Trends in Energy Use: Renewable Energy Today and Tomorrow

Dean Current, Program Director, CINRAM

Fueling the Future:
The Role of Woody and Agriculture Biomass for Energy Workshop

February 18, 2009

Roosevelt

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Trends in Energy Use: Renewable Energy Today and Tomorrow

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Fueling the Future:
The role and use of woody and agriculture biomass for energy workshop
February 18, 2009 (Wednesday) - Nite Hawk Bar and Grill - Roosevelt, MN

Figure 1.1 Primary Energy Overview

Overview, 1949-2007

Renewable Energy Consumption
1973-2007

Figure 10.1 Renewable Energy Consumption
(Quadrillion Btu)

Total and Major Sources, 1973-2007

Renewable Energy-Source and Sector

By Source, 2007

- Hydro-electric Power: 2.5
- Wood: 2.2
- Bio-fuels: 1.0
- Waste: 0.4
- Geothermal: 0.4
- Wind: 0.3
- Solar: 0.1

By Sector, 2007

- Residential: 0.6
- Commercial: 0.1
- Industrial: 2.0
- Transportation: 0.6
- Electric Power: 3.5

So what does the future hold? - Projections from EIA

- Long-term economic growth averages about 2.5 percent per year between 2007 and 2030
- World crude oil prices recover from a near-term decline and reach $130 per barrel (in 2007 dollars) by 2030
- A robust domestic natural gas resource base allows for a steady expansion of production given projected growth in demand and prices
- Recently-enacted policies and concerns over greenhouse gas (GHG) emissions, combined with high energy prices, moderate projected growth in energy consumption and emissions
Use of Renewables will grow

Non-fossil energy use grows rapidly, but fossil fuels still provide 79 percent of total energy use in 2030
Biomass is an important component

Nonhydropower renewable power meets 33% of total generation growth between 2007 and 2030

## Potential demand for biomass

<table>
<thead>
<tr>
<th>Energy Facility</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rock Tenn</td>
<td>Saint Paul, MN</td>
</tr>
<tr>
<td>Laurentian Energy Authority</td>
<td>Virginia, MN</td>
</tr>
<tr>
<td>Minnesota Power</td>
<td>Grand Rapids, MN</td>
</tr>
<tr>
<td>FibroMin (Ag residue and wood)</td>
<td>Benson, MN</td>
</tr>
<tr>
<td>District Energy</td>
<td>Saint Paul, MN</td>
</tr>
<tr>
<td>Little Falls Ethanol Cooperative</td>
<td>Little Falls, MN</td>
</tr>
<tr>
<td>Rahr Malting – KODA Energy</td>
<td>Shakopee, MN</td>
</tr>
</tbody>
</table>
Renewable Energy
- Biomass Opportunities

- Prairie grasses – various configurations
  - Switchgrass, Miscanthus, Native prairie
- Corn/cellulosic ethanol
- Woody harvest residues
- Dedicated woody crops
- Brushlands
- Fuel and fiber integrated forest management
Dedicated energy crops

- Hybrid poplar or willow
- 3-6 year rotation
- Economics improving but still marginal
- Payments for environmental services could improve economics (CO2, water)
Thinning

- Due to costs of pre-commercial thinnings, thinning does not take place.
- Thinning has the potential to increase productivity of stands 50% or more.
- Thinning could provide an important source of biomass and productivity enhancement.
- Est. 4.5 dry tons/acre at age 10 and 23.5 at age 30 aspen (Demchik, 2006).
Logging Residue

- 10-19 Green tons/acre depending upon cover type (est. $15-25/ton at plant)
- Would probably have to leave up to 30% on site

Source: Minnesota Logged Area Residue Analysis – MN DNR, 2006
Integrated, intensive forest management

- Include biomass generation throughout management cycle
  - Optimize biomass and forest product production
  - Healthier, more resistant forest
  - Improved forest productivity for a number of benefits
  - Under guidelines that ensure environmental services
  - Increased employment opportunities
Hazardous fuel removal

- Forest Service pays up to $575/acre currently for hazardous fuel removal
- 14,000 acres on the Superior National Forest in 2007
- 7-10 green tons/acre
- By harvesting hazardous fuel for biomass energy use, costs of treatment could be reduced
- Little work has been done on this
Brushland harvest

- Brush currently sheared, piled and often burned for wildlife habitat management
- Brush could be harvested and sold
- Density of brush important to economics
- Estimated 12-17 dry tons/acre on well stocked sites (Berguson, 1997)
Bio-baler

Photos courtesy of Philippe Savoie – Agriculture and Agri-Food Canada
Concerns

- Food vs. fuel
- Deforestation in other parts of the world linked to renewable production
- Sustainable production
- Energy balance
- GHG emissions
Environmental concerns

- Over harvest of forest lands
- Depletion of nutrients when removing greater amount of material
- Sustainable Biodiesel Alliance – BMP’s
- Brushland and slash harvest principles
  - Research background provided by UMN
  - Guidelines prepared by DNR and MN Forest Resources Council
Environmental benefits

- Healthier, more productive forest
- More resilient ecosystems
- Carbon credits - Minnesota Terrestrial Carbon Project
  - Rules and inst. structure for CO2 trading
  - Trading has started on the Chicago Climate Exchange
  - Carbon credits available for tree plantings
Issues:

- Many of the biomass related activities are new to land managers

Production issues

- How much biomass is available from ag lands and forests (thinnings and harvest residue)
- How can we economically harvest and transport biomass as an energy source
- What kind of productivity improvements are possible and what is their value
Issues:

Logistics:
- New machinery needs
- Transportation issues
- Densification
- Handling smaller material

Products
- Chemicals/Bio-oil
- Chips
- Pellets
Issues:

- Ecological services
  - Carbon payments
  - Sustainable management
  - Maintaining forest areas

- Economics
  - Profitability of different options
  - Initial investment needs for new activities
  - Economic/community development
Questions?

For additional information contact:

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