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TO:

HRB Dist

FROM:

M. I. Lundin

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A preliminary investigation into the economics of generating power from a homogeneous research reactor indicates that the installation of a turbogenerator station would be preferable to the complete rejection of the energy available under the following conditions: (See Figure I)

<u>Power Revenue mils/Kw-hr</u>	<u>Station Load Factor (minimum)</u>
1.7	100
1.95	90
2.2	80
2.5	70
2.9	60

It should be noted that a market for "dumped power"* exists in the Oak Ridge Area. It is estimated that a year round average price available for such power would be in the order of 2 - 2.5 mils per Kw-hr.

Table I shows an estimate of the variation of installed and yearly charges for a turbo-generator facility as a function of the steam temperature at the throttle.

Table II shows the estimated costs for a heat rejection system based on the use of air cooled steam condensers.

Table III shows the yearly power revenue as a function of the station load factor and power charges.

M. I. Lundin
M. I. Lundin

* "dumped power" is defined as non-firm power sold on an intermittent basis.

3

TABLE I

TURBOGENERATOR SYSTEM COSTS

Steam Temp. at Throttle °F	Cycle Efficiency %	Gross Electrical Generation MW	Net Electrical Generation MW	\$ / Kw	Installed Costs	
					Total \$	Yearly Charge * \$
320	21.17	105.85	99.50	113.80	11,323,000	1,868,000
350	22.78	113.90	107.07	110.60	11,842,000	1,954,000
380	24.57	122.85	115.48	108.60	12,472,000	2,058,000
410	26.12	130.60	122.76	105.80	12,988,000	2,143,000
430	27.15	135.75	127.61	104.75	13,367,000	2,206,000

* Includes amortization, operation, and maintenance.

4
TABLE II

HEAT REJECTION SYSTEM COSTS

Steam Temp. °F	Approx. Area [*] Req'd. - sq.ft x 10 ⁻⁶	Installed Cost \$	Year Charge ^{**} \$
320	1.1609	1,358,300	287,700
350	1.0632	1,243,800	270,600
380	.998	1,167,700	259,200
410	.986	1,154,200	257,100
430	.954	1,120,000	252,000

* based on steam to air cycle; air at 95°F, 30°F approach.

** includes amortization, power and operating charges.

TABLE III
YEARLY POWER REVENUE
(\$/yr at Load Factor Indicated)

5.

Load Factor	100	90	80	70	60
Steam Temp. (°F)	<u>1. at \$0.002 per Kw-hr</u>				
320	1,743,000	1,569,000	1,395,000	1,220,000	1,046,000
350	1,876,000	1,688,000	1,501,000	1,313,000	1,126,000
380	2,023,000	1,820,000	1,619,000	1,416,000	1,214,000
410	2,151,000	1,936,000	1,721,000	1,506,000	1,290,000
430	2,236,000	2,012,000	1,789,000	1,565,000	1,341,000
	<u>2. at \$0.0025 per Kw-hr</u>				
320	2,179,000	1,961,000	1,743,000	1,525,000	1,307,000
350	2,345,000	2,110,000	1,876,000	1,641,000	1,407,000
380	2,529,000	2,276,000	2,023,000	1,770,000	1,517,000
410	2,688,000	2,420,000	2,151,000	1,882,000	1,613,000
430	2,795,000	2,515,000	2,236,000	1,956,000	1,677,000
	<u>3. at \$0.003 per Kw-hr</u>				
320	2,615,000	2,353,000	2,092,000	1,830,000	1,569,000
350	2,814,000	2,532,000	2,251,000	1,970,000	1,688,000
380	3,035,000	2,731,000	2,428,000	2,124,000	1,821,000
410	3,226,000	2,904,000	2,581,000	2,258,000	1,936,000
430	3,354,000	3,018,000	2,683,000	2,348,000	2,012,000

FIGURE 1