Moving Towards Biomass: Trends and Challenges
Norbridge Survey Results

July 2009
About this study

- Norbridge conducted this study independently to better understand interest in solid biomass fuels for power generation
- The study is based on 33 interviews with utilities/power generators and state agencies, unless otherwise noted
- Norbridge did not attempt to verify or otherwise confirm interviewee statements and opinions
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- Introduction
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Biomass is likely to be a fast growing “green” fuel for power generation

- Biomass is already the fourth-largest global energy source after coal, oil, and natural gas
- The Intergovernmental Panel on Climate Change considers biomass to be “carbon-neutral”

Types of biomass

- Agricultural Products
- Wood Sources
- Solid Waste
- Hog Fuel & Slash

Renewable energy process

Wood pellet example
25+ states have committed to renewable energy standards, and others are considering it

- Renewable Energy Portfolio Standards (RPS) are a major driver of biomass fuel use
  - 13 additional states are considering RPS legislation
  - Congress is considering federal RPS legislation (25% by 2025)
- Cap-and-trade legislation before Congress would also spur biomass use

Source: Database of State Incentives for Renewable Energy (DSIRE).
Note: North Dakota, South Dakota, Utah, Virginia, and Vermont, have nonbinding goals for adoption of renewable energy instead of an RPS.
Norbridge interviewed 16 utilities and 17 states on the role of biomass fuel for power generation

Utilities/Power Generators
- Utilities and generators interviewed comprise 27% of total U.S. electric utility revenue and 44% by market capitalization. They operate in 27 states.

State Agencies
- States interviewed included cross section of states with and without RPS, with and without potential biomass supplies, and with geographic diversity.

States Represented in Utility and Generator Interviews

Key Interview Topics: biomass initiatives, plans, importance, interest, readiness, challenges, and supply chain issues
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Only 25% of those surveyed currently use biomass for power generation

- 75% of interviewees use renewables, but only 25% use biomass

- Why? Cost trade-offs between biomass and fossil fuels still favor traditional fuel sources

- Current use of renewables
  - Hydro: Already used where possible, but unlikely to increase
  - Wind: Recent expansion limited by higher cost, weak local wind resources, and community concerns
  - Solar/Geothermal: No significant use cited so far

**Interviewee Comment:** “We are obligated to choose the lowest cost options for our rate payers. For the moment, that is not biomass.”
However, 69% of interviewees are interested in increasing biomass usage

- What is driving the interest?
  - Government mandates, such as RPS, court rulings
  - Government incentives, such as tax credits, cap-and-trade
  - Scarcity of other renewable alternatives
  - Fuel diversification

**Interviewee Comment:** “Our state RPS mandates use of renewables. Because our local wind and solar resources are weak, we are now studying use of the most attractive renewable option for us, biomass”
Utilities are discussing numerous potential biomass conversions at power plants

- Most plants will have <100MW capacity, though some planned are 300MW or greater
- One utility expects 5-10 million tons of annual biomass consumption by 2015**
- Even for those that have studied biomass extensively, questions remain:
  - Co-firing vs. full conversion
  - Fuel source
  - Use of aggregator vs. direct sourcing
  - Seasonal burn expectations

* Average of range given by each interviewee who provided plant size estimates.
**Not all utilities planning to use biomass estimated plant size, including the interviewee that expects 5-10M tons of annual biomass consumption.
However, many utilities are waiting for regulatory signals before initiating a biomass conversion

- Most utilities are “in a holding pattern” until federal or state legislation clarifies economics and/or mandates to act
- Some utilities already have court orders or state RPS obligations forcing them to act
- Few interviewees source biomass cheaply enough to burn without RPS obligations

**Interviewee Comment:** “On the surface, it seems that the economic decision would be clearly in favor of coal. However, due to the RPS, the biomass plant will be competing against wind, solar and other renewables...the economics could be favorable”
Utilities are considering several potential biomass sources

- Utilities are most frequently considering pelletized or non-pelletized woody biomass
  - BTU content of pelletized fuels can be twice that of low-energy-content biomass
  - However, pelletized biomass can be significantly more expensive than non-pelletized options

- Sustainable forestry and land use issues are major factors in decision-making
  - Wood vs. agricultural sources
  - Virgin vs. unmerchantable wood
  - Re-growth timeframe
  - Marginal vs. productive land

Fuel Sources Considered
Number of Mentions in Norbridge Survey

<table>
<thead>
<tr>
<th>Fuel Source</th>
<th>Number of Mentions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Pelletized Wood-Based Biomass</td>
<td>8</td>
</tr>
<tr>
<td>Pelletized Wood-Based Biomass</td>
<td>6</td>
</tr>
<tr>
<td>Low Energy Intensity Wood</td>
<td>4</td>
</tr>
<tr>
<td>Agricultural Sources</td>
<td>3</td>
</tr>
<tr>
<td>Animal Waste</td>
<td>0</td>
</tr>
</tbody>
</table>
Access to biomass supply and fuel cost are the most pressing challenges

- Potentially scarce supply concerns many utilities
- Utilities struggle with the high cost of biomass fuel to meet their environmental obligations

**Interviewee Comment:** “We are looking into all biomass options now because we expect competition among utilities for biomass resources to heat up soon”
Transportation and logistics are also seen as key challenges to biomass conversion

- Multiple modes need to be evaluated, particularly for larger plant sizes or longer transport distances
- Fuel characteristics differ markedly from coal (e.g. BTU, moisture absorption, durability, and combustibility), with significant impacts on transportation, handling and storage requirements

**Interviewee Comment:** “We will likely use a low energy-intensity wood-based fuel, so that means we will have to transport around twice the tonnage of coal for each unit of energy. The sources of that tonnage will be disparate”
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Over 70% of states surveyed are very interested in biomass

- State RPS legislation drives significant interest
- Biomass is also of interest to states without RPS due to:
  - Potential federal RPS
  - Focus of state governor
- Biomass is particularly important to coal-reliant states with little or no potential for other renewables (solar, wind, hydro)

**State interest in increasing biomass as a source of power or heating**
Scale of 1 to 10, across 17 states

**Interviewee Comment:** “Biomass is our low-hanging fruit...We have a lot of forested land.”
States are promoting various initiatives to support biomass development

Common types of biomass initiatives

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Number of Mentions</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>State tax credits, subsidies, and other assistance</td>
<td>11</td>
<td>Support for research and development, fuel suppliers, as well as businesses and households utilizing biomass</td>
</tr>
<tr>
<td>Supply and feasibility assessment</td>
<td>8</td>
<td>Research ranging from availability studies to long-range strategic plans, often with university involvement</td>
</tr>
<tr>
<td>Biomass task force</td>
<td>5</td>
<td>Regular meetings to develop/implement biomass policy and/or review potential projects</td>
</tr>
</tbody>
</table>

Examples

- AK – renewable energy fund of $100 million
- CT – Clean Energy Fund funded by ratepayers
- MO – Wood energy tax credit of $5/ton
- OR – 50% business energy tax credit (BETC)

- MA -- Sustainable Forest Bioenergy Initiative to evaluate biomass potential and feasibility
- Multiple states – evaluations of biomass supplies and potential uses e.g. co-firing with coal, use in pulverized coal boilers, utilization of energy grasses

- GA – Bioenergy One-Stop Shop – monthly cross-agency meeting to evaluate projects
- SC – Biomass Council with quarterly meetings and >200 members representing broad set of stakeholders – www.scbiomass.org
18 biomass energy projects are planned or underway in the states surveyed

**Biomass energy projects planned or currently underway**

<table>
<thead>
<tr>
<th>MW Capacity</th>
<th>Number of Mentions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 20MW</td>
<td>4</td>
</tr>
<tr>
<td>21 to 40MW</td>
<td>5</td>
</tr>
<tr>
<td>41 to 60MW</td>
<td>5</td>
</tr>
<tr>
<td>61 to 80MW</td>
<td>0</td>
</tr>
<tr>
<td>81 to 100MW</td>
<td>3</td>
</tr>
<tr>
<td>Above 100MW</td>
<td>1</td>
</tr>
</tbody>
</table>

Number of mentions in Norbridge Survey

- Most are less than 60MW, although larger projects (> 80MW) are under development in at least three states
- One state is looking at a very large plant (>1MM tons per year) that will utilize multiple modes of transportation (rail, barge, truck)

**Examples under consideration**

- Using reclaimed land from coal mines for energy crops
- Switching tobacco farms to switchgrass and other energy crops
- Using 20 million tons of biomass annually by 2025 to reduce carbon footprint

**Interviewee Comment:** “Coal interests are providing funding…they want to provide their customers with low-carbon options in addition to coal.”
## Logistics, economics, and supply are top issues for state officials

### Top challenges to adoption of biomass energy

Number of mentions in Norbridge survey

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Number of Mentions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation, logistics, and infrastructure</td>
<td>8</td>
</tr>
<tr>
<td>Economics</td>
<td>7</td>
</tr>
<tr>
<td>Supply assurance</td>
<td>6</td>
</tr>
<tr>
<td>Financing</td>
<td>4</td>
</tr>
<tr>
<td>Developing a fuels market</td>
<td>4</td>
</tr>
<tr>
<td>Competition with other renewables (wind, solar)</td>
<td>3</td>
</tr>
</tbody>
</table>

### Examples of interviewee comments

#### Logistics
- “It’s hard to get the biomass market going without the supply chain in place”
- “Our power plants are not near the biomass sources...transportation costs are important.”
- “Storage issues are a big concern”

#### Economics
- “It’s hard to compete with coal”
- “Cost is overriding concern...coal is lowest”
- “Need to know the cost ten years from now”

#### Supply
- “Banks want long-term contracts...but logging companies aren’t willing to sign them”
- “Farmers are not in favor of long-term contracts...but biomass facilities need to be certain of their feedstock”
- “Top issue is long-term sustainable supply”

Note: Other issues include developing sustainable harvesting practices, competition from other users (i.e. pulp and paper industry), ensuring localism (keeping economic benefits close), determining right type of energy crops to use, siting and permitting (despite “not in my backyard” opposition), and limited regulatory / legislative support.
Over 70% of interviewees view biomass supply chain issues as crucial

- Biomass fuels raise major logistics issues
  - Moving new material on an unprecedented scale
  - Different characteristics from coal (BTU, moisture sensitivity, durability, combustibility)
  - Potential network of densification facilities to increase transport efficiency – “we will be densifying from 15 to 35 pounds/cubic foot”
  - Need for specialized equipment (storage, unloading)
  - Dependence on truck transport
  - Handling risks (can degrade quality)
  - Distance to market

Interviewee Comment: “Our number one issue is logistics...how to transport, handle and store millions of tons of biomass per year”

Importance of supply chain issues for biomass
Scale of 1 to 10, 15 responses

- Low
- High

73% of states
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Norbridge is a management consulting firm with industry focus on transportation/logistics, energy, and mining

- **Founded:** 1993 (Formerly CFGW, Inc.)
- **Locations:** Boston, MA; Chicago, IL; Washington, DC
- **Employees:** 16 Partners and Principals with a total staff of 30
- **Philosophy:** Successful consulting is a relationship business built on trust, hard work and a track record of excellence in creating client value
- **Goal:** Help clients make better decisions
- **Value Proposition:**
  - **Attention** to a few client relationships
  - **Partners and Principals** participate in all aspects of an assignment
  - **Deliver Bottom Line Results**, not just PowerPoint reports