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September 18, 2017

Mr. Patrick Wruck
Commission Secretary and Manager
Regulatory Support
British Columbia Utilities Commission
Suite 410, 900 Howe Street
Vancouver, BC V6Z 2N3

Dear Mr. Wruck:

RE: Project No. 1598922
British Columbia Utilities Commission (BCUC or Commission)
Inquiry Respecting Site C
British Columbia Hydro and Power Authority (BC Hydro)
Response to BCUC Information Requests

BC Hydro encloses responses to specific requests for information made by the Commission arising from our Filing submitted on August 30, 2017 (document F1-1).

The Commission’s correspondence related to this proceeding should be directed to Fred James at 604-623-4046 or by email at bchydroregulatorygroup@bchydro.com.

Media or public inquiries should be directed to BC Hydro Media Relations at 604-928-6468.

Yours sincerely,

Fred James
Chief Regulatory Officer

Enclosure (1)
1.0 Reference: Appendix Q page 8

1.1.0 Please provide descriptions of the identified resources (other than Revelstoke and load curtailment). Please include the location of the facility, along with data sources, calculations and assumptions underlying the UEC/UCC values. For those facilities.

RESPONSE:

In the attached working Excel:

- The Resource Options tab shows the location of the facility (in terms of transmission region – refer to column B); and

- The UEC_UCC tab shows the calculations.

Key assumptions and data sources used to develop this information include:

- Pumped storage assumptions:
  
  - The pumped storage resource potential was identified by Knight Piesold Consulting in 2010 [Link].
  
  - For modelling simplicity, the least cost pumped storage site (named by the consultant as ‘Upper Deserted – Un-named’) was used to represent multiple sites in the Lower Mainland region.
  
  - Cost shown has not reflected energy losses, however this is reflected in the UEC blocks (see below) and BC Hydro’s portfolio analysis.
  
  - Pumped storage is assumed to run at an 18 per cent capacity factor based on assumption of running during heavy load hours during high-use months (November through February).

- Wind Resource Assumptions:
  
  - Wind speeds based on ten years of modelled ten-minute wind speed time series [BC Hydro Wind Data Study, 2009].
  
  - Project location and installed capacity based on GIS analysis [BC Hydro Wind Data Study, 2009; BC Hydro Wind Data Study Update, 2009].
  
  - Assumed a 3 MW turbine nameplate capacity with a 100 m hub height.
Applied updated power curves, based on information provided by turbine manufacturers in 2015. Power curves were developed for each IEC turbine class.

Assumed a 20.4 per cent loss factor (includes losses due to availability, wake effect, electrical, environmental, turbine performance and curtailment).

Capital costs are based on line item analysis conducted by Hatch in 2015 (Link), and considers impact of project size on capital costs. Based on stakeholder input (Link), B.C.-wide costs instead of region specific costs are used (Link).

Costs based on generic 'best case scenario' site conditions. A 20 per cent increase in CAPEX is applied to sites with challenging topography (identified using Google Earth) to better reflect higher costs associated with building in difficult terrain (vetted by stakeholders, Link).

The numbers in column BE of the spreadsheet are shown in Appendix Q.

Column BG shows the range of capital cost for these projects in terms of $/kW.
REFER TO LIVE SPREADSHEET MODEL

Provided in electronic format only

(Accessible by opening the Attachments Tab in Adobe)
2.0 Reference: Main Submission, pp. 62, 63. Site C Unit Energy Costs and Alternate Energy Resource Unit Energy Costs.

1.2.0 Please provide source data, calculations and any assumptions underlying the numerical values in the UEC column.

RESPONSE:

Resource Alternatives

The Resource Alternative UEC of $153 is based on a portfolio of wind for energy resources and pumped storage for capacity. There are two steps to go from the resource-specific data at the point of interconnection (provided in the Attachment 1 to BCUC IR 1.1.0) to the Resource Alternative UEC.

The working Excel provided as Attachment 1 shows the adjustments made to adjust costs from the point of interconnection to the lower mainland.

The “Resource Options” tab shows the input data

The “Table of Constants” tab shows input and assumptions common for all resources

The “Calculations” tab shows the calculation of the adjustments for the specific resource. The resource can be changed via the drop-down in cell C2, while the resulting UEC is provided in cell C54.

The working Excel provided as Attachment 2 shows the composition of the $153/MWh Resource Alternative UEC. Specifically:

The “Wind+PS” tab shows the calculation.

Pumped storage usage results in a net loss of energy through every pump-release cycle. This energy loss results in a need for extra energy resources (wind in this case) to make up the same energy generation of Site C. As a result, the total energy from column E/F from wind project is greater than Site C’s energy, but is equal to Site C when accounting for losses.

Site C

For the Site C UEC, refer to the working Excel provided as Attachment 3 to this response. The “UEC table” tab column E helps the reader navigate the spreadsheets.
REFER TO LIVE SPREADSHEET MODEL

Provided in electronic format only

(Accessible by opening the Attachments Tab in Adobe)

1.3.0 Please ask BC Hydro to produce the spreadsheet that they used to create the graphs and tables in appendix R, attachment 1 of their Site C submission.

RESPONSE:

Please refer to the attached working Excel documents.
REFER TO LIVE SPREADSHEET MODEL

Provided in electronic format only

(Accessible by opening the Attachments Tab in Adobe)

1.4.0 Please ask BC Hydro for the following information:

BC Hydro’s Site C Submission, Appendix K, tables K-1, K-2, K-3 and K-4 in a working spreadsheet

For Table K-1 and Table K-2 above, the row titled “2016 May Mid Load Forecast Before DSM” in a working spreadsheet, showing the load by each key customer segment (residential, commercial, light industrial etc.)

RESPONSE:

The attached working excel file contains the supporting information for both Appendix K and the 2016 May Mid Load Forecast Before DSM. In preparing the attached file we discovered that several numbers in Appendix K had been updated since the RRA figures and were reflected in the materials provided to Deloitte. We have highlighted the affected numbers in yellow in the attached file and we note that the changes are not material and do not impact the timing of need for new supply nor our submission conclusions. As such we are not proposing to file an errata at this time.

The revision included: correcting the “Existing and Committed IPP Resource” energy and capacity amounts for two small IPP projects in the fiscal 2034 to fiscal 2036 period; aligning the high and low peak load in fiscal 2035 and fiscal 2036 to the load forecast that what was provided to Deloitte; and correcting the “Surplus/Deficit as % of Net Load (Planning View)” in Table K-3 to be based on planning estimates during the test period and in Table K-1 to remove Revelstoke Unit 6 from the calculation in order to be consistent with the rest of the table.

The attached file contains six worksheets (or tabs), as follows:

1. “Table K-1 Energy - NoSiteC “: Table K-1: Energy Load Resource Balance after Planned Resources without Site C and Revelstoke Unit 6;

2. “Table K-2 Capacity - NoSiteC”: Table K-2: Capacity Load Resource Balance after Planned Resources without Site C and Revelstoke Unit 6;

3. “Table K-3 Energy – wSiteC”: Table K-3: Energy Load Resource Balance after Planned Resources with Site C and without Revelstoke Unit 6;

4. “Table K-4 Capacity – wSiteC”: Table K-4: Capacity Load Resource Balance after Planned Resources with Site C and without Revelstoke Unit 6;

5. “Load: Energy”: May 2016 Energy Load Forecast Before Demand Side Management; and

REFER TO LIVE SPREADSHEET MODEL

Provided in electronic format only

(Accessible by opening the Attachments Tab in Adobe)
5.0 **Reference:** Appendix R.

1.5.0 In several places in their submission, BC Hydro refers to the cost of terminating site C, including alternative energy, as being $81.4 billion in nominal dollars (pages 66, 76, appendix R page 7).

But there's one reference in appendix R page 6 to incremental energy costs alone being $105.5 billion.

Is the number $105.5 billion correct? If so, is there an explanation of how it relates to the number $81.4 billion?

**RESPONSE:**

The $105.5 billion is correct, and is a component of the net $81.4 billion amount.

This $81.4 billion amount is an estimate of the total net incremental impact on BC Hydro's revenue requirement (costs to be recovered from ratepayers), and is arrived at by taking the sum of the annual amounts on Line 8 on 'Summary' pages 2, 3 and 4 (of 48) in Appendix R, Attachment 1 ("Ratepayer Impact Calculations - Results and Inputs").

This total net amount includes the incremental impact of terminating Site C on BC Hydro's energy costs, operating costs, amortization, finance charges and net regulatory account (DSM) recoveries. Some of these costs, such as energy costs, will be higher as a result of procuring alternative energy, while others, such as amortization costs, will be incrementally lower as a result of not building Site C.

For further clarity, the incremental impact on BC Hydro's energy costs of $105.5 billion is the sum of the annual amounts shown on Line 1 on 'Summary' pages 2, 3 and 4 (of 48) in Appendix R, and again on Line 25 on 'Input Data' pages 5, 6 and 7 (of 48).