Forest Bioenergy in the United States: Current Status and Outlook

Seth Walker
Bioenergy Economist
swalker@risi.com
April 7, 2016
Energy From the Forest

• Biomass Power
  – Stand-Alone Plants
  – Forest Products Industry

• Wood Pellets
  – Domestic Heating Markets
  – Industrial Exports

• Liquid Biofuels
  – Cellulosic
  – Pulping by-products
  – No significant impact in the US over the near term
Woodfiber Consumption by Bioenergy

Million dry short tons

Source: RISI
Electricity Generation

- Forest product industries produce 64% of electricity from wood and wood-derived fuels in the US
  - Little to no growth
- Production at stand-alone biomass power plants has nearly doubled over the past 15 years
  - 8 million MWh in 2001
  - 15 million MWh in 2015

Electricity Production from Wood and Wood-derived Fuels

Source: EIA
Wood Biomass Power in the United States

- Most significant recent growth in the South
  - Dominion Power – VA
  - Gainesville Renewable Energy – FL
- Historically Northeast was the biggest market
  - Little growth due to woodfiber price/availability constraints
- Moderate growth in West peaked in 2005, bottom in 2012
  - Sawlog dominated market (lumber production)
  - End of housing boom

Source: RISI
Wood Pellet Production

- Emergence of a significant export market to Europe
  - Driven by renewable energy and CO₂ reduction policies
  - Primarily UK, Belgium
  - Displacing coal in power plants
- Smaller domestic heating market has been around for decades
  - Low oil prices, warm winters have really hurt this market

![US Pellet Production Chart](chart.png)

Source: RISI
North American Pellet Supply

2014 North American Pellet Mill Map
Capacity Shown in Thousand Tonnes

Operational: < 100, 101-249, 250-499, 500+
Construction: < 100, 101-249, 250-499, 500+
Proposed: < 100, 101-249, 250-499, 500+
Doubtful: < 100, 101-249, 250-499, 500+
Closed: < 100, 101-249, 250-499, 500+

© 2014 RISI
Development of the European Industrial Wood Pellet Market

- Primarily focused in UK, Belgium, Netherlands, Denmark
  - Countries without a significant amount of domestic resources
  - Previous reliance on coal

Source: RISI
United Kingdom

**Policy:** Transition period from Renewables Obligation (RO) to Contracts for Difference
- Limited by budgetary constraints (Levy Control Framework) – removal of Levy Exemption Credits, few units qualified for CfD
- European Commission investigating whether CfD violates state-aid guidelines

**Major Players:** Drax (3x 660MW units), RWE (400MW), MGT Power (greenfield CHP – mostly wood chips)

**Sources:** US, Canada, Latvia, Portugal, Brazil

**Market Size:** ~6-7 million mt

**Market Potential:** ~9-10 million mt
Denmark

Policy: Fossil Fuel tax aversion, FiT (significantly less impact)

Major Players:
Central power stations and district heating
Dong, Hofor, Verdo Energy

Sources: Latvia, Estonia, Sweden, Russia, Germany, US

Market Size: ~2 million mt

Market Potential: ~3-4 million mt
Belgium

**Policy:** Green Certificate Program – varies by region (Flanders and Wallonia)
- Flanders shut down pellet consumption for several months in 2014
- Disagreement with Flemish forest products groups

**Major Players:**
Engie - Rodenhuize (Ghent), Les Awirs (Liege)
E.ON - Antwerp, Genk (sold to German Pellets)
Bee Power Ghent

**Sources:** US, Canada

**Market Size:** ~1 million mt

**Market Potential:** ~3 million mt
Netherlands – Co-firing

**Policy:** SDE+ (guaranteed minimum price of electricity)
- Sustainability criteria had to be established (certification requirement, limitations of biomass coming from natural forest to plantation conversion)
  - Smaller holdings exempt for the short term < 1000 hectares
- 2 companies applied in 2015 (RWE, Engie) – unsuccessful (budget)
- 2016 budget >2x 2015

**Major Players:**
RWE, E.ON, Engie (GDF Suez)

**Sources:** US, Canada, Portugal

**Market Size:** insignificant

**Market Potential:** ~4 million mt
Why the US South?

North American Delivered Pulpwood Prices - 2005-Present
USD/GST - Delivered

Source: RISI North American Woodfiber and Biomass Markets
Southern Wood Fiber Supply and Demand

- 63% of US timber harvest occurs in the South
- Nearly 3/4 of all US low grade (pulpwood, residuals and biomass) woodfiber demand is in the South
Historical US Softwood Growing Stock Removals by End Use
Billion Cubic Feet

© Copyright 2016 RISI, Inc. | Proprietary Information
Timber Supply Outlook

• Really boring chart!
  – Stable inventory outlook

• Some transition from managed hardwood to softwood

• Does not include public / reserved lands
  – Where growing stock (carbon) is increasing
2015 US South Timber Harvest Value and Volume

- Even though sawtimber represent only 28% of total Southern timber harvest volume, it represents 54% of the value.
- Conversely, while pulpwood and biomass account for 51% of total timber harvest volume, they represent only 22% of the total value.
- Sawlog harvest is still the major driver of forest management in the US South.

Source: RISI Timber Transaction Price Service
Fiber Paying Capability

- A measure of the relative competitiveness of various wood using industries
  - Essentially the margin left to pay for wood at breakeven
- Bioenergy industries require low cost stable feedstocks

<table>
<thead>
<tr>
<th>Sales Price</th>
<th>- Selling Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Financial Costs</td>
</tr>
<tr>
<td></td>
<td>- Fixed Costs</td>
</tr>
<tr>
<td></td>
<td>- Variable Costs</td>
</tr>
<tr>
<td></td>
<td>= FPC</td>
</tr>
</tbody>
</table>

Fiber Paying Capability
US South Woodfiber Users
$/gst

- Market Pulp
- OSB
- Export Pellets
- Electricity Generation
Key Takeaways

• Domestic Biomass Power Sector
  – Opportunistic (needs low cost feedstocks)
  – Relatively moderate growth
  – To this point, no significant federal support + low fossil fuel prices

• Rapid emergence of industrial wood pellet export sector
  – Growth slowing, but a major player in US South fiber markets

• Forest volume/carbon stocks
  – Stable outlook despite increased consumption
  – Increased demand > higher price > more supply

• Bioenergy industries bottom of the barrel economically
  – Not driving forest management practices
  – Timber management based on value maximization from sawlog production
See the forest through the trees!
Contact Information

Seth Walker
Bioenergy Economist, RISI
Bedford, MA
swalker@risi.com
+1.781.734.8992
Twitter @BioEconomist