Feedstock Supply Logistics- Challenges & Opportunities for Biofuels

Learnings from Finland, Sweden, and the Cariboo

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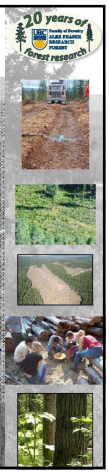
Introduction

- Alex Fraser Research Forest
  - self-funded unit of the UBC Faculty of Forestry
  - Established 1987
- Revenues from
  - timber sales,
  - research and service contracts
- Exploring biomass supply from the forest management and business perspective for several years



Observation 1

- The engineers are in charge
  And they don't understand forest management and operations
  - If you are building a plant
  - The engineers will probably tell you the feedstock will just show up at
    - Quality you want
    - Price you can afford
    - The time when you need it
  - It's not that simple!

Observation 3

- Biomass from the forest has a cost
  I can't afford to make it if someone can't afford to pay for it.
  - I need an average of at least $40/m^3 of logs to bring a product to the gate
  - If you want to source biomass from the woods
  - $40/m^3 equates to about 0.67¢/kW of heat or CHP, or 1.67¢/kW of electricity only

Observation 4

- I am concerned that there may not be enough supply in the future to match the demand we are starting to build
- Can our forest ecosystems sustain all the demand for wood, and still continue to keep BC Supernatural
- Emerging demand must develop according to future supply capacity

Williams Lake Context for Bioenergy

- Population
  - City of Williams Lake 11,000
  - Service Area 35,000
- Bioenergy plants built to consume sawmill waste stream
  - Capital Power Williams Lake Power Plant – 65 MW electricity
    - Biomass-fired steam generator
  - Pinnacle Pellet Williams Lake – 500 metric tonnes/day production
- Early 2009 sawmills reduced production
  - Turned to biomass in the forest for furnish
    - Logging slash
    - Wildland Urban Interface treatments
    - Mountain pine bark beetle damage in young stands

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Two Activities to Report

- A month of study travel in Finland and Sweden
  May 2009
- Six Case Studies of Forest-Origin Biomass Supply
  2008/09

Biomass Supply Logistics

TRAVEL IN FINLAND AND SWEDEN

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Learning from Finland and Sweden

- Energy security is a powerful motivation
- Heat is a lower cost product than power
- Biomass is a valuable product, not waste
  - Minimize contamination
    - Soil and Rock
    - Steel
- Biomass inventory in a plant's yard is expensive
  - Just-in-time delivery
- Feedstock consistency is critical
  - Manage moisture content
  - Develop long-lasting supply relationships
- There are real concerns about environmental implications
  - Biodiversity
  - Nutrient export
  - Machine traffic/soil
- Willingness to work together
  - E.G. protect pulp-log supply by supplying energy wood

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Manage Moisture Content

- Inventory in the woods

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Transportation

- Flexibility is key

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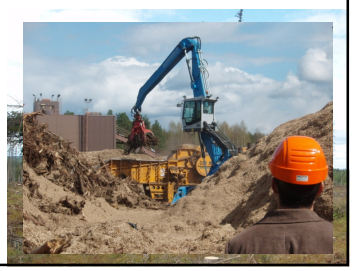
Learning from Finland and Sweden

Environmental Implications

- Present levels of dead wood very low
- Spring gathering slash
- Nutrient export
- Stump extraction



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Biomass Supply Logistics

SIX CASE STUDIES IN THE CARIBOO

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Results & Discussion

- Total Cost to grind, load and truck material
  - $39 - $147 per ODt
- Moisture Content
  - 24 – 47%

- Larger projects cost less ($/ODt)
- Very small projects suffer mobilization and trucking inefficiencies
- Organization of debris is important to reduce grinding costs
- Distance from the plant is a key factor

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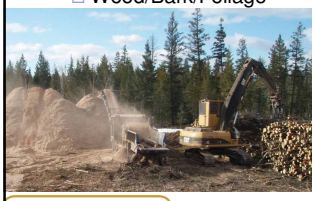
Discussion – Feedstock Quality

- Composition
  - Species
  - Wood/Bark/Foliage
- Contamination
  - Accidental steel
  - Throw-away metal
  - Garbage
- Sticks and stones
  - Attached to debris
  - Picked up in loading



We need to develop a culture that values biomass as a product

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Discussion – Moisture Content

- Water is heavier than wood
  - 1% increase in MC adds 3-4 kg/m^3
  - If bulk density increases above 200 kg/m^3, trucks become weight-limited
    - Diminished energy value per trip
- Dry material is more efficient
  - Handling
  - Grinding
  - Trucking
- Water must be driven off in processing
  - Consumes energy, reduces efficiency

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Lessons Learned

- Organize logging to produce biomass as a product
- Grind into trucks, not onto the ground
  - 15 cm (6 in) left behind equates to 11% of pile volume
  - Contamination is difficult to avoid
- Bulk density and truck volume are both potentially limiting
  - Minimize moisture content
  - Maximize bulk density

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More Lessons Learned

- Plan the project considering the trucking problems
- More tools in the toolbox

- Winter operations
  - Snow and ice mixed into feedstock
  - Feedstock is well chilled and can freeze
    - During transport (stuck in van)
    - In the infeed at the plant
  - Much greater heat input to dry

Conclusions

- Fibre has a value
  - To provide a product on spec, on time, and on cost, we need to be paid fairly
- Culture shift – biomass is a product, not waste
- Manage moisture content
- Develop a toolbox of approaches to satisfy large and small projects
- Production costs are high relative to the value of the product

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Questions?

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