

# ornl

ORNL/TM-11187

**OAK RIDGE  
NATIONAL  
LABORATORY**

**MARTIN MARIETTA**

**Oak Ridge Research Reactor Shutdown  
Maintenance and Surveillance  
Quarterly Report  
January, February, and March 1989**

G. H. Coleman  
D. L. Laughlin

OAK RIDGE NATIONAL LABORATORY

CENTRAL RESEARCH LIBRARY

CIRCULATION SECTION

4000L ROOM 111

**LIBRARY LOAN COPY**

DO NOT TRANSFER TO ANOTHER PERSON

If you wish someone else to use this  
report, send its name with report and  
the library will arrange a loan.

OPERATED BY  
MARTIN MARIETTA ENERGY SYSTEMS, INC.  
FOR THE UNITED STATES  
DEPARTMENT OF ENERGY

This report has been reproduced directly from the best available copy.

Available to DOE and DOE contractors from the Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831; prices available from (615) 576-8401, FTS 626-8401.

Available to the public from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Rd., Springfield, VA 22161.

NTIS price codes—Printed Copy: A03 Microfiche A01

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Research Reactors Division  
Reactor Operations Section

**OAK RIDGE RESEARCH REACTOR SHUTDOWN MAINTENANCE AND  
SURVEILLANCE QUARTERLY REPORT  
JANUARY, FEBRUARY, AND MARCH 1989**

G. H. Coleman  
D. L. Laughlin

SPONSOR: A. L. Lotts  
Research Reactors Division

Date Published - May 1989

Notice: This document contains information of a preliminary nature. It is subject to revision or correction and, therefore, does not represent a final report.

Prepared by the  
Oak Ridge National Laboratory  
Oak Ridge, Tennessee 37831  
operated by  
MARTIN MARIETTA ENERGY SYSTEMS, INC.,  
for the  
U.S. DEPARTMENT OF ENERGY  
under Contract DE-AC05-84OR21400

MARTIN MARIETTA ENERGY SYSTEMS LIBRARIES



3 4456 0299609 7



# CONTENTS

	<u>Page</u>
LIST OF TABLES .....	v
SUMMARY .....	1
SHUTDOWNS .....	1
INSTRUMENTATION AND REACTOR CONTROLS .....	1
PROCESS SYSTEM .....	1
EXPERIMENT FACILITIES, AND GASEOUS-WASTE FILTERS .....	1
SUMMARY OF SURVEILLANCE TESTS .....	15



## LIST OF TABLES

	<u>Page</u>
1 Fuel status .....	2
2 Analysis of shutdowns .....	4
3 Scheduled shutdowns, details .....	4
4 Shutdown activities .....	5
5 Maintenance and changes, instrumentation and controls .....	8
6 Process systems, maintenance and changes .....	9
7 Experiment facility usage .....	13
8 Status of filters, gaseous-waste systems .....	14
9 Summary of surveillance tests .....	16



OAK RIDGE RESEARCH REACTOR SHUTDOWN MAINTENANCE  
AND SURVEILLANCE QUARTERLY REPORT  
JANUARY, FEBRUARY, AND MARCH 1989

SUMMARY

The ORR was not operated during January, February, and March of 1989.

Maintenance activities, both mechanical and instrument, were essentially routine in nature. Details of fuel usage and inventory may be found in Table 1.

SHUTDOWNS

Reactor downtime (power level  $<N_L$ ) totaled 2160 hours. A summary of the shutdown is given in Table 2, and details of the scheduled shutdown are contained in Table 3. Shutdown activities are shown in Table 4.

INSTRUMENTATION AND REACTOR CONTROLS

The performance of the instrumentation for the facility was satisfactory, and maintenance required is indicated in Table 5.

PROCESS SYSTEM

The performance of the process system was satisfactory, and maintenance required is indicated in Table 6.

EXPERIMENT FACILITIES, AND GASEOUS-WASTE FILTERS

Experiment facility usage is given in Table 7. Table 8 summarizes the results of efficiency tests of the various gaseous-waste filters.

Table 1. Fuel status

	This quarter	Last quarter
<u>HEU</u>		
Depleted fuel elements transferred for chemical recovery	79	16
Average percent burnup of fuel elements transferred	37	39
New elements, start of quarter	139	139
New elements received	0	0
New elements placed in service	0	0
New elements, end of quarter	139	139
Special or test elements	21	21
Depleted shim-safety rod elements transferred for chemical recovery	0	4
Average percent burnup of shim-safety rods transferred	0	74
New shim-safety rod elements, start of quarter	8	8
New shim-safety rod elements received	0	0
New shim-safety rod elements placed in service	0	0
New shim-safety rod elements, end of quarter	8	8
<u>LEU</u>		
Depleted fuel elements transferred for chemical recovery	56	0
Average percent burnup of fuel elements transferred	25	--
New elements start of quarter	30	30
New elements received	0	0

Table 1. Continued

	This quarter	Last quarter
New elements placed in service	0	0
New elements end of quarter	30	30
Special or test elements	0	0
Depleted shim-safety rod elements transferred for chemical recovery	10	0
Average percent burnup of shim-safety rods transferred	25	--
New shim-safety rod elements start of quarter	4	4
New shim-safety rod elements received	0	0
New shim-safety rod elements placed in service	0	0
New shim-safety rod elements end of quarter	4	4

Table 2. Analysis of shutdowns

Description of shutdown	Number	Downtime(h)
<u>Scheduled</u>		
Special, DOE shutdown*	1	2160
Subtotal:	<u>1</u>	<u>2160</u>
<u>Unscheduled</u>		
Subtotal	0	0000.0
TOTAL:	<u>1</u>	<u>2160</u>

\*The Department of Energy ordered the Oak Ridge Research Reactor to be placed in permanent shutdown on July 14, 1987.

Table 3. Scheduled shutdowns, details

Date	Duration (h)	End cycle	Remarks
1-1-89 thru 3-31-89	2160.0	--	The ORR was shut down on March 26, 1987, by the Department of Energy orders for shutdown of class A and B reactors. On July 14, 1987, the Department of Energy issued orders for the ORR to be placed in permanent shutdown .

Table 4. Shutdown activities

Date	Remarks
1-5-89	Transferred five aluminum cans containing fuel plates from south hot cell to fuel storage rack IV
1-5-89	Transferred two shim rod fuel sections and one fuel element from pool storage to south hot cell
1-25-89	Sampled water found in NOG filter pit. Counted background. Pumped and drained water from pit to process waste to permit filter inspections. Water found in East bank and moisture in West
1-25-89	Transferred four aluminum cans containing fuel plates and one fuel element to storage racks in center pool
1-29-89	GE-700 carrier containing the second fuel shipment shipped to Savannah River
1-30-89	Transferred MFE-6J experiment to south hot cell for disassembly
2-1-89	Loaded GE-700 carrier with ten LEU elements and ten LEU shim rod fuel sections, removed water from carrier, purged with nitrogen, HP smeared and tagged carrier. Carrier shipped to Savannah River
2-4-89	Loaded GE-700 carrier with nineteen LEU elements and one twenty-six inch aluminum spacer, removed water from carrier, purged with nitrogen, HP smeared and tagged carrier. Carrier shipped to Savannah River
2-7-89	Removed empty South 7-up fuel rack from center pool, rinsed, wiped off, double bagged and placed in c-zone
2-8-89	Loaded GE-700 carrier with twenty HEU fuel elements, removed water from carrier, purged with nitrogen, HP smeared, and tagged carrier. Carrier shipped to Savannah River
2-11-89	Loaded GE-700 carrier with twenty HEU fuel elements, removed water from carrier, purged with nitrogen, HP smeared, and tagged carrier. Carrier shipped to Savannah River
2/13/89	Removed pool demineralizer from service, backwashed cation and anion columns to increase flow. Flow increased from 20 gpm to 62 gpm

Table 4. Shutdown activities

Date	Remarks
2-15-89	Loaded GE-700 carrier with twenty HEU fuel elements, removed water from carrier, purged with nitrogen, HP smeared, and tagged carrier. Carrier shipped to Savannah River
2-21-89	Loaded GE-700 carrier with nineteen HEU fuel elements and One (26") Al spacer, removed water from carrier, purged with nitrogen, HP smeared, and tagged carrier. Carrier shipped to Savannah River
2-24-89	Loaded GE-700 carrier with one fuel element, six Al cans containing fuel plates, one (26"), and six (52") al spacers, removed water, purged with nitrogen, HP smeared, and tagged carrier. Carrier shipped to Savannah River
3-1-89	Removed empty fuel racks No. II and No. IX from center pool, rinsed, wiped off, bagged in plastic, and placed in second level c-zone
3-2-89	Removed empty fuel racks No's III, IV, and V from center pool, rinsed, wiped off, bagged in plastic, and placed in second level c-zone
3-6-89	Covered cell vent filter pit with blue tarp
3-7-89	Removed eight aluminum-cadmium sleeves from rack in c-zone, bagged in plastic, and placed in box in basement with eleven other al/cd sleeves
3-7-89	Wrapped empty HSST storage rack in plastic and placed in second level c-zone
3-8-89	Transferred Al can A-01 containing fifteen LEU fuel plates to South hot cell
3-9-89	Removed HFED work platform from West pool, rinsed, wiped off, bagged bottom section in plastic, and stored over Loop II cell
3-13-89	Health physicist calibrated building 3042 monitrons
3-14-89	Performed cell vent system functional checks
3-14-89	Transferred five miscellaneous items from vault to burial ground

Table 4. Shutdown activities

---

Date	Remarks
3-16-89	Transferred Al can A-02 containing twelve LEU and one HEU fuel plates to south hot cell
3-28-89	Counted water samples for hot cell personnel
3-30-89	Loaded OGR hole 51 converter plate from 3001 canal to OD-2 carrier and shipped to burial ground
3-31-89	Continued wetting wood of secondary towers as a means of fire prevention
3-31-89	Water quality during quarter: pool water resistivity ohm-cm was 806,800, reactor water resistivity ohm-cm was 812,800, and pool and reactor water radioactivity cpm/ml BG

---

Table 5. Maintenance and changes, instrumentation and controls

Date	Component	Reason or maintenance
1-6-89	3042 CAMs	I&C performed programmed maintenance on CAMs
1-17-89	Cell vent	I&C placed small 2 mr/hr source next to duct probe monitor to stop downscale alarms.
1-18-89	Cell vent	I&C replaced duct monitor probe connector
2-14-89	pH meter	I&C replaced probe on meter in basement
2-23-89	Monitron	I&C repaired control room monitron and returned to service
2-23-89	NOG	I&C personnel performed first quarter surveillance functional tests on PT-63, PT-64, and radiation alarms
2-23-89	Cell vent	I&C personnel performed first quarter surveillance functional tests on PT-65, PT-66, and radiation alarms
2-23-89	Seismic channels	I&C personnel tested "B" and "C" channels
2-23-89	Recorder TR-2	I&C personnel functionally tested and calibrated
2-23-89	Recorder TR-902	I&C personnel functionally tested and calibrated
3-1-89	FRCAS	I&C personnel performed quarterly checks
3-22-89	Monitron	I&C hooked up new cable and returned pool top monitron to service
3-27-89	Cell vent	I&C personnel removed PX-108 cleaned, reinstalled, calibrated, and returned to service

Table 6. Process systems, maintenance and changes

Date	Component	Remarks
1-3-89	Process sump pump	P&E repaired coupling
1-5-89	Emergency diesel generator	P&E performed 2 hour load test
1-5-89	Elevator	P&E repaired
1-6-89	Truck doors	P&E performed programmed maintenance
1-9-89	Process sump pump	P&E repaired pump motor fan
1-17-8	Process sump pump	P&E greased and adjusted coupling on low level pump
1-20-89	Overhead crane	P&E performed programmed maintenance
1-23-89	Steam trap	P&E replaced cracked steam trap north of Building 3085
1-24-89	Steam lines	Insulators insulated lines in second level changehouse
1-25-89	NOG filter pit	Riggers removed concrete shields from pit
1-25-89	NOG filter banks	Millwrights removed east and west bank filter housing tops for inspection, reinstalled after inspection
1-25-89	NOG charcoal filters	Millwrights prepared two charcoal filters
1-25-89	NOG filter pit drain	Pipefitters installed valve on drain line, removed plug from drain in pit, and removed cap from end of drain line
1-26-89	Steam lines	Insulators insulated lines in third level changehouse
1-27-89	NOG	P&E changed out the pre, hepa, and charcoal filters in east and west banks

Table 6. Continued

Date	Component	Remarks
1-27-89	NOG	Riggers reinstalled filter pit concrete shields
1-30-89	MFE-6J experiment	P&E removed experiment top section and leads for transfer to south hot cell
1-30-89	NOG	QA&I performed DOP test on east and west filter banks. Results 99.998%
1-30-89	Steam lines	Insulators insulated lines in Room 207
1-31-89	NOG	QA&I performed elemental iodine test on west filter bank. Results 99.90%
2-1-89	GE-700 carrier	Riggers transferred from Metler trailer to second level west Building 3042
2-1-89	GE-700 carrier	Riggers transferred loaded carrier to Metler trailer, covered with protective shield, and completed tie-down to trailer
2-1-89	NOG	QA&I performed elemental iodine test on east filter bank. Results 99.883
2-4-89	GE-700 carrier	Riggers transferred from Metler trailer to second level west Building 3042 and returned loaded carrier to trailer, covered with protective shield, and completed tie-down to trailer
2-6-89	Overhead crane	P&E performed programmed maintenance
2-6-89	3042 CAM'S	P&E replaced belt on first level south CAM
2-8-89	GE-700 carrier	Riggers transferred from Metler trailer to second level west Building 3042, and returned loaded carrier to trailer, covered with protective shield, and completed tie-down to trailer

Table 6. Continued

Date	Component	Remarks
2-11-89	GE-700 carrier	Riggers transferred from Metler trailer to second level west Building 3042, and returned loaded carrier to trailer, covered with protective shield, and completed tie-down to trailer
2-13-89	GE-700 carrier	Millwright fabricated fourteen (52") and two (26") Al spacers for carrier
2-15-89	Elevator	P&E performed programmed maintenance
2-15-89	GE-700 carrier	Riggers transferred from Metler trailer to second level west Building 3042, and returned loaded carrier to trailer, covered with protective shield, and completed tie-down to trailer
2-16-89	Monitron	Electrician removed pool top monitron faulty cable
2-21-89	GE-700 carrier	Riggers transferred from Metler trailer to second level west Building 3042, and returned loaded carrier to trailer, covered with protective shield, and completed tie-down to trailer
2-24-89	GE-700 carrier	Riggers transferred from Metler trailer to second level west Building 3042, and returned loaded carrier to trailer, covered with protective shield, and completed tie-down to trailer
2-24-89	GE-700 grid container	Carpenters placed container on front of Metler trailer and secured for shipping with GE-700 carrier
3-2-89	Safety Showers	P&E checked and serviced all safety showers in area
3-9-89	Basement lab hooks	P&E replaced hood filters and transferred vent fan motor to shop for repair
3-13-89	Basement lab hoods	P&E installed repaired hood vent fan motor and returned to service

Table 6. Continued

Date	Component	Remarks
3-14-89	Storage racks	Riggers transferred four fuel racks, one seven-up rack, and two miscellaneous racks to burial ground
3-14-89	Cell vent	QA&I checked cell vent seal tank back flow preventer
3-15-89	Monitron	P&E installed new cable for pool top monitron
3-16-89	NOG	QA&I performed DOP test on east and west banks. Results 99.996% efficient
3-16-89	Cell vent	QA&I performed DOP test on filters. Results 99.994% efficient
3-16-89	Basement lab hoods	QA&I performed DOP test on north and south hood filters. Results north 99.994% and south 99.991% efficient
3-20-89	GE-700 carrier	Riggers delivered base plate and tie-down cables that had been removed from Metler trailer to first level east
3-21-89	HFIR equipment	P&E installed fence at first level south to secure storage of HFIR equipment
3/27/89	Elevator	P&E repaired outer door at second level
3-30-89	OD-2 carrier	Riggers transferred OD-2 scrap carrier to west side of 3001 building
3-31-89	LITR carrier	QA&I dye checked one place fuel carrier welds

Table 7. Experiment facility usage

Facility	Access flange	Date installed	Date removed	Description of experiment	Division or sponsor
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 <sup>a</sup>	Research Reactors

<sup>a</sup>The facility is on standby.

Table 8. Status of filters, gaseous waste systems

Type filter	Bank designation	Date last changed	Date last tested	Type test	Retention efficiency (%)
<u>Cell-ventilation system</u>					
CWS	Overall <sup>a</sup>	North, 4-16-80 South, 8-14-85	3-16-89	DOP	99.994
Charcoal	Both banks	North, 6-30-87 South, 1-29-88	6-22-88	Elemental iodine	99.882 <sup>bc</sup>
<u>Basement hood exhaust</u>					
CWS	South	3-9-89	3-16-89	DOP	99.991
CWS	North	3-9-89	3-16-89	DOP	99.994
<u>Normal off-gas</u>					
CWS	West	1-27-89	3-16-89	DOP	99.998
Charcoal	West	1-27-89	1-31-89	Elemental iodine	99.900
CWS	East	1-27-89	3-16-89	DOP	99.996
Charcoal	East	1-27-89	2-1-89	Elemental iodine	99.883 <sup>b</sup>

<sup>a</sup>The CWS filters in the cell-ventilation system were checked in series.

<sup>b</sup>Filter retention efficiency 99.882% unsatisfactory, filters to be changed.

<sup>c</sup>Fissionable material removed from facility.

DOE granted technical specification suspension.

## SUMMARY OF SURVEILLANCE TESTS

Table 9 is a tabulation of the completion dates of the shutdown surveillance tests required by the Technical Specifications. This table reflects only the shutdown surveillance requirements for the ORR facility. The technical specifications document is currently under revision to address only shutdown surveillance requirements. This document will be submitted to RORC and DOE for review and approval. 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 9. Summary of surveillance tests

Test	Most recent	Previous
<u>Biennially</u>		
Normal off-gas vacuum monitor calibration	10-1-87	9-5-86
Building ventilation flow monitor calibration	5-5-87	11-19-86
<u>Semiannually</u>		
Pressure-drop measurements across NOG filters	3-27-89	12-25-88
NOG filter system efficiency		
Elemental iodine test - east bank	2-1-89	6-23-88
Elemental iodine test - west bank	1-31-89	12-29-88
Diocetyl phthalate test - east bank	3-16-89	9-20-88
Diocetyl phthalate test - west bank	3-16-89	9-20-88
Containment closure system function test	3-14-89	9-29-88
Cell-ventilation filter system efficiency*		
Elemental iodine measurements	6-22-88	2-10-88
Diocetyl phthalate measurements	3-16-89	9-20-88
Radiation monitoring equipment calibration	3-13-89	10-6-88
Stack radiation monitor calibration	2-8-89	11-21-88

\*Fissionable material removed from facility.  
DOE granted technical specification suspension.

## INTERNAL DISTRIBUTION

- |                       |                                      |
|-----------------------|--------------------------------------|
| 1. S. J. Ball         | 18. B. H. Montgomery                 |
| 2. L. D. Bates        | 19. D. L. Moses                      |
| 3. T. W. Burwinkle    | 20. F. E. Muggridge                  |
| 4. G. H. Coleman      | 21. F. R. Mynatt                     |
| 5. T. L. Dahl         | 22. G. M. Piper                      |
| 6. W. A. Duggins      | 23. K. H. Poteet                     |
| 7. R. E. Fenstermaker | 24. L. P. Pugh                       |
| 8. S. M. Gibson       | 25. J. A. Ray                        |
| 9. H. A. Glovier      | 26. J. B. Richard                    |
| 10. T. P. Hamrick     | 27. J. A. Setaro                     |
| 11. S. S. Hurt        | 28. K. W. West                       |
| 12. R. R. Judkins     | 29. RRD Document Control Center      |
| 13. H. T. Kerr        | 30-31. Laboratory Records Department |
| 14. M. W. Kohring     | 32. Laboratory Records, ORNL R.C.    |
| 15. D. L. Laughlin    | 33-34. Central Research Library      |
| 16. A. L. Lotts       | 35. Document Reference Section       |
| 17. D. M. McGinty     | 36. ORNL Patent Section              |

## EXTERNAL DISTRIBUTION

37. N. Goldenberg, Director, Safety, QA, and Safeguards, Office of Support Programs, Department of Energy, Germantown, Maryland 20545
38. J. N. Maddox, ER73, Mail Stop G226 GTN, Office of Health and Environmental Research, Office of Energy Research, Department of Energy, Washington, DC 20545
39. L. E. Temple, Director, Construction Management, Office of Energy Research, Department of Energy, Washington, D.C. 20585
40. Safety and Environmental Control Division, Department of Energy, Oak Ridge, Tennessee 37831
41. Office of Assistant Manager for Energy Research and Development, Department of Energy, Oak Ridge Operations Office, Oak Ridge, Tennessee 37831
- 42-51. Office of Scientific and Technical Information, DOE, Oak Ridge, Tennessee 37831