Biomass Heating Projects
Opportunities and Economics

Eric Kingsley
Innovative Natural Resource Solutions LLC
Innovative Natural Resource Solutions LLC

• Based in New Hampshire and Maine, a region with 25+ years of continuous biomass power experience, and pellet mills for 15+ years
• Based in the forest industry – work at the intersection of forest industry, energy and economic development
• My focus is on feedstock supply for biomass electric, thermal, pellet and liquid fuel projects
• Structured a dozen long-term supply agreements
• Clients include utilities, merchant generators, investors, developers, and industries
• Conducted work in all regions of North America
• www.inrsllc.com
Why Biomass Thermal?

• Heat Local – biomass is a renewable, local, and supports the economy
• Every time a truckload of heating oil enters Maryland, a truckload of money leaves
  • About 85% of dollars spent on heating oil (and propane) leaves the state*
  • Money spent on biomass fuel stays local, and supports the local economy
• Study by Biomass Energy Resource Center in Vermont
  • State spends $1.7 billion annually in fossil fuels – money that leaves Vermont and does not help the local economy
  • Heating 19% of homes in the state (~62,000 homes) would create 7,000 jobs

* Based on work conducted in New England
A Quick Look at Biomass Thermal Projects

• From a wood chip boiler on a college campus to the pellet stove in my house
• All located in Maine – a state with significant reliance on oil for home heating
  • Lessons to be learned here, but...at current pricing it is hard to compete with pipeline natural gas
• All based upon public information, and all projects received some level of public support
• Assumes that all fuel prices (pellets and oil) stay flat forever (probably not true, but allows clear comparison)
  • There is a case to be made that pellets escalate at a rate lower than oil; this would make projects much more attractive – not part of this analysis
• Helpful in thinking about how we design capital subsidies for biomass projects >> what is it you want to accomplish?
Biomass Boiler at Colby College

Chiptec

- $11.25 million project, $750,000 grant
- Waterville, Maine
- Stand-alone greenfield boiler facility
- Chiptec Wood Energy System
- Replaces 90% of 1.1 million gallons #2 oil per year
- Wood delivered as chips, live floor trucks
- Completion January 2012
- Saves an estimated $1.5 million in heat costs annually
# Colby College

## Key Metrics

<table>
<thead>
<tr>
<th>Project</th>
<th>Colby College</th>
</tr>
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<tbody>
<tr>
<td><strong>Biomass Fuel Type</strong></td>
<td>Chips (green)</td>
</tr>
<tr>
<td><strong>Capital Cost</strong></td>
<td>$11.25 million</td>
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<td><strong>Annual Fuel Savings</strong></td>
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</tr>
<tr>
<td><strong>20-Year Savings</strong></td>
<td>$23.95 million</td>
</tr>
<tr>
<td><strong>30-year Savings</strong></td>
<td>$47.8 million</td>
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<tr>
<td><strong>Payback Period (years, full cost)</strong></td>
<td>6.4 years</td>
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<tr>
<td><strong>Subsidy / 20 year savings</strong></td>
<td>3%</td>
</tr>
</tbody>
</table>
Maine’s Institutional Wood Energy Facilities
Via wood2energy.org database
22 Projects in Maine Supported with ARRA $

- Criteria for the project selection included:
  - the number of jobs created and preserved;
  - unemployment rates;
  - the size and scope of the project;
  - community support; and
  - amount of community funding

- Save the recipients between 1/2 to 2/3 on their annual heating bills
- Total project cost $23.9 million
- Total subsidy $10.5 million
- Funding from USDA Forest Service, administered by Maine Forest Service
- Maine's 24 Biomass Thermal Projects created or retained over 350 full-time jobs during the construction phase of these projects.
- Rural communities in Maine are not spending $5.5 million in tax dollars each year to $100,000 gallons of heating oil.
- Instead, they will spend about $1.2 million annually for wood chips and pellets, which supports over 10 full-time forest worker jobs.

ARRA Wood to Energy Grants

- ARRA Biomass Boiler - Completed
- ARRA Biomass Boiler - Under Construction

Locations:
Falmouth Middle School
Maine

- 53 beds
- 6.7 MMBTU chip boiler
- 142,000 square feet
**Falmouth Middle School**

**Key Metrics**

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<tr>
<td>Biomass Fuel Type</td>
<td>Wood Chips</td>
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<tr>
<td>Capital Cost</td>
<td>$1,494,500</td>
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<tr>
<td>Customer Capital Cost</td>
<td>$994,500</td>
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<tr>
<td>Annual Fuel Savings</td>
<td>$81,214</td>
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<tr>
<td>20-Year Savings</td>
<td>$1.6 million</td>
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<tr>
<td>Payback Period (years, full cost)</td>
<td>18.4 years</td>
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<tr>
<td>Payback Period (w/ subsidy)</td>
<td>12.2 years</td>
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<tr>
<td>Subsidy / 20 year savings</td>
<td>385%</td>
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</table>
Northern Maine Medical Center

Maine

- 739,000 students
- 4.3 MMBTU chip boiler
- 106,000 square feet
A “Dashboard” for All

Projects

Information on projects, capital cost, payback, etc.

http://mfs.nmcc.edu
Maine Biomass Heating Projects Data Dashboard

Choose Site

Northern Maine Community College

Summary Data

Northern Maine Community College

Public School building
33 Edgmont Drive
Presque Isle, ME, 04769
Building Size = 125,500 Square Feet
New Boiler: Schmied Model USTR 900
Boiler Capacity = 3.07 MMBTU/hr
Fuel Type is Pellets
Grant Amount = $500,000
Owner Amount = $485,726
Total Cost = $985,726
Capital Cost per MMBTU = $320,979
Completion Date: December 31, 2012

Northern Maine Community College, 2012-13 Actual
2012-2013 Savings = - $35,869

Heating cost per degree day / 10,000 sq. ft.

Projected in Grant

Prior Oil Cost
$152,789.39
Estimated Wood Cost
$51,600.00
Estimated Oil Cost
$24,876.00
Estimated Savings
$66,313.39
Savings Variance from Grant (+ is good)
($10,445.70)
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<tr>
<td>Biomass Fuel Type</td>
<td>Wood Chips</td>
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<tr>
<td>Capital Cost</td>
<td>$1,845,627</td>
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<td>Customer Capital Cost</td>
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<td>Annual Fuel Savings</td>
<td>$159,750</td>
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<td>20-Year Savings</td>
<td>$3.2 million</td>
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<tr>
<td>Payback Period (years, full cost)</td>
<td>11.6 years</td>
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<td>56%</td>
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Kingsley Family Stove
Portland, Maine

- Technology: Quadrafire - Castine
- Total project cost - $3,400
- Federal tax credit - $1,000 (no longer)
- Supplemental heat – primary heat from natural gas (unlike most homes in Maine)
  - For comparison purposes, we’ll substitute #2 oil
  - Displaces about 245 gallons of oil
- Wood pellets delivered to my garage on pallets
- Storage in basement
  - 2 tons per year
- Simple payback 8.7 years (6.2 years with subsidy)
- In winter (6 months), the most popular spot in the house
## Kingsley Family Stove

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<td>20-Year Savings</td>
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<td>30-year Savings</td>
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<td>Payback Period (years, full cost)</td>
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Comparing Biomass Heating Projects

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Maryland has lots of “blank spots on the map” for biomass projects (via wood2energy.org)
My Take-Away Messages

• You have limited resources
  • Think about what you are trying to accomplish, and design public support systems that support this goal
  • You can’t do everything – and you shouldn’t want to
  • If you “over-fund” demonstration projects – MAKE THEM DEMONSTRATE

• A fact-based, comparable set of metrics can help determine what is a “good” project
  • If a competitive solicitation, methodology and metrics should be the same for all projects

• Biomass makes economic sense in places that currently use oil, propane and trucked natural gas as fuel
  • Focus on those spots where you have the greatest likelihood of success
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