Wood-based Biomass in the U.S. An Emphasis on Wood Energy

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Presentation Outline

• Overview
• Wood Biomass
• Energy Options
• Recent Events
• Issues & Challenges
• Concluding Observations
There is a great future in plastics......think about it.
There is a great future in wood......think about it.
Wood-based Biomass Types

Primary mill residues

Wood materials and bark generated at manufacturing plants (primary wood-using mills) when round wood products are processed into primary wood products.

Slabs, edgings, trimmings, sawdust, veneer clippings and cores, and pulp screenings.
Wood-based Biomass Types

Secondary mill residues

Wood scraps and sawdust from woodworking shops, furniture factories, wood container and pallet mills, etc. that use lumber, plywood and other “primary” raw materials.
Wood-based Biomass Types

Urban wood waste

Discarded wood, tree trimmings, material from construction and demolition sites, etc.
Wood-based Biomass Types

Forest residues

Logging residue, unused portions of trees, cut or killed during logging or silvicultural activities and left in the woods; unutilized volume of trees cut or killed during logging operations.

Different Types of Slash
Wood-based Biomass Sources
Comparative Advantage in Feedstock Production

Forest Residues (130)
Crop Residues (152)
Perennial Crops (26)
Figure 1. Thematic map depicting acres of timberland sales by state and survey unit across the south.

- Coal: 48.5%
- Nuclear: 19.4%
- Natural Gas: 21.6%
- Hydroelectric Conventional: 5.8%
- Nuclear: 19.4%
- Other Renewables: 2.5%
- Petroleum: 1.6%
- Other Gases: 0.3%
- Other: 0.3%

Wood Energy in the U.S.

• Wood is the most commonly used biomass fuel for heat and power in the U.S.

• About 84% of the wood and wood waste fuel used in the U.S. is consumed by industry, electric power producers, and commercial businesses.

• Most of this is used at wood product manufacturing facilities in cogeneration.
U.S. Wood Biomass Energy Consumption by Sector, 2006
(Total = 2.18 Quadrillion BTU)

Source: U.S. Energy Information Administration
Why Wood?

• Renewable, carbon-neutral, and locally available compared to most fossil fuels.

• In combustion, wood produces 90% less carbon dioxide (CO$_2$) than fossil fuels with minimal emissions of sulfur, heavy metals and particulates (USDA 2004).

• Cellulosic content of wood → candidate biomass for transportation fuel production (USDA 2004).
$/MM Btu for Various Fuel Sources
Q4 2008

- Coal
- Chips

Source: Pete Stewart, Forest2Market
Wood Biomass Supply
Biomass Research & Development Initiative

- Department of Agriculture
- Department of Energy
- National Science Foundation
- Environmental Protection Agency
- Department of the Interior
- Office of Science and Technology Policy
- Department of Transportation
- Department of Commerce
- Department of the Treasury
- Department of Defense

Available at:
www.brdisolutions.com
Wood Biomass Supply
Billion –Ton Annual Supply Study

Biomass as Feedstock for a Bioenergy and Bioproducts Industry: The Technical Feasibility of a Billion-Ton Annual Supply

April 2005

Available at: www.osti.gov/bridge
Wood to Energy
What are the options?
Wood Pellets

- First engineered in the 1970s in response to energy shortage in the US (Ellen 2008).
- In North America, in 2008 there were 80 mills that manufacture wood pellets (Pellet Fuels Institute 2008).
- 450 pellet plants in Europe.
- U.S. Production: home heating, exported to Europe, some electricity production.
- Increased growth in demand in European markets (25-30% expected in Germany & Austria in 2009) (Egger and Oehlinger 2009).
Wood Pellet Demand in Europe

Sources – Pellets@las and Wood Resource Quarterly

+1,900%
Gasification

Converts carbon-based materials, such as coal, petroleum, biofuel, or biomass.....

Into carbon monoxide and hydrogen.....

By reacting the raw material, at high temperatures controlled with oxygen and/or steam.

The resulting gas mixture is called synthesis gas or syngas and is itself a fuel.
Pyrolysis

Chemical decomposition of a condensed substance by heating.

Does not require oxygen.

Extreme pyrolysis, which leaves only carbon as the residue, is called *carbonization* and is also related to the chemical process of *charring*.

Pyrolysis is used in the to produce charcoal, activated carbon, methanol and other chemicals from wood.
Cogeneration

- Simultaneous production of heat and electricity, commonly called combined heat and power (CHP), from a single fuel.

- Traditionally, a steam turbine is used to produce electricity, although a wood gasification/internal combustion unit can also be a cogeneration unit.

- Most of U.S. CHP capacity is in wood products manufacturing industries.
170 U.S. ethanol distilleries in operation and another 24 under construction as of January 2009.
"Fuel or food debate" – ethical challenges in deciding the best use of natural resources.

There are 13 cellulosic ethanol plants currently operating or under construction in the U.S. that use woody biomass as feedstock (C. Cornell, 2009 in Biofuels Business).
Wood Energy Facilities in the U.S.
Wood Energy Facilities in the U.S.

- There were about 200 wood burning electricity plants in the United States in 2008, including 72 with 40 megawatt capacity or larger (Lindsay 2008).

- At least another 8 wood-burning electricity plants of 40 megawatt capacity or larger have been proposed.

- More than 100 biomass power plants connected to the U.S. electrical grid in 2008 (Galbraith 2008).
Recent Events in Wood Energy in the U.S.

**Weyerhaeuser and Chevron Form Biofuels JV**

- Catchlight Energy LLC
- 50-50 joint venture
- Develop renewable fuels from nonfood sources.
- Research and develop technology for converting cellulose-based biomass into economical and low-carbon biofuels.

“(The) long view is petroleum prices are going to go back up, and a lot of chemical manufacturers are focused on chemical products that come out of cellulose and lignin”

*Dan Fulton, President/CEO Weyerhaeuser*

Sources: Thomson Reuters February 29, 2008; Puget Sound Business Journal January 2, 2009
Recent Events in Wood Energy in the U.S.

**Duke Energy & French Nuclear Engineering Co. Areva**

- **ADAGE™**

- First biopower ("biomass to electricity") partnership in the United States between major energy companies.

- Plans to build up to 12 wood-electricity plants with roughly 50 megawatt capacity on the Eastern seaboard in the next six years.

- Proposed site of its first U.S. biopower plant in Hamilton County, Florida (50 Megawatt)

Recent Events in Wood Energy in the U.S.

- 1.4 million gallon per year (MGY) cellulosic ethanol plant in Jennings, LA
- Nation’s first demonstration-scale plant capable of producing ethanol from non-food cellulosic biomass sources.
- Feedstock: sugarcane bagasse, dedicated energy crops, wood products and switchgrass
Recent Events in Wood Energy in the U.S.

- Wiggins, Mississippi
- Produces more than 50,000 tons of wood fuel pellets annually
- Mostly from recycled forest waste material supplemented with green wood

www.pwpellets.com
Recent Events in Wood Energy in the U.S.

- 400,000 metric tonnes of wood pellets produced per year
- Offices in Baton Rouge Louisiana USA plus Hamburg and Munich Germany
- Operations and shipments start in the 3rd quarter 2010
- Currently accepting orders
- Connects growing European wood pellet market to Louisiana-grown timber
- Superior low cost position for shipments to Europe
- Expandable to larger capacities

www.pbioen.com/
Louisiana Biomass Resources Database
www.lsuagcenter.com/biomass

To Generate the Map use the menu below:
- Choose Data Type
- Select Color
- Map Size

Select from the list below to view totals per parish:

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</tbody>
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Louisiana Biomass Resources Database
www.lsuagcenter.com/biomass
Recent Events in Wood Energy in the U.S.

American Recovery and Reinvestment Act

- President Obama announced that $786.5 million from the will be provided to accelerate advanced biofuels research and development and expand commercialization by providing additional funding for commercial biorefineries.

- The new categories include:
  - Cellulosic biofuels;
  - Biomass-based diesel;
  - Advanced biofuels; and
  - Total renewable fuel.

Source: THE WHITE HOUSE; Office of the Press Secretary; May 5, 2009
Issues & Challenges
Effects on Forest Sector Structure?

- Federal and state mandates, if fully implemented, would lead to over-harvesting of forests in the United States and are unrealistic.

- Growth for wood-energy industry will be constrained by sustainable harvest levels and wood fiber prices.

Source: RISI. Sept. 23, 2008 (PRNewswire)
U.S. demand for wood fiber from these emerging biomass markets is expected to rise from 2 million tons in 2008 to at least 13.5 million tons in 2020.

Higher prices for traditional biomass inputs (chips).

Demand will be driven by a) wood-burning power companies that produce and sell electricity to public utilities and; b) increasing wood pellets exported to Europe.

Biomass → cellulosic ethanol for transportation fuel will also impact the forest products industry.

Source: Forest2Market. 2008
Concluding Observations

- Investors are opportunistic and are seeking competitive advantage.
- First mover advantage is significant.
- Increased demand for wood biomass = increased wood biomass/chip prices.
- Subsidies and other policy instruments can create an uneven playing field.
- Forest landowners (and agricultural producers) are examining restructuring their business portfolios to include biomass → energy.
Final Observation