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R. Nilson

July 10, 1964

NEPTUNIUM-237 PRODUCTION FORECASTS - IPD
1964-73

R. NILSON

HANFORD ATOMIC PRODUCTS OPERATION
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NEPTUNIUM-237 PRODUCTION FORECASTS - IPD
1964-73

R. NILSON

Neptunium-237 production has been calculated according to the equations documented in Reference 1 for use in 1964 AEC study cases. The assumptions made in the forecasts are as follows:

1. Only the 947 stream is recycled.
2. The blend enrichment for the recycle material is 1.2 per cent for FY 64 and 65. For FY 66-73, a blend enrichment of 1.4 per cent is assumed which is a better value according to the optimization model of C. W. Showalter².
3. The 947 stream recycle time is two years.
4. In cases A and B where the 947 stream volume is materially increased, virgin 947 material is introduced to make up the material balance.
5. The U-236 content of the blend material is 66 ppm².
6. The U-236 input level in the 947 stream for the input of FY 64 is 200 ppm¹.
7. Separations recovery is 85 per cent for FY 64-65 and 90 per cent thereafter.

The material throughput data are given in Table I. These values are consistent with those being assumed for the AEC study cases³. The Kgs of Np-237 by fiscal year are given in Table II. It must be remembered that these forecasts are based on a particular set of idealized assumptions, and the schedules represent IPD output only. The Hanford output schedule must factor in cooling and separation times. For a practical comparison the Hanford Np-237 output was 17.4 Kg in FY 64.

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1. R. Nilson. Np-237 Production in the Hanford IPD Reactors, HW-72075. May 25, 1964. ()
 2. F. P. Baranowski. Report on Pu-238 Production, HAN-88354. May 7, 1964. ()
 3. L. W. Lang and J. W. McCurry. 1964 Production Studies IPD Production Data, HW-82946. June 25, 1964. (). The throughput assumptions are those of the General Electric Company. They do not reflect modifications by the AEC for the small reactor cases.

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TABLE I

CASE CONDITIONS

<u>Case 1 and 3 (Pu only from IPD)</u>		<u>FY 1964</u>		<u>FY 1965</u>		<u>FY 1966-73</u>	
		<u>Tons</u>	<u>Mwd/t</u>	<u>Tons</u>	<u>Mwd/t</u>	<u>Tons</u>	<u>Mwd/t</u>
Nat. U.	K's	2546	792	3047	650	3634	630
	C	720	668	721	625	767	600
	Small	2716	676	2056	600	1556	600
Enr. U.	K's	386	846	397	825	358	870
	C	164	845	176	800	179	810
	Small	913	885	1055	900	210	790
<u>Case 2 (Same as Case 1 except for FY 1966 and 1967)</u>		<u>FY 1966</u>		<u>FY 1967</u>			
		<u>Tons</u>	<u>Mwd/t</u>	<u>Tons</u>	<u>Mwd/t</u>		
Nat. U.	K's	0	630	1622	630		
	C	767	600	767	600		
	Small	1490	600	1490	600		
Enr. U.	K's	3046	870	1854	870		
	C	179	810	179	810		
	Small	200	790	200	790		
<u>Case A (Part IPD on E-N)</u>		<u>FY 1966-73^a</u>					
		<u>Tons</u>		<u>Mwd/t</u>			
Nat. U.	K's	2433		630			
	C	0		0			
	Small	0		0			
Enr. U.	K's	1258		870			
	C	767		810			
	Small	1426		790			
<u>Case B (All IPD on E-N)</u>		<u>FY 1966-73^a</u>					
		<u>Tons</u>		<u>Mwd/t</u>			
Nat. U.	K's	0		0			
	C	0		0			
	Small	0		0			
Enr. U.	K's	3046		870			
	C	767		810			
	Small	1426		790			

^a FY 1964-65 same as Case 1.

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TABLE II

Np-237 FORECASTS - IPD REACTORS^a

		Kgs Produced by Fiscal Year										Total
Case 1 and 3		64	65	66	67	68	69	70	71	72	73	
Nat. U.	K's	6.1	5.8	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	68.7
	C	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	13.1
	Small	5.2	3.4	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	31.0
	Total	12.7	10.5	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	112.8
Enr. U.	K's	1.6	1.7	1.8	1.9	2.0	2.0	2.1	2.1	2.1	2.2	19.5
	C	0.6	0.7	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	8.1
	Small	3.6	4.5	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	15.8
	Total	5.8	6.9	3.5	3.6	3.7	3.8	4.0	4.0	4.0	4.1	43.4
Grand Total		18.5	17.4	14.7	14.8	14.9	15.0	15.2	15.2	15.2	15.3	156.2
Case 2												
Nat. U.	K's	6.1	5.8	0	3.2	7.1	7.1	7.1	7.1	7.1	7.1	67.9
	C	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	13.0
	Small	5.2	3.4	2.7	2.6	2.8	2.8	2.8	2.8	2.8	2.8	29.4
	Total	12.7	10.5	4.0	7.1	11.2	11.2	11.2	11.2	11.2	11.2	110.3
Enr. U.	K's	1.6	1.7	11.8	8.6	2.0	2.0	2.1	2.1	2.1	2.2	36.2
	C	0.6	0.7	0.6	0.7	0.8	0.8	0.9	0.9	0.9	0.9	7.8
	Small	3.6	4.5	0.6	0.8	0.9	1.0	1.0	1.0	1.0	1.0	15.4
	Total	5.8	6.9	13.0	10.1	3.7	3.8	4.0	4.0	4.0	4.1	59.4
Grand Total		18.5	17.4	17.0	17.2	14.9	15.0	15.2	15.2	15.2	15.3	160.9
Case A												
Nat. U.	K's	6.1	5.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	50.3
	C	1.4	1.3	0	0	0	0	0	0	0	0	2.7
	Small	5.2	3.4	0	0	0	0	0	0	0	0	8.6
	Total	12.7	10.5	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	61.6
Enr. U.	K's	1.6	1.7	4.9	5.1	5.9	6.0	6.6	6.7	7.0	7.1	52.6
	C	0.6	0.7	2.6	2.7	3.0	3.1	3.3	3.5	3.5	3.6	26.6
	Small	3.6	4.5	4.6	4.8	5.6	5.6	6.0	6.1	6.4	6.4	53.6
	Total	5.8	6.9	12.1	12.6	14.5	14.7	15.9	16.3	16.9	17.1	132.8
Grand Total		18.5	17.4	16.9	17.4	19.3	19.5	20.7	21.1	21.7	21.9	194.4
Case B												
Nat. U.	K's	6.1	5.8	0	0	0	0	0	0	0	0	11.9
	C	1.4	1.3	0	0	0	0	0	0	0	0	2.7
	Small	5.2	3.4	0	0	0	0	0	0	0	0	8.6
	Total	12.7	10.5	0	0	0	0	0	0	0	0	23.2
Enr. U.	K's	1.6	1.7	10.9	11.3	13.6	13.9	15.4	15.6	16.6	16.8	117.4
	C	0.6	0.7	2.4	2.5	2.9	3.0	3.2	3.2	3.5	3.5	25.5
	Small	3.6	4.5	4.3	4.4	5.2	5.3	5.8	5.9	6.2	6.3	51.5
	Total	5.8	6.9	17.6	18.2	21.7	22.2	24.4	24.7	26.3	26.6	194.4
Grand Total		18.5	17.4	17.6	18.2	22.4	22.4	24.4	24.7	26.3	26.6	217.6

^a All quantities rounded off to nearest 0.1 Kg

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