Wood Energy Market Opportunities

Biomass and Small Tree Utilization Workshop
Tok, September 29, 2005

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Alaska Energy Authority
Alaska Energy Authority

- Public corporation with Alaska Industrial Development and Export Authority
- Infrastructure Owner: Anchorage, Fairbanks Intertie, Bradley Lake Hydro, Healy Clean Coal Plant
- Rural Energy Group: Tank farm construction, power system repair, alternative energy
What I’ll Talk About

- General market drivers on wood energy
- Thermal plant economics
- Power plant market benchmarks
- McGrath feasibility and conclusions
Market Considerations

- Public and utility concerns
  - System reliability and complexity
  - Air pollution
  - Fuel supply—depletion, aesthetics, conflicts
- Economic feasibility
  - Heat and power buyers
  - Other alternatives
Wood as a local fuel
Wood-Fired Facility Heating

Economically feasible when

- Low to moderately priced fuel available
- Oil, propane, or electric energy displaced
Dot Lake Economics
(Half of oil displaced by wood)

Wood System Installed Cost $66,000

Wood Operation and Maintenance
   Labor $1,330
   Wood fuel ($35/cord x 47 cords) 1,654
   Maintenance 812
   Total $3,797

Oil System Operation and Maintenance
   Labor/materials $1,000
   Fuel ($1.30/gal x 7,750 gal) 10,075
   Total $11,075

Yearly Savings $7,278
Dot Lake Conclusion:

Someone has to stoke the boiler.
Economics of Stick-Fired Systems

Break-even cost of 15,000 gal/yr oil displacement
### Table 5. Summary of Economic Analyses: Savings compared with Propane

<table>
<thead>
<tr>
<th>USE</th>
<th>1000 BTUH</th>
<th>Capital Cost</th>
<th>Fuel Oil Replaced gal/yr</th>
<th>Cost of Wood Fuel $/ton</th>
<th>Net Savings (NPV) Current oil</th>
<th>Net Savings (NPV) Future oil</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fuel Costs</strong></td>
<td></td>
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<tr>
<td>Propane</td>
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<td></td>
<td></td>
<td></td>
<td>$1.72</td>
<td>$2.50</td>
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<tr>
<td>Fuel Oil</td>
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<td></td>
<td></td>
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<td>$1.46</td>
<td>$2.00</td>
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<tr>
<td><strong>Pool only</strong></td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>Oil fired</td>
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<td></td>
<td></td>
<td></td>
<td>$238,216</td>
<td>$409,512</td>
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<tr>
<td>Hand fed</td>
<td>425</td>
<td>$134,000</td>
<td>15,323</td>
<td>$30</td>
<td>$270,588</td>
<td>$554,353</td>
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<tr>
<td>Chip, auto</td>
<td>600</td>
<td>$327,000</td>
<td>15,323</td>
<td>$10</td>
<td>$129,035</td>
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<td><strong>Pool only and Schools</strong></td>
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<tr>
<td>Oil fired</td>
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<td>$238,217</td>
<td>$488,711</td>
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<tr>
<td>Chip</td>
<td>1,200</td>
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<td>29,328</td>
<td>$10</td>
<td>($122,419)</td>
<td>$343,332</td>
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<tr>
<td>Chip</td>
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<td>29,328</td>
<td>$10</td>
<td>$110,581</td>
<td>$576,332</td>
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</table>
Wood-Fired Power

Economically feasible when

- Plentiful-low cost fuel available
- Diesel power is displaced
- Large market for both power and heat
Energy Price Breakdown

Manokotak
38 cents/kWh

- Fuel 46%
- Gen, and Admin. 14%
- Operation and maintenance 21%
- Renewal and Replacement 19%

Tok 23 cents/kWh (fy05)

- Other 50%
- Fuel 50%
Price of Power Gen Fuel, FY05
Avoided Cost vs Consumption--
All Utilities

Average Generation or Sales (kW) vs Avoided Non-Firm Cost ($/kWh)
Avoided Cost vs Consumption--
> 200 kW

<table>
<thead>
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<th>Average Generation or Sales (kW)</th>
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<td></td>
<td>1000</td>
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<td></td>
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</table>

Avoided Cost ($/kWh)

- Railbelt
- Copper Valley Electric
- Angoon, Aniak, Cordova, Ft
- Yukon, Galena, Hoonah, Kake, McGrath, Yakutat

Non-Forested
Forested
Cost of Wood-Fired Power
Based on AEA Solid Fuel Model for 3 MW plant

Cost of Fuel / Green Ton

Cents / kWh

Heat Market (mmBtu/hr)
## McGrath System Alternatives

<table>
<thead>
<tr>
<th>Fuel Scenario</th>
<th>Power: Installed Cost</th>
<th>Oil Wood / Oil</th>
<th>Oil Wood / CHP</th>
<th>Oil</th>
<th>Wood</th>
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<tbody>
<tr>
<td>Mill residues ($9/ton)</td>
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<tr>
<td>O&amp;M</td>
<td>1.2</td>
<td>0.9</td>
<td>1.3</td>
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<tr>
<td>Total</td>
<td>9.3</td>
<td>8.3</td>
<td>9.0</td>
<td>6.7</td>
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<tr>
<td>Mill residues and harvested fuelwood ($45/ton)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>O&amp;M</td>
<td>1.2</td>
<td>0.9</td>
<td>1.3</td>
<td></td>
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</tr>
<tr>
<td>Total</td>
<td>9.3</td>
<td>8.5</td>
<td>9.2</td>
<td>10.9</td>
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<tr>
<td>Harvested fuelwood ($90/ton)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>O&amp;M</td>
<td>1.2</td>
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<td>1.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>9.3</td>
<td>8.7</td>
<td>9.5</td>
<td>16.2</td>
<td></td>
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</tbody>
</table>
Conclusion

- Wood-fired space heating larger buildings is widely cost-effective.
- Power generation is more complex.
- Wood fired boilers are simple and reliable, but they require a commitment above oil-fired systems.
- Chip-fired heating provides a stepping stone to CHP.
Questions?

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