Presentation Outline

Focus: plant-derived biomass feedstocks

- Why Biomass Heating
- Community Biomass Heating Systems
- Key Factors to Success
- Choosing a Fuel Source
- Choosing a Conversion System (Thermal Conversion)
- Future of Biomass Heating
Why Biomass Heating

• Natural Gas & Fuel Oil Prices Rising

• “Avoided” Electricity Price Low
  • Biomass Electricity generation costs = $0.06 - $0.12 per kilowatt hour (kWh)
  • Difficult to get PPA outside of Mandate

• Efficiency Benefits.
  • Electricity Only: 20% efficiency.
  • Heat Only: 80-85% efficiency.

• Capital Cost Reduction
  • No need for turbine, high pressure boiler
A Community Energy System

Connects a centralized source of heat generation to a set of residential, commercial, and/or industrial thermal energy users.
Key Factors for Success

(1) Availability of low-cost biomass fuel supply.

(2) Adequate thermal loads (Should be consistent throughout the year)
Choosing a Fuel Source

- Urban Wood Waste (Cities)
- Mill & Forest Residues (up North)
- Agricultural Residues (Mid/South)
- Energy Crops (Across the State - working to make more cost effective)
Fuel Handling Critical Issues

• Drying - Most fuels have a 10-60% moisture content
• Transporting - Distance from Facility/Transport Type
• Pre-Processing – Fuel size and blending
• Storing - Times of harvest v. boiler needs & redundancy
• Long-term Contracts
Choosing a Conversion System

- **Fuel Flexibility**
  - Hedge against Weather and Market Dynamics

- **Fuel Handling/Processing Needs**

- **Capital Costs**
  - Depends on scale of project, but boiler and distribution system pipes are majority of costs

- **Scalability**
  - Economies of scale v. Fuel Need Pressure
  - Permitting (EIA at 25 MW)
Combustion

Conventional Stoker Boiler
- Fuel Flexibility: limited. Can take wood but only about 10% agricultural biomass (alkali/silica).

Fluidized Bed Boiler
- More Flexible. Can take about 30% agricultural biomass.
- Can Take moisture content of up to 50-60%
- Fuel Size Needs: 2-4 inches
St. Paul District Energy
Gasification

• Gasifies the biomass in oxygen-starved environment.
• Fuel Flexibility: very good.
• Fuel Handling: dry fuels of uniform size (sawdust)
• Moisture Content needs: 15 percent to 20 percent.
• Very efficient and low emissions

• EXAMPLE: Little Falls Ethanol Plant
Future of Biomass Heating

Fuel Source: Energy Crops
- Perennial natives prairie grasses and woody biomass.
  - Promoting Legislation on:
    » Standards
    » Payments to Crop Producers
    » Incentives to heat and power facilities that utilize perennial natives.

Technologies: Gasification (Europe), Small Modular Systems, Biorefinery Byproduct
Thank You!

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