Amherst College
Fuel Arbitrage Opportunities

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IDEA 2015 – BOSTON
Summer 2015
Presentation Overview

• Energy Plant at Amherst College
• Fuel Arbitrage Opportunities Made Available by Dual Fuel Capabilities
• Results of Fuel Arbitrage During the Past Two Winters
• Achieve Savings w/out Jeopardizing Budget Certainty and Stability
Amherst College

- Member of the Five Colleges consortium
- 1,800 students
- 415 faculty and staff
- 1,000-acre campus
- 52% of electricity generated on-site

FY16 Energy Budget
2 boilers – Dual Fuel (Natural Gas or #6 oil)

1.2 MW Combustion Turbine/Generator (CTG) - Dual Fuel – Natural Gas or ULSD

500 kW Backpressure steam turbine/generator (Operates on in the Winter)

Heat Recovery Steam Generator (Exhaust Gas from the CTG)
Amherst Central Plant - Schematic
Amherst Central Plant - History

- Prior to 1975 - Coal
- 1975 – Switched from Coal to Oil
- 1978 – Added Natural Gas as Fuel Option
- 2007 – Fuel Price Spread led to consideration of Dual-Fuel Operations
- 2012 – Developing an Institutional Acceptance of Operational Flexibility
Fuel Switching

Dual Fuel Capability Enables Customers with Contract Commitments to Purchase Specific Volumes of Natural Gas to:

- Sell back contracted gas to the supplier at the spot price
- Purchase a lower cost fuel at the market price
Fuel Switching

Established Trigger Prices Based on Cost of Alternative Fuel (#6 oil or ULSD)

$25/mmbtu for Winter 2013-14

$20/mmbtu for Winter 2014-15
How To – The Process

Procedure

- **8:30 am**: CES provides NG spot price estimate for next day. If price exceeds trigger, CES notifies Supplier that Amherst can Switch Fuels

- **10:00 am**: Supplier makes price offer to buy back gas. CES calculates costs for each scenario using applicable fuel and buyback prices

<table>
<thead>
<tr>
<th>Scenario</th>
<th>boilers</th>
<th>HRSG</th>
<th>Costs</th>
<th>Liquidation</th>
<th>Total</th>
<th>daily savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>no action</td>
<td>NG</td>
<td>NG</td>
<td>$12,511</td>
<td>$0</td>
<td>$12,511</td>
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<tr>
<td>liquidate boilers gas, HRSG on NG</td>
<td>#6</td>
<td>NG</td>
<td>$16,851</td>
<td>-$6,438</td>
<td>$10,413</td>
<td>$2,099</td>
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<tr>
<td>liquidate all gas, HRSG off</td>
<td>#6</td>
<td>OFF</td>
<td>$22,604</td>
<td>-$14,655</td>
<td>$7,949</td>
<td>$4,562</td>
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<tr>
<td>liquidate all gas, HRSG on ULSD</td>
<td>#6</td>
<td>ULSD</td>
<td>$26,496</td>
<td>-$14,655</td>
<td>$11,841</td>
<td>$670</td>
</tr>
</tbody>
</table>

- **10:30 am**: Parties coordinate liquidation of volumes for next day
# Results of Fuel Switching

## Winter 2013-14

<table>
<thead>
<tr>
<th></th>
<th># days action taken</th>
<th>Supplier Invoice</th>
<th>sellback proceeds</th>
<th>#6 oil gal</th>
<th>#6 oil costs</th>
<th>#6 oil gal</th>
<th>#6 oil costs</th>
<th>ULSD gal</th>
<th>ULSD costs</th>
<th>purchased electricity</th>
<th>lost APS credits</th>
<th>Fuel Switch TOTAL</th>
<th>Gas-only TOTAL</th>
<th>SAVINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec-13</td>
<td>3</td>
<td>$156,487</td>
<td>$(46,286)</td>
<td>17,507</td>
<td>$44,464</td>
<td>5,515</td>
<td>$18,200</td>
<td>$2,517</td>
<td>$(1,650)</td>
<td>$18,893</td>
<td>$57,168</td>
<td>$(38,275)</td>
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</tr>
<tr>
<td>Jan-14</td>
<td>12</td>
<td>$(147,472)</td>
<td>$(266,655)</td>
<td>80,718</td>
<td>$209,809</td>
<td>3,789</td>
<td>$12,504</td>
<td>$19,494</td>
<td>$(6,600)</td>
<td>$(24,848)</td>
<td>$201,907</td>
<td>$(226,755)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feb-14</td>
<td>9</td>
<td>$2,340</td>
<td>$(136,639)</td>
<td>44,706</td>
<td>$116,204</td>
<td>14,247</td>
<td>$47,015</td>
<td>$8,785</td>
<td>$(4,950)</td>
<td>$35,365</td>
<td>$66,422</td>
<td>$(31,057)</td>
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<td></td>
</tr>
<tr>
<td>Mar-14</td>
<td>8</td>
<td>$32,281</td>
<td>$(113,552)</td>
<td>35,298</td>
<td>$91,750</td>
<td>28,105</td>
<td>$92,747</td>
<td>-</td>
<td>$(4,400)</td>
<td>$57,536</td>
<td>$88,710</td>
<td>$(31,173)</td>
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<td></td>
</tr>
<tr>
<td>Total</td>
<td>32</td>
<td>$43,636</td>
<td>$(563,132)</td>
<td>178,229</td>
<td>$462,226</td>
<td>51,656</td>
<td>$170,465</td>
<td>$30,796</td>
<td>$(17,600)</td>
<td>$86,947</td>
<td>$414,208</td>
<td>$(327,260)</td>
<td></td>
<td></td>
</tr>
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<td>Feb-15</td>
<td>10</td>
<td>$46,317</td>
<td>$(84,482)</td>
<td>12,018</td>
<td>$129,011</td>
<td>40,775</td>
<td>$91,522</td>
<td>$(2,280)</td>
<td>$(212,477)</td>
<td>$129,467</td>
<td>$(83,010)</td>
<td></td>
</tr>
</tbody>
</table>


Additional Considerations

- There are secondary impacts that may need to be considered:
  - Boiler O&M; Unit Performance Warranties
  - Renewable Energy Credits (APS Credits)
  - GHG Emissions

- Contribution of Institution to Maintaining Electrical System Reliability and freeing natural gas use for residential and other customers
Fuel Switching allows the Institution to Have Its Cake and Eat It Too. By Fuel Switching, Amherst College is able:

- To lock in fuel prices in advance of a budget year to achieve budget certainty and stability
- To achieve some of the savings that are available through spot market purchasing without exposing the College to commensurate risks