

# BC Hydro Resource Options Update Solar Technical Workshop

## Summary Notes for November 20, 2019

*Includes post-session comments and consideration of feedback*

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### AGENDA

- Review technical characteristic and potential for the solar resource in B.C.
- Review solar financial estimates

### ATTENDEES

- BC Hydro: Alex Tu (Technical Lead), Alevtina Akbulatova, Anne Wilson
- Representatives of: FortisBC, Sunfield Energy, HES PV, Convergent Energy + Power, independent consultants, and BC Ministry of Energy, Mines and Petroleum Resources.

### SUMMARY NOTES

Alex welcomed participants and reviewed the agenda and purpose of today, which is to review solar financial estimates. Purpose of the exercise is to develop indicative and reasonable costs of generic solar resources. Alex invited participants to help assess the reasonableness of costs and to account for the B.C. context. Participants were welcome to provide feedback through the presentation and written comments following this meeting.

Comments captured below are organized based on slide number of the session presentation “Resource Options Engagement – Solar Financial Estimates, November 20, 2019”

#### Slide 2 – Input on Technical Assumptions

- Alex mentioned that all of the input received at the session last week was accepted and incorporated into the assumptions.
- There was a comment about the classification of utility scale versus urban vs customer. Perhaps consider a wider margin for utility scale – i.e. 10, 15, 35, 50, 100 MW – it is a wide range.
- Solar resources can also be distribution connected at sizes typically less than 15 MW. There are several relevant classifications of solar: one clear classification is <15 MW and connected to distribution voltage, another is slightly larger than 15 MW and connected to transmission voltage, and perhaps a third classification is very large and connected to transmission voltage. Each classification has a unique cost per MW.

#### Slide 4 – What are relevant costs to account for?

- A lot of solar projects are now coupled with batteries – where is battery storage accounted for? It was confirmed batteries are included as a separate stream, which will address the idea of pairing battery storage with intermittent power resources.
- It was mentioned that companies model projects as solar with storage – it is a natural fit.
- It was emphasized from the BC Hydro 2016 summary of resource options report included unit energy costs and unit capacity cost. And understand the importance of capacity value.

#### Slide 5 – Utility Scale Capital Costs

- It was confirmed that BC Hydro did not put together this chart.

#### Slide 6 – Utility Scale Costs

- With regards to the module, mid-range costs – is there any reason that B.C. would be any different than the costs estimated here? Absolutely no difference in B.C., the cost of modules and inverters would be the same except for freight costs. For either of these the timeframe you are buying will affect price – for instance if you are buying when there is a bottleneck or if you are ordering a few years out.
- It was mentioned by a participant that they are seeing costs of about \$.48/W (modules at mid).
- In U.S., participants are seeing prices at scales smaller than utility scale at about \$.38/W in U.S. dollars.
- Assume that all makes sense for most components however it was agreed the cost of land in B.C. would be higher. It is reasonable that it is higher with high real estate values, and only 5% is private land with much of that on agricultural land reserve.
- In terms of topography between B.C. and Alberta – it was also mentioned the difference in forested land and flat land is the cost of clearing and site prep.
- In terms of developer costs, the size of market doesn't really impact developer costs. It should be about the mid, and don't think they would range that much.
- It will always be a range.
- In general, is it reasonable for capital costs for a moderate sized utility-scale solar plant in B.C. be approximately 1.64 CDN / W in 2020? This number is quite a bit lower than solar cost in Portland but higher than average U.S. cost. Participants will look at it and give written comments.

#### Slide 7 – Utility Scale Costs - OMA

- Daily maintenance – define daily maintenance on utility scale? A participant is not familiar with that phrase. Does not account to full time staff on site; it could be seen as annual maintenance. It will be a range of costs – depending on the projects themselves – e.g. ground cover, dusty, etc.
- No reason why B.C. would be any different? Agreed, cannot see a reason why it would be different.
- What about the substation maintenance? On the network side may be dealt with differently.
- Sustaining capital – would trackers break down? Or modules need to be replaced? Not unless the developer chose the wrong materials; generally the same price.

- Insurance / property taxes – may come up to about ½ of typical OMA costs in states.
- Is it as straightforward – B.C. assessment has proposed a new property tax structure that will be included in this exercise.

### Slide 8 – Utility scale solar

- Is a 1.60\$ CDN / W reasonable? A participant mentioned it would be hard to say, for instance is it sited in a high radiance area or low? Sited on a transmission line or away? Note that this cost is inclusive only of plant costs and does not include costs of interconnection or delivery to the grid.
- Many site-specific assumptions will influence the capital costs, and it will be better to have a range. Is the economy of scale 15 between 100 MW. Yes, there will be economies of scale – different sizes will not have same capital costs. For example, 100 MW will have a lower capital costs than a 50 MW and lower than a 15 MW.
- The permitting cost however in B.C. for a 100 MW would be the same as 50 MW. The threshold for an environmental assessment is 50 MW. Below this you are working with permitting, above the 50 MW into a full blown environmental assessment. The expense will be quite similar for smaller and larger projects. It may make sense to have a step scale.

### Slide 9 – Cost of Urban Scale

- Confused about urban scale, really could have called this the distribution scale. They will be limited to 15 MW because of voltage constraints.

### Slide 10 – Cost of Urban Scale

- In general, yes, there is a differentiation in cost with urban scale, but not on modules. Will see it on cost of land.
- People are invited to provide feedback on the cost premium.
- Land is so site specific.
- There will be interconnection costs to connect to the existing distribution system, but those costs won't entail anything similar to a 20-km transmission line contemplated for some large utility-scale solar.

### Slide 11 – Urban Scale

- There was a question about the assumption of ownership. E.g. Private Sector? Or a social program, a municipality or First Nations community? Or just the use of distributed power lines? It was confirmed the major defining feature is that it is distribution connected and less than 15 MW.
- It was mentioned the assumption is that it is all ground mounted.

### Slide 15 – Cost of Customer Scale (rooftop)

- On average U.S. are higher on residential side \$2.37-\$2.63/W DC – B.C. will have better pricing on lower quantities of modules; because they have been on the IPC for a long time;
- B.C. cost estimates from participant does not include sales tax, which would be applied to the customer installed costs.
- In the U.S., the some of the larger costs for solar projects are customer acquisition costs – i.e. marketing
- Nova Scotia at \$2.5/W and Alberta close to that, suggesting

### Slide 16 – Customer Scale Costs - OMA

- Typically no annual maintenance, but equipment replacement or failure.
- Clean and inspection OMA – there was a comment that they haven't seen that materialize in B.C. despite it being recognized as a typical cost in U.S. installations
- Property tax not supposed to be affected – in Ontario cannot add that value to property tax.
- Insurance – currently is at home owner discretion to include solar as an asset – typically it is covered under general insurance.

### Slide 17 – Customer scale costs

- Larger scale rooftop – little harder to narrow down – probably a range between \$2/W to \$2.50/W, so these numbers may be a little high.
- It was commented that a new build has lower costs, haven't quantified that, but there would be a nominal savings.

### Slide 18 – Customer scale costs

- There is no stable market for OMA costs for larger businesses.
- It was commented that participants have not come across B.C. customers who install residential solar to acquire additional home insurance.

### Slide 20 – Development timelines for solar

- Reasonable planned construction for solar in B.C. was estimated at about a range of 4 to 5 years, could be done faster in 3 to 4 years. Depends on how quick and nimble BC Hydro is in the interconnection work – that is important.
- Transmission permitting – if that is corridor that would be overall permitting – so that segment of the slide would disappear. The time required for transmission studies and the time for PPA is important. I would encourage a PPA at start line and other things to follow.
- The boxes don't necessarily fit in the schematic on this slide – would prefer a different format.
- For a smaller 20 or 30 MW plant – could construction be done in one year? Yes, it could be however, there would need to be time ahead of construction to have the equipment delivered – there may be bottlenecks and would need to be forward planning. But if it is modular it can be built quickly and if the permitting authorities

understand the benefits and why it is less impactful than say wind (i.e. small, no visual impacts, no sound emissions) it could be much easier to permit.

- Because it is modular – you can look at the transmission system and build in accordance to transmission capacity.

### Session closing

- Alex thanked the participants for their time and comments today. If people have further comments, please send to Alex by next Tuesday, November 26.

### POST SESSION COMMENTS

- BC Hydro received two notifications that expressed their general support of the assumptions outlined in the session.
- As requested, one of the participants provided detailed cost estimates for residential rooftop and commercial rooftop solar systems relevant to 2020.

### CONSIDERATION OF FEEDBACK

Feedback	BC Hydro's consideration of feedback
Consider a more granular range of solar classifications beyond just 'urban' and 'utility'.	BC Hydro agrees to create an additional classification of solar – large utility greater than 50 MW – to recognize the improvements in economies of scale for these very large solar projects.
Solar and batteries are naturally being considered as mutually beneficial and offer cost synergies.	BC Hydro agrees that combined solar and storage represents cost savings and potentially operational synergies when co-located. BC Hydro will include a 'co-located storage' category in the Resource Options report, where any cost savings will be attributed to the cost of the storage facility.
B.C. based projects will have a higher relative cost for land than the reference U.S. projects, due to real estate costs in B.C. and the small amount of private land in B.C.	BC Hydro will incorporate a small land cost premium when determining the cost of B.C. distributed solar projects.
Costs for behind the meter solar was provided in detail in the B.C. Context, noting that the small installer market in B.C. is structured differently than it is in the U.S.	BC Hydro will adopt these estimates as provided.
The project lead time is likely between 4-5 years based on the current interconnection and construction time requirements.	BC Hydro will adopt these estimates as provided.