MASTER

This document is classified

by *A. P. Vinther*

DUN-850 3
HANFORD CODE C-65

September 15, 1967

~~document contains 20 pages of 58 pages. 58 pages A.~~

MANUFACTURING SECTION
SEMIANNUAL SUMMARY REPORT
(PERIOD ENDING JUNE 30, 1967)

By

D. L. DeNeal
Manufacturing Section

RECEIVED
MANUFACTURING SECTION
A. P. Vinther

DISTRIBUTION

1. T. W. Ambrose	28. A. R. Maguire
2. J. T. Baker - R. P. Rowe	29. W. M. Mathis
3. J. W. Baker	30. J. C. McLaughlin
4. J. J. Bombino	31. J. C. McKay
5. L. V. Barker	32. R. R. Meyers
6. R. W. Bown	33. R. V. Myers - R. K. Wahlen
7. R. S. Bell	34. R. D. Miller
8. R. J. Bursey	35. R. Nilson
9. R. G. Clough - L. C. Lessor	36. E. J. O'Black
10. C. D. Corbit	37. G. F. Owsley
11. D. L. DeNeal	38. R. L. Plum - RL-AEC
12. R. E. Dunn	39. T. Prudich
13. W. J. Ferguson	40. R. W. Reid
14. M. L. Faught - J. R. Young	41. O. C. Schroeder
15. E. J. Filip - R. H. Steach	42. W. Seeburger
16. G. D. Geise	43. N. H. Skarshaug
17. J. W. Green	44. H. G. Spencer
18. C. N. Gross	45. J. T. Stringer
19. R. E. Hall	46. A. P. Vinther
20. R. W. Hallet, Jr.	47. F. F. Vlacil - C. R. Barker
21. C. D. Harrington	48. R. P. Walton
22. A. K. Hardin	49. G. W. Wells
23. C. E. Harkins	50. W. W. Windsheimer
24. H. W. Heacock	51. W. K. Woods
25. J. W. Hedges	52.-56. Extra
26. R. T. Jessen	57. DUN File
27. C. W. Kuhlman	58. DUN Record

This document contains restricted data as defined in the
Atomic Energy Act of 1954. The transmission or the dis-
semination of its contents in any form to unauthorized
person is prohibited.

GROUP 1
Excluded from automatic downgrading
and declassification

As
DISTRIBUTION RESTRICTED TO U.S. ONLY

[REDACTED]

MANUFACTURING SECTION
SEMIANNUAL SUMMARY REPORT
(PERIOD ENDING JUNE 30, 1967)

INTRODUCTION

In this fourth semiannual issue, the reactor and power data are shown for the six-month period January through June, 1967, together with data for the three preceding six-month periods. For comparison purposes, the two years of experience will continue to be shown by dropping and adding a six-month period with each semiannual issue.

STATISTICAL SUMMARY

The most significant statistics for the period July through December, 1966 and January through June, 1967, shown by individual reactors on the attached pages, are summarized on pages 4 and 5 for the small reactors (B-C-D) and for the K reactors (KE-KW).

Reactor and power operations were interrupted during the last half of CY 1966 (July 8 through August 23) because of strikes by the Hanford Atomic Metal Trades Council against two Hanford contractors (ITT/FSS and BNW). The significantly lower production (KMWD and kgs) during the July-December, 1966 period is due largely to the 500 KMWD production loss during the work stoppage.

Graphs showing the "Reactor Availability" and "Reactors Operated Simultaneously" for FY 1967 appear on pages 18, 19 and 20.

Achievements during the period January through June, 1967 are shown below.

New maximum power level records (held 24 hours) were attained in February, 1967 at B, 2210 megawatts, and at C, 2500 megawatts.

B Reactor achieved a new monthly input production record of 63.7 KMWDs, in April, 1967, exceeding their own May, 1966 record by 6.0 percent and the previous record of any small Hanford reactor (excluding C Reactor) by 0.2 percent.

During May, 1967, C Reactor achieved a monthly time operated efficiency of 100 percent for the first time since startup in November, 1952. This efficiency resulted in a new C Reactor monthly input production record of 70.1 KMWDs, exceeding their own production record of January, 1966 by 5.1 percent.

REACTOR DEACTIVATION

D Reactor was deactivated at 1402 hours on June 26, 1967, and placed on a standby basis. This reactor has been in operation since December 17, 1944.

D. L. DeNeal

D. L. DeNeal, Specialist
Production Reports and Administration

DLD:bm

Reactor Statistical Summary

	<u>Jul-Dec</u> <u>1966</u>	<u>Jan-Jun</u> <u>1967</u>
<u>Production (Input)</u>		
<u>Plutonium - KMWDs</u>		
Small (B, C & D)	655.1	950.0
Ks (KE & KW)	916.2	1,285.7
Combined	1,571.3	2,235.7
<u>Plutonium - Kgs</u>		
Small	526.8	740.9
Ks	791.3	1,107.7
Combined	1,318.1	1,848.6
<u>Uranium U-233 - Grams</u>		
Small	19,472	17,441
Ks	15,726	13,174
Combined	35,198	30,615
<u>Polonium 210 - Curies</u>		
Small	5,501	4,973
Ks	0	0
<u>Power Level</u>		
<u>Maximum - Average - MW</u>		
B & D	1,930	2,118
C	2,257	2,398
KE & KW	4,375	4,400
<u>Average Operating - MW</u>		
B & D	1,865	2,031
C	2,209	2,330
KE & KW	4,293	4,342
<u>Time Operating Efficiency - (TOE %)</u>		
Small	59.8 (84.4) ¹	82.8
Ks	58.0 (83.2) ¹	81.8
Combined	59.1 (83.9) ¹	82.4
<u>Reactor Outages - No.</u>		
	<u>Small</u> <u>Ks</u> <u>Total</u>	<u>Small</u> <u>Ks</u> <u>Total</u>
Scheduled	8 6 14	13 10 23
Unscheduled	12 7 19	20 3 23
Scrams	9 5 14	11 15 26

¹Excluding TOE loss due to work stoppage.

Reactor Statistical Summary - Contd.

	<u>Jul-Dec</u> <u>1966</u>			<u>Jan-Jun</u> <u>1967</u>		
<u>Process Tubes Replaced</u>						
Small	138			131		
Ks	10			17		
Total	148			148		
<u>Process Tube Leaks (Incl. V.S.)</u>						
Small	11			39		
Ks	0			3		
Total	11			42		
<u>Fuel Element Failures</u>						
	<u>Small</u>	<u>Ks</u>	<u>Total</u>	<u>Small</u>	<u>Ks</u>	<u>Total</u>
I&E Natural U.	2	3	5	5	0	5
I&E Enriched U.	1	0	1	2	1	3
Other	0	2	2	0	0	0
<u>Helium Usage - CFD</u>						
Small	14,541			25,949		
Ks	10,909			14,613		
Total	25,450			40,562		
<u>Outage Work - % Time Allocation</u>						
	<u>Small</u>	<u>Ks</u>	<u>Total</u>	<u>Small</u>	<u>Ks</u>	<u>Total</u>
Charge-Discharge	4.2	5.6	4.8	6.2	6.7	6.4
Rupture Removal	0.1	1.2	0.5	1.2	0.2	0.8
Tube Leaks	1.2	0	0.7	2.9	1.3	2.3
Tube Replacement	1.5	0.6	1.1	1.2	0.1	0.8
Other Maintenance	5.5	6.4	5.9	3.5	3.9	3.6
Standard Check	0.8	0.6	0.7	0.9	0.6	0.8
Production Test	0.9	1.3	1.1	1.0	5.1	2.6
Project Work	0.6	0.2	0.4	0.1	0	0.1
Work Stoppage	24.6	25.2	24.9	-	-	-
Other	0.8	0.9	0.8	0.2	0.3	0.2
Total	40.2	42.0	40.9	17.2	18.2	17.6

REACTOR STATISTICS

	B			C			D		
	Jul-Dec 1965	Jan-Jun 1966	Jul-Dec 1966	Jan-Jun 1966	Jul-Dec 1966	Jan-Jun 1967	Jul-Dec 1965	Jan-Jun 1966	Jan-Jun 1967
<u>PRODUCTION (Input Basis)</u>									
KMWD - In Nat. U	197.8	227.7	144.3	261.4	165.1	207.7	157.8	230.2	226.4
KMWD - In Enr. U	77.1	64.0	41.2	59.0	94.3	132.4	93.1	109.4	63.6
KMWD - Total	274.9	291.7	185.5	320.4	259.4	340.1	250.9	339.6	290.0
KMWD - % of Forecast	103.6	114.9	105.2	110.4	92.0	111.4	106.2	101.4	102.8
Pu (kg) - In Nat. U	163.9	191.0	121.7	210.8	141.7	178.9	135.9	196.0	174.8
Pu (kg) - In Enr. U	53.1	44.3	28.4	40.6	65.7	92.3	64.6	75.6	43.1
Pu (kg) - Total	217.0	235.3	150.1	251.4	207.4	271.2	200.5	271.6	217.9
Conv. Ratio - In Nat. U	0.829	0.839	0.843	0.806	0.858	0.861	0.861	0.851	0.772
Conv. Ratio - In Enr. U	0.689	0.692	0.689	0.688	0.697	0.697	0.694	0.691	0.678
Polonium - Curies	20,300	2,968	0	0	15,500	9,733	0	0	4,973
Uranium-233 - Grams	8,239	7,389	5,668	6,639	7,909	9,540	7,130	5,446	5,356
<u>OPERATING EFFECTIVENESS (a)</u>									
Power Level, Max - MW	1,861	2,034	1,917	2,148	2,152	2,423	2,257	2,398	2,087
Power Level, Avg - MW	1,787	1,942	1,835	2,061	2,000	2,329	2,209	2,330	2,001
Level Efficiency - %	96.0	95.5	95.7	95.9	92.9	96.1	97.9	97.2	95.9
Time Oper. Effic. - %	83.6	83.0	54.9	85.9	70.5	80.7	61.7	80.5	(87.1)(b)
Production Effic. - %	80.3	79.3	52.5	82.4	65.5	77.6	60.4	78.2	82.1
Effective Cent. Tubes	1,438	1,485	1,523	1,505	1,521	1,587	1,601	1,622	1,519
Non-Eq. Loss/Startup	0.35	0.30	0.33	0.30	0.35	0.30	0.16	0.14	0.15

(a) Max. PL is Avg. of Monthly Maximums; LE = Avg. PL ÷ Max. PL; PE = LE X TOE.
 ECT = Equil. PL ÷ Avg. Power of 10 Most Productive Tubes. NE Loss/Startup is
 Expressed as Days of Equilibrium Operation (Derived by R&E).

(b) TOE excluding the loss due to work stoppage.

REACTOR STATISTICS

	KW				TOTAL			
	KW		KW		TOTAL		TOTAL	
	Jul-Dec 1965	Jan-Jun 1966	Jul-Dec 1966	Jan-Jun 1967	Jul-Dec 1965	Jan-Jun 1966	Jul-Dec 1966	Jan-Jun 1967
PRODUCTION (Input Basis)								
KMWD - In Nat. U	422.8	396.9	343.4	324.6	369.9	347.6	358.5	321.7
KMWD - In Enr. U	220.4	248.0	104.7	317.0	196.1	194.3	109.6	322.4
KMWD - Total	643.2	644.9	448.1	641.6	566.0	541.9	468.1	644.1
KMWD - % of Forecast	104.9	105.2	111.9	101.7	90.3	103.8	96.0	101.6
Pu (kg) - In Nat. U	371.9	363.1	311.2	314.2	333.9	316.5	321.8	308.6
Pu (kg) - In Enr. U	166.4	179.2	77.7	241.0	148.8	141.2	80.6	243.9
Pu (kg) - Total	538.3	542.3	388.9	555.2	482.7	457.7	402.4	552.5
Conv. Ratio - In Nat. U	0.880	0.915	0.906	0.968	0.903	0.911	0.898	0.959
Conv. Ratio - In Enr. U	0.755	0.723	0.742	0.760	0.759	0.727	0.735	0.757
Polonium - Curies	0	0	0	0	0	0	0	0
Uranium-233 - Grams	25,465	29,197	7,824	5,783	24,479	22,509	7,902	7,391
OPERATING EFFECTIVENESS (a)								
Power Level, Max - MW	4,362	4,400	4,365	4,400	4,334	4,400	4,385	4,400
Power Level, Avg - MW	4,260	4,341	4,289	4,350	4,190	4,282	4,297	4,333
Level Efficiency - %	97.7	98.7	98.3	98.9	96.7	97.3	98.0	98.5
Time Oper. Effic. - %	82.1	82.1	56.8	81.5	73.4	69.9	59.2	82.1
Production Effic. - %	80.2	81.0	55.8	80.6	71.0	68.0	58.0	80.9
Effective Cent. Tubes	2,341	2,247	2,385	2,221	2,237	2,191	2,366	2,139
Non-Eq. Loss/Startup	0.24	0.14	0.17	0.10	0.26	0.15	0.18	0.09

(a) Max. PL is Avg. of Monthly Maximums; LE = Avg PL ÷ Max. PL; PE = LE X TOE.
 ECT = Equil. PL ÷ Avg. Power of 10 Most Productive Tubes. NE Loss/Startup is
 Expressed as Days of Equilibrium Operation (Derived by R&E).

(b) TOE excluding the loss due to work stoppage.

REACTOR STATISTICS

	B				C				D			
	Jul-Dec 1965	Jan-Jun 1966	Jul-Dec 1966	Jan-Jun 1967	Jul-Dec 1965	Jan-Jun 1966	Jul-Dec 1966	Jan-Jun 1967	Jul-Dec 1965	Jan-Jun 1966	Jul-Dec 1966	Jan-Jun 1967
<u>REACTOR OUTAGES (Number, by Cause)</u>												
Charge-Discharge	4	6	1	2	-	4	4	7	1	2	2	1
Tube Replacement	-	-	-	-	-	-	-	-	-	-	-	1
Fuel Ruptures	4	-	-	3	12	2	1	-	7	2	1	4
Tube Leaks (Incl. Van S)	-	-	-	-	2	1	2	2	1	1	1	7
Project Work	-	-	-	-	-	1	-	-	-	1	-	-
Production Tests	-	-	-	-	-	-	-	-	-	1	1	-
Front Face Leaks	-	1	-	-	1	-	-	-	-	-	-	-
Rear Face Leaks	-	2	1	-	-	-	-	-	-	-	-	-
Rods - Horiz. & Vert.	-	1	-	-	1	-	-	1	-	3	-	-
Reactor Hardware	-	2	2	1	1	1	-	2	2	1	-	2
Panelit System	-	-	-	1	6	5	-	2	3	-	2	2
Other Instrumentation	-	1	1	-	-	-	-	-	-	1	1	-
Electric Power	-	1	1	-	-	1	-	-	-	-	-	-
Water Flow (105 Bldg. -	-	-	-	-	-	-	-	-	-	-	-	-
190 Building	-	2	-	1	-	-	1	-	1	-	2	1
Reactivity Control	-	-	-	1	-	-	-	-	-	-	-	-
Temperature Control	-	-	-	1	-	-	-	-	-	-	-	-
Work Stoppage	-	-	1	-	-	-	1	-	-	-	1	-
Other	-	-	2	-	-	-	-	2	6	-	-	-
Total Outages	8	16	9	10	23	15	9	16	21	12	11	18
Outage Recap:												
Scheduled Outages (a)	4	6	2	3	1	5	4	7	2	2	2	3
Unsched. Shutdowns	4	3	4	4	15	3	4	6	9	4	4	10
Scrams	0	7	3	3	7	7	1	3	10	6	5	5

(a) Excluding those which followed scrams or unscheduled outages.

REACTOR STATISTICS

REACTOR OUTAGES (Number, by Cause)	KE				KW				TOTAL			
	Jul-Dec 1965	Jan-Jun 1966	Jul-Dec 1966	Jan-Jun 1967	Jul-Dec 1965	Jan-Jun 1966	Jul-Dec 1966	Jan-Jun 1967	Jul-Dec 1965	Jan-Jun 1966	Jul-Dec 1966	Jan-Jun 1967
	1965	1966	1966	1967	1965	1966	1966	1967	1965	1966	1966	1967
Charge-Discharge	2	4	2	4	1	2	3	4	8	18	12	18
Tube Replacement	-	-	-	-	-	-	-	-	-	-	-	1
Fuel Ruptures	6	1	3	-	5	3	2	1	34	8	7	8
Tube Leaks (Incl. Van S)	-	-	-	-	2	1	-	1	5	3	3	10
Project Work	-	-	-	-	-	-	-	-	-	1	-	-
Production Tests	2	-	-	2	-	-	-	1	2	1	1	3
Front Face Leaks	-	1	-	-	-	1	-	1	1	4	-	1
Rear Face Leaks	-	-	-	-	-	-	-	-	-	2	1	-
Rods - Horiz. & Vert.	-	-	-	-	-	2	-	-	1	3	-	1
Reactor Hardware	-	2	1	1	1	3	-	1	4	11	3	7
Panelit System	3	3	1	4	3	7	3	3	15	16	6	12
Other Instrumentation	2	-	-	-	1	-	-	3	3	1	2	3
Electric Power	-	-	-	-	-	1	-	-	-	4	1	-
Water Flow (105 Bldg.)	-	1	-	-	-	-	-	-	-	1	-	-
190 Building	-	-	-	-	-	-	-	-	1	2	3	2
165 Building	-	-	-	1	1	-	1	-	1	-	1	1
Reactivity Control	-	-	-	-	1	-	-	1	1	-	-	2
Temperature Control	-	-	-	-	-	1	-	-	-	1	-	1
Work Stoppage	-	-	-	-	-	-	1	-	-	-	4	-
Other	5	1	1	-	3	2	-	-	14	3	3	2
Total Outages	20	13	8	12	18	23	10	16	90	79	47	72
Outage Recap: (a)												
Scheduled Outages	2	5	3	5	2	2	3	5	11	20	14	23
Unsched. Shutdowns	8	4	4	0	8	12	3	3	44	26	19	23
Scrams	10	4	1	7	8	9	4	8	35	33	14	26

(a) Excluding those which followed scrams or unscheduled outages.

REACTOR STATISTICS

	B				C				D			
	Jul-Dec 1965	Jan-Jun 1966	Jul-Dec 1966	Jan-Jun 1967	Jul-Dec 1965	Jan-Jun 1966	Jul-Dec 1966	Jan-Jun 1967	Jul-Dec 1965	Jan-Jun 1966	Jul-Dec 1966	Jan-Jun 1967
<u>OUTAGE WORK (% Time Allocation, Including Cooling Time and Startup Preparation)(a)</u>												
Charge-Discharge	7.0	7.5	2.6	5.8	10.1	7.9	5.7	8.7	5.8	7.6	4.4	4.1
Rupture Removal	1.3	-	-	0.8	3.8	0.5	0.1	0	0.6	0.4	0.1	2.6
Tube Leaks (Inc. Van S)	1.4	1.7	1.0	1.8	1.5	0.4	1.3	1.5	2.8	1.2	1.4	5.5
Tube Replacement	2.1	1.6	1.4	1.2	1.5	0.9	1.1	1.3	1.4	3.1	1.8	1.3
Other Maintenance	3.2	3.8	10.7	2.6	8.7	3.8	3.8	6.2	8.1	2.8	2.0	1.5
Standard Check	0.7	0.7	0.5	0.6	1.1	0.4	1.3	0.9	0.6	0.7	0.7	1.3
Production Test	0.5	0.2	1.1	1.1	0.1	1.2	0.3	0.4	3.3	1.8	1.4	1.5
Project Work	-	-	1.6	0	0.1	3.3	0.1	0.4	0	0.1	-	0
Work Stoppage	-	-	24.9	-	-	-	24.6	-	-	-	24.4	-
Other	0.2	1.5	1.3	0.2	2.6	0.9	-	0.1	0.4	0.5	1.1	0.1
Total	16.4	17.0	45.1	14.1	29.5	19.3	38.3	19.5	23.0	18.2	37.3	17.9

SCRAMS (Number, by Cause)

Reactor Operations: (b)

Equip. Failure - 105	-	3	-	1	-	1	-	1	4(c)	3(c)	-	2
" - 190	-	1	-	1	-	-	1	-	-	-	1	1
Improp. Proced. - 105	-	-	1	1	-	-	-	-	1	-	-	-
" - 190	-	-	-	-	-	-	-	-	-	-	1	-
Unexplained Trips	-	-	-	-	6	4	-	2	4	2	2	2
Other Inst. Trips	-	1	1	-	-	-	-	-	-	-	1	-
Manual Trips	-	-	-	-	1	1	-	-	-	-	-	-
Subtotal	0	5	2	3	7	6	1	3	9	5	5	5

Test Facilities

Elect. Power Supply	-	-	-	-	-	-	-	-	-	-	-	-
Total Scrams	0	7	3	3	7	7	1	3	10	6	5	5

(a) Allocation per standard "Reactor Outage Time Reporting Procedure."

(b) Excluding scrams due to fuel failures and process tube leaks.

(c) Includes two scrams due to orifice screen plugging.

REACTOR STATISTICS

	KE				KW				TOTAL			
	Jul-Dec 1965	Jan-Jun 1966	Jul-Dec 1966	Jan-Jun 1967	Jul-Dec 1965	Jan-Jun 1966	Jul-Dec 1966	Jan-Jun 1967	Jul-Dec 1965	Jan-Jun 1966	Jul-Dec 1966	Jan-Jun 1967

OUTAGE WORK (% Time Allocation, Including Cooling Time and Startup Preparation) (a)

Charge-Discharge	8.7	9.1	4.6	7.6	12.2	8.4	6.6	5.8	8.8	8.1	4.8	6.4
Rupture Removal	1.2	0.3	1.3	0	1.8	0.7	1.1	0.4	1.7	0.4	0.5	0.8
Tube Leaks (Incl. Van S)	-	-	-	0	1.9	1.5	-	2.7	1.5	0.9	0.7	2.3
Tube Replacement	0.1	0.4	-	0.1	0.9	0.4	1.2	0	1.2	1.3	1.1	0.8
Other Maintenance	3.6	3.5	9.2	3.9	4.9	14.8	3.6	3.9	5.7	5.7	5.9	3.6
Standard Check	0.8	0.8	0.8	0.8	1.3	0.9	0.4	0.5	0.9	0.7	0.7	0.8
Production Test	1.9	1.2	1.6	5.6	2.3	2.2	1.1	4.5	1.6	1.3	1.1	2.6
Project Work	0.3	-	-	0	0.2	-	0.3	0	0.2	0.7	0.4	0.1
Work Stoppage	-	-	24.9	-	-	-	25.5	-	-	-	24.9	-
Other	1.3	2.6	0.8	0.5	1.1	1.2	1.0	0.1	1.1	1.4	0.8	0.2
Total	17.9	17.9	43.2	18.5	26.6	30.1	40.8	17.9	22.7	20.5	40.9	17.6

SCRAMS (Number, by Cause)

Reactor Operations: (b)

Equip. Failure - 105	*1	-	-	2	-	-	-	1	5	7	-	7
" - 190	-	-	-	-	-	-	-	-	-	1	2	2
Improp. Proced. - 105	4	1	-	1	2	1	1	-	7	2	2	2
" - 190	-	-	-	-	-	-	1	-	-	-	2	-
Unexplained Trips	3	3	-	2	3	6	2	4	16	15	4	10
Other Inst. Trips	-	-	-	-	-	-	-	2(c)	-	1	2	2
Manual Trips	-	-	-	1	3	1	-	1	4	2	-	2
Subtotal	8	4	-	6	8	8	4	8	32	28	12	25
Test Facilities	2	-	1	1	-	-	-	-	2	-	1	1
Elect. Power Supply	-	-	-	-	-	1	-	-	1	5	1	-
Total Scrams	10	4	1	7	8	9	4	8	35	33	14	26

*Plugged Venturi

(a) Allocation per standard "Reactor Outage Time Reporting Procedure."

(b) Excluding scrams due to fuel failures and process tube leaks.

(c) High speed scanning system.

REACTOR STATISTICS

	B				C				D			
	Jul-Dec		Jan-Jun		Jul-Dec		Jan-Jun		Jul-Dec		Jan-Jun	
	1965	1966	1966	1967	1965	1966	1966	1967	1965	1966	1966	1967
<u>OUTAGE TIMES (Hours, Average)</u>												
Charged to Scrams	-	10.2	18.6	4.0	8.1	8.1	15.6	8.0	1.3	6.6	11.5	2.2
Cooling Time	8.2	6.3	6.5	2.4	4.9	5.7	5.4	3.2	4.3	5.0	4.9	4.5
Startup Preparation	6.2	4.0	4.3	4.9	4.1	3.9	4.1	6.0	3.2	3.8	5.6	5.0
<u>OTHER STATISTICS</u>												
Equil. Recov. Time (a)	14	2	2	2	23	21	21	21	11	1	1	1
Charge-Disch. Rate (b)	16.2	18.7	20.9	18.8	12.1	13.2	13.9	12.1	16.9	17.9	21.3	14.6
Tubes Replaced - Total	30	31	38	31	20	8	22	28	61	122	78	72
Water Leaks:												
Process Tube	1	0	2	2	2	1	5	1	7	2	1	8
Van Stone Flange	2	8	3	9	0	1	0	2	8	1	0	17
Water Coll. - Gallons	261	399	359	719	5,296	2,645	2,369	782	4,645	1,002	1,500	2,782
" - Days >10 gals	9	19	17	25	97	53	59	30	89	26	47	65
Failures - I&E Nat. U	3	0	0	3	8	2	1	0	1	1	1	2
Failures - I&E Enr. U	1	0	0	0	4	0	0	0	6	2	1	2
Failures - Other	-	-	0	0	1	-	0	0	-	-	0	0
Disch. Expos.: (c)												
Nat. U. - Weapons (c)	617	625	582	550	605	610	597	601	634	599	579	531
Nat. U. - Nondefense (c)	0	0	0	920	0	0	0	0	0	0	0	966
Enr. U. - Weapons (c)	802	844	790	851	802	836	825	842	813	904	769	799
Enr. U. - Nondefense (c)	0	0	0	0	0	0	0	0	0	0	0	1,229

(a) Minutes, average, as defined and reported by Research & Engineering.

(b) Tubes/hour, average for standard charging of regular fuel as defined in the "Reactor Outage Time Reporting Procedure."

(c) MWD/T.

REACTOR STATISTICS

	KE			KW			TOTAL				
	Jul-Dec 1965	Jan-Jun 1966	Jul-Dec 1966	Jan-Jun 1967	Jul-Dec 1965	Jan-Jun 1966	Jul-Dec 1966	Jan-Jun 1966	Jul-Dec 1966	Jan-Jun 1967	1967
<u>OUTAGE TIMES (Hours, Average)</u>											
Charged to Scrams	3.2	11.7	0.5	11.1	3.6	3.4	6.8	8.1	3.2	8.0	11.2 7.3
Cooling Time	4.3	5.3	5.5	4.3	4.0	3.3	5.1	4.3	5.1	5.1	5.5 3.7
Startup Preparation	4.8	6.9	7.3	6.7	4.0	4.0	5.3	5.0	4.5	4.5	5.3 5.5
<u>OTHER STATISTICS</u>											
Equil. Recov. Time (a)	16	0	0	0	16	0	0	0	-	-	-
Charge-Disch. Rate (b)	17.5	21.7	25.8	18.8	14.8	16.8	20.0	17.5	15.3	17.0	19.4 15.8
Tubes Replaced - Total	3	5	4	8	7	9	6	9	121	175	148 148
Water Leaks:											
Process Tube	0	0	0	0	0	1	0	2	10	4	8 13
Van Stone Flange	0	0	0	0	0	1	0	1	10	11	3 29
Water Coll. - Gallons	0	0	0	42	7,107	1,551	178	3,489	-	-	- -
" - Days >10 gals	0	0	0	1	82	48	6	57	-	-	- -
Failures - I&E Nat. U	3	0	2	0	2	1	1	0	17	4	5 5
Failures - I&E Enr. U	0	0	0	0	4	2	0	1	15	4	1 3
Failures - Other	3	1	1	0	-	-	1	0	4	1	2 0
Disch. Expos.:											
Nat. U. - Weapons (c)	747	659	649	645	641	710	663	599	660	643	625 603
Nat. U. - Nondefense (c)	0	0	0	943	0	0	0	1,024	0	0	0 972
Enr. U. - Weapons (c)	947	976	907	827	1,009	899	897	863	903	914	853 840
Enr. U. - Nondefense (c)	0	0	0	0	0	0	0	0	0	0	0 1,229

(a) Minutes, average, as defined and reported by Research & Engineering.

(b) Tubes/hour, average for standard charging of regular fuel as defined in the "Reactor Outage Time Reporting Procedure."

(c) MWD/T.

REACTOR STATISTICS

	B				C				D			
	Jul-Dec 1965	Jan-Jun 1966	Jul-Dec 1966	Jan-Jun 1967	Jul-Dec 1965	Jan-Jun 1966	Jul-Dec 1966	Jan-Jun 1967	Jul-Dec 1965	Jan-Jun 1966	Jul-Dec 1966	Jan-Jun 1967
<u>OTHER STATISTICS - contd.</u>												
Helium Loss/CF/Day	6,319	7,835	4,221	10,358	10,113	12,085	6,540	7,902	6,176	7,044	3,780	7,689
Fuel Charge: (At End of Period)												
Tons Nat. U	154.5	154.4	155.4	178.0	125.7	127.6	152.4	165.1	149.0	143.4	148.6	-
" Enr. U	53.7	53.9	54.0	39.5	76.7	75.9	61.2	49.5	57.7	61.5	57.9	-
Tube Loadings: (At End of Period)												
Nat. U Elms/Tube	31	31	31	31	31	31	31	31	31	31	31	-
Enr. U Els/Tube (Sh)	33	33	33	33	34	34	34	34	33	33	33	-
Enr. U Els/Tube (lg)	43	43	43	43	42	42	42	42	43	43	43	-
Mixers/Tube	1	1	1	1	1	1	1	1	1	1	1	-
Dry Channels	1	2	2	2	4	4	4	4	4	4	4	-
Water Tubes	7	7	1	1	11	4	4	5	12	6	7	-
Graph. Stringers	8	8	8	8	10	10	10	10	8	9	9	-
Non-Fuel Productive Tubes:												
In Blanket	168	168	168	112	167	167	84	84	168	167	167	-
Elsewhere	5	-	-	-	5	-	-	-	4	10	5	-

REACTOR STATISTICS

	KE		KW		TOTAL							
	Jul-Dec 1965	Jan-Jun 1966	Jul-Dec 1966	Jan-Jun 1967	Jul-Dec 1965	Jan-Jun 1966	Jul-Dec 1966	Jan-Jun 1967				
OTHER STATISTICS - contd.												
Helium Loss/CF/Day	8,211	12,493	6,138	8,699	8,420	9,816	4,771	5,914	39,239	49,273	25,450	40,562
Fuel Charge: (At End of Period)												(a)
Tons Nat. U	115.8	330.3	325.4	243.6	117.4	334.0	353.6	231.9	662.4	1,089.7	1,135.4	818.6
" Enr. U	273.1	101.2	105.6	194.0	271.1	97.1	84.3	202.7	732.3	389.6	353.0	485.7
Tube Loadings: (At End of Period)												
Nat. U Elems/Tube	38	38	38	38	38	38	38	38	-	-	-	-
Enr. U Els/Tube (Sh)	46	46	46	46	46	46	46	46	-	-	-	-
Enr. U Els/Tube (Lg)	51	49	51	51	51	49	51	51	-	-	-	-
Mixers/Tube	1	1	1	1	1	1	1	1	-	-	-	-
Dry Channels	2	2	3	3	2	2	5	7	13	14	18	16
Water Tubes	6	5	6	6	5	5	5	5	41	27	23	17
Graph. Stringers	6	7	6	6	6	7	7	7	38	41	40	31
Non-Fuel Productive Tubes:												
In Blanket	192	193	192	77	193	193	80	83	888	888	691	356
Elsewhere	221	-	-	5	217	-	6	15	452	10	11	20

(a) Includes 45.2 tons of special depleted uranium in each of the KE and KW Reactor E-D loadings (PITA-048).

DECLASSIFIED
WATER PLANT STATISTICS

	B			C			D		
	Jul-Dec 1965	Jan-Jun 1966	Jul-Dec 1966	Jul-Dec 1965	Jan-Jun 1966	Jul-Dec 1966	Jul-Dec 1965	Jan-Jun 1966	Jan-Jun 1967
WATER PLANT OPERATIONS									
River Water Pumped-MMG	52,214	53,452	40,790	(Included with B)			21,630	22,561	18,935
Water Exported-MMG	4,030	3,989	3,036	-	-	-	-	-	791
Water Treated-MMG	19,205	19,844	13,480	28,915	29,594	24,122	21,034	21,982	17,703
									22,450
Chem. Consumption-ppm:									
Alum	0.463	0.043	0.154	0.081	0	0.050	1.268	0.148	0.123
Bauxite	4.507	4.701	4.532	4.911	4.869	4.193	4.242	4.463	4.629
Chlorine	0.886	0.713	0.702	0.546	0.613	0.751	0.873	0.806	0.685
Sulfuric Acid	22.834	24.610	23.000	22.045	24.991	23.190	24.540	27.409	22.600
Filter Conditioner	0.021	0.024	0.016	0.017	0.013	0.010	0.017	0.018	0.019
									0.027
Process Water-MMG	20,659	20,521	14,119	21,698	22,935	19,183	19,790	20,649	16,479
Proc. Water-GPM, Normal	89,600	89,500	90,600	94,800	103,750	106,900	90,300	92,300	94,000
Process Water Analysis:									
Turbidity-ppm	.004	.004	.004	.005	.004	.004	.005	.006	.004
pH	6.62	6.65	6.67	6.66	6.65	6.68	6.61	6.61	6.66
Cl Residual-ppm	0.09	.18	.17	0.07	.23	.13	0.06	.10	.14
Dichromate-ppm	0.993	.97	1.00	0.991	.97	1.00	0.949	1.00	.96
									.94
STEAM PLANT OPERATIONS									
Generation-MMG Lbs.	332.2	341.7	331.7	365.9	(Included with B)			207.3	207.9
Gener.-Lbs/Hr., Max.	89,000	103,700	139,000	97,500	"	"	95,300	85,500	180.3
" -Lbs/Hr., Avg	74,700	79,300	74,700	84,700	"	"	46,000	47,900	78,700
									40,500
Lbs. Steam/Lb. Coal	9.08	9.04	9.33	9.17	"	"	8.53	8.28	8.10
									8.29

DECLASSIFIED

DECLASSIFIED

	KE			KW			TOTAL				
	Jul-1965	Dec-1966	Jan-Jun-1967	Jul-1965	Dec-1966	Jan-Jun-1967	Jul-1965	Dec-1966	Jan-Jun-1967	Jul-1966	Jan-Jun-1967
<u>WATER PLANT OPERATIONS</u>											
River Water Pumped-MMG	51,155	50,054	39,689	47,491	46,742	51,208	172,490	172,809	142,280	177,915	
Water Exported-MMG	-	-	-	-	-	-	4,030	3,989	3,827	3,165	
Water Treated-MMG	51,119	50,013	39,658	47,491	46,742	51,208	167,764	168,175	137,832	174,581	
Chem. Consumption-ppm:											
Alum	16.243	15.769	11.853	6.038	10.078	13.348	12.407 ^{a)}	13.023 ^{a)}	7.602 ^{b)}	2.287	
Bauxite	-	-	.531	-	-	-	4.596	4.697	1.925 ^{b)}	3.819	
Chlorine	0.941	0.803	.871	1.033	0.802	0.884	0.884	0.759	0.814	0.816	
Sulfuric Acid	14.474	16.879	15.020	19.748	19.350	22.664	19.562	20.605	17.910	23.571	
Filter Conditioner	0.012	0.025	0.019	0.005	0.019	0.015	0.013	0.020	0.016	0.021	
Process Water-MMG	47,589	46,551	36,456	42,474	41,253	46,601	152,112	151,909	123,939	159,397	
Proc. Water-GPM, Normal	209,700	212,800	215,000	209,100	213,500	215,900	702,400	715,000	722,500	722,700	
Process Water Analysis:											
Turbidity-ppm	.005	.004	.005	.006	.005	.010	-	-	-	-	
pH	6.67	6.66	6.82	6.67	6.79	6.68	6.65	6.67	6.73	6.63	
Cl Residual-ppm	0.20	.19	.17	0.19	.19	.20	-	-	-	-	
Dichromate-ppm	0.933	.90	.90	0.946	.90	.90	0.955	.95	.95	.91	
<u>STEAM PLANT OPERATIONS</u>											
Generation-MMM Lbs.	163.2	224.6	135.8	149.5	186.4	133.9	852.2	960.6	778.8	832.3	
Gener.-Lbs/Hr., Max.	42,000	69,700	61,200	42,000	64,200	38,300	268,300	323,100	322,600	259,800	
" -Lbs/Hr., Avg.	37,500	52,200	32,400	33,700	43,400	31,000	191,900	222,800	177,100	192,700	
Lbs. Steam/Gal. Oil	114.6	104.8	100.9	107.2	100.0	101.1	110.9	102.5	101.6	100.9	
Lbs. Steam/Lgs. Coal	-	-	-	-	-	-	8.80	8.66	8.86	8.73	

a) K Reactors only.

b) Based on flows for all reactors.

DECLASSIFIED

REACTOR AVAILABILITY

(PERCENT OF TIME REACTORS OPERATED PLUS
SCHEDULED SHUTDOWN TIME)

REACTOR AVAILABILITY
(PERCENT OF TIME REACTORS OPERATED PLUS
SCHEDULED SHUTDOWN TIME)

END

DATE
FILMED

7 / 8 / 93