

SUMMARY Resource Options Update:  
 NOTES Wood-Based Biomass

March 31, 2015  
 10:00 –12:00  
 BC Hydro Dunsmuir

TYPE OF MEETING	Technical Engagement – Wood-Based Biomass
ATTENDEES	Albert Nussbaum, Amy Sopinka, Carlo Dalmonte, Dennis Paradine, Ester Berube, Frankie Nash, Leya Behra, Michael Weedon, Mike Hopkins, Paul Wieringa, Ron Hankewich, Rob Schuetz, Ron Zeilstra, Ryan Midgley, Sara Wellman, Sinclair Tedder, Fred Scott, Karim Hirji
BC HYDRO	Randy Reimann, Anne Wilson, Nan Dai, Judy Baum, Dave Hargreaves, Kathy Lee,
OBJECTIVES	Seek input from industry to inform the characterization of the Wood based biomass resource option
AGENDA	<ol style="list-style-type: none"> <li>1. Overview of approach and draft results</li> <li>2. Fiber availability</li> <li>3. Delivered fiber costs</li> <li>4. Bioenergy project cost</li> </ol>
MATERIALS	Presentation slides

MEETING SUMMARY
<p>BC Hydro welcomed participants to the meeting, and reviewed the agenda and objectives of the meeting. The consultant undertaking the biomass energy potential study was introduced. BC Hydro and the consultant then walked through the slide presentation to provide an overview of draft results to date.</p> <p>The consultant clarified that the results presented the available quantity of biomass that is not being utilized; over and above the fiber that is already committed to existing or proposed users. The study accounts for those proposed new bioenergy plants where construction has commenced.</p> <p>There was a question as to what was the general volume of new projects – new bioenergy projects at Fort St. James and Merritt are about 40 MW each. Lavington Pellet plant is about 100K tonnes per year. Two Canfor / Pacific Bioenergy pellet plants are 140K tonnes and 70K tonnes per year.</p> <p>There was a question as to what is the assumed attrition rate for existing electricity purchase agreements (EPAs). For the purpose of this study, no attrition has been assumed in order to provide a conservative estimate for future potential.</p> <p>A question as to what happens if sawmills shut down where fiber exists? Consultant clarified that he accounts for sawmill closures by looking at fibre supply forecasts by regions. Currently, looking forward it is anticipated about four or five sawmills will shut down in the near future due to fiber supply. Economic closure has not been modelled. It was commented that cost goes up as a result of sawmill shut down because hog fuel is lost or there is a longer transportation distance to fiber.</p> <p><b>KAMLOOPS/OKANAGAN REGION</b></p> <p>Status quo. Not much change and not much opportunity in this region.</p> <p>There is lots of hog fuel but it is being utilized so it does not show up on this chart. Someone could go in and compete for that, however, no guarantee that if you don't have secure tenure that you can retain rights to it.</p> <p><b>PRINCE GEORGE REGION</b></p> <p>Opportunities have dropped recently due to a decrease in the annual allowable cut (AAC) and the allocation of excess bioenergy fibre to Fort St. James Green Energy and West Fraser's Fraser Lake Sawmills.</p> <p>The AAC was increased over the past two decades from 11M to 18M to clear the mountain pine beetle infected trees. The AAC has gone down (currently to 14.5M) and will continue to decline. Forest companies have really targeted harvesting pine stands and are converting dead standing trees to new plantations. Plantations will grow back up to</p>

become sawlogs in about 50-80 years, so it will be about 2050 before a rebound in the AAC begins to occur.

#### **CARIBOO REGION**

Recent developments with First Nations land title court ruling is changing the landscape and adding considerable uncertainty in the regional fibre supply. The recent Tsilhqot'in decision effectively removed considerable Crown land from the previously administered area contributing to the timber harvesting land base.

In terms of AAC determination there are 71 management units. There is an area component that is excluded from harvesting within each management unit and is managed either for other resources values or is currently considered uneconomic for traditional forestry. New technologies may allow us to expand harvesting into these previously considered 'uneconomic' areas. There are biomass stands within each management unit that may provide future opportunities for growing the bioenergy industry, but the economics of harvesting these areas must first be proven.

The shape of the biomass availability forecast is contingent on the shelf life of the mountain pine beetle – how long the trees will be physically available to us. It will help you understand why they drop. Shelf life assumptions are included in Slide 24.

#### **WEST KOOTENAY**

Celgar pulp mill is big in this region – producing black liquor to generate bioenergy. There are also eight smaller sawmills in the area. Most of the residue is currently being shipped to U.S.

It was noted the scale on this slide is quite different than the others. Mountain pine beetle does not play a big role in this region and that is why the fiber availability forecast is so stable.

#### **COAST**

It was clarified that the recent Port Alice pulp mill closure has not been factored into this chart. It was questioned as to whether it was assumed someone will take over Port Alice.

There was a question as to whether fuel from construction/demolition activities is included. Consultant clarified that the study only looks at forestry at this point; it has not included fiber from construction/demolition activities as the opportunity is not deemed significant (scale). Participant commented that the amount of fiber available through construction/demolition has significantly increased (around 150K tonnes and it is dry), may start to be comparable to the hog fuel. BC Hydro and MetroVan can follow up on this potential afterwards.

Participant commented that all boilers on the coast need to be permitted to burn construction debris and not all boilers can take it.

Slide 10 shows the fiber that is not presently consumed. Participant questioned as to where the hog fuel is going to now as it was believed there are no beehive burners on the coast. It was commented there are piles of hog fuel up and down the Island and they are growing, not one concentrated pile. Some has high contamination, and some of this is being landfilled. Salt content in the fiber on the coast was considered an issue. Some participants mentioned that modern boilers can handle it but participants who operate existing bioenergy facilities stated that it is still a major challenge.

#### **PRINCE RUPERT REGION**

No further comments

#### **SOUTH PEACE REGION**

No further comments

#### **FIBER AVAILABILITY – Concluding Comments**

BC Hydro will follow up with Metro Van regarding construction and demolition based fuel availability

There was a question on the unit cubic meter and how it relates to oven dry tonne. BC Hydro explained that a conversion factor of 2.45 cubic meters per oven dry tonne was used.

Participants commented in general that these fiber availability results seem quite intuitive for what would be expected.

Participant asked the consultant how the potential for roadside residue was derived. Consultant explained that it was estimated at 18% of what is harvested. The 18% assumption was from FP Innovations studies in the Cariboo.

**DELIVERED FIBER COST – Slides 15 to 17**

There was a question regarding the distance assumed for calculating the delivered fiber cost (i.e., distance from a hypothetical plant / fiber delivery point to the working forest). The consultant quoted a maximum distance of 200-300 km (e.g., Mackenzie) and average distance about 100-150 km. Consultant further noted that each area is a bit different. For example Kitimat, they don't go out that far; will differ from the Cariboo. Most companies are operating in a 2-2.5 hour cycle time (i.e., out and back).

Participant commented that the cycle time in the Coast and Prince Rupert was longer; 6 hour cycle time for about 150 km radius.

Participant commented that the roadside wood waste cost for the Coast and Prince Rupert are considerable higher than shown on Slide 17, about \$20 higher to around \$88. It was mentioned that the other numbers look about right.

Participant questioned whether the sawmill hog fuel numbers represent market value only or include transportation cost. Consultant clarified that it is a combination (i.e., market value plus transportation). Participants commented in general they look a bit light – sawmill managers locked into long-term contracts okay, but if you are building a new plant you will pay a lot more. Participants commented that the cost in the interior is more like \$40 to \$50 per oven dry tonne.

There was another comment that the cost is light, with a thought that the cost is not low on the fiber side, but on the delivery side.

Participant commented that the fiber availability and delivered cost should be considered together. For example, the fiber in the Interior is mostly tied up. If the hog fuel is not presently being taken by anybody – it's probably not economic. It gets a bit complicated, where the low hanging fruit is gone or tough to get at. For example, delivery from a sawmill at Tahsis will take more than \$28/tonne to get it to a Nanaimo plant.

Consultant clarified that the costs presented represent current situation under contract. Participants questioned whether these costs are representative of future potential given the left over fiber are likely at the periphery of most of these locations, or scattered potential like on the Coast. Similarly for roadside waste.

Participant further questioned how much the cost of hog fuel would influence the cost of fuel mix because it is such a small portion of fiber supply, it could be discounted. The opportunity may be more on roadside residue, and BC Hydro / FortisBC will take it away to consider further.

It was mentioned that BC Hydro / FortisBC are looking for written comments, and people were encouraged to send in comments.

**SUMMARY OF KEY CHANGES AND RESULTS**

***Bioenergy Project Economics – Slide 19***

Participants commented that the proposed lead time is short, and it should be a minimum of four years. For example, the Merritt project was greater than seven years. BC Hydro asked for feedback on the lead time between EPA and in-service as well as between substantial investment and in-service. Participants commented that major spending happens over the last 27 months (~two years) before in-service.

Participants also commented that the proposed project life is short – should probably be more like 25 years. It was mentioned that fiber contracts were 25 years on one of the projects. Projects are designed for 30-year engineering life. The unit energy cost can be reduced by increasing project life. BC Hydro commented that we should consider fiber sustainability if a longer project life is considered. Given the fiber potential in most regions is substantially reduced in the long run, the overall potential if longer project life is considered would be substantially reduced as well. Consultant suggested handling this by screening out short-term potential.

Participants pointed out that EPAs generally have liquidated damage provisions – may serve to keep the project life a bit shorter. For some developers, the project or contract life would depend on the fuel risk people are willing to take on. With the Merritt project, the proponent took it on – 25 year agreement provided the mill is running. Not all developers are willing to accept the fuel supply risk.

Participants commented that aside from project life and lead time, the rest of the proposed numbers appear to be right.

**Bioenergy Project Economics – Slide 20**

A participant commented that the conversion factor may be different from that used by industry: 2.2 cubic meters per oven dry tonne is what the participant used as conversion in the interior instead of 2.45 as proposed. Participant explained that 2.45 is based on solid wood – doesn't account for bark. However, there were some questions at the meeting as to why the resulting conversion factor is lower instead of higher given the logic provided. BC Hydro was to follow up with the participant after the meeting.

The conversion factor of 0.72 (oven dried tonnes to MWh) is a sweet spot for ~35 MW conventional boiler. Participants are in agreement with the factor, and commented that there is a range of about 0.65 to 1.65.

BC Hydro clarified that the costs of delivering the fiber need to be added to the \$84/MWh, which is the unit energy cost excluding delivered fiber cost. Basically we are looking at upward of \$110 considering the cheapest fuel.

**BIOENERGY TECHNOLOGIES**

BC Hydro / FortisBC are looking for information from participants to fill out table.

Participants commented that these are the only technologies that can get financing, considering three years of operation for more than three places world wide.

Participant commented that MacKenzie has a circulating fluidized bed.

For the Organic Rankine Cycle, participant commented that it may be more than 6K, more like 8K if for a stand-alone facility without existing burner.

Participant commented that we are generally seeing massive investment in bioenergy technologies and that BC Hydro should think about other technologies – liquid fuels, next generation pellets etc. An alternate perspective from participants is that the technology needs to be financeable. BC Hydro / FortisBC would appreciate any information.

It was also mentioned that resource options inventory is updated regularly and technologies can be revisited and incorporated into the inventory as it becomes proven.

BC Hydro noted that the Resource Options Inventory look at technologies including emerging technologies, the Resource Options write up can provide commentary on technology innovations. Participants are welcomed to send BC Hydro information on coming technologies.

Participant commented that from a capital cost perspective, the costs shown should be treated as proxies. Either expansion or addition on brownfield can get a lot more capacity – so something may be missing if we don't include that. If mills go down and there is latent capacity in existing plant, it may be more cost effective. There was a question as to whether there is any analysis about this. Participant also suggested having a workshop with some self-generation proponents to discuss what is theoretical capacity and what is the opportunity. BC Hydro indicated that the potential is limited – there has been work in that area and the economic opportunities have been considered and reflected on the Power Smart side.

There was another comment about fuel plantations and their potential, and whether they are included in the study? Participant commented that the technology exists and is being used all over Europe, will likely be introduced here at some time. In the interior some people have looked at some of these opportunities. Hybrid poplar has been looked at in the south of the Province.

BC Hydro / FortisBC will follow up with Metro Van on construction and demolition fuel potential, with Brian McCloy & Bastion Power on the 2.2 cubic meters to oven dry tonne conversion; and would also like to seek information on new technologies.

There was a final call for participants to send additional comments to Kathy Lee at [Kathy.lee@bchydro.com](mailto:Kathy.lee@bchydro.com).

People were thanked for their participation.

Meeting close.