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**SINGLE PASS REACTORS - OPERATIONS DIVISION
SEMIANNUAL SUMMARY REPORT
PERIOD ENDING DECEMBER 31, 1970**

11

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SINGLE PASS REACTORS - OPERATIONS DIVISION
SEMIANNUAL SUMMARY REPORT
PERIOD ENDING DECEMBER 31, 1970

By

T. Prudich

January 20, 1971

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SINGLE PASS REACTORS - OPERATIONS DIVISION
SEMIANNUAL SUMMARY REPORT
PERIOD ENDING DECEMBER 31, 1970

INTRODUCTION

In this semiannual issue⁽¹⁾ the single pass reactor and water plant data are shown for the six-month period July through December, 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 CY-1969 through CY-1970, are summarized on pages 4 and 5.

The efficiency and production of the Single Pass KE Reactor during the six-month period July through December, 1970, have nearly equaled the forecast even though the reactor was down some 13 days longer than scheduled in August and early September, due to BPA power condition and river temperature.

Time Operated Efficiency

Production KMWDs

Forecast - 70.6%

501.0

Actual - 70.3%

474.3

Actual TOE = 99.6% of Forecast

Actual Production = 94.7% of Forecast

T. Prudich, Manager
Production Planning

TP:MAT:bm

⁽¹⁾ Previous semiannual reports issued: DUN-850 through DUN-850 5,
DUN-5566 through DUN-5566 3.

Single Pass Reactor
Statistical Summary

	<u>CY-1969</u>	<u>CY-1970</u>
<u>Production (Input)</u>		
<u>Plutonium - KMWDs</u>		
KE	928.5	870.6
KW	1,064.0	94.6*
Total	1,992.5	965.2
<u>Plutonium - Kgs</u>		
KE	695.2	785.6
KW	810.7	81.1*
Total	1,505.9	866.7
<u>Uranium (U-233) - Grams</u>		
KE	144,233	6,697
KW	129,131	824*
Total	273,364	7,521
<u>Power Level</u>		
<u>Maximum - Average - MW</u>		
KE	3,938	3,788
KW	3,945	3,978*
<u>Average Operating - MW</u>		
KE	3,729	3,762
KW	3,752	3,946*
<u>Time Operating Efficiency - (TOE - %)</u>		
KE	68.1	63.7
KW	77.7	77.4*
<u>Process Tubes Replaced</u>		
KE	10	22
KW	6	0*
Total	16	22
<u>Process Tube Leaks (Incl. V.S.)</u>		
KE	5	2
KW	2	0*
Total	7	2

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

Single Pass Reactor
Statistical Summary - contd.

	<u>CY-1969</u>			<u>CY-1970</u>		
<u>Helium Usage - CFD</u>						
KE	3,496			3,597		
KW	3,506			3,646*		
	<u>KE</u>	<u>KW</u>	<u>Total</u>	<u>KE</u>	<u>KW*</u>	<u>Total</u>
<u>Reactor Outages - Number</u>						
Scheduled	7	8	15	9	1	10
Unscheduled	13	6	19	6	0	6
Scrams	13	20	33	5	0	5
<u>Fuel Element Failures</u>						
Natural U	1	0	1	0	0	0
Enriched Uranium	5	1	6	0	0	0
Other	1	7	8	1	0	1
	<u>KE</u>	<u>KW</u>	<u>Avg</u>	<u>KE</u>	<u>KW*</u>	<u>Avg**</u>
<u>Outage Work - % Time Allocation</u>						
Charge-Discharge	9.0	9.3	9.1	11.5	4.9	12.6
Fuel Element Failure Removal	0.7	0	0.4	0.4	-	0.3
Tube Leak (Incl. V.S.)	1.5	0.6	1.1	0.3	-	0.2
Tube Replacement	0.5	0.5	0.5	0.4	0.8	0.9
Other Maintenance	10.8	5.3	8.0	12.2	2.0	10.9
Standard Check (Incl. Equip. Maint. Std.)	1.7	1.5	1.6	1.4	14.1	11.9
Production Test	3.1	2.4	2.7	0.9	0.9	0.9
Project Work	3.8	1.4	2.6	-	-	-
Flow Stoppage	-	-	-	-	-	-
Other	0.8	1.3	1.1	9.2	-	7.1
Total	31.9	22.3	27.1	36.3	22.7	44.8

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

**Weighted average.

	KE			
	Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970	Jul-Dec 1970
<u>PRODUCTION (Input Basis)</u>				
KMWD - In Nat. U	3.5	40.1	297.7	370.0
KMWD - In Enr. U	508.7	376.2	97.5	104.3
KMWD - Total	512.2	416.3	395.2	474.3
KMWD - % of Forecast	100.7	75.1	100.8	94.7
Pu (kg) - In Nat. U	3.3	39.8	272.0	350.3
Pu (kg) - In Enr. U	372.6	279.5	73.0	79.6
Pu (kg) - Total	375.9	319.3	345.0	429.9
Conv. Ratio - In Nat. U	0.943 ^{a)}	0.992 ^{a)}	0.914	0.947
Conv. Ratio - In Enr. U	0.732	0.743	0.749	0.763
Uranium 233 - Grams	83,020	61,213	6,173	524
<u>OPERATING EFFECTIVENESS^{b)}</u>				
Power Level, Max - MW	3,972	3,904	4,000	3,708
Power Level, Avg - MW	3,836	3,623	3,869	3,666
Level Efficiency - %	96.6	92.8	96.7	98.8
Time Oper. Effic. - %	73.8	62.5	56.6	70.3
Production Effic.	71.3	58.0	54.7	64.5
Effective Cent. Tubes	2,229	2,253	2,250	2,170
Non-Eq. Loss/Startup	0.39	0.35	0.39	0.48

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

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

a) Special depleted included.

b) 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.

TATISTICS

KW				Total			
Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970*	Jul-Dec 1970	Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970**	Jul-Dec 1970
2.8	179.3	73.0	-	6.3	219.4	370.7	370.0
520.9	361.0	21.6	-	1,029.6	737.2	119.1	104.3
523.7	540.3	94.6	-	1,035.9	956.6	489.8	474.3
92.6	94.4	102.1	-	96.4	84.9	101.0	94.7
2.8	166.9	64.9	-	6.1	206.7	336.9	350.3
374.7	266.3	15.3	-	747.3	545.8	88.3	79.6
377.5	433.2	80.2	-	753.4	752.5	425.2	429.9
1.000	0.931	0.889	-	0.968	0.942	0.909	0.947
0.719	0.738	0.708	-	0.726	0.740	0.741	0.763
79,730	49,401	824	-	162,750	110,614	6,997	524
4,013	3,877	4,000	-	7,985	7,781	8,000	3,708
3,794	3,711	3,946	-	7,630	7,334	7,815	3,666
94.5	95.7	98.6	-	95.6	94.3	97.7	98.8
76.3	79.1	77.4	-	75.0	70.8	60.2	70.3
72.1	75.7	76.3	-	71.7	66.8	65.5	64.5
2,256	2,186	2,210	-	-	-	-	2,170
0.32	0.31	0.27	-	0.35	0.33	0.33	0.48

- 6 -

DUN-5566 4

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

*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			
Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970*	Jul-Dec 1970	Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970**	Jul-Dec 1970
3	4	1	-	5	8	5	5
-	-	-	-	-	-	-	-
-	1	-	-	-	6	1	-
1	-	-	-	1	3	-	-
1	-	-	-	2	-	-	-
-	-	-	-	1	-	1	-
-	-	-	-	-	-	-	-
-	-	-	-	-	1	-	-
-	-	-	-	1	1	-	-
-	-	-	-	-	-	-	1
5	7	-	-	8	10	1	4
4	2	-	-	6	6	-	-
1	-	-	-	1	-	-	-
-	-	-	-	-	-	-	-
1	3	-	-	1	4	1	-
-	-	-	-	-	1	-	-
-	-	-	-	-	-	-	-
-	1	-	-	-	1	-	-
16	18	1	-	26	41	9	10
3	4	1	-	6	8	6	5
2	4	-	-	3	16	3	1
10	10	-	-	16	17	2	4

DUN-5566 4

REACTOR

	KE			
	Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970	Jul-Dec 1970
<u>OUTAGE WORK</u> (% Time Allocation, Including Cooling Time and Startups)				
Charge-Discharge	7.3	10.6	9.0	14.0
Rupture Removal	0	1.5	0.7	-
Tube Leaks (Incl. Van S.)	0	2.9	0	0.6
Tube Replacement	0	1.1	0.3	0.3
Other Maintenance	12.1	9.6	20.1	4.5
Standard Check	1.7	1.8	1.3	1.6
Production Test	3.8	2.4	1.4	0.4
Project Work	0	7.4	0	-
Flow Stoppage	-	-	-	-
Other	1.3	0.2	10.0	8.3
Total	26.2	37.5	42.8	29.7

SCRAMS (Number, by Cause)

Reactor Operations: ^{b)}				
Equip. Failure - 105	1	1	1	1
" " - 165	-	-	1	-
Improp. Proced. - 105	-	1	0	-
" " - 165	-	-	0	-
Unexplained Trips	2	2 ^{c)}	0	3
Other Inst. Trips	2 ^{c)}	3 ^{c)}	1	-
Manual Trips	-	-	0	-
Subtotal	5	7	3	4
Test Facilities	1	-	0	0
Elect. Power Supply	0	-	0	0
Total Scrams	6	7	3	4

*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			
Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970*	Jul-Dec 1970	Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970**	Jul-Dec 1970
Preparation)a)							
8.5	10.1	4.9	-	7.9	10.3	8.4	14.0
0	0	0	-	0	0.8	0.7	-
1.0	0.3	0	-	0.5	1.6	0	0.6
0	1.0	0	-	0	1.1	0.3	0.3
5.6	5.0	0.3	-	8.8	7.3	17.4	4.5
1.9	1.1	14.0	-	1.8	1.4	3.2	1.6
3.0	1.7	0.9	-	3.4	2.1	1.3	0.4
2.7	0.1	0	-	1.4	3.7	0	-
0	-	-	-	-	-	-	-
1.0	1.6	0	-	1.2	0.9	10.0	8.3
23.7	20.9	20.1	-	25.0	29.2	41.3	29.7

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

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REACTOR

	KE			
	Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970	Jul-Dec 1970
<u>OUTAGE TIMES (Hours, Average)</u>				
Charged to Scrams	7.3	12.0	41.2	19.5
Cooling Time	2.2	2.0	3.7	2.7
Startup Preparation	6.2	5.0	5.7	7.6
<u>OTHER STATISTICS</u>				
Charge-Discharge Rate ^{a)}	13.4 ^{b)}	11.8 ^{b)}	11.2	13.4
Tubes Replaced - Total	1	9	21	1
Water Leaks:				
Process Tube	0	3	1	0
Van Stone Flange	0	2	0	1
Failures - Nat. U	1	0	0	0
Failures - Enr. U	0	5	0	0
Failures - Other	0	1	1	0
Disch. Expos.: (MWD/T)				
Nat. U - Weapons	674	0	590	420
Nat. U - Nondefense	1,348	804	-	-
Enr. U - Weapons	632	717	682	520
Enr. U - Nondefense	1,134	1,085	-	-
Special Depleted	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 de

b) Includes charging of E-Q material.

STATISTICS

KW				Total			
Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970*	Jul-Dec 1970	Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970**	Jul-Dec 1970
6.7	3.7	0	-	7.0	7.8	41.2	19.5
4.2	5.9	5.9	-	3.2	3.9	4.8	2.7
8.8	9.9	6.5	-	7.5	7.4	6.1	7.6
12.2 ^{b)}	11.3 ^{b)}	18.2	-	12.7	11.6	14.7	13.4
1	5	0	-	2	14	21	1
1	0	0	-	1	3	1	0
0	1	0	-	0	3	0	1
0	0	0	-	1	0	0	0
0	1	0	-	0	6	0	0
0	7	0	-	0	8	1	0
709	254	506	-	-	-	-	-
1,185	1,104	-	-	-	-	-	-
834	722	711	-	-	-	-	-
1,232	1,141	-	-	-	-	-	-
2,008	3,566	-	-	-	-	-	-

defined in the "Reactor Outage Time Reporting Procedure."

KE

Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970	Jul-Dec 1970
-----------------	-----------------	-----------------	-----------------

OTHER STATISTICS - contd.

Helium Loss/CF/Day	2,840	4,150	3,094	4,099
Fuel Charged: (At End of Period)				
Tons Nat. U	3.0	333.8	355.3	366.4
Tons Enr. U	356.9	98.7	86.8	80.3
Tube Loadings: (At End of Period)				
Nat. U Elems./Tube	38	38	38	38
Enr. U Elems/Tube (Sh)	46	46	46	46
Enr. U Elems/Tube (Lg)	51	51	51	51
Mixers/Tube	1	1	1	1
Dry Channels	3	3	3	4
Water Tubes	7	11	10	10
Graph Stringers	6	6	6	6
Non-Fuel Productive Tubes:				
In Fringe Blanket	189	0	0	0
Elsewhere (Core)	210	30	11	5
("Buckle")	82	0	0	0
Top & Bottom - Lithium	0	83	42	42

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

STATISTICS

KW				Total			
Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970*	Jul-Dec 1970	Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970**	Jul-Dec 1970
3,453	3,559	3,646	-	6,293	7,711	6,740	4,099
5.5	356.0	-	-	8.5	689.8	355.3	366.4
357.4	84.4	-	-	714.3	183.1	86.8	80.3
38	38	-	-	-	-	-	-
46	46	-	-	-	-	-	-
51	51	-	-	-	-	-	-
1	1	-	-	-	-	-	-
10	10	-	-	13	13	3	4
6	9	-	-	13	20	10	10
7	7	-	-	13	13	6	6
187	0	-	-	376	0	0	0
231	0	-	-	441	30	11	5
78	0	-	-	160	0	0	0
0	82	-	-	0	165	42	42

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

WATER PLANT OPERATIONS

River Water Pumped-MMG	41,880	38,385	38,512	43,778
Water Treated-MMG	41,863	38,373	37,631	43,778
Chem. Consumption-ppm:				
Alum	1.756	0.707	0.812	0.911
Bauxite	4.145	4.353	4.621	4.459
Chlorine	0.869	0.121	0.829	0.903
Sulfuric Acid	20.372	22.424	21.221	22.760
Filter Conditioner	0.025	0.239	0.293	0.268
Process Water-MMG	39,050	35,074	34,281	39,502
Proc. Water-GPM, Normal	189,000	190,800	199,900	200,950
Proc. Water Analysis:				
Turbidity-ppm	.013	.009	.009	.005
pH	6.68	6.64	6.72	6.72
Cl Residual-ppm	0.16	0.09	0.09	0.14
Dichromate-ppm	0.50	0.50	0.50	0.50

STEAM PLANT OPERATIONS

Generation-MMM Lbs.	349.6	143.5	137.8	155.9
Gener.-Lbs/Hr., Max.	46,800	60,300	49,550	60,000
"-Lbs/Hr., Avg	30,000	32,700	31,461	3,510
Lbs. Steam/Gal. Oil	97.6	97.4	95.7	98.4

*Figures for KW represent the months of January and February, 1
 **Total reflects KW figures for January and February, 1970 only.

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STATISTICS

KW				Total			
Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970*	Jul-Dec 1970	Jan-Jun 1969	Jul-Dec 1969	Jan-Jun 1970**	Jul-Dec 1970
43,629	46,339	10,221	-	85,509	84,724	48,733	43,778
43,629	46,339	10,221	-	85,492	84,712	47,852	43,778
1.224	0.973	2.933	-	1.500	0.850	1.882	0.911
4.311	3.471	4.985	-	4.195	3.879	4.770	4.459
0.901	0.124	0.470	-	0.886	0.123	0.650	0.903
22.127	21.633	18.307	-	21.220	21.999	19.764	22.760
0.022	0.178	0.278	-	0.024	0.207	0.285	0.268
40,140	43,283	9,698	-	79,190	78,357	43,979	39,502
190,600	195,800	158,200	-	379,600	386,600	358,100	200,950
.008	.005	.005	-	-	-	-	-
6.68	6.69	6.84	-	6.68	6.67	6.78	6.72
0.16	0.09	0.09	-	-	-	-	-
0.90	1.12	0.50	-	0.70	0.81	0.50	0.50
365.3	149.1	47.3	-	714.9	292.6	185.1	155.9
59,900	70,300	62,500	-	106,700	130,600	112,050	60,000
32,800	33,600	32,310	-	62,800	66,300	63,771	3,510
103.3	102.3	97.3	-	100.4	99.9	96.5	98.4

70 only.

DECLASSIFIED

- 11 -

DUN-5566 4

REACTOR AVAILABILITY

PERCENT OF TIME REACTORS OPERATED PLUS SCHEDULED
SHUTDOWN TIME - CY 1970

**DATE
FILMED**

6 / 28 / 93