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Briefing Note

Biocoal

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At a Glance

The downturn of the forest industry in B.C. combined with the need to find alternative sources of energy, gives rise to new opportunities. One such opportunity proposed in Terrace is a biocoal facility. This briefing note intends to add some context to better understand the potential opportunities and challenges of biocoal technologies. This briefing note does not however touch on the unique local level issues associated with a biocoal facility in north-western B.C.

Local resource-use decisions will be a challenge for communities in the years ahead, particularly as local communities seek out new opportunities to expand their economic base.

From an initial review, it would appear that the local economic benefits provided by harvesting existing biomass in the region could bring new opportunities to the resource workers in Terrace and surrounding areas. Specifically, in B.C., regions have been hit hard by the mountain pine beetle and there is a significant amount of wood available. If carefully planned and managed it would appear that using some of this wood for biocoal production could provide short term economic value for the region.

However, before heading down this road it is important to consider some key issues that will emerge. In particular, what happens when this current salvageable wood supply is exhausted? What new forestry management practices and regulations need to be in place in B.C. to ensure there is a sustainable wood supply to support this biocoal industry? If a biocoal industry becomes well-established in B.C., what are the implications for the broader forest sector in terms of competition for wood supply?

Bioenergy Sources

There are several forms of feedstock that can be used to produce bioenergy. This section focuses on the solid bioenergy derived from a variety of biomass resources (forest industry waste products — sawdust, wood chips, forest slash) that are suitable for large-scale electricity generation combustion facilities. There are several terms and technologies used to these types of bioenergy sources.

Wood pellets: Wood pellets are a type of wood fuel typically made from forest manufacturing by waste products such as sawdust. Other biomass sources include wood chips originating from tree tops, branches and traditionally non-commercial species. Wood pellets are formed by compressing and drying wood biomass to create a higher-density fuel that can be more easily

transported and more easily integrated with existing combustion technologies (combined heat and power, coal plants, high-efficiency wood stoves, etc.) Experiences in Europe over the past decade demonstrate that wood pellets can be co-fired in electricity generating stations to reduce the amount of coal combusted.

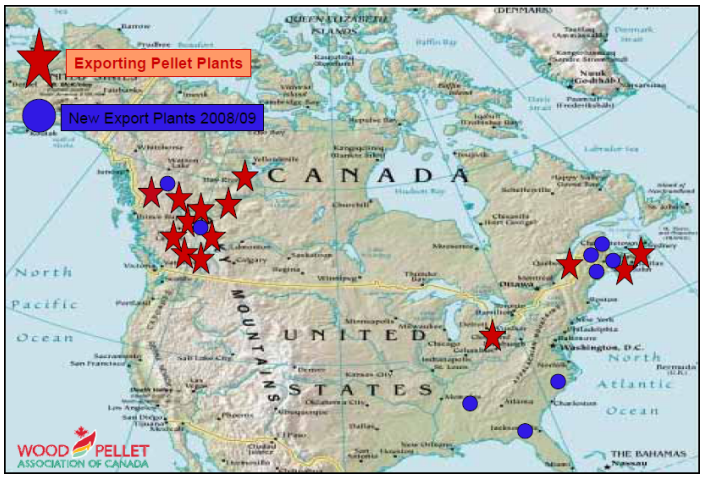
Biocoal: Biocoal is a term used to describe converting biomass into a coal-like substance using different technology processes. Biocoal is often referred to as biochar. The following are two example types of technologies that can be used to produce biocoal.

- Torrefaction: Torrefaction is a mild form of pyrolysis which converts biomass to a brittle, coal-like substance. The torrefaction process produces a fuel that has lower operating costs because torrefied biomass behaves and handles more like coal. It also has a higher energy-per-unit capacity (for example, wood pellets have a BTU value of about 4,500 where torrified wood pellets can have a BTU value of about 10,000 to 12,000 BTU[1]) making transportation more economical as well. There are a handful of commercial torrefaction plants in Europe that covert wood pellets to biocoal.
- Pyrolysis: Pyrolysis is a chemical process that has many purposes. Specific to biomass, it is a process that also converts biomass to a coal-like substance, but does it at a much higher temperature than torrefaction. Pyrolysis occurs under pressure and in the absence of oxygen. It is currently very expensive and there are no commercial plants in existence.

The proposal for a plant in Terrace by Global Bio-Coal Energy Inc. would use a pyrolysis technology.

Canada and wood pellets

Canada is a world leader in producing wood pellets. In 2009, Canada produced and shipped over 1.5 million tons of wood pellets, mostly to the EU, as seen in the figure below.[2] The majority of the wood pellets in Canada are produced in British Columbia:



The Wood Pellet Association of Canada (WPAC), located in Prince George, is trying to advocate to Canadian power utilities to start co-firing wood pellets with coal to create a domestic market and demand for wood pellets. Ontario is the first province to look at co-firing wood pellets for large-scale electricity generation.

[1] Lisa Gibson, "Densification conference panel has torrefaction emphasis," *Biomass Power and Thermal*, Sept. 24, 2010. http://www.biomassmagazine.com/article.jsp?article_id=4105

[2] John Swann, "Wood Pellet Export: History, Opportunites, Challenges," presented at SmallWood 2008, May 13, 2008. http://www.forestprod.org/smallwood08swaan.pdf

What is happening in B.C.?

The interest in biocoal in Terrace has emerged from a company called Global Bio-Coal Energy Inc. of Vancouver. Global Bio-Coal recently announced that a commercial-sized biocoal manufacturing facility in Terrace, B.C. is planned for 2011. The technology to be utilized is a microwave process that transforms biomass into biocoal/biochar allowing the biomass to be converted to various types of end products, i.e. torrefied pellets through to charcoal. The target production capacity of the plant is three million tonnes of biocoal per year for the world market. Producing this volume of biocoal would require several processing plants in the area.

Potential opportunities

Economic driver — Biocoal production of three million tonnes per year could generate $1 billion CND in exports and create 600 new jobs to operate the facilities.[3] The forest industry could also restore around 5,200 jobs in biomass harvesting, transportation and other indirect jobs in the forestry sector. This could be important for B.C., which has been hit hard by the decline in the traditional forest sector.

Energy — Torrefaction and pyrolysis conversion processes produce vapours and volatiles from the biomass. These vapours can be combusted and the thermal energy can be used to dry the biomass.

[3] BC to Host World's First Bio-Coal Production Facility, *Globenet*, June 12, 2010. http://www.globe-net.com/articles/2010/june/12/bc-to-host-world%E2%80%99s-first-bio-coal-production-facility-.aspx?sub=10

Potential challenges

Competition for biomass resources — To date, only wood pellets are produced in B.C., and these are derived from waste biomass, i.e. logging waste and residue from sawmill operations. If there is an increased demand for biocoal in B.C., there may be competition for these waste resources, and there is potential for these wastes to be exhausted. This could in turn lead to competition for other, non-waste biomass resources.

Sustainable forestry — Additional harvesting of wood in B.C. forests affected by pine beetle may further weaken the health and sustainability of the forests which require that a certain amount of forest slash remain intact to support healthy regrowth. If there is an increase in demand for biomass to fulfill biocoal contracts, additional harvesting of slash waste and even trees would need to be done in a manner consistent with accepted sustainable forest management practices outlined by the Forest Stewardship Council.

Greenhouse gases — The greenhouse gas benefits of using biocoal depend on the fuel being displaced and the time frame of the forest harvest rotation. To properly understand the greenhouse gas benefits of biocoal, a full life-cycle analysis must be done. Biocoal sustainably produced in B.C. and used in Canada to displace coal-fired electricity generation could decrease greenhouse gas emissions, whereas biocoal produced unsustainably and used overseas to displace fuel oil for space heating could actually increase greenhouse gas emissions.

Economic diversification — Biocoal production in a local community results in continued dependence on forests and could shift communities away from other forms of economic development.