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TITLE

SINGLE PASS REACTORS - OPERATIONS DIVISION
SEMIANNUAL SUMMARY REPORT
PERIOD ENDING JUNE 30, 1970

AUTHOR

T. Prudich

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SINGLE PASS REACTORS - OPERATIONS DIVISION
SEMIANNUAL SUMMARY REPORT
PERIOD ENDING JUNE 30, 1970

By

T. Prudich

September 3, 1970

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SINGLE PASS REACTORS - OPERATIONS DIVISION
SEMIANNUAL SUMMARY REPORT
PERIOD ENDING JUNE 30, 1970

INTRODUCTION

In this semiannual issue⁽¹⁾ the single pass reactor and water plant data are shown for the six-month period January through June, 1970, together with data for the three preceding six-month periods. For comparison purpose 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 Single Pass Reactors (KE and KW) for the two-year period, FY-1969 and FY-1970, are summarized on pages 4 and 5.

The low efficiency and production of the Single Pass K Reactors during the six-month period January through June, 1970, were mainly due to the following:

1. KW Reactor was shut down on February 1, 1970 and placed on standby status.
2. KE Reactor was down from February 1, 1970 to March 22, 1970 for the "Wye" joint replacement outage.

GENERAL

On June 3, 1970, the 83 tubes of fringe thoria were replaced with 42 tubes of lithium and 41 tubes of C2N type fuel elements.

T. Prudich, Manager
Production Planning

TP:MAT:bm

(1) Previous semiannual reports issued: DUN-850 through DUN-850 5, DUN-5566 through DUN-5566 2.

Single Pass Reactor
Statistical Summary

	<u>FY-1969</u>	<u>FY 1970</u>
<u>Production (Input)</u>		
<u>Plutonium - KMWDs</u>		
KE	1,103.0	812.6
KW	1,041.3	634.9
Total	<u>2,144.3</u>	<u>1,447.5</u>
<u>Plutonium - Kgs</u>		
KE	813.1	744.5
KW	764.8	565.0
Total	<u>1,577.9</u>	<u>1,309.5</u>
<u>Uranium (U-233) - Grams</u>		
KE	166,313	67,385
KW	150,515	50,225
Total	<u>316,828</u>	<u>117,610</u>
<u>Power Level</u>		
<u>Maximum - Average - MW</u>		
KE	4,041	3,934
KW	4,062	3,894
<u>Average Operating - MW</u>		
KE	3,905	3,741
KW	3,859	3,744
<u>Time Operating Efficiency - (TOE - %)</u>		
KE	77.4	59.5
KW	73.9	78.9
Combined	<u>75.7</u>	<u>66.9</u>
<u>Process Tubes Replaced</u>		
KE	1	30
KW	3	5
Total	<u>4</u>	<u>35</u>
<u>Process Tube Leaks (Incl. V.S.)</u>		
KE	0	6
KW	2	1
Total	<u>2</u>	<u>7</u>

Single Pass Reactor
Statistical Summary - contd.

	<u>FY-1969</u>			<u>FY-1970</u>		
<u>Helium Usage - CFD</u>						
KE	5,807			3,593		
KW	8,330			3,538		
	<u>KE</u>	<u>KW</u>	<u>Total</u>	<u>KE</u>	<u>KW</u>	<u>Total</u>
<u>Reactor Outages - Number</u>						
Scheduled	6	7	13	9	5	14
Unscheduled	4	5	9	17	6	23
Scrams	15	15	30	6	8	14
<u>Fuel Element Failures</u>						
Natural Uranium	1	0	1	0	0	0
Enriched Uranium	2	0	2	2	1	3
Other	0	5	5	5	7	12
<u>Outage Work - % Time Allocation</u>						
	<u>KE</u>	<u>KW</u>	<u>Avg</u>	<u>KE</u>	<u>KW</u>	<u>Avg</u>
Charge-Discharge	7.5	8.0	7.8	9.8	9.3	9.6
Rupture Removal	0.3	0.1	0.2	1.1	-	0.7
Tube Leak (Incl. V.S.)	0	1.2	0.6	1.5	0.3	1.0
Tube Replacement	0	0	0	0.7	1.0	0.8
Other Maintenance	9.6	3.9	6.8	14.8	4.5	11.0
Standard Check (Incl. Equip. Maint. Std.)	1.5	1.3	1.4	1.6	3.0	2.1
Production Test	2.9	2.1	2.5	2.0	1.6	1.8
Project Work	0	1.4	0.7	3.8	-	2.4
Flow Stoppage	0	7.5	3.8	-	-	-
Other	0.8	0.6	0.7	5.2	1.4	3.7
Total	22.6	26.1	24.4	40.5	21.1	33.1

Note: KW data covers a seven-month operating period for FY-1970.

	KE			
	Jul-Dec 1968	Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970
<u>PRODUCTION (Input Basis)</u>				
KMWD - In Nat. U	63.8	3.5	40.1	297.7
KMWD - In Enr. U	527.0	508.7	376.2	97.5
KMWD - Total	590.8	512.2	416.3	395.2
KMWD - % of Forecast	101.1	100.7	75.1	100.8
Pu (kg) - In Nat. U	51.3	3.3	39.8	272.0
Pu (kg) - In Enr. U	385.9	372.6	279.5	73.0
Pu (kg) - Total	437.2	375.9	319.3	345.0
Conv. Ratio - In Nat. U	0.804	0.943	0.992	0.914
Conv. Ratio - In Enr. U	0.732	0.732	0.743	0.749
Uranium 233 - Grams	83,293	83,020	61,213	6,173

OPERATING EFFECTIVENESS^(a)

Power Level, Max - MW	4,110	3,972	3,904	4,000
Power Level, Avg - MW	3,967	3,836	3,623	3,869
Level Efficiency - %	96.5	96.6	92.8	96.7
Time Oper. Effic. - %	80.9	73.8	62.5	56.6
Production Effic.	78.1	71.3	58.0	54.7
Effective Cent. Tubes	2,218	2,229	2,253	2,250
Non-Eq. Loss/Startup	0.20	0.39	0.35	0.39

*Figures for KW represent the month of January, 1970 only.

**Total reflects KW figures for January, 1970 only.

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

STATISTICS

KW				Total			
Jul-Dec 1968	Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970*	Jul-Dec 1968	Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970**
60.5	2.8	179.3	73.0	124.3	6.3	219.4	370.7
457.1	520.9	361.0	21.6	984.1	1,029.6	737.2	119.1
517.6	523.7	540.3	94.6	1,108.4	1,035.9	956.6	489.8
109.6	92.6	94.4	102.1	104.9	96.4	84.9	101.0
47.9	2.8	166.9	64.9	99.2	6.1	206.7	336.9
339.4	374.7	266.3	15.3	725.3	747.3	545.8	88.3
387.3	377.5	433.2	80.2	824.5	753.4	752.5	425.2
0.792	1.000	0.931	0.889	0.798	0.968	0.942	0.909
0.742	0.719	0.738	0.708	0.737	0.726	0.740	0.741
70,785	79,730	49,401	824	154,078	162,750	110,614	6,997
4,110	4,013	3,877	4,000	8,220	7,985	7,781	8,000
3,926	3,794	3,711	3,946	7,893	7,630	7,334	7,815
95.5	94.5	95.7	98.6	96.0	95.6	94.3	97.7
71.7	76.3	79.1	77.4	76.3	75.0	70.8	60.2
68.5	72.1	75.7	76.3	73.2	71.7	66.8	65.5
2,202	2,256	2,186	2,210	--	--	--	--
0.22	0.32	0.31	0.27	0.21	0.35	0.33	0.33

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REACTOR

	KE			
	<u>Jul-Dec</u> <u>1968</u>	<u>Jan-Jun</u> <u>1969</u>	<u>Jul-Dec</u> <u>1969</u>	<u>Jan-Jun</u> <u>1970</u>
<u>REACTOR OUTAGES (Number, by Cause)</u>				
Charge-Discharge	3	2	4	4
Tube Replacement	-	-	-	-
Fuel Rupture	2	-	5	1
Tube Leaks (Inc. Van S.)	-	-	3	-
Project Work	-	1	-	-
Production Tests	-	1	-	1
Front Face Leaks	1	-	-	-
Rear Face Leaks	-	-	1	-
Rods - Horiz. & Vert.	-	1	1	-
Reactor Hardware	-	-	-	-
Panelit System	7	3	3	1
Other Instrumentation	2	2	4	-
Electric Power	-	-	-	-
Water Flow (105 Bldg)	-	-	-	-
165 Bldg.	-	-	1	1
Reactivity Control	-	-	1	-
Temperature Control	-	-	-	-
Other	-	-	-	-
Total Outages	15	10	23	8
Outage Recap:				
Scheduled Outages (a)	3	3	4	5
Unsched. Shutdowns	3	1	12	3
Scrams	9	6	7	2

*Figures for KW represent the month of January, 1970 only.

**Total reflects KW figures for January, 1970 only.

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

STATISTICS

KW				Total			
<u>Jul-Dec</u> <u>1968</u>	<u>Jan-Jun</u> <u>1969</u>	<u>Jul-Dec</u> <u>1969</u>	<u>Jan-Jun</u> <u>1970*</u>	<u>Jul-Dec</u> <u>1968</u>	<u>Jan-Jun</u> <u>1969</u>	<u>Jul-Dec</u> <u>1969</u>	<u>Jan-Jun</u> <u>1970**</u>
3	3	4	1	6	5	8	5
-	-	-	-	-	-	-	-
1	-	1	-	3	-	6	1
-	1	-	-	-	1	3	-
-	1	-	-	-	2	-	-
-	-	-	-	-	1	-	1
-	-	-	-	1	-	-	-
-	-	-	-	-	-	1	-
-	-	-	-	-	1	1	-
-	-	-	-	-	-	-	-
4	5	7	-	11	8	10	1
1	4	2	-	3	6	6	-
-	1	-	-	-	1	-	-
-	-	-	-	-	-	-	-
-	1	3	-	-	1	4	1
2	-	-	-	2	-	1	-
-	-	-	-	-	-	-	-
-	-	1	-	-	-	1	-
11	16	18	1	26	26	41	9
3	3	4	1	6	7	8	6
3	2	4	-	6	3	16	3
5	10	10	-	14	16	17	2

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REACTOR

	KE			
	Jul-Dec 1968	Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970
<u>OUTAGE WORK</u> (% Time Allocation, Including Cooling Time and Startup				
Charge-Discharge	7.7	7.3	10.6	9.0
Rupture Removal	0.5	0	1.5	0.7
Tube Leaks (Incl. Van S.)	0	0	2.9	0
Tube Replacement	0.1	0	1.1	0.3
Other Maintenance	7.2	12.1	9.6	20.1
Standard Check	1.3	1.7	1.8	1.3
Production Test	1.9	3.8	2.4	1.4
Project Work	0	0	7.4	0
Flow Stoppage	0	-	-	-
Other	0.4	1.3	0.2	10.0
Total	19.1	26.2	37.5	42.8

SCRAMS (Number, by Cause)

Reactor Operations: (b)				
Equip. Failure - 105	2	1	1	1
" " - 165	-	-	-	1
Improp. Proced. - 105	-	-	1	0
" " - 165	-	-	-	0
Unexplained Trips	6	2	2	0
Other Inst. Trips	-	2(c)	3(c)	1
Manual Trips	-	-	-	0
Subtotal	8	5	7	3
Test Facilities	1	1	-	0
Elect. Power Supply	-	0	-	0
Total Scrams	9	6	7	3

*Figures for KW represent the month of January, 1970 only.

**Total reflects KW figures for January, 1970 only.

(a) Allocation for Standard, "Reactor Outage Time Reporting Procedure"

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

(c) HSSS trips.

STATISTICS

KW				Total			
Jul-Dec 1968	Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970*	Jul-Dec 1968	Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970**
Preparation)(a)							
7.5	8.5	10.1	4.9	7.6	7.9	10.3	8.4
0.1	0	0	0	0.3	0	0.8	0.7
1.4	1.0	0.3	0	0.7	0.5	1.6	0
0.1	0	1.0	0	0.1	0	1.1	0.3
2.3	5.6	5.0	0.3	4.7	8.8	7.3	17.4
0.6	1.9	1.1	14.0	1.0	1.8	1.4	3.2
1.3	3.0	1.7	0.9	1.6	3.4	2.1	1.3
0	2.7	0.1	0	0	1.4	3.7	0
14.7	0	-	-	7.3	-	-	-
0.3	1.0	1.6	0	0.4	1.2	0.9	10.0
28.3	23.7	20.9	20.1	23.7	25.0	29.2	41.3

-	-	-	0	2	1	1	1
-	-	1	0	-	-	1	1
-	-	-	0	-	-	1	0
-	1	-	0	-	1	-	0
4	6	7	0	10	8	9	0
1	3(c)	2(c)	0	1	5	5	1
-	-	-	0	-	-	-	0
5	10	10	0	13	15	17	3
-	0	-	0	1	1	-	0
-	0	-	0	-	-	-	0
5	10	10	0	14	16	17	3

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	KE			
	Jul-Dec 1968	Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970
<u>OUTAGE TIMES (Hours, Average)</u>				
Charged to Scrams	4.3	7.3	12.0	41.2
Cooling Time	3.1	2.2	2.0	3.7
Startup Preparation	5.1	6.2	5.0	5.7
<u>OTHER STATISTICS</u>				
Charge-Discharge Rate ^(a)	14.4 ^(b)	13.4 ^(b)	11.8 ^{*b)}	11.2
Tubes Replaced - Total	0	1	9	21
Water Leaks:				
Process Tube	0	0	3	1
Van Stone Flange	0	0	2	0
Failures - Nat. U	0	1	0	0
Failures - Enr. U	2	0	5	0
Failures - Other	0	0	1	1
Disch. Expos.: (MWD/T)				
Nat. U - Weapons	674	674	0	590
Nat. U - Nondefense	1,171	1,348	804	-
Enr. U - Weapons	809	632	717	682
Enr. U - Nondefense	1,138	1,134	1,085	-
Special Depleted	1,466	2,004	3,637	-

*Figures for KW represent the month of January, 1970 only.

**Total reflects KW figures for January, 1970 only.

(a) Tubes/hour, average for standard charging of regular fuel as c

(b) Includes charging of E-Q material.

OR STATISTICS

KW				Total			
<u>Jul-Dec</u> <u>1968</u>	<u>Jan-Jun</u> <u>1969</u>	<u>Jul-Dec</u> <u>1969</u>	<u>Jan-Jun</u> <u>1970*</u>	<u>Jul-Dec</u> <u>1968</u>	<u>Jan-Jun</u> <u>1969</u>	<u>Jul-Dec</u> <u>1969</u>	<u>Jan-Jun</u> <u>1970**</u>
1.7	6.7	3.7	0	3.0	7.0	7.8	41.2
5.0	4.2	5.9	5.9	4.0	3.2	3.9	4.8
9.0	8.8	9.9	6.5	7.0	7.5	7.4	6.1
10.1 ^(b)	12.2 ^(b)	11.3 ^(b)	18.2	12.4	12.7	11.6	14.7
2	1	5	0	2	2	14	21
0	1	0	0	0	1	3	1
1	0	1	0	1	0	3	0
0	0	0	0	0	1	0	0
0	0	1	0	2	0	6	0
5	0	7	0	5	0	8	1
709	709	254	506	-	-	-	-
1,190	1,185	1,104	-	-	-	-	-
830	834	722	711	-	-	-	-
1,301	1,232	1,141	-	-	-	-	-
1,454	2,008	3,566	-	-	-	-	-

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efined in the "Reactor Outage Time Reporting Procedure."

KE			
Jul-Dec 1968	Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970

OTHER STATISTICS - contd.

Helium Loss/CF/Day	2,967	2,840	4,152	3,094
Fuel Charged: (At End of Period)				
Tons Nat. U	2.8	3.0	333.8	355.3
Tons Enr. U	360.6	356.9	98.7	86.8
Tube Loadings: (At End of Period)				
Nat. U Elms./Tube	38	38	38	38
Enr. U Elms/Tube (Sh)	46	46	46	46
Enr. U Elms/Tube (Lg)	51	51	51	51
Mixers/Tube	1	1	1	1
Dry Channels	3	3	3	3
Water Tubes	5	7	11	10
Graph Stringers	6	6	6	6
Non-Fuel Productive Tubes:				
In Fringe Blanket	189	189	0	0
Elsewhere (Core)	240	210	30	11
("Buckle")	82	82	0	0
Top & Bottom - Lithium	0	0	83	42

*Figures for KW represent the month of January, 1970 only.
 **Total reflects KW figures for January, 1970 only.

STATISTICS

KW				Total			
<u>Jul-Dec</u> <u>1968</u>	<u>Jan-Jun</u> <u>1969</u>	<u>Jul-Dec</u> <u>1969</u>	<u>Jan-Jun</u> <u>1970*</u>	<u>Jul-Dec</u> <u>1968</u>	<u>Jan-Jun</u> <u>1969</u>	<u>Jul-Dec</u> <u>1969</u>	<u>Jan-Jun</u> <u>1970**</u>
4,877	3,453	3,559	3,646	7,844	6,293	7,711	6,740
1.2	5.5	356.0	-	4.0	8.5	689.8	355.3
359.6	357.4	84.4	-	720.2	714.3	183.1	86.8
38	38	38	-	-	-	-	-
46	46	46	-	-	-	-	-
51	51	51	-	-	-	-	-
1	1	1	-	-	-	-	-
9	10	10	-	12	13	13	3
4	6	9	-	9	13	20	10
8	7	7	-	14	13	13	6
191	187	0	-	380	376	0	0
237	231	0	-	477	441	30	11
77	78	0	-	159	160	0	0
0	0	82	-	0	0	165	42

KE

Jul-Dec 1968	Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970
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WATER PLANT OPERATIONS

River Water Pumped-MMG	47,305	41,880	38,385	38,512
Water Treated-MMG	47,262	41,863	38,373	37,631
Chem. Consumption-ppm:				
Alum	1.081	1.756	0.707	0.812
Bauxite	4.401	4.145	4.353	4.621
Chlorine	0.929	0.869	0.121	0.829
Sulfuric Acid	25.160	20.372	22.424	21.221
Filter Conditioner	0.014	0.025	0.239	0.293
Process Water-MMG	44,144	39,050	35,074	34,281
Proc. Water-GPM, Normal	197,500	189,000	190,800	199,900
Process Water Analysis:				
Turbidity-ppm	.009	.013	.009	.009
pH	6.52	6.68	6.64	6.72
Cl Residual-ppm	0.20	0.16	0.09	0.09
Dichromate-ppm	0.50	0.50	0.50	0.50

STEAM PLANT OPERATIONS

Generation-MMM Lbs.	146.0	349.6	143.5	137.8
Gener.-Lbs/Hr., Max.	57,700	46,800	60,300	49,550
-Lbs/Hr., Avg	33,400	30,000	32,700	31,461
Lbs. Steam/Gal. Oil	100.1	97.6	97.4	95.7

*Figures for KW represent the months of January and February, 1970

**Total reflects KW figures for January and February, 1970 only.

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STATISTICS

KW				Total			
Jul-Dec 1968	Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970*	Jul-Dec 1968	Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970**
42,239	43,629	46,339	10,221	89,544	85,509	84,724	48,733
42,239	43,629	46,339	10,221	89,501	85,492	84,712	47,852
1.015	1.224	0.973	2.933	1.058	1.500	0.850	1.882
3.922	4.311	3.471	4.985	4.129	4.195	3.879	4.770
1.254	0.901	0.124	0.470	1.092	0.886	0.123	0.650
25.373	22.127	21.633	18.307	25.237	21.220	21.999	19.764
0.008	0.022	0.178	0.278	0.010	0.024	0.207	0.285
39,073	40,140	43,283	9,698	83,217	79,190	78,357	43,979
197,200	190,600	195,800	158,200	394,700	379,600	386,600	358,100
.007	.008	.005	.005	--	--	--	--
6.62	6.68	6.69	6.84	6.57	6.68	6.67	6.78
0.20	0.16	0.09	0.09	--	--	--	--
0.90	0.90	1.12	0.50	0.70	0.70	0.81	0.50
127.2	365.3	149.1	47.3	273.2	714.9	292.6	185.1
59,500	59,900	70,300	62,500	117,200	106,700	130,600	112,050
29,100	32,800	33,600	32,310	62,500	62,800	66,300	63,771
99.9	103.3	102.3	97.3	100.0	100.4	99.9	96.5

only.

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REACTOR AVAILABILITY
PERCENT OF TIME REACTORS OPERATED PLUS
SCHEDULED SHUTDOWN TIME
FY 1970

**DATE
FILMED**

7 / 1 / 93