Forest Management and Renewable Energy

Boulder County, Colorado
Overview

- Forest Management Leads to Biomass Energy
  - Mountain Pine Beetle
  - Wildland Fire
- Feasibility Study
- Biomass Central Heating Plant
- Current Status
- Lessons Learned
Biomass Energy

Using wood chips from forestry thinning operations to provide thermal energy for central heating system
Unhealthy Forest
Mountain Pine Beetle Epidemic
Mountain Pine Beetle Colorado

- Native insect
- 3.3 Million acres in Colorado
- 140,000 acres in Boulder County
- USFS declared epidemic
Due to the nature of aerial surveys, the data on this map will only provide rough estimates of location, intensity and the resulting trend information for agents detectable from the air. Many of the most destructive diseases are not represented on this map because these agents are not detectable from aerial surveys. The data presented on this map should only be used as a partial indicator of insect and disease activity, and should be validated on the ground for actual location and causal agent. Shaded areas show locations where tree mortality or defoliation were apparent from the air. Intensity of damage is variable and not all trees in shaded areas are dead or defoliated.
Wildland Fire
Forest Management

- Manage ~ 30,000 acres of forested land
- Thin ~ 100-200 acres/year
- 25 years to thin 5000 ac
1600 slash piles/year
Chipping on Site
Healthy Forest
Benefits of Biomass Energy

- Renewable resource
  - Energy conservation in BC Comprehensive Plan
- Uses forest treatment residue
- Reduce soil impacts of chips

- Innovation in Colorado
Feasibility Study

• Heating System Size
• Annual Wood Consumption
• Emissions from Wood Combustion
• Economic Analysis
Heating System Size

- 5 Buildings: 95,000 sq ft
- Peak output demand estimated at 100 bhp
- Energy use: 6,700 million Btu/yr

Annual Wood Consumption

- 650 tons of green wood per year to fuel boiler

  Thinning 65 acres per year yields enough material
Comparing Open Burning to Biomass Boiler Output Emissions: CO₂

Figure 3—CO₂ emissions per dry ton of forest treatment residues utilized in the bioenergy alternative compared with disposal by on-site pile burning and using either distillate oil or natural gas to provide the equivalent thermal.
Economic Analysis Chart

Simple Payback Period
vs. Wood and Natural Gas Prices

Simple Payback Period = \( \frac{\text{Incremental Capital Cost}}{\text{Incremental Annual Costs}} \)

Annual Costs include O&M and Fuel

Wood Price [$/green ton]

<table>
<thead>
<tr>
<th>Natural Gas Price [$/MMBtu]</th>
<th>Simple Payback Period [years]</th>
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Annual Costs include O&M and Fuel.
Feasibility Conclusions

• Proven technology
• Natural resources available on county land
• Meets air quality standards
• Will pay for itself over time
BOCO Biomass Heating Plant
Biomass Processing & Transport

..... or how do we get it from there to here?
Forest Operations
Fuel Bin and Auger System
Boiler and Fuel Box
What about the smoke and ash?
Current Status

• Operation began December 2005
• Fuel handling and transport costs $24/ton (25 miles)
• Installed second system 2010
• Saving $30,000/year per system
Lessons Learned

- Get everyone on board
- Consistent chip quality – no rocks, moisture content
- It takes time – fine tuning
- We set the stage for others in Colorado
Integrated Natural Resource Management