AEC
RESEARCH
and
DEVELOPMENT
REPORT

BNWL-106
71-

MINIMIZED FUEL CYCLE COST
FOR A SIMULATED
HEAVY WATER REACTOR
PART I

April, 1965

K R WISE 32629 328 SEP 25 1967

PACIFIC NORTHWEST LABORATORY operated by BATTELLE MEMORIAL INSTITUTE

LEGAL NOTICE

This report was prepared as an account of Government sponsored work. Neither the United States, nor the Commission, nor any person acting on behalf of the Commission:

A. Makes any warranty or representation, expressed or implied, with respect to the accuracy, completeness, or usefulness of the information contained in this report, or that the use of any information, apparatus, method, or process disclosed in this report may not infringe privately owned rights; or

B. Assumes any liabilities with respect to the use of, or for damages resulting from the use of any information, apparatus, method, or process disclosed in this report.

As used in the above, "person acting on behalf of the Commission" includes any employee or contractor of the Commission, or employee of such contractor, to the extent that such employee or contractor of the Commission, or employee of such contractor prepares, disseminates, or provides access to, any information pursuant to his employment or contract with the Commission, or his employment with such contractor.

PACIFIC NORTHWEST LABORATORY

RICHLAND, WASHINGTON

operated by

BATTELLE MEMORIAL INSTITUTE

for the

UNITED STATES ATOMIC ENERGY COMMISSION UNDER CONTRACT AT(45-1)-1830

PRINTED BY/ FOR THE U. S. ATOMIC ENERGY COMMISSION

BNWL-106

MINIMIZED FUEL CYCLE COST FOR A SIMULATED HEAVY WATER REACTOR

PART I

By

D. E. Deonigi
P. A. Horton
A. F. McConiga

FIRST UNRESTRICTED
DISTRIBUTION MADE

AUG 24 '65

Fuel Cycle Analysis
Physics and Instruments Department
Pacific Northwest Laboratories

April 1965

Pacific Northwest Laboratory
Richland, Washington

3 3679 00060 1536

MINIMIZED FUEL CYCLE COST FOR A SIMULATED HEAVY WATER REACTOR

PART I

INTRODUCTION

The fuel cycle costs of power reactors vary with the reactor type and the applicable economic conditions. For each reactor type and each economic condition, an operating situation exists which will yield the lowest fuel cycle cost (minimum fuel cost). Before a reactor is built, its fuel cycle design is optimized for the projected economic situation which may exist. This would include the cost of fuel fabrication, the interest rates on both fuel and other working capital, the cost of fuel reprocessing, fuel shipping costs, and the cost of nuclear materials such as uranium and bred fuels. The data presented in this report assumes that the reactor type being considered has been constructed and that the lattice spacing, or fuel-to-moderator ratio, will remain fixed. Under these conditions, the minimum fuel costs were calculated over a series of changing economic conditions which include the variation of cost parameters as shown in Table I. The description of the reactor simulated in this study is described in, Heavy Water Moderated Power Reactor Cooled by D₂O or H₂O, DPW-64-135. The complete burnup data and detailed economic analysis of this fuel cycle are contained in Part II of this report.

The minimized fuel costs were determined by analyzing the fuel cycle cost for each of eight reactivity limited fuel exposures. The fuel cost data were then accurately curve fitted using the MINIMIZER code, HW-71813, which is a subroutine to the QUICK fuel cycle economics code,

TABLE I
VARIATION OF ECONOMIC PARAMETERS

Parameter	Parameter Values				
Fuel Fabrication Cost, \$/kg U	30.00	60.00	90.00	120.00	
Fuel Reprocessing Cost, \$/kg U	10.00	20.00	40.00	60.00	
Uranium Cascade Feed Cost, \$/kg U (\$/lb U_3O_8)	13.10 (4.00)	17.30 (5.60)	23.50 (8.00)	32.00 (11.63)	40.00 (14.35)
Separative Duty Cost, \$/kg U	15.00	30.00	45.00	60.00	
Working Capital Interest Rate, %/yr	6.00	8.00	10.00	12.00	

HW-71812. Results of these curves were searched for the minimum cost for each economic condition and reported along with the required enrichment and resulting fuel exposure. The minimum costs determined by this method represent the "mathematical minimum" which may not exactly represent the situation in a given power reactor because corrections to the costs are not made for the incremental cost of the control system requirements, the cost of containment, nor the cost of coolant and moderator. It is also probable that a reactor operator would be interested in operating at an exposure slightly lower than the mathematically optimum exposure which would cost very little in terms of mills/kW_{he}, but may result in not requiring as costly a fuel element because the optimum exposure may be reduced appreciably. Also, reactivity changes and heat transfer requirement may be reduced. However, longer exposure will result in reduced down time. These data are tabulated in Part II as the backup minimum cost where the backup cost increment is plus 0.1 mill/kW_{he}.

Figure 1 shows a typical total fuel cost curve along with each of the components of total fuel cost. On the total fuel cost curve, both the mathematical and backup minimum are pointed out. It can be seen also from Figure 1 that as the exposure is extended, the unit processing costs which include fuel fabrication, separations, and out-of-reactor interest charges tend to decrease with exposure, whereas working capital and burnup costs increase, forming a minimum.

In general, the following effects take place (1) when interest rates are increased on the fuel and working capital, which were set equal in this report, the optimum exposure decreases; (2) if fabrication or separations costs increase, the desired exposure will also increase to

TYPICAL FUEL COST DATA AS A FUNCTION OF FUEL EXPOSURE

FIGURE 1

write off the cost of fabrication and reprocessing. It should be noted that because fabrication occurs long before revenue is received in the fuel cycle and because separations occur long after revenue has been acquired, the unit cost of fabrication plus interest on fabrication yields a larger mill/kWh_e change per dollar than does separations which are allowed to discount the interest. As the cost of feed material or the cost of separative duty increases, the exposures are reduced to minimize the average fuel investment.

When the economic parameters considered in this report deviate strongly from economic parameters for which this reactor was designed, the cost in general may become very high because the reactor design is not reoptimized. A reactor operator, operating under a condition where the cost of fuel has increased appreciably would be driven to a higher specific power to reduce the effect of these higher fuel charges. Similarly, it may be possible to modify the fuel-to-moderator ratio to adjust the fuel performance by adjusting the rod spacing or reducing the fuel density. Some of these considerations will be examined in a future study.

There are two other companion reports which analyze the pressurized water reactor and the boiling water reactor under the same ground rules as used here.

TABLE OF CONTENTS

<u>Page Number</u>	<u>Feed Cost, \$/kg</u>	<u>Separative Duty, \$/kg</u>	<u>Working Capital, \$/yr</u>
1	13.10	15	6
2	17.30	15	6
3	23.50	15	6
4	32.00	15	6
5	40.00	15	6
6	13.10	15	8
7	17.30	15	8
8	23.50	15	8
9	32.00	15	8
10	40.00	15	8
11	13.10	15	10
12	17.30	15	10
13	23.50	15	10
14	32.00	15	10
15	40.00	15	10
16	13.10	15	12
17	17.30	15	12
18	23.50	15	12
19	32.00	15	12
20	40.00	15	12
21	13.10	30	6
22	17.30	30	6
23	23.50	30	6
24	32.00	30	6
25	40.00	30	6
26	13.10	30	8
27	17.30	30	8
28	23.50	30	8
29	32.00	30	8
30	40.00	30	8

TABLE OF CONTENTS (Continued)

<u>Page Number</u>	<u>Feed Cost, \$/kg</u>	<u>Separative Duty, \$/kg</u>	<u>Working Capital, %/yr</u>
31	13.10	30	10
32	17.30	30	10
33	23.50	30	10
34	32.00	30	10
35	40.00	30	10
36	13.10	30	12
37	17.30	30	12
38	23.50	30	12
39	32.00	30	12
40	40.00	30	12
41	13.10	45	6
42	17.30	45	6
43	23.50	45	6
44	32.00	45	6
45	40.00	45	6
46	13.10	45	8
47	17.30	45	8
48	23.50	45	8
49	32.00	45	8
50	40.00	45	8
51	13.10	45	10
52	17.30	45	10
53	23.50	45	10
54	32.00	45	10
55	40.00	45	10
56	13.10	45	12
57	17.30	45	12
58	23.50	45	12
59	32.00	45	12
60	40.00	45	12

TABLE OF CONTENTS (Continued)

<u>Page Number</u>	<u>Feed Cost, \$/kg</u>	<u>Separative Duty, \$/kg</u>	<u>Working Capital, %/yr</u>
61	13.10	60	6
62	17.30	60	6
63	23.50	60	6
64	32.00	60	6
65	40.00	60	6
66	13.10	60	8
67	17.30	60	8
68	23.50	60	8
69	32.00	60	8
70	40.00	60	8
71	13.10	60	10
72	17.30	60	10
73	23.50	60	10
74	32.00	60	10
75	40.00	60	10
76	13.10	60	12
77	17.30	60	12
78	23.50	60	12
79	32.00	60	12
80	40.00	60	12

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR 1

WITH: FEED COST ----- 13.10 \$/kg
 SEPARATIVE DUTY ----- 15 \$/kg
 WORKING CAPITAL RATE -- 6 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

WITH: FEED COST ----- 17.30 \$/kg
 SEPARATIVE DUTY ----- 15 \$/kg
 WORKING CAPITAL RATE -- 6 %/yr

MINIMUM FUEL COSTS FOR SIMULATED 23.50 \$/kg REACTOR

3

WITH: FEED COST -----
 SEPARATIVE DUTY -----
 WORKING CAPITAL RATE --

23.50 \$/kg
 15 \$/kg
 6 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

4

WITH: FEED COST ----- 32 \$/kg
 SEPARATIVE DUTY ----- 15 \$/kg
 WORKING CAPITAL RATE -- 6 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

5

WITH: FEED COST ----- 40 \$/kg
 SEPARATIVE DUTY ----- 15 \$/kg
 WORKING CAPITAL RATE -- 6 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

WITH: FEED COST ----- 13.10 \$/kg
 SEPARATIVE DUTY ----- 15 \$/kg
 WORKING CAPITAL RATE -- 8 %/yr

FABRICATION COST \$/kg

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

7

WITH: FEED COST ----- 17.30 \$/kg
 SEPARATIVE DUTY ----- 15 \$/kg
 WORKING CAPITAL RATE -- 8 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

8

WITH: FEED COST ----- 23.50 \$/kg
 SEPARATIVE DUTY ----- 15 \$/kg
 WORKING CAPITAL RATE -- 8 %/yr

MINIMUM FUEL COSTS FOR SIMULATED _____ HWR _____ REACTOR _____ 9

WITH: FEED COST ----- 32 \$/kg
 SEPARATIVE DUTY ----- 15 \$/kg
 WORKING CAPITAL RATE -- 8 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

10

WITH: FEED COST ----- 40 \$/kg
 SEPARATIVE DUTY ----- 15 \$/kg
 WORKING CAPITAL RATE -- 8 %/yr

MINIMUM FUEL COSTS FOR SIMULATED _____ HWR _____ REACTOR

11

WITH: FEED COST ----- 13.10 \$/kg
 SEPARATIVE DUTY ----- 15 \$/kg
 WORKING CAPITAL RATE -- 10 %/yr

MINIMUM FUEL COST
 mills/kwhe

FABRICATION COST \$/kg

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

12

WITH: FEED COST ----- 17.30 \$/kg
 SEPARATIVE DUTY ----- 15 \$/kg
 WORKING CAPITAL RATE -- 10 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

13

WITH: FEED COST ----- 23.50 \$/kg
 SEPARATIVE DUTY ----- 15 \$/kg
 WORKING CAPITAL RATE -- 10 %/yr

MINIMUM FUEL COSTS FOR SIMULATED FWR REACTOR

14

WITH: FEED COST ----- 32 \$/kg
 SEPARATIVE DUTY ----- 15 \$/kg
 WORKING CAPITAL RATE -- 10 %/yr

MINIMUM FUEL COSTS FOR SIMULATED _____ HMR _____ REACTOR

15

WITH: FEED COST ----- 40 \$/kg
 SEPARATIVE DUTY ----- 15 \$/kg
 WORKING CAPITAL RATE -- 10 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

16

WITH: FEED COST ----- 13.10 \$/kg
 SEPARATIVE DUTY ----- 15 \$/kg
 WORKING CAPITAL RATE -- 12 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

17

WITH: FEED COST ----- 17.30 \$/kg
 SEPARATIVE DUTY ----- 15 \$/kg
 WORKING CAPITAL RATE -- 12 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

18

WITH: FEED COST ----- 23.50 \$/kg
 SEPARATIVE DUTY ----- 15 \$/kg
 WORKING CAPITAL RATE -- 12 %/yr

SEPARATIONS COST	
CURVE NO.	COST \$/kg
1	10
2	20
3	40
4	60

REACTOR

HWR

MINIMUM FUEL COSTS FOR SIMULATED

WITH: FEED COST ----- 32 \$/kg
 SEPARATIVE DUTY ----- 15 \$/kg
 WORKING CAPITAL RATE -- 12 %/yr

MINIMUM FUEL COSTS FOR SIMULATED

HWR

REACTOR

20

WITH: FEED COST ----- 40 \$/kg
 SEPARATIVE DUTY ----- 15 \$/kg
 WORKING CAPITAL RATE -- 12 %/yr

MINIMUM FUEL COST
 mills/kwhe

FABRICATION COST \$/kg

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

21

WITH: FEED COST ----- 13.10 \$/kg
 SEPARATIVE DUTY ----- 30 \$/kg
 WORKING CAPITAL RATE -- 6 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

WITH: FEED COST ----- 17.30 \$/kg
 SEPARATIVE DUTY ----- 30 \$/kg
 WORKING CAPITAL RATE -- 6 %/yr

MINIMUM FUEL COSTS FOR SIMULATED

WITH: FEED COST ----- 23.50 \$/kg
 SEPARATIVE DUTY ----- 30 \$/kg
 WORKING CAPITAL RATE -- 6 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

24

WITH: FEED COST ----- 32 \$/kg
 SEPARATIVE DUTY ----- 30 \$/kg
 WORKING CAPITAL RATE -- 6 %/yr

MINIMUM FUEL COSTS FOR SIMULATED _____ HWR _____ REACTOR

25

WITH: FEED COST ----- 40 \$/kg
 SEPARATIVE DUTY ----- 30 \$/kg
 WORKING CAPITAL RATE -- 6 %/yr

MINIMUM FUEL COSTS FOR SIMULATED _____ REACTOR

26

WITH: FEED COST ----- 13.10 \$/kg
 SEPARATIVE DUTY ----- 30 \$/kg
 WORKING CAPITAL RATE -- 8 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR 27

WITH: FEED COST ----- 17.30 \$/kg
 SEPARATIVE DUTY ----- 30 \$/kg
 WORKING CAPITAL RATE -- 8 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

28

WITH: FEED COST ----- 23.50 \$/kg
 SEPARATIVE DUTY ----- 30 \$/kg
 WORKING CAPITAL RATE -- 8 %/yr

MINIMUM FUEL COSTS FOR SIMULATED EMR REACTOR 29

WITH: FEED COST ----- 32 \$/kg
 SEPARATIVE DUTY ----- 30 \$/kg
 WORKING CAPITAL RATE -- 8 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR 30

WITH: FEED COST ----- 40 \$/kg
 SEPARATIVE DUTY ----- 30 \$/kg
 WORKING CAPITAL RATE -- 8 %/yr

MINIMUM FUEL COSTS FOR SIMULATED FWR REACTOR 31

WITH: FEED COST ----- 13.10 \$/kg
 SEPARATIVE DUTY ----- 30 \$/kg
 WORKING CAPITAL RATE -- 10 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

32

WITH: FEED COST ----- 17.30 \$/kg
 SEPARATIVE DUTY ----- 30 \$/kg
 WORKING CAPITAL RATE -- 10 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

33

WITH: FEED COST ----- 23.50 \$/kg
 SEPARATIVE DUTY ----- 30 \$/kg
 WORKING CAPITAL RATE -- 10 %/yr

MINIMUM FUEL COSTS FOR SIMULATED _____ HWR _____ REACTOR

34

WITH: FEED COST ----- 32 \$/kg
 SEPARATIVE DUTY ----- 30 \$/kg
 WORKING CAPITAL RATE -- 10 %/yr

MINIMUM FUEL COSTS FOR SIMULATED _____ HWR _____ REACTOR

WITH: FEED COST ----- 40 \$/kg
 SEPARATIVE DUTY ----- 30 \$/kg
 WORKING CAPITAL RATE -- 10 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

36

WITH: FEED COST ----- 13.10 \$/kg
 SEPARATIVE DUTY ----- 30 \$/kg
 WORKING CAPITAL RATE -- 12 %/yr

MINIMUM FUEL COSTS FOR SIMULATED _____ HWR _____ REACTOR

37

WITH: FEED COST ----- 17.30 \$/kg
 SEPARATIVE DUTY ----- 30 \$/kg
 WORKING CAPITAL RATE -- 12 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

38

WITH: FEED COST ----- 23.50 \$/kg
 SEPARATIVE DUTY ----- 30 \$/kg
 WORKING CAPITAL RATE -- 12 %/yr

MINIMUM FUEL COSTS FOR SIMULATED 32 HWR REACTOR

39

WITH: FEED COST ----- 32 \$/kg
 SEPARATIVE DUTY ----- 30 \$/kg
 WORKING CAPITAL RATE -- 12 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

40

WITH: FEED COST ----- 40 \$/kg
 SEPARATIVE DUTY ----- 30 \$/kg
 WORKING CAPITAL RATE -- 12 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

41

WITH: FEED COST ----- 13.10 \$/kg
 SEPARATIVE DUTY ----- 45 \$/kg
 WORKING CAPITAL RATE -- 6 %/yr

MINIMUM FUEL COSTS FOR SIMULATED 42 REACTOR

WITH: FEED COST ----- 17.30 \$/kg

SEPARATIVE DUTY ----- 45 \$/kg

WORKING CAPITAL RATE -- 6 %/yr

FABRICATION COST \$/kg

MINIMUM FUEL COSTS FOR SIMULATED BWR REACTOR

43

WITH: FEED COST ----- 23.50 \$/kg
 SEPARATIVE DUTY ----- 45 \$/kg
 WORKING CAPITAL RATE -- 6 %/yr

MINIMUM FUEL COSTS FOR SIMULATED 100 REACTOR

44

WITH: FEED COST ----- 32 \$/kg
 SEPARATIVE DUTY ----- 45 \$/kg
 WORKING CAPITAL RATE -- 6 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

45

WITH: FEED COST ----- 40 \$/kg
 SEPARATIVE DUTY ----- 45 %/yr
 WORKING CAPITAL RATE -- 6 %/yr

MINIMUM FUEL COSTS FOR SIMULATED AWR REACTOR

46

WITH: FEED COST ----- 13.10 \$/kg
 SEPARATIVE DUTY ----- 45 \$/kg
 WORKING CAPITAL RATE -- 8 %/yr

MINIMUM FUEL COSTS FOR SIMULATED BWR REACTOR

47

WITH: FEED COST ----- 17.30 \$/kg
 SEPARATIVE DUTY ----- 45 \$/kg
 WORKING CAPITAL RATE -- 8 %/yr

MINIMUM FUEL COSTS FOR SIMULATED FWR REACTOR

48

WITH: FEED COST ----- 23.50 \$/kg
 SEPARATIVE DUTY ----- 45 \$/kg
 WORKING CAPITAL RATE -- 8 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

49

WITH: FEED COST ----- 32 \$/kg
 SEPARATIVE DUTY ----- 45 \$/kg
 WORKING CAPITAL RATE -- 8 %/yr

MINIMUM FUEL COSTS FOR SIMULATED

WITH: FEED COST ----- 40 \$/kg
 SEPARATIVE DUTY ----- 45 \$/kg
 WORKING CAPITAL RATE -- 8 %/yr

FABRICATION COST \$/kg

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

51

WITH: FEED COST ----- 13.10 \$/kg
 SEPARATIVE DUTY ----- 45 \$/kg
 WORKING CAPITAL RATE -- 10 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

52

WITH: FEED COST ----- 17.30 \$/kg
 SEPARATIVE DUTY ----- 45 \$/kg
 WORKING CAPITAL RATE -- 10 %/yr

REACTOR

MINIMUM FUEL COSTS FOR SIMULATED

HWR

WITH: FEED COST ----- 23.50 \$/kg
 SEPARATIVE DUTY ----- 45 \$/kg
 WORKING CAPITAL RATE -- 10 %/yr

FABRICATION COST \$/kg

REACTOR

HWR

MINIMUM FUEL COSTS FOR SIMULATED

WITH: FEED COST ----- 32 \$/kg
 SEPARATIVE DUTY ----- 45 \$/kg
 WORKING CAPITAL RATE -- 10 %/yr

MINIMUM FUEL COSTS FOR SIMULATED

HTWR

REACTOR

55

WITH: FEED COST ----- 40 \$/kg
 SEPARATIVE DUTY ----- 45 \$/kg
 WORKING CAPITAL RATE -- 10 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

56

WITH: FEED COST ----- 13.10 \$/kg
 SEPARATIVE DUTY ----- 45 \$/kg
 WORKING CAPITAL RATE -- 12 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

57

WITH: FEED COST ----- 17.30 \$/kg
 SEPARATIVE DUTY ----- 45 \$/kg
 WORKING CAPITAL RATE -- 12 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

58

WITH: FEED COST ----- 23.50 \$/kg
 SEPARATIVE DUTY ----- 45 \$/kg
 WORKING CAPITAL RATE -- 12 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

59

WITH: FEED COST ----- 32 \$/kg
 SEPARATIVE DUTY ----- 45 \$/kg
 WORKING CAPITAL RATE -- 12 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

60

WITH: FEED COST ----- 40 \$/kg
 SEPARATIVE DUTY ----- 45 \$/kg
 WORKING CAPITAL RATE -- 12 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

61

WITH: FEED COST ----- 13.10 \$/kg
 SEPARATIVE DUTY ----- 60 \$/kg
 WORKING CAPITAL RATE -- 6 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

62

WITH: FEED COST ----- 17.30 \$/kg
 SEPARATIVE DUTY ----- 60 \$/kg
 WORKING CAPITAL RATE -- 6 %/yr

MINIMUM FUEL COSTS FOR SIMULATED 23.50 60 6 REACTOR

63

WITH: FEED COST ----- 23.50 \$/kg
 SEPARATIVE DUTY ----- 60 \$/kg
 WORKING CAPITAL RATE -- 6 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

64

WITH: FEED COST ----- 32 \$/kg
 SEPARATIVE DUTY ----- 60 \$/kg
 WORKING CAPITAL RATE -- 6 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

65

WITH: FEED COST ----- 40 \$/kg
 SEPARATIVE DUTY ----- 60 \$/kg
 WORKING CAPITAL RATE -- 6 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

66

WITH: FEED COST ----- 13.10 \$/kg
 SEPARATIVE DUTY ----- 60 \$/kg
 WORKING CAPITAL RATE -- 8 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

67

WITH: FEED COST ----- 17.30 \$/kg
 SEPARATIVE DUTY ----- 60 \$/kg
 WORKING CAPITAL RATE -- 8 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

68

WITH: FEED COST ----- 23.50 \$/kg
 SEPARATIVE DUTY ----- 60 \$/kg
 WORKING CAPITAL RATE -- 8 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

69

WITH: FEED COST ----- 32 \$/kg
 SEPARATIVE DUTY ----- 60 \$/kg
 WORKING CAPITAL RATE -- 8 %/yr

FABRICATION COST \$/kg

MINIMUM FUEL COSTS FOR SIMULATED 70 REACTOR

WITH: FEED COST ----- 40 \$/kg
 SEPARATIVE DUTY ----- 60 \$/kg
 WORKING CAPITAL RATE -- 8 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

71

WITH: FEED COST ----- 13.10 \$/kg
 SEPARATIVE DUTY ----- 60 \$/kg
 WORKING CAPITAL RATE -- 10 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HMR REACTOR

72

WITH: FEED COST ----- 17.30 \$/kg
 SEPARATIVE DUTY ----- 60 \$/kg
 WORKING CAPITAL RATE -- 10 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

73

WITH: FEED COST ----- 23.50 \$/kg
 SEPARATIVE DUTY ----- 60 \$/kg
 WORKING CAPITAL RATE -- 10 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

74

WITH: FEED COST ----- 32 \$/kg
 SEPARATIVE DUTY ----- 60 \$/kg
 WORKING CAPITAL RATE -- 10 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

75

WITH: FEED COST ----- 40 \$/kg
 SEPARATIVE DUTY ----- 60 \$/kg
 WORKING CAPITAL RATE -- 10 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

76

WITH: FEED COST ----- 13.10 \$/kg
 SEPARATIVE DUTY ----- 60 \$/kg
 WORKING CAPITAL RATE -- 12 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

77

WITH: FEED COST ----- 17.30 \$/kg
 SEPARATIVE DUTY ----- 60 \$/kg
 WORKING CAPITAL RATE -- 12 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR REACTOR

78

WITH: FEED COST ----- 23.50 \$/kg
 SEPARATIVE DUTY ----- 60 \$/kg
 WORKING CAPITAL RATE -- 12 %/yr

MINIMUM FUEL COSTS FOR SIMULATED _____ HWR _____ REACTOR 79

WITH: FEED COST ----- 32 \$/kg
 SEPARATIVE DUTY ----- 60 \$/kg
 WORKING CAPITAL RATE -- 12 %/yr

MINIMUM FUEL COSTS FOR SIMULATED HWR 80 REACTOR

WITH: FEED COST ----- 40 \$/kg
 SEPARATIVE DUTY ----- 60 \$/kg
 WORKING CAPITAL RATE -- 12 %/yr

FABRICATION COST \$/kg

ONSITE DISTRIBUTION

Copy Number

Pacific Northwest Laboratory

1	D. E. Deonigi
2 - 65	E. A. Eschbach
66	P. A. Horton
67	A. F. McConiga
68 - 70	Technical Information Files
71 - 72	Technical Publications

Richland Operations Office

73 - 75	P. G. Holsted
76 - 77	R. K. Sharp
78	Technical Information Library

OFFSITE DISTRIBUTION (SPECIAL)

No. of Copies

18	Atomic Energy Commission, Washington Division of Reactor Development Attn: J. M. Vallance (15)
5	Division of Technical Information Extension Oak Ridge, Tennessee