Energy and Greenhouse Gas Reduction Projects at New York State Campuses

NYCSHE Webinar, March 8, 2016
Robert M. Neimeier
Presentation Summary

Site vs Source Energy
Drivers / Goals / Commitments
Energy Program Outline
Case Study Energy Conservation Measures:
  SUNY, University at Albany
  SUNY Buffalo State
  City University of New York
Key Takeaways
Site Versus Source EUI

**Energy Use Intensity (EUI)**

Annual energy consumed by a building, measured as thousands of Btu per gross square foot (kBtu/SF-year)

**Site Energy**

Thermal energy and electricity consumed by a building as reflected in utility bills

**Source Energy**

Total amount of fuel consumed in the generation and use of energy consumed including generation, transmission and storage losses
Drivers / Goals / Commitments

PlaNYC –
30% GHG/per GSF reduction by 2017

Build Smart NY –
20% Source EUI kBtu/GSF reduction by 2020
Energy Program Outline

- **Energy Assessment**
  - Analysis and Benchmarking
  - ASHRAE Audits – ECMs, IRs
- **Energy Master Plan**
  - Goals, Targets, Strategies
  - Energy Program Areas
  - Capital Projects
  - Implementation Plan
- **Submetering**
  - Energy Management System
- **Operation & Maintenance Plan**
  - EBCx and continuous Cx
Case Studies of New York State Campuses

SUNY University at Albany

SUNY Buffalo State

City University of New York
Learned Outcomes

- Established Campus Energy Manager
- Proactive ECM implementation
  - significant $$ to get savings
- Operations & Maintenance
  - $$ and training
  - Instrumentation & Controls Shop
  - Temperature setpoint policy
- Buildings slated for gut rehab – ??
- Short-term, medium-term, long-term actions: Aligned with FMP
## UAlbany Energy Master Plan

### Savings Strategy Summary

<table>
<thead>
<tr>
<th>EMP Savings Strategy</th>
<th>Electrical (kWh/yr.)</th>
<th>Natural Gas (MMBtu/yr.)</th>
<th>Site Energy (kBtu/yr.)</th>
<th>Percentage of Baseline Site Energy</th>
<th>Source Energy (kBtu/yr.)</th>
<th>Percentage of Baseline Source Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010-2011 UAlbany Baseline</td>
<td>71,040,900</td>
<td>459,618</td>
<td>735,760,103</td>
<td>100%</td>
<td>1,325,226,945</td>
<td>100%</td>
</tr>
<tr>
<td>ECM/TA Savings</td>
<td>12,868,399</td>
<td>165,996</td>
<td>209,928,660</td>
<td>28.5%</td>
<td>320,533,021</td>
<td>24.2%</td>
</tr>
<tr>
<td>O&amp;M Savings</td>
<td>1,420,818</td>
<td>9,192</td>
<td>14,043,039</td>
<td>1.9%</td>
<td>25,825,654</td>
<td>1.9%</td>
</tr>
<tr>
<td>CHP Savings</td>
<td>14,400,000</td>
<td>-57,752</td>
<td>-8,590,400</td>
<td>-1.2%</td>
<td>103,733,400</td>
<td>7.8%</td>
</tr>
<tr>
<td>Renewable Energy Savings (600 kW PV)</td>
<td>550,000</td>
<td>0</td>
<td>1,877,700</td>
<td>0.3%</td>
<td>6,271,518</td>
<td>0.5%</td>
</tr>
<tr>
<td>Total Savings</td>
<td>29,239,217</td>
<td>117,436</td>
<td>217,258,998</td>
<td>29.5%</td>
<td>456,363,593</td>
<td>34.4%</td>
</tr>
</tbody>
</table>
Combined Heat & Power

Cogeneration – generation of electricity and useful thermal energy from a single system
## Existing Building Commissioning

Review building systems, identify performance improvements

<table>
<thead>
<tr>
<th>Energy Cost Savings ($/yr)</th>
<th>Estimated Capital Cost</th>
<th>Simple Payback Period (Year)</th>
<th>Source Energy (kBtu/yr)</th>
<th>Source EUI Reduction (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>133,500</td>
<td>132,000</td>
<td>1.0</td>
<td>19,511,912</td>
<td>1.5</td>
</tr>
</tbody>
</table>

### Project Benefits

- Source Energy Reduction – fan and motor use reduction
- GHG Reduction
- O&M - Longevity of assets
- Fewer complaints - Increase building occupancy comfort
- Decrease operating costs = increase net operating income
Learned Outcomes

- No Campus Energy Manager
- Take credit for implemented measures
- Operations & Maintenance
  - $$$ and training
- Build energy savings into new projects - Ask for it
- Environmental mitigation impacts on business case
<table>
<thead>
<tr>
<th>ID</th>
<th>Measure</th>
<th>Description</th>
<th>Capital Cost ($)</th>
<th>Reduction in Source EUI (%)</th>
<th>Cumulative Reduction in Source EUI (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EUI Reductions as of June 2013</td>
<td></td>
<td>N/A</td>
<td>10.0%</td>
<td>10.0%</td>
</tr>
<tr>
<td>2</td>
<td>NC-5</td>
<td>Technology Building</td>
<td>Funded</td>
<td>2.1%</td>
<td>12.1%</td>
</tr>
<tr>
<td>3</td>
<td>NC-2</td>
<td>Houston Gymnasium Rehabilitation</td>
<td>Funded</td>
<td>0.8%</td>
<td>12.9%</td>
</tr>
<tr>
<td>4</td>
<td>NC-8</td>
<td>Caudell Hall Renovation</td>
<td>Funded</td>
<td>-0.3%</td>
<td>12.6%</td>
</tr>
<tr>
<td>5</td>
<td>NC-3</td>
<td>Siemens Upgrade Project</td>
<td>Awaiting Approval &amp; Funding</td>
<td>3.7%</td>
<td>16.3%</td>
</tr>
<tr>
<td>6</td>
<td>NC-1</td>
<td>Heating Plant Replacement</td>
<td>Design Funded</td>
<td>3.7%</td>
<td>20.0%</td>
</tr>
<tr>
<td>7</td>
<td>LC/NC</td>
<td>Low Cost/No Cost Energy Conservation Measures</td>
<td>N/A</td>
<td>2.5%</td>
<td>22.9%</td>
</tr>
<tr>
<td></td>
<td>Subtotal</td>
<td></td>
<td>$0</td>
<td></td>
<td>22.9%</td>
</tr>
<tr>
<td>8</td>
<td>ECM-16*</td>
<td>Campus Energy Manager</td>
<td>$135,000</td>
<td>8.9%</td>
<td>31.8%</td>
</tr>
<tr>
<td></td>
<td>Subtotal</td>
<td></td>
<td>$135,000</td>
<td></td>
<td>31.8%</td>
</tr>
<tr>
<td>9</td>
<td>ECM-13*</td>
<td>Install Removable Insulation Covers</td>
<td>$47,000</td>
<td>1.3%</td>
<td>33.1%</td>
</tr>
<tr>
<td>10</td>
<td>ECM-11*</td>
<td>Implement Steam Trap Maintenance Program</td>
<td>$198,000</td>
<td>1.9%</td>
<td>35.6%</td>
</tr>
<tr>
<td>11</td>
<td>ECM-8*</td>
<td>Perform Existing Building Commissioning (EBCx)</td>
<td>$896,000</td>
<td>1.5%</td>
<td>36.5%</td>
</tr>
<tr>
<td>12</td>
<td>ECM-15*</td>
<td>Building Level Utility Submetering</td>
<td>$272,000</td>
<td>1.3%</td>
<td>37.8%</td>
</tr>
</tbody>
</table>
## SUNY Buffalo State Energy & GHG Savings

### Campus Energy Manager
Monitor and manage energy efficiency, resources, and savings

<table>
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<tr>
<th>Energy Cost Savings ($/yr)</th>
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<th>Source EUI Reduction (%)</th>
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<tr>
<td>381,000</td>
<td>135,000</td>
<td>0.35</td>
<td>60,000,000</td>
<td>8.9</td>
</tr>
</tbody>
</table>

**Project Benefits**
- Monitor/analyze utility data and metering systems – react and respond
- Develop energy strategies and conservation programs to reduce GHGs
- Project development assistance – advocacy role
- Project implementation – verification of savings
- Manage incentive programs – financial benefit to campus
# SUNY Buffalo State Energy & GHG Savings

## Steam Trap Maintenance Program

Minimize energy loss from steam trap failure

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<th>Energy Cost Savings ($/yr)</th>
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<th>Source EUI Reduction (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>78,000</td>
<td>198,000</td>
<td>2.5</td>
<td>10,000,000</td>
<td>1.9</td>
</tr>
</tbody>
</table>

### Project Benefits

- Cost benefits: Reduced water, sewer, and energy costs
- GHG reduction: less energy used
- Asset management - proactive O&M
About City University of New York

Largest Urban University System in the U.S.

- Senior, community, honors, graduate, and professional colleges
- Over 500,000 students
- 36,000 faculty and support staff
- 300 buildings
- 26.3 million gross square feet

- Annual CUNY energy cost = $84M
  - Approx 1% of NYC energy load
- Decentralized governance
- Average building age of 52 years
Learned Outcomes

- Establishment of CUNY Conserves
  - Submetering and Energy Management System
  - Peak Load Management
  - Operations & Maintenance Plan
  - Training and Education
- Impact of lighting technology advancements
- Strong energy conservation history
  - Early adopters have to dig deeper
CUNY Stabilization Wedge Diagram: Actions in Meeting PlaNYC Goals by 2017

CUNY Stabilization Wedge
# CUNY Energy & GHG Savings

**LED Lighting – Bureau of Manhattan Community College**

<table>
<thead>
<tr>
<th>Energy Cost Savings ($/yr)</th>
<th>Estimated Capital Cost</th>
<th>Simple Payback Period (Year)</th>
<th>Source Energy (kBtu/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$151,000</td>
<td>$4,122,500</td>
<td>27</td>
<td>20,000,000</td>
</tr>
</tbody>
</table>

**Project Benefits**

- Source Energy Reduction – 47% reduction in kW load
- GHG Reduction – Reduced impact on local utility
- Lighting will meet recommended practices
- LED technologies – energy and visual performance
- O&M – decrease in maintenance labor and inventory stock

**Lighting improvement program**
### CUNY Energy & GHG Savings

**Boiler and Chiller Replacement – New York City College of Technology**

Renovation and renewal of facility assets.

<table>
<thead>
<tr>
<th>Annual Therm</th>
<th>Annual kWh</th>
<th>Energy Cost</th>
<th>Estimated Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Gas Reduction (%)</td>
<td>Electric Reduction (%)</td>
<td>Savings ($/yr)</td>
<td>Cost</td>
</tr>
<tr>
<td>23.5</td>
<td>43</td>
<td>25,000</td>
<td>$16,500,000</td>
</tr>
</tbody>
</table>

**Project Benefits**

- Source Energy Reduction
- GHG Reduction – Reduced impact on local utility
- Reduced operating expenses
- More resilient facility assets
Campus Energy Master Planning

1. Define your goals, approach, and expectations
2. Consideration to short, mid, and long-term goals
3. Alignment with other plans - Capital, Facilities, Strategic
4. Energy project versus infrastructure renewal
5. Energy measures: systems versus buildings
6. Continual awareness of technology advancements
7. Campus Energy Manager – Need and benefits
8. Enhanced O&M and Training – Smart building systems
9. Identifying implementation hurdles
10. Early energy conservation adopters – Dig deeper for energy savings
11. Submetering and Energy Management System platform
12. Incorporate energy savings into new designs and projects – Ask for it
Thank-you!

Robert Neimeier, Rob.Neimeier@obg.com