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OUTLINE

N-REACTOR CAPABILITY REPORT

R. L. Dickeman

September 1, 1964

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OUTLINE

N-REACTOR CAPABILITY REPORT

ABSTRACT

The flexibility of N-Reactor will be demonstrated by comparing (in tabular form) the basic 4000 Mw Pu-only, weapons grade case with a 4800 Mw co-product, weapons grade mode including production of Po-210 and Pu-238. The competitive position of N-Reactor in the AEC complex will be illustrated in a table summarizing 1964 production studies.

I. BASIC N-REACTOR

The capabilities of N-Reactor operating in the plutonium-only mode will be enumerated, with the discussion centered around three plutonium qualities (Pu-240 content) of prime interest to the AEC, namely:

1. weapons grade, 2. blendable, 3. reactor fuel grade.

II. N-REACTOR's POTENTIAL FOR IMPROVEMENT

A. Improvement through Power Increase

Considerable attention will be given to N-Reactor's power level "stretch capability" of up to 20 percent, with negligible capital costs and resultant improvement in unit product cost. An initial 5 percent power level increase would be programmed to occur July 1966, with follow-on increases of 5 percent coming at 6-month intervals, achieving a 120 percent power level by January 1968.

B. Improvement Through Added Products

1. Tritium

Adding Tritium as a major product results in increased production and decreased unit cost.

2. Polonium-210 and Plutonium-238

N-Reactor can produce Po-210 and Pu-238 in significant quantities and at costs measurably below cost projections from other sources.

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III. N-REACTOR IN THE AEC COMPLEX

The results of the latest production studies for all reactors in the AEC complex will be compared, emphasizing N-Reactor's competitive position.

IV. POWER-ONLY OPERATION OF N-REACTOR

The benefits accruing to the AEC and the US taxpayer resulting from dual purpose rather than power-only operation will be highlighted.

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N-REACTOR FLEXIBILITY

	BASIC REACTOR	IMPROVED REACTOR
POWER LEVEL	4000 Mw	4800 Mw
EXPOSURE MWD/T	840	1700
PLUTONIUM kg	1052	886
Net Unit Cost		
TRITIUM kg		504
Net Unit Cost		
NEPTUNIUM kg	16	37
Net Unit Cost		
POLONIUM-210		500
Net Unit Cost		
PLUTONIUM-238		
Net Unit Cost		
STEAM (\$ x 1000)	6700	6700

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BASIC N-REACTOR
4000 Mw POWER LEVEL

EXPOSURE MWD/T	840	1300	2100
PLUTONIUM kg	1052	1000	920
Pu-240 (%)	6	8.6	12
Net Unit Cost			
NEPTUNIUM kg	16	20	23
Net Unit Cost			
STEAM VALUE (\$ x 1000)	6700	6700	6700

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IMPROVED N-REACTOR

4800 Mw POWER LEVEL

EXPOSURE MWD/T	840	1300	2100
PLUTONIUM kg	1242	1160	1080
Pu-240 (%)	6	9	12
Net Unit Cost			
NEPTUNIUM kg	19	24	28
Net Unit Cost			
STEAM VALUE (\$ x 1000)	6700	6700	6700

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ADDING PRODUCTS

TRITIUM

4800 Mw POWER LEVEL

EXPOSURE MWD/T	1700	2100
TRITIUM kg (Plutonium Equiv.)	504	504
Net Unit Cost		
PLUTONIUM kg	905	886
Pu-240 (%)	6	6.9
Net Unit Cost		
NEPTUNIUM kg	30	37
Net Unit Cost		
STEAM VALUE (\$ x 1000)	6700	6700

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ADDING PRODUCTS

PLUTONIUM-238 and POLONIUM-210

4800 Mw POWER LEVEL

EXPOSURE MWD/T	1700	2100
PLUTONIUM-238 kg		
Net Unit Cost		
POLONIUM-210 kg	500	500
Net Unit Cost		
PLUTONIUM-239 kg	905	886
Pu-240 (%)	6	6.9
Net Unit Cost		
TRITIUM kg (Pu Equiv.)	504	504
Net Unit Cost		
NEPTUNIUM kg	30	37
Net Unit Cost		
STEAM (\$ x 1000)	6700	6700

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