More Creek Hydroelectric Project - Generation Estimates

Background

Alaska Hydro Corp. (AHC) is proposing to develop the More Creek hydroelectric project, located approximately 10 km northwest from Bob Quinn Lake in the Northwest region of British Columbia.

This memorandum provides an estimate of the average annual generation at the proposed project.

Assumptions and Methodology

The generation calculations are based on a set of historical daily flows at the project site. The hydrology is based on flow data from the Water Survey Canada (WSC) streamflow gauge '08CG005 – More Creek near the mouth'. The gauge was located near the proposed intake site and was active from 1972 to 1995 and has a set of 19 complete years of daily flow data available. The drainage area of WSC 08CG005 is 844 km², which is the same as the drainage at the intake of the proposed project. Thus the flow data from the WSC gauge are used without any adjustments as the basis of the hydrology at the site.

A spreadsheet model is used to calculate the monthly and annual generation at the site. The model uses 19 complete years of daily flows as the basis of the calculations.

The basic assumptions used in the model are:

Design flow	80	m³/s
Dam crest elevation	498	m
Minimum lake level	468	m
Mean tailwater level	380	m
Gross head	118	m
Instream flow release	2.476	m³/s (5% of mean annual flow)
Minimum turbine flow	20	m³/s
Generating equipment efficiency	86.45%	
Friction head loss	6%	

A lake storage curve, which was developed from available 1:20,000 mapping, is used.

The 30 m of available storage are equivalent to approximately 90 days of storage at the design flow. One potential operation plan of the plant would dictate that excess water is stored during the summer months and used in the fall and winter months.

However, this operation assumes that the electricity price is the same throughout the year. Since at this stage, the electricity pricing scheme is not known, the model used the current BC Standing Offer Program (SOP) monthly delivery time adjustments to vary the electricity price through the year.

The model used monthly targets for the design flow to simulate the operation of the plant and maximize the average annual generation and revenue. Our preliminary analysis determined that the following monthly targets for the design flow resulted in the maximum generation at the plant:

Table 1. Monthly targets for design flow

	Flow (m^3/s)
Jan	80
Feb	80
Mar	70
Apr	40
May	45
Jun	35
Jul	45
Aug	60
Sep	80
Oct	70
Nov	70
Dec	80

Note that the above targets are usually not achieved in modeling.

Generation Estimate

The resulting monthly and annual generation estimates are shown in Table 2 below:

Table 2. Generation estimates (GWh)

	1974	1975	1977	1978	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	Average
Jan	52.7	25.1	2.7	20.9	20.8	48.3	46.2	37.1	10.9	2.7	8.1	35.5	28.1	25.2	45.7	45.1	46.0	23.7	46.6	30.1
Feb	46.4	1.3	2.7	1.3	2.7	31.1	9.6	0.0	1.3	0.0	0.0	1.3	1.3	2.7	6.8	4.0	10.9	2.7	12.4	7.3
Mar	41.3	2.3	2.3	1.2	1.2	2.3	1.2	1.2	1.2	2.3	3.5	1.2	1.2	1.2	2.3	1.2	5.9	1.2	3.5	4.1
Apr	20.9	1.3	4.7	2.7	4.0	3.4	1.3	4.7	2.7	0.7	2.7	4.0	4.7	4.0	5.4	4.7	7.4	6.7	6.1	4.9
May	13.6	15.9	21.3	15.9	21.5	20.8	9.8	21.3	20.7	13.0	14.4	15.2	22.4	19.7	20.7	22.4	18.3	23.6	22.2	18.6
Jun	18.2	18.7	18.9	19.0	20.2	19.7	19.1	19.7	18.9	19.1	19.0	18.6	19.4	19.5	19.8	19.7	19.9	21.3	19.1	19.4
Jul	25.9	29.0	28.1	28.0	30.0	28.7	29.1	29.1	27.7	28.7	28.7	28.1	28.5	29.1	29.3	29.5	30.8	30.5	28.2	28.8
Aug	36.6	40.8	40.8	40.0	41.8	40.9	41.2	40.5	39.8	40.8	40.9	39.9	40.3	41.2	41.5	41.3	42.0	42.0	40.3	40.7
Sep	48.7	52.2	53.6	51.9	53.8	54.0	53.7	53.0	51.8	52.7	52.5	51.7	52.9	54.1	54.2	54.0	53.4	53.8	53.1	52.9
Oct	45.1	45.2	47.1	46.1	48.8	48.2	47.8	46.3	45.2	46.5	46.9	46.7	46.9	48.4	48.3	48.4	47.0	47.7	48.3	47.1
Nov	43.3	41.0	43.7	43.5	46.2	45.4	44.7	42.8	41.1	42.7	44.6	43.5	43.7	45.2	45.1	45.4	43.6	45.7	45.2	44.0
Dec	47.6	32.7	47.5	47.3	52.2	50.9	49.2	46.2	34.2	45.9	49.0	48.0	47.8	50.4	50.1	50.6	47.7	51.1	50.2	47.3
Annual	440.3	305.6	313.4	317.8	343.1	393.8	352.9	342.0	295.5	295.1	310.3	333.7	337.1	340.7	369.1	366.5	372.8	350.0	375.1	345.0

If an electricity price of $100/MWh is assumed the same throughout the year, then the average annual revenue would be $34.5 million. Note the lowest and highest annual revenue are $29.5 and $44.0 million respectively.

Applying the current BC Hydro monthly delivery adjustment factors, the average annual revenue would be about $34.8 million, ranging from $29.8 to $44.4 million.

Note that if the electricity price variance through the year is different from that of the current SOP, the monthly target for the design flow may differ from the ones shown above. Also, the impact of any monthly variation of electricity prices may vary depending on price variance and plant operation.

Impact on Forest Kerr hydro project

The operation of the More Creek hydro project would potentially increase the generation of the existing Forrest Kerr project, located about 40 km downstream from the More Creek powerhouse on the Iskut River. The storage of water during the summer months, when

Forrest Kerr would typically be spilling water, and the subsequent release of the stored water over the winter months would increase the Forrest Kerr generation potential.

The operational details of the Forrest Kerr project are not available to us. A high level estimate of the potential additional generation at Forrest Kerr is based on converting the additional flow (m^3/s) to power (MW) using a factor of 0.80. The additional average annual generation at the Forrest Kerr project, using the above assumptions, is estimated at about 140-150 GWh.

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