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Bulk Shielding Facility Quarterly Report April, May, and June 1985

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Operations Division
Reactor Operations Section

BULK SHIELDING FACILITY QUARTERLY REPORT APRIL, MAY, AND JUNE 1985

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SPONSOR: J. H. Swanks
Operations Division

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BULK SHIELDING FACILITY QUARTERLY REPORT
APRIL, MAY, AND JUNE 1985

SUMMARY

The BSR operated at an average power level of 1134 kW for 5.1% of the time during April, May, and June. Water-quality control in both the reactor primary and secondary cooling systems was satisfactory.

The PCA is shutdown for shim-safety rod magnets and associated electronic components upgrading.

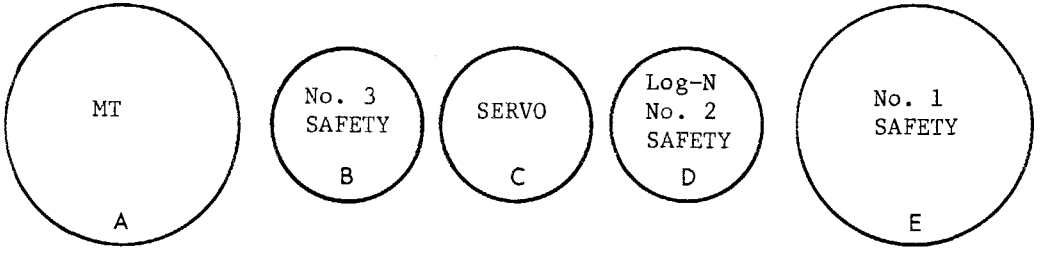
BULK SHIELDING FACILITY

OPERATIONS

The BSR remained down for most of the quarter due to no request to operate. The brief periods of operation were used for functional checks, NLTNIF workshop demonstration, NLTNIF flux mapping, new fission chamber calibration, servo excessive-action functional checks, personnel training, and university student training.

The preliminary work for the National Low-Temperature Neutron Irradiation Facility (NLTNIF) installation continues on schedule.

The new core loading 102 is shown in Fig. 1.



81	82	83	84	FC 85	Al Can 86	Al Can 87	Al Can 88	Al Can 89
71	72	73	74	Al Can 75	Al Can 76	Al Can 77	Al Can 78	Al Can 79
61	EAST 62	63	64	OR-98-F 200 65	BSF-S-17 64 66	BSF-A10 188 67	BSF-S-18 65 68	BSF-A9 178 69
51	D_2O 52	53	54	BSF-T6 218 55	M-111-F 180 56	YZP-0049 204 57	BSF-T2 182 58	BSF-T5 215 59
41	TANK 42	43	44	BSF-S-T2 110 45	BSF-T1 173 46	BSF-S-T4 109 47	BSF-T3 198 48	Al Plug[a] 49
31	32	33	34	M-110-F 181 35	M-59-H 202 36	M-102-F 198 37	M-104-F 202 38	BSF-T4 216 39
21	22	23	24	M-60-H 187 25	BSF-S-T1 85 26	M-95-F 185 27	BSF-S-T3 85 28	M-61-H 189 29
11	12	13	14	Al Plug 15	Al Plug 16	Al Plug 17	Al Plug 18	Al Plug 19

[a]Core position for the National Low-Temperature Neutron Irradiation Facility.

BSR CORE

LOADING NO.
102

DATE
March 21, 1985

EXCESS REACTIVITY
4.95% Δk/k

OPERATING MASS
4014 g

ROD POSITIONS AT CRITICAL
(With Operating Mass)

ROD NO.	IN. WITHDRAWN	
1	9.09	10.88
2	9.09	10.88
3	9.09	10.88
4	9.09	10.88
5	23.00	10.88
6	23.00	10.88

REMARKS:

Fig. 1. Core loading 102, BSR.

UCN-8504
(3 7-78)

Table 1. Basic operating data
(April-June 1985)

	This quarter	Last quarter	Year to date
Total energy, kWd	5,263	9,857	7,560
Average operating power, kW	1,134	1,370	1,252
Time operating, %	5.1	8.0	6.6
Reactor availability, %	99.9	99.9	99.9
Reactor water radioactivity, counts min^{-1} ml^{-1}(av)	3,337[a]	2,565	2,951[a]
Reactor water resistivity, ohm-cm (av)	1,671,000	1,059,000	1,365,000
Research samples	0	1	1

[a]Average water radioactivity during operating time.

Shutdowns

There were no unscheduled shutdowns during the quarter. Table 2 gives an analysis of the scheduled shutdowns.

Table 2. Analysis of shutdowns

Description of shutdown	Number	Downtime (h)
Scheduled		
Experimenters:		
No request to operate	3	1483.450
Reactor Operations:		
University of Kentucky approach-to-critical, rod calibrations, and startups	1	18.550
Quarterly checks	1	96.000
Servo excessive-action functional checks	2	192.000
Training	4	282.619
Subtotal:	11	2072.619
Unscheduled		
Experimenters:	0	0
Reactor Operations:	0	0
Subtotal:	0	0
TOTAL:	11	2072.619

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.

Table 3. Maintenance and changes, instrumentation and controls

Date	Components	Trouble/change	Reason for maintenance
4-2-85	Servo	Too active	Stablize rod at power
4-15-85	SW CAM	Sensitive Lo alarm	Raised low-level alarm to 2200 cpm
4-17-85	No. 3 shim-safety rod	Clutch switch	Completed post-maintenance functional checks
4-19-85	Servo execessive action	New annunciator	Functional test (change memo No. 57)
4-23-85	Servo	Too active	Stablize for 2-MW operations
4-24-85	Log count rate meter	Routine	Adjusted
4-24-85	No. 1 safety	Failed	Readout stuck at 5%
4-30-85	Miscellaneous temperature recorder	Routine	Wired to print points
5-9-85	SW CAM	Routine	Functional checks
5-13-85	Servo excessive action	New annunciator	Change memo No. 57, complete
5-15-85	Log-N period recorder	Drive motor failed	Replaced motor
5-15-85	Miscellaneous temperature recorder	Routine	Rezeroed
5-15-85	Decay tank level gauge	Routine	Replaced and set zero
5-16-85	SW CAM	Sensitive Lo alarm	Raised low-level alarm to 3000 cpm

Table 3. (Continued)

Date	Components	Trouble/change	Reason for maintenance
5-17-85	No. 5 shim-safety rod	Rod dropped	Rod dropped during a power change
6-4-85 to 6-10-85	Instruments	Routine	Quarterly check
6-18-85	NW CAM	Routine	Repaired chart drive
6-19-85	Pump house monitron	Failed	Monitron would not reset
6-24-85	Log-N power supply	Failed	Replaced power supply

Table 4. Maintenance and changes, process systems

Date	Component	Trouble/change	Reason for maintenance
4-2-85	Control room AC	Failed	Replaced belt
4-8-85	Skimmer filter pipe	Obsolete	Removed obsolete piping to make room for SW CAM in order to clear walkway
4-18-85	West laboratory door	Routine	Installed new hasp
4-18-85	Resistivity meter	Failed meter	Replaced pump house meter
4-29-85	Cell vent flow	Routine	Adjusted to 4,500 cfm
4-29-85	Skimmer filter pipe	Replacement	Replacement pipe installed

Table 4. (Continued)

Date	Component	Trouble/change	Reason for maintenance
4-30-85	Secondary float valve	Routine	Returned to service
5-8-85	Primary pump gauges	Routine	Replaced both suction and discharge gauges
5-16-85	Below-ground vault	Routine	Installed electric sump pump
5-21-85	Auxiliary NOG and air header	Routine	Installed to serve NLTNIF
5-24-85	Instrument bridge	Modified	Modified ladder to align with entrance. Modified post and chains for safety
5-28-85	Primary pump	Routine	Tightened shaft packing gland to reduce water leak
6-4-85	Tower return drain line	Failed	Replaced and refilled excavated hole
6-5-85	Tower corrosion sample	Routine	Installed brackets for sample support
6-6-85	Acid line check valve	Failed	Repaired
6-17-85	Primary heat exchanger	Routine	Removed both heads for cleaning
6-19-85	Primary heat exchanger	Routine	Replaced both heads along with new gaskets

Table 5. Maintenance and changes, mechanical system

Date	Components	Trouble/change	Reason for maintenance
4-17-85	No. 3 shim-safety rod drive assembly	Stuck clutch switch	Cleaned switch
4-17-85	No. 2 shim-safety rod drive assembly	Routine	Functinal checks
6-3-85	No. 1 shim-safety rod drive assembly	Routine	Cleaned clutch switch and push rod
6-13-85	Ion chamber mounting bracket	New experiment	Prepare to test new fission chamber

Operational Activities

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

Table 6. Operational activities

Date	Remarks
4-12-85	Moved 3 spent fuel elements to the ORR pool

Experiments

Work relating to the National Low-Temperature Neutron Irradiation Facilities, NLTNIF, is listed in Table 7.

Table 7. Experiment facilities activity, NLTNIF

Date	Remarks
4-1-85	Installed in CP-49 a shield and mockup containing flux monitors
4-3-85	Removed shield and mockup from CP-49 and placed in pool storage
4-4-85	Removed flux monitor from mockup. Weighed two new cryostats to determine ballast weight
4-8-85	Removed flux monitor to S.S. laboratory
4-18-85	Dropped pool water level 2 in. for platform maintenance
5-16-85	Six-in. cell vent duct connected to the vertical section of the existing cell vent duct on the south side of Building 3010
5-30-85	Set up catwalk bridge and moved reactor in preparation for visitors
6-3-85	Relocated catwalk bridge, installed west personnel bridge, removed core piece and stored, and installed aluminum plug in CP-49
6-19-85	Installed a 900-pound base on liquid helium storage vessel

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	1	1
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	1	1	1
New shim-safety rod fuel elements available	7	7	7
Partially depleted fuel elements available for use (includes core)	28	31	30
New boron stainless steel shim rods placed in service	0	0	0
Boron stainless steel shim rods in service	6	6	6
Boron stainless steel shim 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	Operations
Wet thermal-neutron tubes (D-4-1 and -2, D-6-1, -2, -3, -4, and -5)	East D_2O tank	Operations
National Low-Temperature Neutron Irradiation Facility[a] (NLTNIF)	Southwest corner of pool	Solid State

[a]Construction in progress.

Demineralizer Performance

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

SUMMARY OF SURVEILLANCE TESTS AT THE BSR

Table 11 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 (counts min^{-1} ml^{-1}) In	Gross gamma (counts min^{-1} ml^{-1}) Out	pH In	pH Out	Specific resistance (ohm-cm) In	Specific resistance (ohm-cm) Out
54	12-19-78	4-10-79	3,040,000	1,964	134	5.6	5.9	1,183,000	1.910,000
55	4-11-79	7-24-79	2,750,000	2,188	164	5.5	5.7	1,006,000	1.675,000
56	7-27-79	11-19-79	2,800,000	1,801	138	5.3	5.5	971,000	1,743,000
57	11-20-79	4-8-80	2,750,000	1,866	134	5.3	5.5	1,084,000	2,038,000
58	4-9-80	5-29-80	1,000,000	1.979	123	5.3	5.5	808,000	1,832,000
59	5-30-80	6-2-80	5,000	1,950	125	5.3	5.6	774,000	1,538,000
60[a]	6-3-80	8-4-80	1,750,000	1,929	106	5.4	5.6	1,278,000	3,466,000
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

[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. Summary of surveillance tests at the BSR

Test	Most recent test	Previous test
Biennial tests		
Inspection of the shim-safety rods	8-28-84	8-4-83
Annual tests		
Core ΔT channel calibration	12-13-84	9-14-84
Primary coolant flow channel calibration	12-13-84	9-14-84
Pool-water level channel calibration	6-10-85	12-13-84
Maximum rate of reactivity addition by the shim-safety rods	6-7-85	3-7-85
Reactivity assigned to the servo-control system	3-22-85	12-13-84
Subcriticality with each shim-safety rod at its upper limit while all other shim-safety rods are fully inserted	6-7-85	3-7-85
Semiannual		
Cell-ventilation filter efficiency		
A. Elemental iodine	12-18-84	4-19-84
B. Dioctyl phthalate	12-26-84	6-13-84
Radiation monitoring equipment calibration	5-21-85	3-21-85
Stack radiation monitor calibration	6-6-85	12-18-84
Quarterly		
Safety channel No. 1 calibration	6-6-85	3-6-85
Safety channel No. 2 calibration	6-6-85	3-6-85
Safety channel No. 3 calibration	6-6-85	3-6-85
Log-N channel calibration	6-6-85	3-5-85
Fission chamber channel calibration	6-5-85	3-5-85
Flapper valve position channel functional test	6-10-85	3-7-85
Measurement of release time and time of flight for the shim-safety rods	6-7-85	3-7-85
Containment closure system functional test	6-11-85	3-8-85
In-leakage during containment mode	6-11-85	3-8-85
Others		
Calibration of shim-safety rods	3-22-85	9-12-83

POOL CRITICAL ASSEMBLY

OPERATIONS

The Pool Critical Assembly (PCA) is shutdown for shim-safety rod magnets and associated electronic components upgrading. Operational activities are shown in Table 12.

Table 12. Operational activities

Date	Remarks
6-6-85	Removed the Nos. 1 and 3 shim-safety rod drive units, the auxillary fission chamber, and the primary fission chamber. Stored the components in Building 3001.
6-7-85	Moved 7 fuel elements from the core to storage. Removed the ionization chamber housings containing ionization chambers, No. 1 safety, No. 2 safety, No. 3 safety, log-N, and servo; stored in Building 3001. Stored chamber housings in the warehouse

MAINTENANCE AND CHANGES

No PCA maintenance activities are reported this quarter.

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 Specification 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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