

786

SCRA

HJR 62

8672

March 24, 1980

6967 Laser Drive
Anchorage, Alaska
99504

Senator Arliss Sturgulewski
Pouch V
Juneau, Alaska 99811

Dear Arliss:

After talking to you the other day regarding the proposed hydro project at Ketchikan I got out some old information R.W. Beck had given me as well as the more up to date data from Eric Yould. Other than a general interest in hydro development I enjoyed studying this project since I am familiar with the area. I grew up there and still have family and friends in Ketchikan.

As I stated before it is not possible to correctly evaluate a power project without information on all energy requirements of the area. This is becoming even more the case as it becomes clear that dependence upon petroleum must be reduced and eventually eliminated. The handwriting is also on the wall that all combustion of carbon based fuels must be reduced to an absolute minimum. Current technology can now provide the required alternatives for all except transportation related requirements. In time hydrogen and improved batteries will be available for transportation needs. The use of biomass such as burning wood, wood waste or organically produced alcohol is also being advocated by some but it cannot be a long term solution. The immediate effect of burning carbon is the same whether it comes from wood, alcohol, coal or oil. Even though biomass carbon comes from the carbon dioxide in the air a long residence time in a fixed state is necessary for a stable carbon cycle. In fact it is now believed that at least half of the CO₂ build up is due to shorting the carbon residence time in the biosphere by human activities. I am certainly not advocating that we stop using wood as a domestic fuel supplement, or as a total supply where appropriate, but I do want to see that we avoid future problems and restrictions which are sure to come as global pollution problems become more pressing.

Returning to the immediate question, I have made an estimate of the Ketchikan area stationary energy requirements. These are current needs and do not include any allowance for growth. They are as follows:

K.P.U. Current generation	82.2 million KWH
Space heating (now primarily oil)	105.5 million KWH
L.P.K. pulp mill (now primarily oil)	<u>15.0 million KWH</u>
Total area stationary energy use	202.6 million KWH

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The figure for heating requirements is based upon data on estimated needs if conversion from oil to electric heat occurred. The total number is mine based on that data and the number of residential and commercial customers they now have. I checked this against the electric and oil equivalent of our own home gas use and even allowing for differences in the climate I believe the number I used is quite low.

Their currently existing hydro capacity can produce 62.7 million KWH and the proposed Swan Lake project could produce an average of 85.4 million KWH, so in terms of absolute need for energy the project is not too large. Ultimately they will need this project and more. The problem is financial and one of the proper sequence of development. While to stop using oil for space heating and power generation is the only rational action in the long run, people are not going to willingly replace \$1.00 per gallon oil with electricity at over twice the price just for the sake of conservation. On the other hand the longer the hydro is delayed the more it will cost and delay will just make the inevitable transition more painful. I don't think anyone could live in Southeast long without realizing that sunshine there comes in the form of rain.

Now as to the other smaller project, Mahoney Lake. The data on the Mahoney Lake project in the Electric Power in Alaska report done by I.S.E.R. I found highly suspect. However, among the Beck material I did find what appears to be a reasonable estimate for the project. If fact, if the Beck data and projections had been properly interpreted, Mahoney Lake is the project that should have been pushed for first.

The current construction cost estimate for Swan Lake is \$75 million, the remainder of the required funds are for interest during construction, reserves, financing costs, etc. Escalating the old Beck estimate for Mahoney Lake by the same factor (1.23) as required to bring the old Beck estimate for Swan Lake up to current costs yields a construction cost of \$36.5 million. Assuming both plants are built for 50% load factor (more or less standard practice), one gets a cost of \$3847/Kw for Swan Lake and \$3313/Kw for Mahoney Lake. Thus Mahoney Lake should produce cheaper energy if escalation and inflation factors are removed. Beck analyzed the first ten years energy costs for four alternatives. Swan Lake, Lake Grace (a larger project yet), Mahoney Lake and continued expansion of the diesel plant. They showed that the first ten years energy cost was lower for Swan Lake. Under their assumptions this was true but from an engineering and financial standpoint, one should look at the present worth of future costs not just future costs. Present worth analysis takes into account the time value of money and of course shows the benefits of deferring investments which can be deferred while for a simple sum a future cost counts the same as a present one. Using

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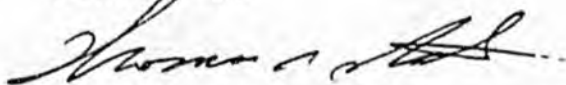
the present worth approach the Beck numbers indicate a lower levelized life cycle cost for Mahoney Lake. Looking at the year to year cost of these alternatives shows Swan Lake power costing initially about 50% more than Mahoney Lake power. It is only in the sixth year that the annual cost of Swan Lake power becomes cheaper. These are old estimates and projections and I have not taken the time to update them except as noted. Current oil costs and escalations have been higher than anticipated and load growth somewhat less, but all in all I think a good job was done in everything except interpreting the results.

Clearly they should have worked on Mahoney Lake first, but it does not automatically follow that is what should be done now. If because of licensing and/or design problems it would take two years longer to start actual construction on Mahoney Lake it would no longer be the more economical producer of power. At 15% annual inflation, which may be on the low side just now, Mahoney Lake goes to \$3810/Kw with one year delay and to \$4381/Kw in two years. Since escalation will effect the cost of energy over 40 years, it will ultimately make up for differences in the available load during the early years. Therefore the correct project to build is the one which can be built first.

The other factor is what the people are willing to pay at the front end for power rates. I would assume that the elected representatives from Ketchikan should be able to evaluate community feeling on that issue.

Since transmission line problems have been such a problem in Juneau it may become a issue here. I have walked over a good portion of the proposed Swan Lake route and have seen from the water most of the remainder so I feel confident the proposed route will not have severe problems such as the Snettisham line or even the Turnagain line has had.

Sincerely,



Thomas R. Stahr

TRS:slg

SWAN LAKE, LAKE GRACE AND MAHONEY LAKE PROJECTS

Table 1

COST ESTIMATE SUMMARY

ITEM	PROJECT		
	SWAN LAKE	LAKE GRACE	MAHONEY LAKE
1. Preparatory Work	\$ 3,378,000	\$ 5,611,000	\$ 3,460,000
2. Dam and Reservoir	9,719,000	8,498,000	629,000
3. Power Tunnel	4,785,000	9,720,000	7,229,000
4. Power Plant Civil Work	2,614,000	2,905,000	2,125,000
5. Power Plant Mechanical Equipment ...	2,772,000	2,890,000	1,200,000
6. Power Plant Electrical Equipment ...	2,534,000	2,700,000	1,400,000
7. Transmission and Switchyards	9,540,000	13,500,000	420,000
TOTAL DIRECT CONSTRUCTION COST ...	\$35,342,000	\$45,924,000	\$16,463,000
Contingencies	5,301,000	6,889,000	3,293,000
Subtotal	\$40,643,000	\$52,813,000	\$19,756,000
Engineering & Owner Administration	5,081,000	6,602,000	2,469,000
TOTAL CONSTRUCTION COST (Bid Date January 1977)	\$45,724,000	\$59,415,000	\$22,225,000
Interest During Construction (5%/yr.)	3,429,000	4,456,000	1,667,000
TOTAL INVESTMENT COST (Bid January 1977, On-Line September 1980)	\$49,153,000	\$63,871,000	\$23,892,000
Escalation (7%/yr.)	15,277,000	19,851,000	7,426,000
TOTAL INVESTMENT COST (Bid January 1981, On-Line September 1983)	\$64,430,000	\$83,722,000	\$31,318,000

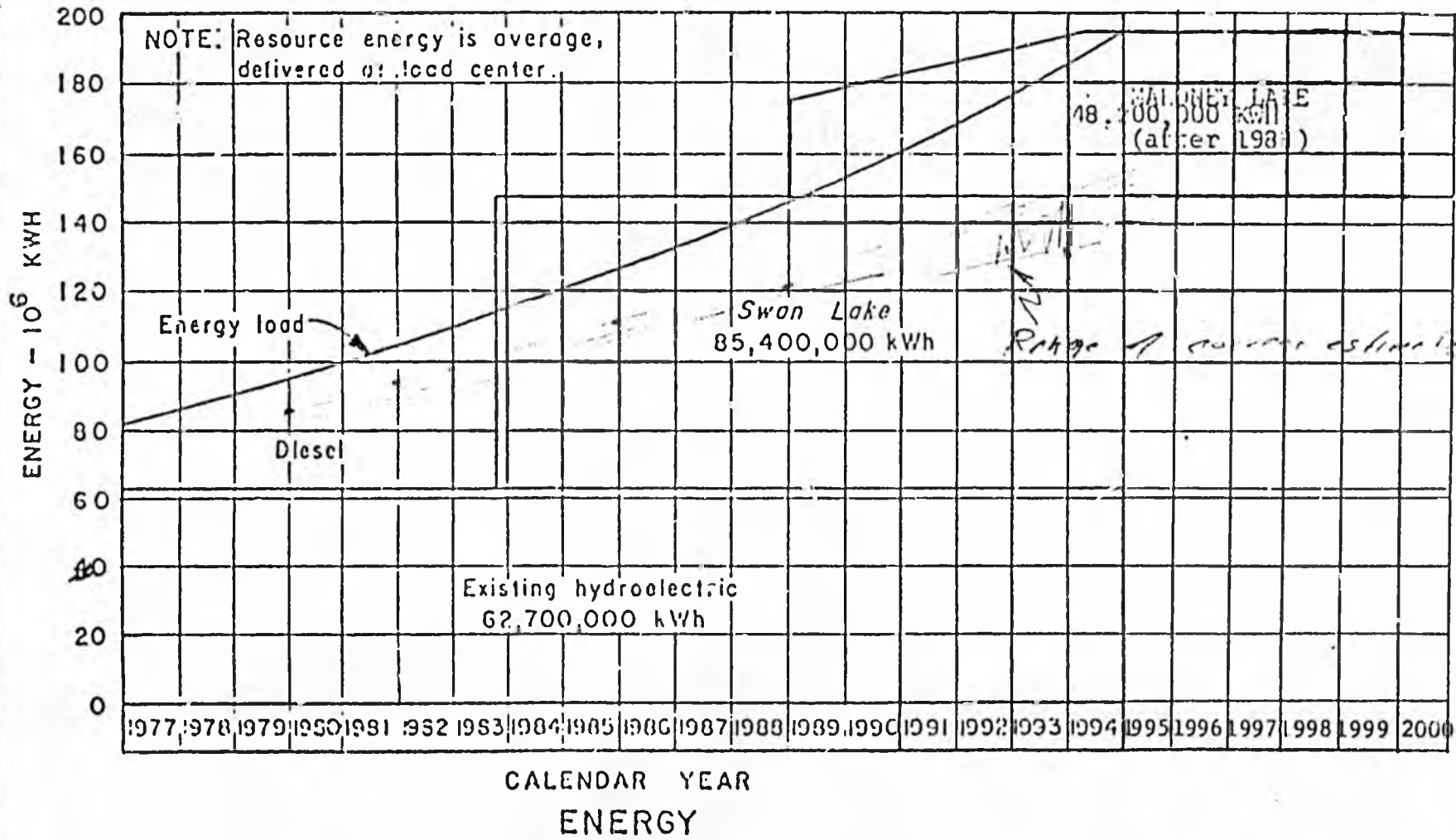
subtract IDC - 3,429,000
61,001,000

- 1,667,000
29,651,000

Current estimate 75,000,000
Factor 1.23

36,455,550

Chart No. 2



SWAN LAKE, LAKE GRAGE AND MAHONEY LAKE PROJECTS

COST OF POWER - COMPARISON OF ALTERNATIVES

SWAN LAKE ALTERNATIVE	ANNUAL COST - \$1,000(1)									
	1983-84(2)	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93
	<i>P.W. factor .93</i>	<i>.87</i>	<i>.82</i>	<i>.76</i>	<i>.71</i>	<i>.67</i>	<i>.62</i>	<i>.58</i>	<i>.54</i>	<i>.51</i>
Hydro Debt Service (3)	3,592	3,592	3,592	3,592	3,592	3,592	3,592	3,592	3,592	3,592
Hydro O&M (4)	916	980	1,048	1,122	1,200	1,284	1,374	1,470	1,543	1,683
Existing Diesel O&M (Fuel)	-	-	-	-	-	-	513	1,180	1,983	2,919
TOTAL										
1. No Sale of Excess Energy ..	4,508	4,572	4,640	4,714	4,792	4,876	5,479	6,242	7,148	8,194
Credit for Sale of Excess(5)	-164	-175	-188	-208	-215	-	-	-	-	-
2. With Sale of Excess Energy	4,344	4,397	4,452	4,506	4,577	4,876	5,479	6,242	7,148	8,194
3. Present worth of cost * <i>41040</i>	<i>3,825</i>	<i>3,625</i>	<i>3,651</i>	<i>3,425</i>	<i>3,250</i>	<i>3,267</i>	<i>3,397</i>	<i>3,620</i>	<i>3,860</i>	<i>4,179</i>
LAKE GRAGE ALTERNATIVE <i>yearly cost/kwh</i>	<i>82.3</i>	<i>75.0</i>	<i>68.8</i>	<i>63.3</i>	<i>58.8</i>	<i>57.5</i>				
Hydro Debt Service	4,668	4,668	4,668	4,668	4,668	4,668	4,668	4,668	4,668	4,668
Hydro O&M	1,190	1,273	1,362	1,457	1,560	1,669	1,785	1,910	2,044	2,187
Existing Diesel O&M (Fuel)	-	-	-	-	-	-	-	-	527	1,361
TOTAL	5,858	5,941	6,030	6,125	6,228	6,337	6,453	6,578	7,239	8,216
MAHONEY LAKE ALTERNATIVE										
Hydro Debt Service	1,746	1,746	1,746	1,746	1,746	1,746	1,746	1,746	1,746	1,746
Hydro O&M	445	476	509	545	583	674	668	715	765	818
Existing Diesel O&M (Fuel)	740	985	1,316	1,721	2,170	2,653	3,335	4,182	5,135	6,242
New Diesel Debt Service (6)	-	-	-	-	-	-	254	504	504	504
New Diesel O&M (Fixed)	-	-	-	-	-	-	192	410	439	470
TOTAL	2,931	3,207	3,571	4,012	4,499	5,023	6,195	7,557	8,589	9,780
Present worth of cost * <i>2,726</i>	<i>2,726</i>	<i>2,729</i>	<i>2,728</i>	<i>3,049</i>	<i>3,194</i>	<i>3,365</i>	<i>3,840</i>	<i>4,593</i>	<i>4,639</i>	<i>4,927</i>
DIESEL ALTERNATIVE <i>yearly cost/kwh</i>	<i>55.5</i>	<i>54.7</i>	<i>55.2</i>	<i>56.3</i>	<i>57.8</i>	<i>59.2</i>	<i>67.3</i>			
Existing Diesel O&M (Fuel)	2,704	3,210	3,791	4,457	5,217	5,690	6,088	6,514	6,971	7,458
New Diesel Debt Service	381	381	381	381	639	898	898	898	898	898
New Diesel O&M (Fixed)	290	310	355	355	577	827	885	947	1,014	1,064
New Diesel O&M (Fuel)	-	-	-	-	160	546	1,095	1,718	2,466	3,397
TOTAL	3,375	3,901	4,504	5,193	6,593	7,961	8,966	10,077	11,349	12,637
Present worth of cost * <i>3,137</i>	<i>3,137</i>	<i>3,394</i>	<i>3,693</i>	<i>3,946</i>	<i>4,671</i>	<i>5,314</i>	<i>5,550</i>	<i>5,845</i>	<i>6,128</i>	<i>6,547</i>
Generation Required to Meet Load -	59.5	66.6	67.6	72.9						
(10 ⁶ kWh)	52.8	58.6	64.7	71.2	77.8	84.8	92.1	99.8	108.0	113.8

- (1) - Costs of meeting Ketchikan loads during first ten years of project operation (1983-1993) exclusive of costs of existing hydro resources and diesel debt service.
- (2) - Power Year, July 1983 through June 1984, typical.
- (3) - Basis for hydro debt service is the same as shown in Table VI-1.
- (4) - All O&M costs and diesel fuel costs are escalated at 7% per year.
- (5) - Assumed 4,000,000 kWh/year of energy from the Swan Lake Project would be sold to LPK during first five years at 90% of diesel fuel cost.
- (6) - Capital costs of all new diesels are based on current estimated costs escalated at 7% per year to on-line date.

* present worth of cost (1983-1993)

old cost/kwh

8/15/84

KE GRACE AND MAHONEY LAKE PROJECTS

ER - COMPARISON OF ALTERNATIVES

Table 2

ANNUAL COST - \$1,000(1)							Cumulative Total Cost (\$1,000)	Average Cost (Mills/kWh)
86-87	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93		
76	.71	.67	.62	.58	.54	.57		
,592	3,592	3,592	3,592	3,592	3,592	3,592		
.122	1,200	1,264	1,374	1,470	1,543	1,687		
-	-	-	513	1,180	1,983	2,919		
,714	4,792	4,876	5,479	6,242	7,148	8,194	55,165	67.0
-208	-215	-	-	-	-	-		
,506	4,577	4,876	5,479	6,242	7,148	8,194	54,215	65.8
425	3,250	3,267	3,397	3,620	3,860	4,179	35,514	44.8
63.3	58.8	57.5						
,668	4,668	4,668	4,668	4,668	4,668	4,668		
,457	1,560	1,669	1,785	1,910	2,044	2,187		
-	-	-	-	-	527	1,361		
,125	6,228	6,337	6,453	6,578	7,239	8,216	65,005	78.9
,746	1,746	1,766	1,746	1,746	1,746	1,746		
545	583	674	668	715	765	818		
,721	2,170	2,653	3,335	4,182	5,135	6,242		
-	-	-	254	504	504	504		
-	-	-	192	410	439	470		
,012	4,499	5,023	6,195	7,557	8,589	9,780	55,364	67.2
049	3,194	3,365	3,841	4,583	4,632	4,927	35,461	43.6 ←
56.3	57.8	59.2	67.5					
,457	5,217	5,690	6,088	6,514	6,971	7,458		
381	639	898	898	898	898	898		
355	577	827	885	947	1,014	1,084		
-	160	546	1,095	1,718	2,466	3,397		
,193	6,593	7,961	8,966	10,077	11,349	12,637	74,756	90.8
746	4,681	5,314	5,559	5,845	6,128	6,547	48,266	58.6
72.9								
11.2	77.0	84.8	92.1	99.8	108.0	113.8	823.6(10 ⁶) kWh Total	

* present work (p 7) :

old cost estimates
old load projections

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