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HW-61933

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September 16, 1959

U. S. Atomic Energy Commission
Hanford Operations Office
Richland, Washington

Attention: Mr. M. H. Arndt, Chief, Special Projects Branch
Process Engineering and Manufacturing Division

Gentlemen:

INFORMATION IN SUPPORT OF THE FPC STUDY

Three of the items of information you have requested in connection with the FPC study are transmitted herein.

Table of Predicted Life Expectancy of the 105-N Reactor

A table of predicted life expectancy for cases in addition to those covered in the letter of July 30, 1959, to Mr. J. E. Travis, on the same subject, is attached. The predicted lives shown for some of the cases are somewhat higher than those which you had arrived at by interpolation between the points in the referenced letter because of temperature effects on the graphite. There is some difference in lifetime between, for example, a case involving 2800 mw maximum power operating throughout the year at an average 1400 mw and one involving 2800 mw operating for six months and shut down for the remaining six. Both cases would have an average annual plant factor of .50, but the distortion of the graphite would be greater in the latter case. This table was prepared on the basis of the former method of operation--that is, longer period of operation at lower powers to achieve a given plant factor.

It is again emphasized that the variety of numbers given in this table does not indicate that the reactor life can be predicted with a degree of precision of one, two, or three years out of 30. They are to be considered only as numbers within the range previously indicated that can be used in this study to arrive at the relative economics of the several cases.

Steam Generation Transients Following a Scram

As you have requested, ten copies of a curve showing heat rate versus time following a reactor scram are attached.

You will realize that the data shown in these curves are preliminary, but should give a good indication of the steam flow-time relationship. The design of the plant has not progressed to the point where the extent of the by-passing of primary coolant around the evaporators has been determined, but it is expected that it will be between the zero and one-third values shown on the chart, probably closer to the one-third flow value.

Estimated Number of Outages

The following table gives specific numbers for scheduled outages and target unscheduled outages under the various conditions of plant factor and fuel exposure level for both dual-purpose and power-only operation. In the dual-purpose operation the average plant factor is assumed to be 80 percent and estimates are shown for 70 and 100 percent of goal fuel exposure. For the power-only condition, three sets of numbers are given, 50, 80, and 100 percent average plant factor, all at fuel exposure levels of 10,000 mwd/T. In this table the numbers for maximum thermal power assume that some means will be utilized, such as burnable poisons in the fuel elements, to extend the interval between refuelings. As discussed between us, no detailed work has been performed on exactly how this might be accomplished, or what extra fuel costs might be involved; but it is our opinion that it will not be a difficult matter to extend the period between refuelings to the extent shown, at a nominal cost. The values shown for the 40 percent thermal level do not assume any burnable poison in the fuel; those at the 60 percent thermal level assume a small utilization of burnable poison.

The extent to which such means will be employed will, of course, depend upon conditions at the time and on the magnitude of the incentive to extend periods between refueling at some extra fuel cost.

Dual-Purpose - .80 Plant Factor

	Percent Goal Exposure	
	100	70
Scheduled	12	18
Target Unscheduled	6	6
All	15	21

Power-Only - At 10,000 Mwd/T

		Plant Factor	
	.05	0.8	1.0
Maximum Thermal			
Scheduled	5	7	10
Target Unscheduled	4	5	6
All	7	10	13

	Plant Factor .05	0.8	1.0
60 Percent Thermal			
Scheduled	4	6	7
Target Unscheduled	4	5	6
All	6	8	10
40 Percent Thermal			
Scheduled	5	7	10
Target Unscheduled	4	5	6
All	7	10	13

Very truly yours,

W. J. Dowis

CONSULTING ENGINEER
NPR PROJECT SECTION

WJ Dowis:bem

Attachments - 2

cc: J Krema
DJ O'Neil
CR Qualheim
HH Schipper

bcc: [illegible]H Brown
DL Condotta
RL Dickeman
EM Kratz
WW McIntosh
WJ Dowis - 2
Records Center
300 File

[redacted]

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HW-61933

PREDICTED LIFE EXPECTANCY OF THE 105-N REACTOR

Case	Thermal MW First 10 Years	Thermal MW Balance of Life	% Plant Factor	Years Expected Balance of Life Power-Only Period	Reasonable Total Reactor Life - Years
1	4000	4000	80	15	25
2	4000	4000	64	18	28
3	4000	4000	50	24	34
4	4000	4000	35	34	35
5	4000	3800	80	17	27
6	4000	3800	65	21	31
7	4000	3800	50	28	35
8	4000	3800	35	39	35
9	4000	3600	80	18	28
10	4000	3600	65	23	33
11	4000	3600	50	30	35
12	4000	3600	35	42	35
13	4000	3400	80	21	31
14	4000	3400	65	26	35
15	4000	3400	50	33	35
16	4000	3400	35	47	35
17	4000	3200	80	23	33
18	4000	3200	65	29	35
19	4000	3200	50	38	35
20	4000	3200	35	53	35
21	4000	3000	80	27	35
22	4000	3000	65	33	35
23	4000	3000	50	43	35
24	4000	3000	35	61	35
25	4000	2800	80	31	35
26	4000	2800	65	38	35
27	4000	2800	50	49	35
28	4000	2800	35	70	35
29	4000	2600	80	35	35
30	4000	2600	65	44	35
31	4000	2600	50	57	35
32	4000	2600	35	82	35
33	4000	2400	80	40	35
34	4000	2400	65	51	35
35	4000	2400	50	66	35
36	4000	2400	35	95	35
37	4000	2200	80	50	35
38	4000	2200	65	61	35
39	4000	2200	50	80	35
40	4000	2200	35	113	35

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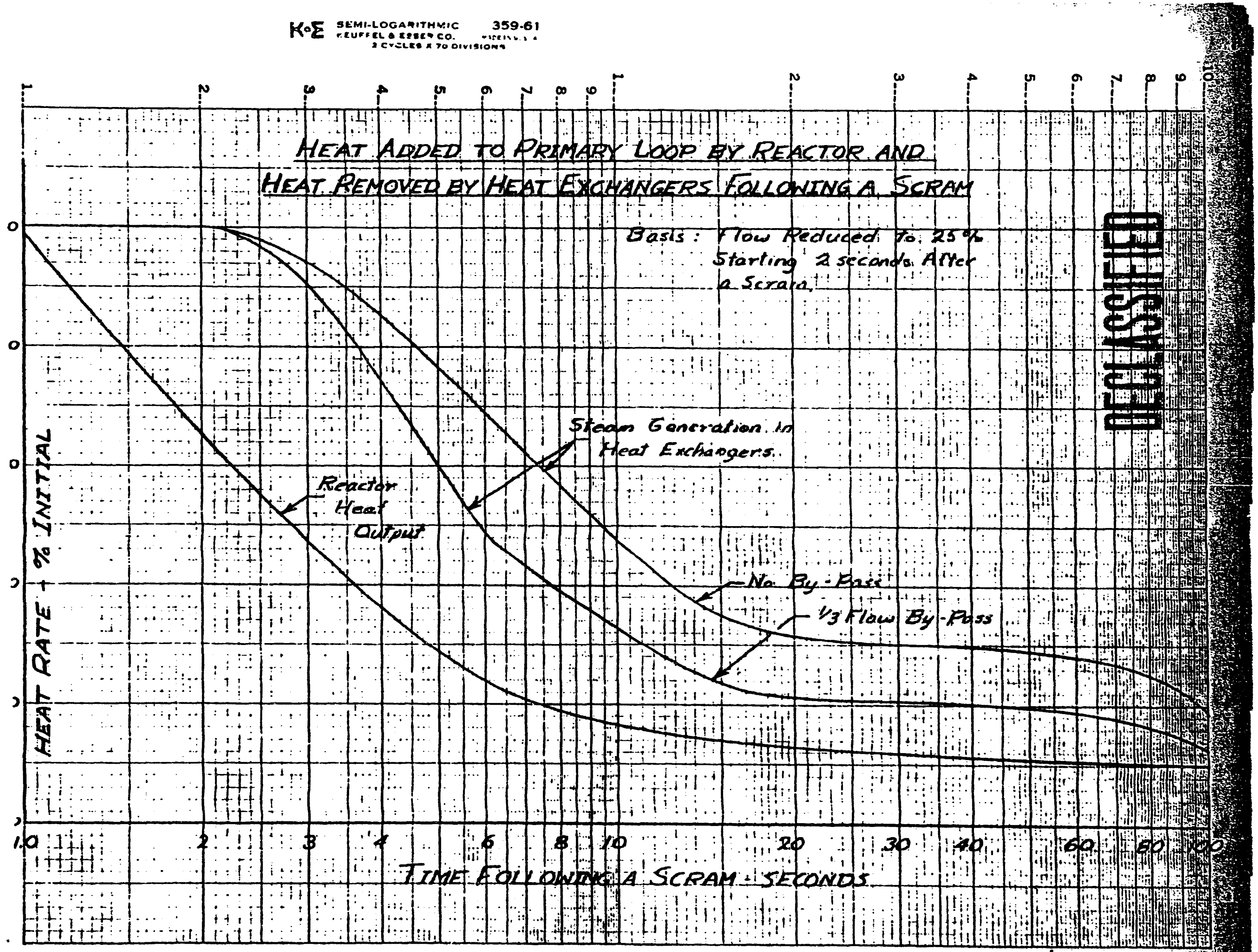
04/20/1994


K&E SEMI-LOGARITHMIC 359-61
KEUFFEL & ESSER CO.
2 CYCLES X 70 DIVISIONS
HEAT ADDED TO PRIMARY LOOP BY REACTOR AND
HEAT REMOVED BY HEAT EXCHANGERS FOLLOWING A SCRAM
Basis: Flow Reduced To 25% Starting 2 seconds After a Scram.
DECLASSIFIED
Steam Generation In Heat Exchangers.
Reactor Heat Output
No By-Pass
1/3 Flow By-Pass
HEAT RATE - % INITIAL
TIME FOLLOWING A SCRAM - SECONDS
1.0
2
3
4
6
8
10
20
30
40
60
80
100

DATE
FILMED
10/20/94

END