Biomass: What if?
The economics of substituting biomass for natural gas

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What if the biomass plant had been running for the 2006-2007 fiscal year?

- Natural gas / fuel oil usage and costs for 06-07
- Equivalent biomass usage and costs
- Operational cost differential
  How much more/less expensive is the biomass plant projected to be?
- Future questions
Assumptions

Natural Gas efficiency – 85% (empirical)

Biomass efficiency – 75% (estimate)
- All biomass types produce similar energy output and efficiency: 5.2lbs biomass/lb of steam

Minimum natural gas turndown: 3000 lbs/hr
- days that exceed the capacity of the biomass plant run natural gas boilers at the minimum
Natural Gas Unit Cost: $0.91/therm
- Weighted average, high demand times

First year risks
- Fuel oil supply still purchased as back up

Not a research project – no grant funding
- Costs of research specific equipment not included
### Actual Costs

<table>
<thead>
<tr>
<th>Month</th>
<th>Therms Gas</th>
<th>Cost / Therm</th>
<th>Total Cost Gas</th>
<th>Total Cost Fuel Oil</th>
<th>Total Heating Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>June</td>
<td>22951</td>
<td>$0.65</td>
<td>$14,903.31</td>
<td>$0.00</td>
<td>$14,903.31</td>
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<tr>
<td>July</td>
<td>22539</td>
<td>$0.69</td>
<td>$15,598.49</td>
<td>$0.00</td>
<td>$15,598.49</td>
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<tr>
<td>August</td>
<td>31665</td>
<td>$0.77</td>
<td>$24,413.54</td>
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<tr>
<td>September</td>
<td>48644</td>
<td>$0.77</td>
<td>$37,214.85</td>
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<tr>
<td>October</td>
<td>89139</td>
<td>$0.52</td>
<td>$46,055.40</td>
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<td>November</td>
<td>108823</td>
<td>$0.87</td>
<td>$94,837.31</td>
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<td>December</td>
<td>125594</td>
<td>$0.95</td>
<td>$119,292.67</td>
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<td>January</td>
<td>146508</td>
<td>$0.90</td>
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<td>$14,608.85</td>
<td>$146,956.54</td>
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<td>February</td>
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<td>$0.91</td>
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<td>$14,722.40</td>
<td>$125,829.74</td>
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<td>April</td>
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<td>$0.80</td>
<td>$63,004.91</td>
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<td>$63,004.91</td>
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<tr>
<td>May</td>
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<td>$0.52</td>
<td>$15,532.15</td>
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<td>$15,532.15</td>
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<tr>
<td><strong>Totals</strong></td>
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<td></td>
<td>$764,692.75</td>
<td>$29,331.25</td>
<td>$794,024.00</td>
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</tbody>
</table>

**Natural Gas – $764,692.75**

**Fuel Oil – $29,331.25**

**Total - $794,024.00**
Equivalent Biomass Use

Total Usage: 6,580 Tons Biomass
46,389 Therms Natural Gas

Where this comes from:
*Biomass plant in limited to 15,000 lbs/hour of steam, maxing out at roughly 4,800 therms output per day
-5.2 lbs of biomass / lb of steam

*2006-2007: Four months had one or more days with demand that exceeded 4,800 therms
-with natural gas minimum running at 3000 lbs/hour, biomass maximum input per day is 64.7 bales per day, or 38.8 tons per day
Biomass Scenarios

1) Low cost option
   -cheapest options, large contracts

2) “Community” option (low cost assumed)
   -limited contracts, spread the opportunity

3) “Community” option (high cost assumed)
### Costs and Savings

- **Scenario 1**
  - Total Heating Cost: $383,779.62
  - Savings: $410,244.38

- **Scenario 2**
  - Total Heating Cost: $526,729.62
  - Savings: $267,254.38

- **Scenario 3**
  - Total Heating Cost: $542,994.62
  - Savings: $251,029.38

**Options**

<table>
<thead>
<tr>
<th>Options</th>
<th>Tons Biomass</th>
<th>Cost/Ton</th>
<th>Total Cost Biomass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Cost</td>
<td>6580</td>
<td>$49.68</td>
<td>$326,900.00</td>
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<tr>
<td>Community Based (Low)</td>
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<td>$71.41</td>
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<td>Community Based (High)</td>
<td>6580</td>
<td>$73.88</td>
<td>$486,115.00</td>
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</table>

*Based on the type, availability, and prices provided by bidders to date*

<table>
<thead>
<tr>
<th>Therms Gas</th>
<th>Cost/Therm</th>
<th>Total Cost Gas</th>
<th>Total Cost Fuel Oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>46389</td>
<td>$0.91</td>
<td>$42,213.99</td>
<td>$14,665.63</td>
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</tbody>
</table>
Additional Costs

Labor
- Biomass loading, assumed twice a day
  - 1 hr/load at $18/hour labor ($25 after all considerations)
  - $50 additional labor expense per day, $18,250 per year

Maintenance
- Speculative, over the course of 20 year life span
- Total differential maintenance cost $645,757.00
- $32,288/year*
Additional Benefits

Price stability

-contracts limit the impact of the price volatility and unpredictability of natural gas

Natural Gas Price Fluctuations

Price/thousand cubit feet ($) vs. Time (January 2000-August 2007)
Future concerns

Extra electricity costs – is the energy input similar to natural gas?

What is going to happen to biomass? What will its price become subject to?

Yearly investment differential – how much more per year should be put in a sinking fund?