Selecting Successful Biomass Projects

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Successful Projects

➢ Common Traits of Successful Projects
  ▪ A committed owner
  ▪ Energy Cost Savings
Identify Owner’s Goals

- Energy Savings
- Environmental
- Fuel Diversity
- Demonstration
- Economic Development

Drop Dead Issues

- Economic
  - Potential energy savings
  - Project cost
  - financing
- Interconnection
  - Central heating system?
  - Distributed heating system?
- Siting
  - Access for fuel delivery
  - Location of biomass system
- Biomass fuel supply
  - Infrastructure
Economics

- Potential Energy Savings
- Capital Cost of the Project
- Financial expectations of the owner
  - Public/Non-Profit looking for positive cash flow
  - Business looking for simple payback of 7 years or less

Energy Savings

- More expensive fossil fuel = greater savings
  - Fuel oil
  - Propane
  - Electric
- Larger loads = greater savings
  - District heating systems
  - Year round loads
- Cost of biomass fuel
  - Opportunity fuel
  - Local market
Relative Fuel Value

<table>
<thead>
<tr>
<th></th>
<th>Wood Chips</th>
<th>Wood Pellets</th>
<th>Natural Gas</th>
<th>Fuel Oil</th>
<th>Propane</th>
<th>Electricity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost per unit</td>
<td>$40/ton</td>
<td>$180/ton</td>
<td>$8/mcf</td>
<td>$3.50/gal</td>
<td>$2.50/gal</td>
<td>$0.10/kWh</td>
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<tr>
<td>Btu/unit, HHV</td>
<td>10,500,000</td>
<td>16,400,000</td>
<td>1,025,000</td>
<td>138,800</td>
<td>91,300</td>
<td>3,412</td>
</tr>
<tr>
<td>Thermal Efficiency</td>
<td>70%</td>
<td>83%</td>
<td>80%</td>
<td>83%</td>
<td>79%</td>
<td>100%</td>
</tr>
<tr>
<td>$/mmBtu, output</td>
<td>$5.44</td>
<td>$13.24</td>
<td>$9.76</td>
<td>$30.38</td>
<td>$34.66</td>
<td>$29.31</td>
</tr>
</tbody>
</table>

1. 40% moisture wood chips
2. HHV based on flue gas temperatures of 150°C which assumes latent heat of water evaporation not recovered

Controlling Project Costs

- Overall project scope
- Right sizing the boiler
  - Not only boiler affected by size selection
    - Pumps
    - Pipes
    - Building and storage size
    - Permits
    - Operating costs
- Type and location of building
- Financial assistance
Environmental Goals

- American College and University Presidents Climate Commitment
- Corporate Environmental Sustainability Policies
- Avoiding permitting compliance costs

Fuel Diversity

- Permit operating restrictions
- Hedge against volatile fossil fuel prices
- Fuel use restrictions
  - Better pricing
  - Limited availability
Pitfalls

- Project Creep
- Selecting the right type of installation
- Financing
- Selecting design team
- Fuel supply

Selecting the Right Type of Installation

- Setting
  - Institutional
  - Industrial
- Owner’s personnel
  - Level of automation
Financing

• Grants
  • Long lead times
  • May add to project costs
    • Limit equipment sourcing
    • Reporting and documentation

• Financial strength of owner
Selecting the Design Team

Pharmaceutical manufacturer

- Energy Savings and Corporate sustainability
- 575,000 gallons of fuel oil annually
- 12,000 lb/hr steam biomass system
- 275 kW electric generation
- $1.2 million in annual savings
- $5.0 million project
University

- Fuel diversification/environmental compliance and energy savings
- Offsets 90% of 7,000 tons of coal and 150,000 mcf NG
- 42,000 lb/hr steam biomass boiler
- $1.0 million in annual savings
- $8.1 million project

County Complex (prison and nursing home)

- Energy Savings
- 250,000 gallons of fuel oil annually
- 220 HP biomass boiler
- $300,000 in annual savings
- $3.2 million project
  - $2.0 million grant
Hospital Complex

- Corporate sustainability goals and energy savings/
- Offsets 157,000 mcf NG
- 440 kW electric generation
- 27 mmBtu Biomass system
- $470,000 in annual savings
- $5.9 million project

School and Community Complex

- 32,000 mcf of NG annually
- 190 kW electric Generation
- $200,000 in annual savings
- $3.5 million project
  - $940,000 grants
  - $600,000 avoided costs
High School

- 45,000 gallons of fuel oil offset
- $100,000 in annual savings
- $1.5 million project
  - $1.1 million in grants

Conclusions

- Successful projects Require
  - A committed owner
  - Must make economic sense
  - Environmental factors can help drive projects
  - Fuel diversity can be important
  - Grant dollars can drive projects for demonstration or to create markets