104-F 195 38	BSF-T4 211 39
21	22	23	24	M-60-H 184 25	BSF-S-T1 83 26	M-95-F 180 27	BSF-S-T3 83 28	M-61-H 186 29
11	12	13	14	15	16	17	18	19

LOADING NO.
103

DATE
March 24, 1987

EXCESS REACTIVITY
(b)

OPERATING MASS
3958 g

ROD POSITIONS AT CRITICAL
(With Operating Mass)

ROD NO.	IN. WITHDRAWN	
1	10.05	11.75
2	10.05	11.75
3	10.05	11.75
4	10.05	11.75
5	23.00	11.75
6	23.00	11.75

REMARKS:

DOE mandated reactor to be shut down 4 p.m., March 26, 1987

[a]Core position for the Low-Temperature Neutron Irradiation Facility.
[b]Rod calibrations are not complete due to a DOE mandated reactor shutdown on March 26, 1987.
[c]Fission chamber.

Fig. 1. Core loading 103, BSR.

UCN-8504
(3 7-78)

Table 1. Basic operating data
(April-June 1988)

	This quarter	Last quarter	Year to date
Total energy, kWd	0	0	0
Average operating power, kW	0	0	0
Time operating, %	0	0	0
Reactor availability, %	99.9	99.9	99.9
Reactor water radioactivity, cpm/ml (av)	BG	BG	BG
Reactor water resistivity, ohm-cm (av)	786,667	1,807,564	1,297,116
Research samples	0	0	0

Table 2. Analysis of shutdowns*

Description of shutdown	Number
Scheduled:	0
Unscheduled:	0
TOTAL:	0

*The Department of Energy ordered the reactor to be shut down on March 26, 1987. The reactor did not operate during the report period.

Table 3. Maintenance and changes, instrumentation and controls

Date	Components	Trouble/change	Maintenance performed
4-12-88	BSR remote	Faulty camera	Replaced upper camera
4-20-88	Seismic scram	New	Connected seismic switches and scrams. Tested seismic makeup and dropout scram channels
4-27-88	FRCAS	Routine	Bi-monthly checks
5-5-88	CAMs	Routine	Quarterly calibration
6-2-88	Decay tank	Routine	Calibrated level indicator
6-2-88	Primary demineralizer	Routine	Calibrated conductivity meter
6-3-88	CAMs	Routine	Quarterly calibration
6-6-88 thru 6-14-88	Reactor controls	Routine	Quarterly checks
6-9-88	FRCAS	Routine	Quarterly checks
6-14-88	Count rate channel	Faulty relay	Replaced K-29 relay
6-14-88	Annunciator	Faulty buzzer	Replaced buzzer on vertical panel "G"
6-22-88	LTNIF	Routine	Quarterly experiment safety check
6-23-88	Pool level alarm	Routine	Calibrated pool level alarms for high and low setpoints
6-29-88	P.A. system	Modify	Connected BSR control room microphone to ORR P.A. system
6-30-88	Servo	Change memo	Excessive servo noise monitor was upgraded per CM-BSR-57, Add. 3

Table 4. Maintenance and changes, process systems

Date	Components	Trouble/change	Maintenance performed
5-11-88	LTNIF	Leaking cooling water line	Repaired line
5-23-88	Control room A.C. unit	Faulty	Replaced belts and fan blade
5-23-88	Building lighting	Routine	Relamped bay area and pump house
6-6-88	A.C. unit No. 7	Replacement	Removed asbestos from ducts for replacement of unit
6-9-88	Neutron source holder	Relocation	Modified and installed in northeast corner of pool
6-24-88	Control room A.C. unit	Faulty	Cleaned condenser, checked freon, and returned to service

Table 5. Maintenance and changes, mechanical systems

Date	Components	Trouble/change	Maintenance performed
4-27-88	Overhead crane	Routine	Inspected gearbox
5-23-88	A.C. tower pump	Routine	Lubricated pump

Table 6. Operational activities

Date	Remarks
5-27-88	Made gamma radiation measurements of reactor core and stored fuel elements
6-17-88 to 6-20-88	Valved NOG system out of service for maintenance work at stack area and returned system to normal service following completion of work

Table 7. Experiment facilities activity, LTNIF

Date	Remarks
4-12-88	Removed experiment test R16 from cryostat to storage area

Fuel

Changes in the fuel inventory are reported in Table 8.

Table 8. Fuel and shim-safety rod status

	This quarter	Last quarter	Year to date
Fuel elements depleted	0	0	0
Shim-safety rod fuel elements depleted	0	0	0
New fuel elements placed in service	0	0	0
New shim-safety rod fuel elements placed in service	0	0	0
Partially depleted shim-safety rod fuel elements	6	6	6
New fuel elements available for use	15	15	15
New shim-safety rod fuel elements available	7	7	7
Partially depleted fuel elements available for use (includes core)	30	30	30
New boron stainless steel shim-safety rods placed in service	0	0	0
Boron stainless steel shim-safety rods in service	6	6	6
Boron stainless steel shim-safety rods available for use	1	1	1

Experiment Facilities Assignments

Experiment facilities assignments are listed in Table 9. The tubes of the east D_2O tank are not permanently assigned; they have been used by various Laboratory personnel for short-term sample irradiations.

Table 9. Experiment facilities assignments

Facility	Location	Division or sponsor
Dry thermal-neutron tubes (D-3-1 and -2)	East D_2O tank	Research Reactors
Wet thermal-neutron tubes (D-4-1 and -2, D-6-1, -2, -3, -4, and -5)	East D_2O tank	Research Reactors
Low-Temperature Neutron Irradiation Facility (LTNIF)	Southwest corner of pool	Solid State

Demineralizer Performance

Table 10 gives detailed information on the condition of the primary water system for the preceding quarters and pertinent data on the performance of the bypass demineralizer.

Gas Filter Status

Table 11 gives detailed information on the condition of both the cell vent and NOG filters.

SUMMARY OF SURVEILLANCE TESTS AT THE BSR

Table 12 is a tabulation of the completion dates of the surveillance tests required by the Technical Specifications. This table contains all the surveillance tests scheduled for frequencies of one test per month or longer. Other surveillance requirements which are not reported are satisfied by routine completion of daily and weekly check sheets, start-up checklists, hourly data sheets, the operating log book, and miscellaneous quality assurance tests.

Table 10. Demineralizer performance data

Run No.	Initiation date	Termination date	Throughput (gal)	Gross gamma (cpm/ml)		pH		Specific resistance (ohm-cm)	
				In	Out	In	Out	In	Out
61	8-5-80	10-30-80	1,850,000	1,824	118	5.4	5.6	1,148,000	2,600,000
62	11-4-80	2-26-81	2,600,000	1,587	110	5.4	5.6	1,368,000	4,319,000
63	3-2-81	6-20-81	2,200,000	1,271	151	5.5	5.7	1,233,000	3,960,000
64	6-29-81	8-11-81	1,250,000	1,941	141	5.4	5.7	896,000	2,258,000
65	8-12-81	9-8-81	425,000	2,163	142	5.2	5.4	445,000	1,126,000
66[a]	9-19-81	1-3-82	850,000	1,666	119	5.4	5.6	1,138,000	1,980,000
67	1-4-82	4-5-82	2,400,000	1,874	150	5.4	5.6	970,000	1,691,000
68	4-7-82	7-8-82	2,000,000	1,841	138	5.3	5.5	915,000	1,841,000
69	7-9-82	7-27-82	750,000	1,962	129	5.2	5.4	720,000	1,136,000
70[a]	9-22-84	8-30-83	1,900,000	527	59	5.2	5.4	1,180,000	2,034,000
71[b]	8-31-83	5-15-84	2,693,560	2,961	166	5.6	5.8	1,030,000	1,830,000
72	6-5-84	9-11-84	2,851,200	--	--	5.5	5.7	1,025,000	2,000,000
73	9-13-84	2-8-85	2,650,000	2,467	230	5.6	5.9	758,000	1,289,000
74	2-16-85	4-1-85	1,114,560	2,565	--	5.6	6.1	468,000	1,501,000
75[a]	4-2-85	7-16-85	3,389,760	3,337	282	5.7	6.1	736,000	1,590,000
76	7-19-85	12-6-85	4,354,460	3,727	196	5.7	5.9	840,000	1,818,000
77	12-10-85	4-9-86	3,543,400	1,268	104	5.7	5.8	1,023,000	2,033,000
78	4-11-86	9-15-86	4,521,600	3,238	365	5.9	6.2	686,000	1,613,000
79	9-17-86	11-1-86	1,094,400	1,122	141	5.8	5.9	939,000	2,165,000
80	11-14-86	1-26-87	530,000	1,910	162	6.0	6.4	641,000	1,583,000
81[a]	1-30-87	9-3-87	4,665,600	374	47	5.6	5.7	922,000	1,708,000
82	9-8-87	--	--	--	--	--	--	--	--

[a]New resin in the demineralizer columns.
[b]The demineralizer operated on low flow (approximately 7 gpm) from September 26, 1983, to January 17, 1984, due to a failure of the booster pump.

Table 11. Gas filter status

Type filter	Bank designation	Date last changed	Date last tested	Type test	Retention efficiency (%)
		Cell-ventilation system			
North CWS	Overall[a]	East, 9-17-85 West, 8-17-83	12-15-87	DOP	99.993
North charcoal		10-7-87	1-7-88	Elemental iodine	99.935
Center CWS	Overall[a]	East, 9-17-85 West, 8-17-83	12-15-87	DOP	99.990
Center charcoal		10-7-87	1-7-88	Elemental iodine	99.990
South CWS	Overall[a]	East, 9-17-85 West, 8-17-83	12-15-87	DOP	99.992
South charcoal		10-7-87	1-7-88	Elemental iodine	99.946
		Normal off-gas			
CWS	West	3-29-88	3-29-88	DOP	99.992
Charcoal	West	3-29-88	6-21-88	Elemental iodine	99.971
CWS	East	3-29-88	3-29-88	DOP	99.998
Charcoal	East	3-29-88	6-23-88	Elemental iodine	99.940

[a]The CWS filters in the cell-ventilation system were checked in series.

Table 12. Summary of surveillance tests at the BSR

Test	Most recent test	Previous test
Biennial tests		
Inspection of the shim-safety rods	1-22-87	9-23-85
Annual tests		
Core dT channel calibration	9-25-87	9-29-86
Core dP channel calibration	9-30-87	9-30-86
Primary coolant flow channel calibration	9-30-87	9-30-86
Pool water-level channel calibration	6-14-88	3-11-88
Maximum rate of reactivity addition by the shim-safety rods	3-26-87*	12-16-86
Reactivity assigned to the servo-control system	3-26-87*	5-2-86
Subcriticality with each shim-safety rod at its upper limit while all other shim-safety rods are fully inserted	6-13-88	3-10-88
Semiannual		
Cell-ventilation filter efficiency		
A. Elemental iodine	1-7-88	10-9-87
B. Dioctyl phthalate	12-15-87	6-22-87
Continuous air monitor	5-5-88	2-26-88
Radiation monitron	6-3-88	2-26-88
Stack radiation monitor calibration	2-26-88	11-24-87

Table 12. (Continued)

Test	Most recent test	Previous test
Semiannual (continued)		
NOG filter system efficiency		
Elemental iodine test - east bank	6-23-88	3-2-88
Elemental iodine test - west bank	6-21-88	12-21-87
Dioctyl phthalate test - east bank	3-29-88	9-3-87
Dioctyl phthalate test - west bank	3-29-88	9-3-87
Quarterly		
Safety channel No. 1 calibration	6-7-88	3-7-88
Safety channel No. 2 calibration	6-7-88	3-7-88
Safety channel No. 3 calibration	6-7-88	3-7-88
Log-N channel calibration	6-7-88	3-8-88
Fission chamber channel calibration	5-26-88**	3-7-88
Flapper valve position channel functional test	6-14-88	3-11-88
Measurement of release time and time of flight for the shim-safety rods	6-13-88	3-10-88
Containment closure system functional test	3-28-88	12-31-87
In-leakage during containment mode	3-28-88	12-31-87
Ten year		
Syphon break system functional test	7-17-86	3-11-82
Reactor containment inspection	9-22-83	1-3-75

Table 12. (Continued)

Test	Most recent test	Previous test
Ten year (continued)		
Support structure inspection	9-22-83	1-3-75
Reactor bridge inspection	8-30-85	10-12-72
Primary piping (in-pool) inspection	6-16-87	1-3-75
Primary piping (pump house) inspection	9-4-85	10-12-72
Primary piping (valve pit) inspection	8-26-85	10-12-72
Primary pump (when accessible) inspection	3-19-81	5-5-80
Others		
Calibration of shim-safety rods	3-26-87*	5-2-86
Emergency electrical power test	3-30-88	12-31-87
LTNIF, pool water level, functional test	6-23-88	6-5-87

*Rod calibrations are not complete due to the DOE-ordered shutdown on March 26, 1987.

**Calibration check of channel was made using RaB neutron source.

POOL CRITICAL ASSEMBLY

OPERATIONS

The PCA is shut down for shim-safety rod magnets and associated electronic components to be upgraded. The fuel elements have been shipped to Savannah River for reprocessing.

SURVEILLANCE TESTS AT THE PCA

Shim-safety-rod magnets and associated electronic components are being upgraded at the PCA. Until this work is completed, it will not be possible to make all the surveillance tests required at this facility by the technical specifications. Thus, a waiver of the PCA technical specifications surveillance test requirements during the proposed modification and component replacement period was granted.[1]

---

[1]Letter to B. L. Corbett from K. H. Poteet, subject "Waiver of Surveillance Tests at the PCA," March 26, 1985.

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