Potential for Biomass Energy Development in South Carolina

Tim Adams
Resource Development Director
South Carolina Forestry Commission
South Carolina’s Forest Products
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Production of Primary Timber Products in South Carolina

[Graph showing production of various timber products from 1936 to 2003.]
Forestry’s Economic Impact

#1 manufacturing industry in jobs & payroll

$17.45 billion total economic impact

#1 agricultural commodity in SC

$1 billion in forest products export
Relative Size of Forestry Sectors

[Diagram showing the relative size of forestry sectors in South Carolina, 2006. The diagram includes sectors such as Pulp & Paper, Sawmills, Logging, Furniture, and Forest-Based Recreation, with bubble sizes representing industry output, number of employees, and labor income.]
South Carolina Manufacturing Sector Rankings
How Big is Forestry in SC?

Each year, the 944,000 loads of wood hauled to South Carolina mills would stretch from Myrtle Beach to Los Angeles ...almost 4 times!
What is Woody Biomass?

- Any organic matter from trees or woody plants
- Woody biomass is generally considered to be forestry residues.
### Biomass Consumption in SC

<table>
<thead>
<tr>
<th>Company</th>
<th>Consumption (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smurfit-Stone</td>
<td>570,000</td>
</tr>
<tr>
<td>Bowater</td>
<td>475,000</td>
</tr>
<tr>
<td>IP - Eastover</td>
<td>320,000</td>
</tr>
<tr>
<td>MeadWestvaco</td>
<td>300,000</td>
</tr>
<tr>
<td>Norbord</td>
<td>162,500</td>
</tr>
</tbody>
</table>

- **48 users in SC** 3.2 million tons

From SC Energy Office web site - 2007 data
Volatile Energy Costs

Coal spot prices
July ’08 - $150
Feb ’09 - $70
State Renewable Portfolio Standards

- California: 20% by 2010
- Illinois: 25% by 2025
- Pennsylvania: 18% by 2020
- North Carolina: 12.5% by 2021
- Virginia: 12% by 2022
- Texas: 5,880 MW by 2015

- 29 state & District of Columbia have an RPS
### Federal Renewable Electricity Standard

<table>
<thead>
<tr>
<th>Calendar year</th>
<th>Minimum annual percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>6.0</td>
</tr>
<tr>
<td>2014</td>
<td>8.5</td>
</tr>
<tr>
<td>2016</td>
<td>11.0</td>
</tr>
<tr>
<td>2018</td>
<td>14.0</td>
</tr>
<tr>
<td>2020</td>
<td>17.5</td>
</tr>
<tr>
<td>2022</td>
<td>21.0</td>
</tr>
<tr>
<td>2024</td>
<td>23.0</td>
</tr>
<tr>
<td>2025</td>
<td>25.0</td>
</tr>
</tbody>
</table>
Electric Generation Fuel Sources in SC

- Nuclear: 53%
- Coal: 40%
- Natural Gas: 3%
- Renewables: 4%
Renewable Energy Resources

U.S. Renewable Energy Resources

Solar

Wind

Biomass

Geothermal
Forest Inventory & Analysis

- Goal: To describe the extent and condition of the state’s forests.
- Have completed 9 surveys between 1936 and 2006.
- Data collection – SC Forestry Commission
- Data analysis – USDA Forest Service
Timber Volume Inventory

- Total Growing Stock Inventory: 100%
- Annual Gross Growth: 6.8%
- Annual Removals: 4.1%
- Annual Mortality: 0.7%
The destruction of Hurricane Hugo in over 23 counties in South Carolina ....is now fueling the biomass initiative.
Age Distribution of South Carolina’s SYP Forestlands

![Bar graph showing age distribution of South Carolina’s SYP Forestlands in 2007. The x-axis represents five-year age classes, and the y-axis represents acres. The age classes are 0 to 5, 11 to 15, 21 to 25, 31 to 35, 41 to 45, 51 to 55, 61 to 65, 71 to 75, 81 to 85, 91 to 95, and 100+. The graph shows a peak in acres for the 11 to 15 age class, with a gradual decrease as the age classes increase.]
The Harris Report

- How much biomass is available?
- Is it economical to substitute biomass for fossil fuels?
- What is the value of the environmental benefits of biomass?
Sources of Biomass – Harris Report

- Logging residues: 4.4 million tons
- Precommercial thinning: 8.6 million tons
- Mill residues: 1.6 million tons
- Urban wood waste: 0.6 million tons
- Commercial thinning: 5.3 million tons
- Southern scrub oak: 0.05 million tons
- Agricultural residues: 1.1 million tons

Total: 21.65 million tons
The Johnson Report

1. Forest Inventory & Analysis Technical Report (Conner, Johnson, Adams)
2. Received input/feedback in the design & results of the study from South Carolina experts.
3. Incorporated entry price points into the model.
New Biomass Components

1. Mill residue
2. Logging residue
3. Standing residuals after harvest
4. Urban wood
5. Precommercial thinnings
6. Commercial thinnings
Mill Residues

6.16 million tons in 2007

Mill Residue by Type

- Bark: 9%
- Coarse: 22%
- Sawdust: 33%
- Shavings: 36%

99.8% utilized
Mill Residue Survey:  **Softwoods**

- 15 softwood mills responded to the survey
- Average hauling distance was **29 miles**

- Bark - $14.30/ton
- Other Coarse Residue $18.00/ton
- Sawdust - $23.75/ton
- Chips - $27.00/ton
- Shavings - $49.85/ton
Mill Residue Survey: Hardwoods

- 5 hardwood mills responded to the survey
- Average hauling distance was 37 miles

- Bark - $10.66/ton
- Sawdust - $12.92/ton
- Other Coarse Residue $13.49/ton
- Chips - $20.07/ton
Logging Residues

4.5 million tons in 2006

Logging Residue by Type

- Whips: 7%
- Recoverable tops & limbs: 40%
- Non-recoverable residue: 53%

~7% utilized
Timber Producer Survey:  
Current Producers

- 6 current biomass producers responded
- Average production is **37,583** tons/year  
  - Ranges from 10,000 tons to 100,000 tons
- Average delivered price is **$20.82/ton**  
  - Ranges from $19/ton to $22/ton
- Average haul distance is **44 miles**  
  - Ranges from 20 to 55 miles
Timber Producer Survey:

Potential Producers

- 19 potential biomass producers identified
- Average estimated production is 34,338 tons/year
- Total production capacity of 19 producers would be 652,426 tons/year.
- Average entry price point is $27.50/ton ($26.29/ton when weighted by production capacity)
  Entry-point prices ranged from $22 to $30/ton
- Assumes 30-mile haul distance
Standing Residuals After Harvest

3.3 million tons in 2006

0% utilized

Standing Residuals by Harvest Type

- Final Harvest: 48%
- Commercial Thinning: 33%
- Partial Harvest: 17%
- TSI: 1%
- Seed Tree/Shelterwood: 1%

[Diagram showing distribution of standing residuals by harvest type]
Urban Wood

2.1 million tons in 2007

73% utilized

Urban Wood by Type

Recycled Materials (tons)

- Paper................. 726,876
- Yard trimmings... 241,679
- Pallets & crates.....25,473
Precommercial Thinnings

593,955 tons in 2006

0% utilized

591,000 acres of overstocked natural seedling/sapling stands contain 7.9 million green tons of biomass <5” dbh.
Commercial Thinnings

Although they may be utilized…

Commercial thinnings were not included in this biomass estimate after analysis of the long-term sustainability of South Carolina’s forest resource.
Pine Volume on Timberland by Diameter Class

<table>
<thead>
<tr>
<th>Diameter Class</th>
<th>Volume (MM Cubic Feet)</th>
<th>2001</th>
<th>2006</th>
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</thead>
<tbody>
<tr>
<td>5.0-6.9</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>7.0-8.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.0-10.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.0-12.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.0-14.9</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>15.0-16.9</td>
<td></td>
<td></td>
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<td>17.0-18.9</td>
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</tr>
<tr>
<td>19.0-20.9</td>
<td></td>
<td></td>
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<tr>
<td>21.0-28.9</td>
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</tbody>
</table>
Age Distribution of South Carolina’s SYP Forestlands

Five-Year Age Class

Acres

0 to 5
11 to 15
21 to 25
31 to 35
41 to 45
51 to 55
61 to 65
71 to 75
81 to 85
91 to 95
100+

0
200,000
400,000
600,000
800,000
1,000,000
1,200,000

2007
Tree Planting in South Carolina 1981-2008

Cost-Share
Non Cost-Share
Pine Pulpwood Inventory Projections

Wood Volume (million tons)

- Expanded Industry Level
- 2001 Industry Level
## Biomass Sourcing at Price Points

<table>
<thead>
<tr>
<th></th>
<th>Cost per ton</th>
<th></th>
<th></th>
<th></th>
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<tr>
<td></td>
<td>$20</td>
<td>$22</td>
<td>$24</td>
<td>$26</td>
<td>$28</td>
<td>$30</td>
</tr>
<tr>
<td>Mill Residues</td>
<td>2,571,000</td>
<td>2,931,000</td>
<td>3,291,000</td>
<td>3,651,000</td>
<td>5,610,000</td>
<td>5,610,000</td>
</tr>
<tr>
<td>Logging Residues</td>
<td>600,000</td>
<td>1,360,000</td>
<td>1,800,000</td>
<td>3,400,000</td>
<td>4,380,000</td>
<td>4,530,000</td>
</tr>
<tr>
<td>Standing Residuals</td>
<td>392,000</td>
<td>981,000</td>
<td>1,275,000</td>
<td>2,419,000</td>
<td>3,138,000</td>
<td>3,269,000</td>
</tr>
<tr>
<td>Urban Wood</td>
<td>1,252,000</td>
<td>1,418,000</td>
<td>1,584,000</td>
<td>1,749,000</td>
<td>1,915,000</td>
<td>2,081,000</td>
</tr>
<tr>
<td>Precommercial Thinning</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>594,000</td>
</tr>
<tr>
<td>Totals</td>
<td><strong>4.8 million</strong></td>
<td><strong>6.7 million</strong></td>
<td><strong>8.0 million</strong></td>
<td><strong>11.2 million</strong></td>
<td><strong>15.0 million</strong></td>
<td><strong>16.1 million</strong></td>
</tr>
</tbody>
</table>
Biomass Sourcing by Price Point

- Precommercial Thinnings
- Urban Wood
- Standing Residuals
- Logging Residues
- Mill Residues

![Graph showing biomass sourcing by price point with different sources and their respective ranges.]
Biomass Projects

• Loblolly Green Power
• Palmetto Renewable Energy
• USC Biomass Plant