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Oak Ridge Research Reactor Quarterly Report April, May, and June 1987

T. P. Hamrick
M. K. Ford

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Research Reactors Division
Reactor Operations Section

OAK RIDGE RESEARCH REACTOR QUARTERLY REPORT APRIL, MAY, AND JUNE 1987

T. P. Hamrick
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SPONSOR: A. L. Lotts
Research Reactors Division

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OAK RIDGE RESEARCH REACTOR QUARTERLY REPORT
APRIL, MAY, AND JUNE 1987

SUMMARY

The ORR was not operated during April, May, and June of 1987.

Maintenance activities, both mechanical and instrument, were essentially routine in nature.

POWER HISTORY

The power history for the quarter is displayed in Figs. 1 through 3.

OPERATIONS

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

Details relative to cycles of operation during the quarter are given in Table 2.

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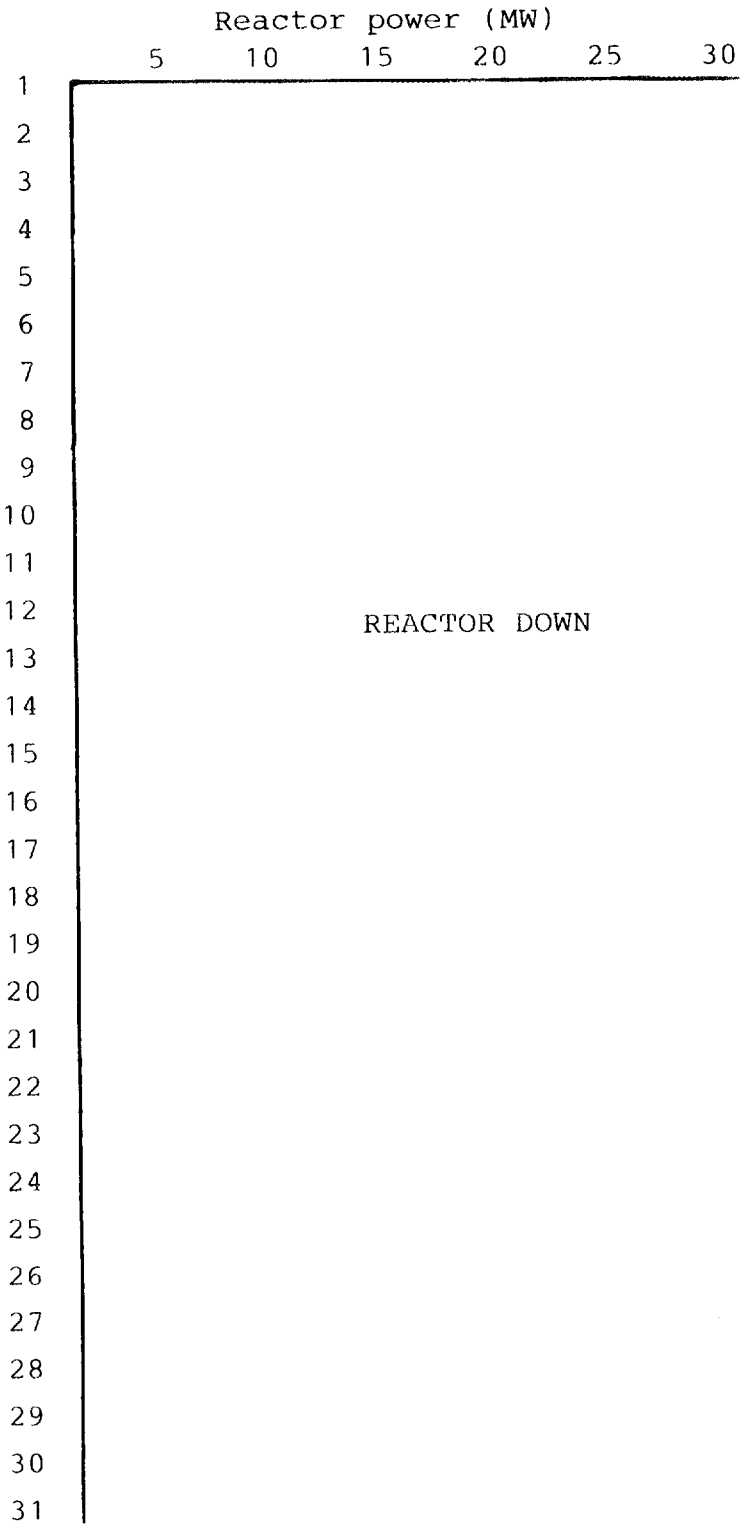

Fig. 1. Reactor power history - April 1987.

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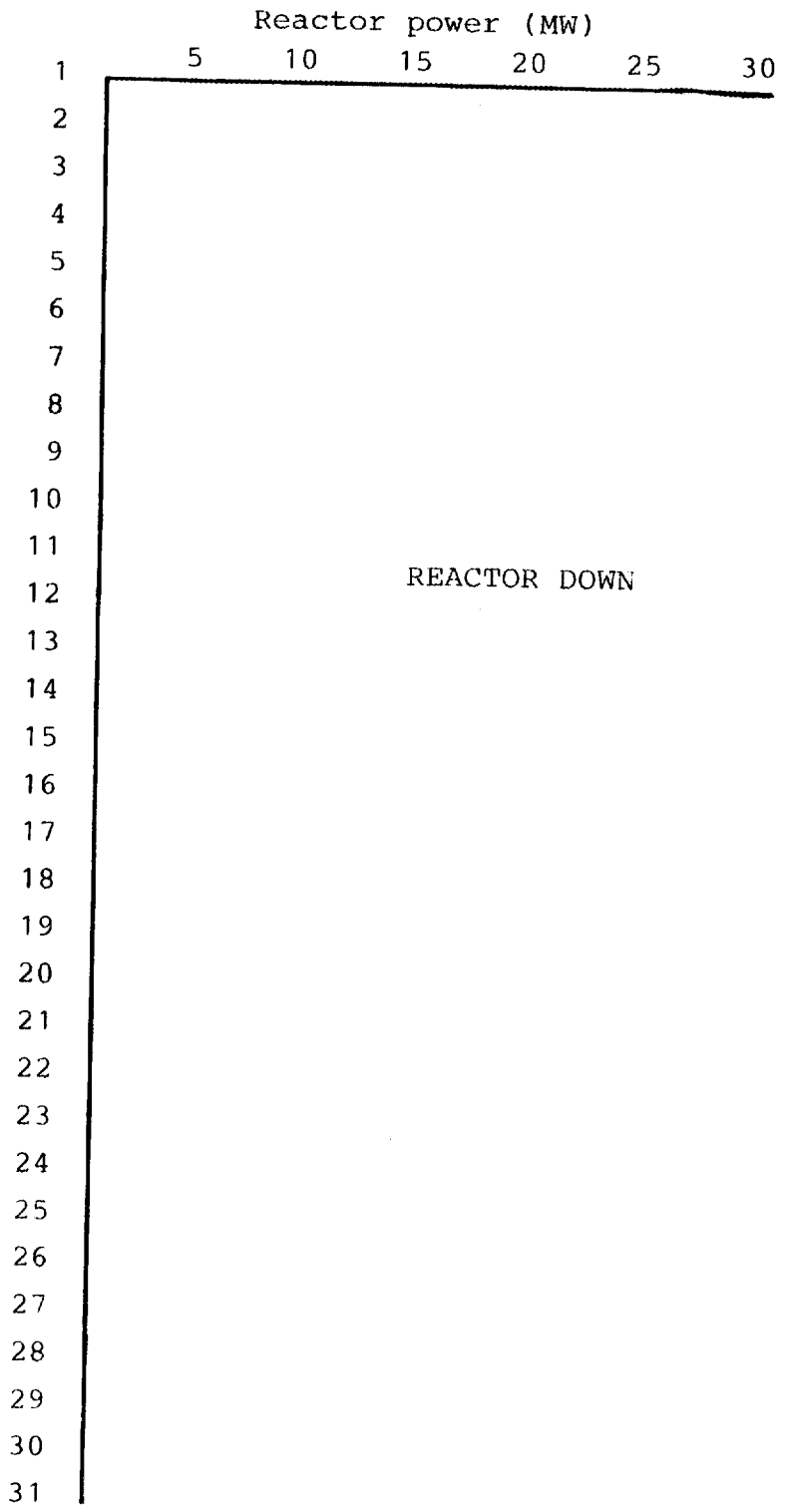

Fig. 2. Reactor power history - May 1987.

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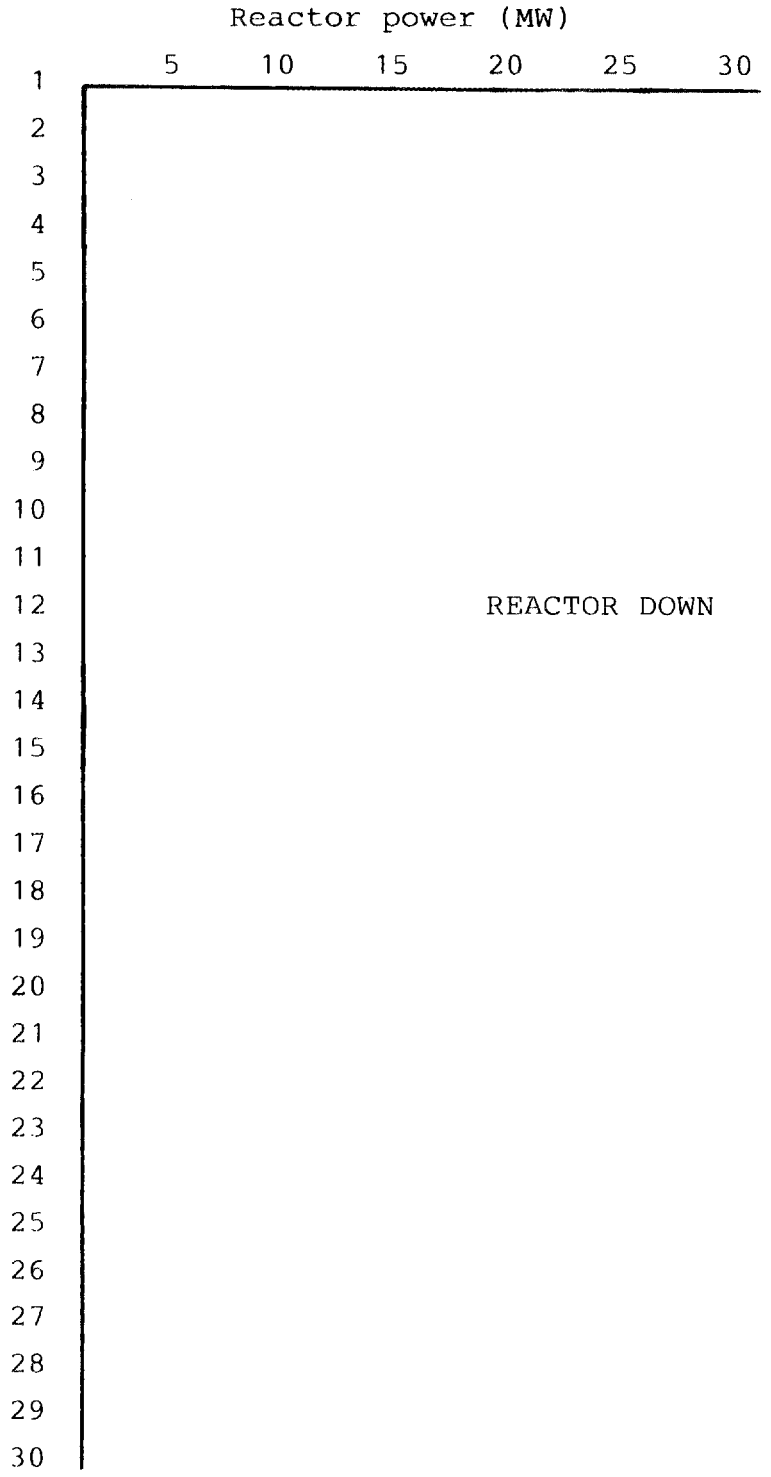

Fig. 3. Reactor power history - June 1987.

Table 1. Basic operating data
(April-May 1987)

	This quarter		Last quarter		Jan.-June 1987		Jan.-June 1986	
Total energy, MWd	0		1,916.4		1,916.4		3616.4	
Average power, MW	0		29.6		29.6		29.7	
Time operating, %	0.00		72.0		35.8		67.2	
Availability, %	0.00		88.1		43.8		81.3	
Reactor water radio-activity, cpm/ml (av)	Bg		45,600		22,800		40,800	
Pool water radioactivity, cpm/ml (av)	Bg		1,900		950		1,335	
Reactor water resistivity, ohm-cm (av)	1,376,000		1,123,000		1,249,500		1,304,000	
Pool water resistivity, ohm-cm (av)	970,000		899,000		934,500		925,000	
	HEU	LEU	HEU	LEU	HEU	LEU	HEU	LEU
Fuel elements depleted	0	0	0	0	0	0	27	0
Average burnup of fuel elements depleted, %	NA	NA	NA	NA	NA	NA	48.7	NA
Shim-safety rods depleted	0	0	0	0	0	0	4	0
Average burnup of shim-safety rods depleted, %	NA	NA	NA	NA	NA	NA	76.2	NA
Radioisotope samples	0		54		54		0	
Research samples	0		7		7		64	

Table 2. Cycles of operation

Cycle No.	Date begun	Date ended	Accumulated energy (MWd)
179	March 6, 1987	March 26, 1987	0.0[a]

[a]MWd this quarter

FUEL USAGE AND INVENTORY

High-Enriched Uranium (HEU)

There were no new HEU fuel elements or HEU shim-safety rods placed in service this quarter.

No spent HEU fuel elements or HEU shim-safety rod fuel sections were shipped for chemical separation this quarter.

Low-Enriched Uranium (LEU)

No new LEU fuel elements or LEU shim-safety rods were placed in service this quarter.

Other details of fuel usage and inventory may be found in Table 3.

Table 3. Fuel status

	This quarter	Last quarter	Jan.-June 1987	Jan.-June 1986
HEU				
Depleted fuel elements transferred for chemical recovery	0	47	47	46
Average percent burnup of fuel elements transferred	--	50.2	50.2	46.8
New elements, start of quarter	139	139	--	--
New elements received	0	0	0	0
New elements placed in service	0	0	0	2
New elements, end of quarter	139	139	--	--
Special or test elements	21	21	21	21
Depleted shim-safety rod elements transferred for chemical recovery	0	4	4	5
Average percent burnup of shim-safety rods transferred	--	76.2	76.2	81.8
New shim-safety rod elements, start of quarter	8	8	--	--
New shim-safety rod elements received	0	0	0	0
New shim-safety rod elements placed in service	0	0	0	2
New shim-safety rod elements, end of quarter	8	8	--	8

Table 3. (continued)

	This quarter	Last quarter	Jan.-June 1987	Jan.-June 1986
LEU				
Depleted fuel elements transferred for chemical recovery	0	0	0	--
Average percent burnup of fuel elements transferred	--	--	--	--
New elements start of quarter	30	41	--	--
New elements received	0	0	0	--
New elements placed in service	0	11	11	--
New elements end of quarter	30	30	--	--
Special or test elements	0	0	0	--
Depleted shim-safety rod elements transferred for chemical recovery	0	0	0	--
Average percent burnup of shim-safety rods transferred	--	--	--	--
New shim-safety rod elements start of quarter	4	6	--	--
New shim-safety rod elements received	0	0	0	--
New shim-safety rod elements placed in service	0	2	2	--
New shim-safety rod elements end of quarter	4	4	--	--

SHUTDOWNS

Reactor downtime (power level $<N_L$) totaled 2184 hours. A summary of the shutdown is given in Table 4, and details of the scheduled shutdown are contained in Table 5.

Table 4. Analysis of shutdowns

Description of shutdown	Number	Downtime (h)
Scheduled		
Special, DOE shutdown*	1	2184.0
Subtotal:	1	2184.0
Unscheduled		
Subtotal:	0	0000.0
TOTAL:	1	2184.0

*The Department of Energy ordered the Oak Ridge Research Reactor to be shut down on March 26, 1987.

Table 5. Scheduled shutdowns, details

Date	Duration (h)	End cycle	Remarks
4-1-87 thru 6-30-87	2184.0	--	The ORR was shut down on 3-26-87 due to Department of Energy orders for shutdown of class A and B reactors. The shutdown continued for the second quarter of 1987.

INSTRUMENTATION AND REACTOR CONTROLS

The performance of the instrumentation for the facility was satisfactory, and maintenance required is indicated in Table 6.

PROCESS SYSTEM

The performance of the process system was satisfactory, and maintenance required is indicated in Table 7.

EXPERIMENT FACILITIES, GASEOUS-WASTE FILTERS, AND CORE CHANGES

Experiment facility usage is given in Table 8. Table 9 summarizes the results of efficiency tests of the various gaseous-waste filters. The core configurations used during the quarter are shown in Fig. 4.

Table 6. Maintenance and changes, instrumentation and controls

Date	Component	Trouble or change	Reason or maintenance
4-1-87	No. 1 log-N recorder	Recorder off-scale	The drive gear was replaced
4-2-87	FRCAS	Spurious alarms	The southwest balcony monitron was repaired
4-21-87	Secondary cooling tower	ΔP cell	The south riser ΔP cell was repaired
4-23-87	Secondary cooling tower	ΔP cell	A new air supply gauge was installed
4-30-87	Pool water makeup tank	Improper level recorder response	A leak on the air line was repaired
5-20-87	Monitron	Spurious alarms	First level northeast monitron was replaced and returned to service
6-1-87	Source level channel	Positioning change	A chamber guide tube was installed into position No. 5

Table 7. Process systems, maintenance and changes

Date	Component	Remarks
	Reactor primary cooling system	
5-11-87	No. 2 primary pump	The check valve gaskets were replaced
5-13-87	No. 3 primary pump	The limit switch on motorized discharge valve was adjusted
5-14-87	No. 1 primary heat exchanger	Leak on inlet valve was repaired
	Reactor secondary cooling system	
4-15-87	Acid transfer	An air leak was repaired and a transfer hose replaced
4-28-87	North fan motor	A fan motor was replaced
	Cell vent system	
5-20-87	Flow instrumentation	Filter ΔP gauges and a flow gauge were replaced
	Reactor control system	
6-5-87	Rod drives	The oil in gear boxes was changed
	Miscellaneous	
4-23-87	No. 5 sump pump	The level control switch was repaired
6-5-87	Beam hole plugs	The relief valves were replaced
6-10-87	NH-4	The check valve was replaced

Table 8. Experiment facility usage

Facility	Access flange	Date installed	Date removed	Description of experiment	Division or sponsor
C-3	V-10	6-28-85		Material test, fusion program (MFE-7J)	Engineering Technology
C-7	V-2	6-28-85		Material test, fusion program (MFE-6J)	Engineering Technology
E-3	None	6-28-85		Aluminum-base, dispersion-type fuel plates (HFED)	Engineering Technology
HB-1	None	9-78		Neutron spectrometer	Solid State Physics
HB-2	None	11-1-58		Neutron diffraction experiments	Solid State Physics
HB-4	None	9-78		Neutron spectrometer	Solid State Physics
HB-6	None	4-76		Neutron small-angle scattering facility	Solid State Physics
HN-3	None	11-59		Activation analysis	Analytical Chemistry
HN-4	None	12-15-63		Neutron diffraction experiment	Instrumentation and Controls
South facility	None	12-16-63		Cold-finger plug[a]	Research Reactors

[a]The facility is on standby.

Table 9. Status of filters, gaseous waste systems

Type filter	Bank designation	Date last changed	Date last tested	Type test	Retention efficiency (%)
		Cell-ventilation system			
CWS	Overall[a]	North, 4-16-80 South, 8-14-85	3-25-87	DOP	99.990
Charcoal	Both banks	North, 11-9-83 South, 8-14-85	6-5-87	Elemental iodine	99.785[c]
		Basement hood exhaust			
CWS	South	3-11-80	3-25-87	DOP	99.997
CWS	North	3-11-80	3-25-87	DOP	99.998
		Normal off-gas			
CWS	West	8-14-85	3-25-87	DOP	99.998
Charcoal	West	8-14-85	10-28-86	Elemental iodine	99.986
CWS	East[b]	9-5-86	3-25-87	DOP	99.850[c]
Charcoal	East[b]	9-5-86	10-3-86	Elemental iodine	99.985

[a]The CWS filters in the cell-ventilation system were checked in series.
[b]Not in service.
[c]Failed efficiency test.

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Lattice loading

For fuel cycles 178A, 179-B

	1	2	3	4	5	6	7	8	9
A	DF	Be	F	F	F	F	F	Be	DF
B	Eu	Ir	F	SR	F	SR	F	Ir	Eu
C	Be	F	MFE 7J E	F	F	F	MFE 6J E	F	Be
D	Eu	F	F	SR	F	SR	F	F	Eu
E	Be	F	Al	F	F	F	Ir	F	Be
F	Eu	Ir	F	SR	F	SR	F	Be	Eu
G	DF	Be	Be	Be	Be	Be	Be	Be	DF

Lattice component	Number
Fuel (F)	26
Shim-safety rod (SR)	6
Beryllium (Be)	14
Experiment (E)	2
Isotope stringer (Iso)	10
Aluminum (Al)	1
Dummy fuel (DF)	4

Fig. 4. Lattice configuration - March 3-June 30, 1987.

IN-SERVICE INSPECTION

ORR Decay Tank and Twenty-Four Inch Strainer

ORR Primary Water Strainer - April 1, 1987. A visual inspection of the interior and exterior surfaces (strainers not removed) revealed no evidence of cracks, severe corrosion, or structural damage. Visual inspection findings were satisfactory and concluded that the strainer was acceptable for further service.

ORR Decay Tank - April 2, 1987. A visual inspection of the interior of the tank showed no evidence of cracks, severe corrosion or structure damage with the exception of the weld cracks in the upper baffle plate as previously reported and repaired. Conclusions showed that repair of these welds was not warranted at this time and that the tank was satisfactory for further service.

SUMMARY OF SURVEILLANCE TESTS

Table 10 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 quarter 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 logbook, and miscellaneous quality assurance tests.

Table 10. Summary of surveillance tests

Test	Most recent	Previous
Biennially		
Primary cooling flow channel calibration		
Direct flow channel	2-20-87	9-5-86
Core ΔP channel	9-5-86	8-14-85
^{16}N channel calibration	2-19-87	9-5-86
North-facility flow channel calibration	5-8-86	4-25-84
South-facility flow channel calibration	5-8-86	4-25-84
Normal off-gas vacuum monitor calibration	9-5-86	8-12-85
Building ventilation flow monitor calibration	11-19-86	11-22-85
The dc pony motor battery bank		
Load-test No. 1 bank	9-1-86	11-3-85
Load-test No. 2 bank	5-4-86	11-3-85
Load-test No. 3 bank	2-17-87	2-20-86
Annually		
Safety-level channels calibration	4-16-87	2-19-87
Log-N channels calibration	6-2-87	2-19-87
ΔT channels calibration	2-19-87	3-6-86
Reactor water exit temperature channels calibration	2-19-87	3-6-86
Fission chamber channels calibration	2-19-87*	11-20-86
Speed measurements of the shim-safety rod drive motors	6-2-87	3-3-87

Table 10. (Continued)

Test	Most recent	Previous
Annually (continued)		
Calibration of shim-safety rods	3-3-87	11-23-86
Reactivity assigned to the servo-control system	3-3-87	11-23-86
Semiannually		
Pressure-drop measurements across NOG filters	6-28-87	3-29-87
NOG filter system efficiency		
Elemental iodine test - east bank	10-3-86	9-23-86
Elemental iodine test - west bank	10-28-86	5-20-86
Dioctyl phthalate test - east bank	3-25-87	9-23-86
Dioctyl phthalate test - west bank	3-25-87	10-28-86
Containment closure system function test	2-18-87	11-19-86
Cell-ventilation filter system efficiency		
Elemental iodine measurements	6-5-87	1-13-87
Dioctyl phthalate measurements	3-25-87	9-23-86
Radiation monitoring equipment calibration	4-8-87	1-7-87
Stack radiation monitor calibration	3-16-87	9-5-86
Quarterly		
Primary coolant flow channels tested	5-21-87	3-3-87
^{16}N channels tested	5-1-87	2-19-87
North-facility flow channels tested	5-21-87	3-3-87
South-facility flow channels tested	5-21-87	3-3-87

Table 10. (Continued)

Test	Most recent	Previous
Quarterly (continued)		
Normal off-gas vacuum monitor tested	5-21-87	3-3-87
Building ventilation flow monitor tested	4-15-87	3-3-87
Manual scrams tested	6-4-87	3-3-87
Measurement of release time and time of flight for the shim-safety rods	6-2-87	3-3-87
Subcriticality with each shim-safety rod at its upper limit while all other shim-safety rods are fully inserted	6-2-87	3-3-87
Seismic channels	6-4-87	3-3-87

*Counts not sufficient to make calibration check. This will be done prior to reactor startup.

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