UCONN Energy Conservation

C.O.R.E Assessment Matrix
December 19, 2008
Energy Budget Goals

• Primary Goal
  – Reduce volatility of gas pricing by increased hedging
  – Currently at near historical low prices

• Secondary Goals
  – Increase outreach programs
  – Reduce average consumption
Energy Expenditures

UCONN Storrs Energy Bill Compared to NYMEX

- **CY08 Estimate**
  - $18.71 Million
  - 7,354 Mwh
  - 1.81 Million MMBTU

- **CY07**
  - $22.32 Million
  - 11,123 Mwh
  - 1.73 Million MMBTU

- **CY06**
  - $25.97 Million
  - 53,648 Mwh
  - 0.79 Million MMBTU (6 mth)
Monitoring Capability

- **FASER Version 5.0 Software (1999)**
  - Monitors all accounts with energy vendors
  - Database maintained by Accounts Payable since 2006 by Bruce Gerber/Michael Virone
  - Updates/Patches required

- **PowerLogic Square D Software**
  - Monitors on campus sub-meters
  - Ideally suited for electrical tracking/troubleshooting
  - Capable of energy use reporting
Monitoring Capability
(Continued)

• Andover Building Management System
  – Capable of control, monitoring, and reporting
  – 150 Buildings can be controlled

• Phoenix Control Systems (Lab Hoods)
  – Used in Labs and Animal Care Facilities where airflow tolerances are critical

• CT Water
  – Monitors campus supplied customers

• Metering Program – In process
  – 30 water meters, minimal users
  – 20 electrical meters
  – 10 steam meters
Energy Hogs

• Develop lists of Top Ten “Energy Hogs”
• Encourage Energy Hog managers to proactively administer conservation efforts
• Develop conservation goals addressing issues discovered
• Pursue high ROI improvements
• Distribute progress reports
CL&P Supplied Energy Hogs
July 2007 to Current

SPRING MANOR FARMS
WATER TREATMENT PLANT
ANIMAL ISOLATION BARN
LONGLEY BLDG
RT. 195 ST LIGHTS
MDC Pump Station Birch Rd
OFFICE OF SPECIAL SVC
AGRONOMY PLANT & SOIL
CAMPUS SHOPPING PLAZA
CELERON PATH

Nayden Clinic
UCONN Main CL&P Meters

MAIN CAMPUS

DEPOT CAMPUS MAIN

Jul-07  Aug-07  Sep-07  Oct-07  Nov-07  Dec-07  Jan-08  Feb-08  Mar-08  Apr-08  May-08  Jun-08  Jul-08  Aug-08  Sep-08
Sample Monthly Electrical Report
Willimantic Well Field

<table>
<thead>
<tr>
<th>Month</th>
<th>Jul-07</th>
<th>Aug-07</th>
<th>Sep-07</th>
<th>Oct-07</th>
<th>Nov-07</th>
<th>Dec-07</th>
<th>Jan-08</th>
<th>Feb-08</th>
<th>Mar-08</th>
<th>Apr-08</th>
<th>May-08</th>
<th>Jun-08</th>
<th>Jul-08</th>
<th>Aug-08</th>
<th>Sep-08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount</td>
<td>$12,000.00</td>
<td>$14,000.00</td>
<td>$16,000.00</td>
<td>$14,000.00</td>
<td>$12,000.00</td>
<td>$14,000.00</td>
<td>$12,000.00</td>
<td>$16,000.00</td>
<td>$14,000.00</td>
<td>$12,000.00</td>
<td>$14,000.00</td>
<td>$12,000.00</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

UCONN Spring Manor Farms CL&P Electrical FY08-Current

The chart shows the electrical costs for each month from July 2007 to September 2008. The costs vary significantly, with some months showing a decrease compared to others.
Sample Monthly Gas Report

Longley Building Natural Gas

![Bar Chart Showing Gas Costs for each Month from July 2007 to September 2008. Each bar represents the cost in dollars, with the highest cost in December 2007 and the lowest in August 2007 and September 2008.]
Converting Gas to Electricity

UCONN Central Utility Plant Natural Gas

- CUP BOILERS
- COGEN GENERATION
- COGEN DEMAND

Jul-07     Aug-07     Sep-07     Oct-07     Nov-07     Dec-07     Jan-08     Feb-08     Mar-08     Apr-08     May-08     Jun-08     Jul-08     Aug-08     Sep-08
Sample PowerLogic Monthly Report

UCCONN COGEN Supplied Building Electrical Energy Hogs FY08-Current

- Average Power (kw)
- Demand Peak (kw)
Conservation Project Types

- Lighting – High Efficiency/Low Wattage
- VFD – Variable Speed Drive on motors/fans
- Occupancy Sensors – Hallways and Stairs
- Energy Star Program – Appliances/Equipment
- CO2 Sensors – Air change optimization
Previous Conservation Projects

Equipment Life Cycle Savings

- Pharmacy Biology New (2005)
- North Parking Garage (2006)
- South Parking Garage (2006)
New Potential Conservation

- **Industry Recruitment/Support**
  - CCEF - Operational Demonstration Program
  - New Energy Technology Program
- **Leasing/Lease Purchase** CCEF - CT Solar Lease Program
- **Property Tax Exemption** Property Tax Exemption for Renewable Energy Systems
- **State Grant Program** C
  - CEF - Community Innovations Grant Program
  - CCEF - On-Site Renewable DG Program
  - CCEF - Project 150 Initiative
  - DPUC - Capital Grants for Customer-Side Distributed Resources
- **State Loan Program**
  - CHIF - Energy Conservation Loan
  - DPUC - Low-Interest Loans for Customer-Side Distributed Resources
- **State Rebate Program**
  - CCEF - Affordable Housing Initiative Solar PV Rebate Program
  - CCEF - Solar PV Rebate Program
  - Furnace and Boiler Replacement Rebate Program
- **Utility Grant Program** The United Illuminating Company - Energy Conscious Blueprint Grant Program
- **RenewablesPortfolio Standard** Renewable Portfolio Standard
- **Alternative Fuel and Vehicle Policies** U.S. Department of Energy's Alternative Fuels Data Center
- **Utility Rebate Program**
  - Connecticut Light & Power - Commercial Energy Efficiency Rebates
  - Connecticut Light & Power - Energy Opportunities Efficiency Program
  - Connecticut Light & Power - Express Rebate Programs
  - Connecticut Light & Power - Operation and Maintenance Program
- **Alternative Fuel and Vehicle Incentives** U.S. Department of Energy's Alternative Fuels Data Center
- **Rules, Regulations & Policies**
- **Appliance/Equipment Efficiency Standards** Energy Efficiency Standards for Appliances
- **Contractor Licensing** Solar and Wind Contractor Licensing
- **Energy Standards for Public Buildings** Green Building Standards for State Facilities
- **Generation Disclosure** Fuel Mix and Emissions Disclosure
- **Green Power Purchasing/Aggregation** Connecticut - Green Power Purchase Plan
- **Net Metering** Connecticut - Net Metering
- **Public Benefits Fund**
  - Connecticut Clean Energy Fund
  - Connecticut Energy Efficiency Fund
Building Schedule Reduction Savings

Weekend and Holiday Break

UCONN Campus Electrical Load
Building Schedule Reduction Savings

Weekend and Holiday Break

UCONN Campus Electrical Load

KWh Demand

Hourly Average

Modified Building Schedule

Weekend

[School In Session 12/01 - 12/12] [School Break 12/12 - 12/22]
Building Schedule Reduction Savings
Weekend and Holiday

UCONN Campus Steam Use

COGEN Hourly Average
## Example Schedule Reductions

### Breaks & Holidays

<table>
<thead>
<tr>
<th>Building Name</th>
<th>Occupied Hours</th>
<th>Revised Occupied Hours</th>
<th>Total Hours Reduced</th>
<th>Percentage run time Saved on AHU/FCU</th>
<th>Percentage of Building’s Energy</th>
<th>Kwh Reduction</th>
<th>Monthly Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Music Orchestra &amp; Library</strong></td>
<td>16</td>
<td>10</td>
<td>6</td>
<td>37.5%</td>
<td>40%</td>
<td>1142</td>
<td>$88.19</td>
</tr>
<tr>
<td><strong>Field House</strong></td>
<td>17</td>
<td>10</td>
<td>7</td>
<td>41.1%</td>
<td>55%</td>
<td>1072</td>
<td>$82.78</td>
</tr>
<tr>
<td><strong>Chemistry</strong></td>
<td>17</td>
<td>10</td>
<td>7</td>
<td>41.1%</td>
<td>40%</td>
<td>1800</td>
<td>$139.00</td>
</tr>
<tr>
<td><strong>Engineering &amp; UTEB</strong></td>
<td>16</td>
<td>7</td>
<td>9</td>
<td>43.7%</td>
<td>40%</td>
<td>681</td>
<td>$52.59</td>
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<tr>
<td><strong>Student Union</strong></td>
<td>15</td>
<td>10</td>
<td>5</td>
<td>33.3%</td>
<td>55%</td>
<td>3009</td>
<td>$232.37</td>
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</table>
Savings Thumb Rule

Cooling Thermostat

Heating Thermostat
# Out Reach Savings Potential
## Non Automated Lighting

<table>
<thead>
<tr>
<th>Assumptions</th>
<th>Residential Buildings</th>
<th>Classroom &amp; Office Buildings</th>
<th>High Tech &amp; Science Buildings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lighting Load</td>
<td>20%</td>
<td>40%</td>
<td>30%</td>
</tr>
<tr>
<td>Focused Compliance</td>
<td>25%</td>
<td>25%</td>
<td>25%</td>
</tr>
<tr>
<td>Example Building</td>
<td>South Campus Dorm</td>
<td>Torrey Life Science</td>
<td>Chemistry</td>
</tr>
<tr>
<td>Kwh Savings/Month</td>
<td>1700</td>
<td>2300</td>
<td>7800</td>
</tr>
<tr>
<td>$$/Mwh @COGEN Cost</td>
<td>10.38</td>
<td>10.38</td>
<td>10.38</td>
</tr>
<tr>
<td>Total Savings/Month</td>
<td>$ 170.00</td>
<td>$ 230.00</td>
<td>$ 780.00</td>
</tr>
<tr>
<td>Annualized Storrs Savings</td>
<td>$28,814</td>
<td>$38,980</td>
<td>$132,203</td>
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</table>
Example Resident Hall Setback
3% Savings Per 1°F (proves Rule of Thumb)

<table>
<thead>
<tr>
<th>Building Name</th>
<th>Square Footage</th>
<th>December 2008 Kwh Data Setback 72°F to 65°F</th>
<th>Average</th>
<th>Delta</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beard</td>
<td>34,878</td>
<td>Mon. 462</td>
<td>Tues. 646</td>
<td>Weds. 409</td>
<td>Thurs. Set-point Reduced 326</td>
</tr>
<tr>
<td>Bethune</td>
<td>25,130</td>
<td>Mon. 419</td>
<td>Tues. 514</td>
<td>Weds. 344</td>
<td>Thurs. Set-point Reduced 254</td>
</tr>
<tr>
<td>Crandall</td>
<td>34,878</td>
<td>Mon. 258</td>
<td>Tues. 323</td>
<td>Weds. 200</td>
<td>Thurs. Set-point Reduced 147</td>
</tr>
<tr>
<td>Flesche</td>
<td>25,130</td>
<td>Mon. 171</td>
<td>Tues. 190</td>
<td>Weds. 144</td>
<td>Thurs. Set-point Reduced 119</td>
</tr>
<tr>
<td>French</td>
<td>25,130</td>
<td>Mon. 256</td>
<td>Tues. 320</td>
<td>Weds. 236</td>
<td>Thurs. Set-point Reduced 192</td>
</tr>
<tr>
<td>Merritt</td>
<td>25,130</td>
<td>Mon. 181</td>
<td>Tues. 297</td>
<td>Weds. 208</td>
<td>Thurs. Set-point Reduced 147</td>
</tr>
<tr>
<td>Grasso</td>
<td>34,878</td>
<td>Mon. 638</td>
<td>Tues. 846</td>
<td>Weds. 645</td>
<td>Thurs. Set-point Reduced 505</td>
</tr>
</tbody>
</table>
Steam Trap & Line Maintenance Program Potential Savings

- 153 Buildings (7M square feet) Supplied
- ~5,000 Steam Traps on Campus
- Water Make-Up of 33-42 Million Gallons/Year
- $2.2 to 3.0 Million/Year Loss
  - 11-15% of Total Energy Cost
- 60% of loss occurs in steam lines & traps
- 40% of loss occurs in condensate lines