

SUMMARY Resource Options Update:
 NOTES Run-of-River

March 2, 2015
 10:30-noon
 BC Hydro Dunsmuir

TYPE OF MEETING	Run-of-River Characterization Meeting
ATTENDEES	Jay Sutton (Alterra Power), Grant Arnold (BluEarth Renewables), Derek McCoy (Innergex Renewable), Jen Adria (Sorgente Hydro), Ken Dextras, Stuart Croft (Summit Power), Chris Labridis (Sigma Engineering), Ron Hankewich (Elemental Energy), Matt Schuett (Clean Energy Consulting), Paul Kariya (Clean Energy BC), Ron Zeilstra (FortisBC), Mike Hopkins (FortisBC), Colleen O'Toole (KWL), Ron Monk (KWL).
BC HYDRO	Anne Wilson, Nan Dai, Sanjaya DeZoysa, Susan Burton
OBJECTIVES	Review approach, and share work completed to date
AGENDA	<ol style="list-style-type: none"> 1. Background – purpose of resource options inventory and update 2. Objectives and expectations of the meeting 3. Overview of previous methodologies 4. Scope of update 5. Summary of work completed to date 6. Next steps and contact information
MATERIALS	Presentation Slides: BC Hydro and FortisBC Resource Options Update Technical Engagement – Run-of-River

MEETING SUMMARY
<p>The meeting was opened with BC Hydro welcoming people to the meeting a round of introductions was undertaken. FortisBC was introduced as collaborating with BC Hydro on the resource options database to help promote consistent datasets.</p> <p>BC Hydro walked through the slides providing an overview of the purpose and objectives of the meeting, the overview of previous methodology for the run-of-river update, the scope of the current update, summary of work completed to date and next steps.</p> <p>The following provides a summary of comments and questions raised.</p> <p>Slide 5 – Overview of Previous Methodologies</p> <p>There was a request to explain the salmon screening aspect of the modelling.</p> <p>KWL explained that rivers with known salmon species were screened out of the data set. Following BC Hydro's instruction, this practice was initiated in the first study undertaken in 2007 when what to be excluded was discussed – the practice of salmon screening is more debatable than protected areas, which prevents development. It is true that it is harder to license but it is possible to develop on salmon streams. It's possible that could be changed in the model, and it is a BC Hydro decision. Currently, if there are known salmon on a river, the model will develop a plant upstream of that location. In addition, this year steelhead has been added to the list. This addition has a pretty modest impact (a few locations) to the numbers as many overlap with other salmon presence. Need to keep in mind this is a planning exercise.</p> <p>It was suggested that KWL include those identified projects but mark them with an identifier (e.g., asterisk). The concern or interest would be to get a better representation of potential – and potential that may be cost competitive. The current practice may be excluding a fairly large resource that may be developed. There are projects now being built on streams with salmon presence. It was noted that in stream flow requirements would need to be modified, and currently they are quite simplified; as well the cost may be a bit higher that is unknown, the permitting challenges would be greater. BC Hydro will consider the request but noted there may not be time this round, or perhaps a qualitative note could be included. KWL has assumed an instream flow requirement of 10 percent flat through the year. What is built on the ground will be different from the planning exercise. It was also questioned why account for</p>

salmon and not for other aspects, such as caribou and bulltrout.

It was also noted that likely, if these excluded streams were put back into the model, there may be concerns from environmental groups.

BC Hydro will take away the comment for consideration.

Slide 7 - Scope of Update – Cost

An edit to the slide was noted, it should read “allocate additional cost for operation of camp” instead of mobilization/demobilization to and from the site.

There a question as to how we size a penstock. KWL explained they look at design flow, know the location between intake and the powerhouse and keep the losses below 9 percent. The model is conservative and oversizes the penstock if anything which in turn may overestimate the cost – some of penstocks drive up cost – penstocks are a significant portion of overall cost.

BC Assessment tries implement to remote location cost. It would be worth looking at BC Assessment definition. What is the range for this model? KWL has implemented 4 zones – (A) within 50 km of community (B) within 200 km (C) within 400 Km and (D) more than 400 Km. The model again is very simplified, for example, some are within 50 km of a community but they may as well be 1000 km given the terrain. Within 50 km assumed to use the facilities within community.

Slide 8 – Scope of Update – Cost (Cont'd)

KWL modified its approach to cost, recognizing that it is a course approach. It was clarified these costs do not include upfront operating costs such as monitoring; this is purely the permitting phase. There is an allowance also for instream flow requirements. If people have experience that is different then let us know. This modification is intended to be closer to reality... make it higher on smaller projects, and lower on larger projects. It was suggested to put a cap of \$3-4 million on this cost.

BC Hydro mentioned a 5% soft cost adder was added to the UEC – if developers have any thoughts let us know – just applied to the end UEC, included capital as well as OMA. A comment suggested that 1 or 2% seems more reasonable if BC Hydro is using UEC, but not 5% (too high).

KWL clarified that O&M is estimated at 2% of capital; and as well, for people with real project experience, if there is a better number we are open to input.

Also confirmed there was no update to the glacier layer by the province this time around.

Slide 11 – Next Steps

The next run-of-river technical engagement meeting to review the draft results is tentatively scheduled by end of March. BC Hydro is looking for any comments from today's discussion by March 10 if possible.

Other items of discussion:

Timing of IRP Review: when will the IRP Review be done – Working to have all of the draft results by March/April. The scope of the IRP Review will be determined in the spring summer and is dependent on new information such as the updated load forecast. The Review will be done towards the end of the calendar year or into the new year.

Financing costs: what about financing costs? How the Unit Energy Cost (UEC) is calculated is explained in the Resource Options Report – it didn't reflect individual financing arrangement, but rather use a discount rate provided by BC Hydro assuming 2% higher than BC Hydro's 5%, which was endorsed by BCUC in 2006 IEP. It was mentioned that 7% and 5% is probably appropriate.

Looking ahead, if oil prices stay low, the price of diesel prices will drop and will affect the manufacturing component. Also, polyethylene pipe prices will also be affected. What will it be in 9 months... don't know. The modularized design would also bring cost down.

In addition, oil and gas companies are lower – but lower cost for construction because they are not being used, could reduce labour costs in other sectors. BC Hydro mentioned that if it undertakes portfolio analysis for the review, then that typically includes a sensitivity analysis of costs. And as well, if you are

willing to provide information on costing, then let us know through the contact information.

Groundtruthing results: how many projects has KWL used to ground truth? KWL uses information primarily in the public domain, dozens of projects – more information would be better – but difficult sometimes and understandably for people in a competitive market to share.

What about in previous reports we publish cost curves – you could comment on the cost curves? KWL has compared model results to real projects. Could do a little more of looking at what projects could be developed.

Storage: Storage is an interesting area to talk about. BC Hydro is not looking at storage now (for collecting results in March and April) but will be looking at it afterwards. It was mentioned that there may be some possibilities of look at storage for fish first in some areas that may be impacted by melting glaciers, then power generation and First Nations.

Materials innovation: What material innovations are possible in Run of River – how might that change things? Hydroelectric technology is very mature – other technologies have costs declining – if there is innovation that is potential in driving costs down that is an area that is of interest to us.

Communication of results: information gets used, and the cost curves got all over the place and a little nervous about how the data is communicated and used. Need to be mindful. For example, the data collected shared with SFU research may be used in a different way than originally intended. Another example is the cost curves for run-of-river going up exponentially using the whole dataset; why would that be in the public domain. Suggestions? In terms of the cost curves it would suggested that \$200/MWh would be an appropriate cut off point.

Costs: There was some comment that operating costs may be a bit overstated as 2% of capital should have covered water rental charge and property tax, not in addition. KWL can look at adjusting operating costs. Also, these are all assumed to be developed in isolation. Some are produced in clustering. Have done some work in regards to clustering opportunities and sharing some costs. It was clarified that clustering is out of scope for this review.

BC Hydro will see about providing a high level summary of what is included in the operating cost and send out with the summary notes.

Participants were thanked for participating and meeting close.