

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

Integ-Ebasco - Hat Creek Project - Supplementary Site Selection
Study - November 1978

ENVIRONMENTAL IMPACT STATEMENT REFERENCE NUMBER: 55

HAT CREEK PROJECT

SUPPLEMENTARY SITE SELECTION STUDY

Integ-Ebasco

November 1978

integ - ebasco

Joint Venture

1155 West Pender Street, Vancouver, British Columbia, Canada. ~~V6E 2R85~~ V6E 2F

2 November, 1978

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IE-78-173

Mr. M.A. Favell
Manager, Thermal Division
B.C. Hydro & Power Authority
Box 12121
555 West Hastings Street
Vancouver, B.C.
V6B 4T6

Dear Mr. Favell:

RE: HAT CREEK PROJECT
SITE SELECTION

In response to your request we have reevaluated the major differential costs between power plant locations adjacent to the mine in Hat Creek Valley and the currently selected site above Harry Lake. A breakdown of the costs is given in Attachments 1 and 2 to this letter.

We estimate that the Harry Lake site incurs an extra capital cost of approximately \$45 x 10⁶ (Attachment 1). This is based on 1978 prices which have not been escalated. The operating costs (Attachment 2) have been levelized and capitalized to 1978 levels to show an approximate increase in operating costs for the Harry Lake site capitalized to \$21 x 10⁶ utilizing financial criteria described in S.D.M. section 72.1-a.

In arriving at these costs we have made use of the latest estimates prepared by ourselves and your HED Department. It must, however, be recognized that whereas the power plant at the Hat Creek site has been subjected to considerable investigation and preliminary engineering, for the Mine Mouth site much less accurate technical and cost information is available.

In most cases we have used information prepared for the Site Evaluation Study (January 1977). In some cases we have made assumptions to obtain comparable data for the Mine Mouth site. Various assumptions used in the site comparison are listed in Attachment 3 of this letter.

Mr. M.A. Favell
B.C. Hydro & Power Authority
2 November, 1978
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We trust you will find the information suitable for your immediate needs.
Should you require any adjustment to the costs or additional factors
included in the comparison we shall be pleased to hear from you.

Very truly yours,

INTEG-EBASCO



E.A. Jodidio
Acting Project Manager

PRG/sa
Att.
c.c. F.B. Titus
J.G. Alesi

ATTACHMENT 1

DIFFERENTIAL CAPITAL COSTS
IN MILLIONS OF 1978 DOLLARS

<u>Equipment</u>	<u>Power Plant Site</u>	
	<u>Mine Mouth (MM)</u>	<u>Harry Lake (HL)</u>
1. <u>Access Road</u> Both schemes require new road from Ashcroft to mine. HL requires additional 1 mile access road at 2×10^6 in 1976 dollars 1978 cost = $2 \times 10^6 \times 1.1556$	--	2.31
2. <u>Coal Conveyor</u> 1978 cost = $\$8.73 \times 10^6$ (CMJV) Initial spares $\$0.6 \times 10^6$ (CMJV) Maintenance road (assumed)	--	8.73 0.60 0.5
3. <u>Coal Storage</u> 1978 cost of 1 month's coal storage and reclaim equipment at power plant. Assumed 1978 cost of conveyors and increasing mine mouth storage to 2 weeks Differential coal storage inventory (1 month at the HL vs 2 weeks at the mine)	-- 1.50 --	11.50 -- 5.3
4. <u>Reservoir & Makeup Water Supply</u> B.C.H. HEDD report DD122 27" pipeline from reservoir to power plant differential length = -4 km @ \$450/m Pumps and pumphouse (at reservoir)	14.53 1.8 --	10.12 -- 2.0
5. <u>Ash Pond</u> Site Evaluation Report (less clay liner) 1976 cost = $27.07 - 4.68 = 22.39 \times 10^6$ 1978 cost = $22.39 \times 1.1556 \times 10^6$ BCH report DD122 (less engineering and contingency)	25.87	23.54
6. <u>Ash Disposal Cutoff Ditches</u> BCH HEDD report DD122 (1978 prices less engineering and contingency) Ash pond cutoff ditches (Base Scheme) Assume 50% for mine mouth site	-- 6.61	13.22 --
7. <u>Plant Grading</u> HL assume 25% rock MM assume 10% rock	4.23	5.97

Attachment 1 (cont'd)

<u>Equipment</u>	<u>Power Plant Site</u>	
	<u>Mine Mouth (MM)</u>	<u>Harry Lake (HL)</u>
8. <u>Foundations</u>		
Site Evaluation Report Differential		
= $-\$0.9 \times 10^6$		
1978 differential = $-0.9 \times 10^6 \times 1.1556$	1.04	--
9. <u>Altitude Effect</u>		
Allowance for derating effect due to altitude increase from 3000' to 4600' (Sp. Vol. increase of air 7% at amb. temp. 60°F - ignoring effect at higher temps. Assumed capital cost increase of 3%.)		
3% of boilers (200×10^6), precipitators (50×10^6), cooling towers and misc. (20×10^6)	--	8.10
	<u>55.58</u>	<u>91.89</u>
Differential	0	36.31
Allowance for Indirect Construction Costs (5%), Contingency (7.9%), Engineering (5%) and Corporate Overhead (5%)		
= $1.05 \times 1.079 \times 1.05 \times 1.05 =$	1.25	9.08
Total Differential Construction Cost		45.39

ATTACHMENT 2

ANNUAL OPERATING COSTS

1. Coal Conveying

From CMJV via S.A. Ridley

1978 costs for energy in years 1-25 = \$ 689,000 p.a.

1978 costs for energy in years 26-35 = \$ 540,000 p.a.

1978 costs for materials and supplies = \$ 365,000 p.a.

Levelized PW of $\$0.689 \times 10^6$ for years 1-25 = $0.689 \times \frac{15.5878}{8.9935} \times 10^6$
 = $\$1.19 \times 10^6$ p.a.

Levelized PW of $\$0.54 \times 10^6$ for years 26-35 = $0.54 \times \frac{3.0258}{9.6445}$
 = $\$0.17 \times 10^6$ p.a.

Levelized PW of materials and supplies = $\$0.365 \times 10^6 \times 1.98$
 = $\$0.72 \times 10^6$ p.a.

Total levelized PW of coal conveying = $\$(1.19 + 0.17 + 0.72) \times 10^6$ p.a.
 = $\$2.08 \times 10^6$ p.a.

2. Makeup Water Supply

Average annual flow = 11,000 USgpm

For HL site static head = 4600-1000 = 3600 ft.

For MM site static head = 4100-1000 = 3100 ft.

Site differential = 500 ft.

Differential Pump Power Absorbed = $\frac{11,000 \times 500}{3960 \times 0.8 \times 0.92} = 1887$ h.p.
 = 1408 kW

Levelizing at 49.5 mills/kWhr

Levelized PW of differential power = $1408 \times 8760 \times \frac{49.5}{1000} = \0.61×10^6 p.a.

3. Maintenance Costs

Coal conveyors included in 1 above.

For other plant 1% of capital cost assumed p.a.

Differential capital costs affected (see Attachment 1)

Access Road	\$ 2.31×10^6
Coal Storage	10.00×10^6
Makeup Water Pipeline & Pumphouse	0.2×10^6
Cutoff Ditches	6.61×10^6
Altitude Effect	8.10×10^6
	<hr/>
	$\$27.22 \times 10^6$

Attachment 2 (cont'd)

$$\text{Differential Annual Cost} = \$0.272 \times 10^6$$

$$\text{Levelized Annual Cost} = \$0.272 \times 1.98 \times 10^6 = \$0.539 \times 10^6$$

4. Total

Total levelized PW from 1, 2 and 3 above

$$= \$(2.08 + 0.61 + 0.54) \times 10^6 \text{ p.a.}$$

$$= \$3.23 \times 10^6 \text{ p.a.}$$

Capitalize at levelized FCR of 15.6%

$$\begin{aligned} \text{Differential capitalized cost. of operation} &= \frac{\$3.23 \times 10^6}{0.156} \\ &= \$20.71 \times 10^6 \end{aligned}$$

ATTACHMENT 3Assumptions

- Mine Mouth (MM) site location as I-E Site Evaluation Study (Jan. 77).
Harry Lake (HL) site location as I-E Drawing BCH 0064 M 101 Rev. F.
- Harry Lake site base scheme with wet ash sluiced to UMC.
- Escalation 1976 - 1978 at 7.5% p.a.
- MM and HL cooling systems identical in capital and operating costs.
- For MM site short coal conveyor from mine required, no power plant coal storage required, but mine storage increased by 2 weeks supply.
- MM site makeup water fed by gravity from reservoir.

Exclusions

Differential costs of the following have not been included:

- Construction (except for earthwork and foundations).
- Ash disposal equipment and operating costs (except for ponds and cutoff ditches).
- Chimney costs.
- Operating and maintenance staff.

COMPARATIVE FEATURES OF MINE MOUTH
AND HARRY LAKE SITES

Advantages of Harry Lake Site

- . Shorter access road
- . Shorter and less expensive make-up water line from reservoir to power plant
- . Slightly lower installed pumping power and pumping energy costs (from Thompson River to reservoir)
- . Smaller and lower ash dam
No saddle dam required
- . Shorter ash transportation distance from power plant to pond
- . Gravity flow of ash from power plant to pond
- . Greater potential for expansion of power plant
- . Smaller or no danger of site flooding
- . Less probability of conflict between power plant and other project features over use of land
- . Better sub-soil conditions for power plant foundations

Disadvantages of Harry Lake Site

- . Longer and more expensive coal conveyor
- . Higher coal conveying energy costs
- . Longer and higher dam for reservoir

In addition, the mine mouth site was environmentally assessed to have a high impact on air quality.

CAPITAL COSTS IN 1981 \$ x 10⁶

<u>Site</u>	<u>Total</u>		<u>Roads</u>	<u>Coal Transport</u>		<u>Earthwork</u>	<u>Cooling System</u>	<u>Make-Up Water System</u>	<u>Elec. Transmissio:</u>
	<u>@ 5%</u>	<u>@ 10%</u>		<u>@ 5%</u>	<u>@ 10%</u>				
Mine Mouth	214.4	211.0	12.0	8.2	4.8	7.4	35.9	49.7	101.2
Harry Lake	248.5	238.4	13.0	24.6	14.5	26.0	35.9	47.8	101.2

N.B. Except for coal handling, these costs assume zero escalation between 1976 and 1981.

TOTAL CAPITAL COSTS IN 1976 \$ x 10⁶

Mine Mouth	168.0 @ 5%	131.0 @ 10%
Harry Lake	194.7 @ 5%	148.0 @ 10%
Differential	26.7 @ 5%	17.0 @ 10%

ANNUAL OPERATING COSTS IN 1976 \$ x 10⁶

<u>Site</u>	<u>Total</u>	<u>Coal Transport</u>	<u>Make-Up System</u>	<u>Make-Up Pumping</u>	<u>CW Pumping</u>	<u>General Transportation</u>
Mine Mouth	19.0	0.7	0.2	4.9	2.7	10.5
Harry Lake	19.7	1.8	0.2	4.5	2.7	10.5

N.B. Energy costs @ 20 mills/kWhr
Capacity factor of 75%

TOTAL CAPITALIZED OPERATING COSTS IN 1976 \$ x 10⁶

Mine Mouth	221 @ 5%	95 @ 10%
Harry Lake	229 @ 5%	98 @ 10%
Differential	8 @ 5%	3 @ 10%

N.B. 35 year life from 1983

TOTAL CAPITALIZED INVESTMENT & OPERATING COSTS IN 1976 \$ x 10⁶

Mine Mouth	168 + 221 = 389 @ 5%	131 + 95 = 226 @ 10%
Harry Lake	195 + 229 = 424 @ 5%	148 + 98 = 246 @ 10%
Differential	35 @ 5%	20 @ 10%