Using Alternative Financing to Achieve Deep Energy Retrofits

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The Issue

- Budget Pressure / Capital Funding Constraints
- Repurposing of Federal Property Holdings
- Energy Efficiency / Sustainability Mandates
- Energy Security / Reliability Concerns
- Accountability for Energy Performance
The Challenge

Combining Renovation with ESPC

• Energy retrofits are less costly to implement during major building renovations, but renovations and energy upgrades are usually performed separately
• Combining them requires a method of integrating the performance of a general contractor (performing renovations) and an ESCO (installing energy conservation measures)
• Not easy to coordinate the activities of the two contractors…
Case Study – UESC at ICC-B

Keys to Success
- Coordination
- Partnership
- Innovation
- Reliability
- Flexibility
- Value
ICC-B UESC Development Team

Owner
- Office of Director of National Intelligence

Executive Agent
- Defense Intelligence Agency

Program Management Office (PMO)
- Markon Solutions

SATOCC
- US Army Corps of Engineers
  BALTIMORE DISTRICT

UESC
- US Army Corps of Engineers
  U.S. ARMY ENGINEERING AND SUPPORT CENTER, HUNTSVILLE

Whiting-Turner
URS
WGL Energy
Honeywell
Former NGA Sumner Campus

Erksine Hall CMP
- Boiler #1 & #2 – 500 hp
- Boiler #3 – 300 hp
- Chiller #1 & #2 – 1200 tons

Maury Hall CMP
- Chiller #1 & #2 – 780 tons

Roberdeau Hall CMP
- Chiller #1 & #2 – 1000 tons

Approximate Site Boundary
ICC-B Campus Vision

- Hot Water Supply
- Hot Water Return
- Chilled Water Supply
- Chilled Water Return

ICC-B CMP
Boiler #1,#2,#3 – 4 MMBtu/h
Chiller #1,#2 – 340 tons
Chiller #3,#4,#5 – 1100 tons
Chiller #6 – 340 tons
Chiller #7 – Future 1100 tons
# ICC-B ECM Descriptions

<table>
<thead>
<tr>
<th>ECM #</th>
<th>ECM Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECM-1</td>
<td>New Central Utility Plant (CUP)</td>
</tr>
<tr>
<td>ECM-2</td>
<td>New AHUs and Fan Powered Terminal Devices with Control Strategies</td>
</tr>
<tr>
<td>ECM-3</td>
<td>Airside Energy Recovery</td>
</tr>
<tr>
<td>ECM-4</td>
<td>Upgrade Campus Wide Energy Management System (EMS)</td>
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<tr>
<td>ECM-5</td>
<td>New Gas Fired Water Heaters</td>
</tr>
<tr>
<td>ECM-7</td>
<td>Lighting Upgrades and Lighting Controls</td>
</tr>
<tr>
<td>ECM-8</td>
<td>New Backup Generators</td>
</tr>
<tr>
<td>ECM-11</td>
<td>Photovoltaic (PV) Systems</td>
</tr>
<tr>
<td>ECM-13</td>
<td>Solar Domestic Hot Water Generation</td>
</tr>
<tr>
<td>ECM-15</td>
<td>Operations and Maintenance (O&amp;M)</td>
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<tr>
<td>ECM-18</td>
<td>Additional Back-Up Chiller for Maury Hall</td>
</tr>
<tr>
<td>ECM-19</td>
<td>Smart Power Strips</td>
</tr>
</tbody>
</table>
ICC-B UESC Program Elements

UESC Structure
- Phase I (Base): CUP Construction
- Phase II: Roberdeau Hall ECMs
- Phase III: Erskine Hall ECMs
- Phase IV: Maury Hall ECMs & PV

Savings Goals
- Reduce up front costs
- Energy efficiency
- Maintenance & Repair cost avoidance
2008 Baseline Campus Model

- Model includes all original campus buildings
- Original distributed chilled water distribution (5,285 tons)
- Original central steam system (1,200 BHP)
- Mostly 24hr operating schedule
- High internal gains from analyst stations / computer rooms
Adjusted Baseline

- Added the Centrum Building
- Upgrades to building envelope thermal performance
- Expanded 3rd floor RH
- Significant increase in window–wall ratio
- Space use based on projected tenants
- Buildings served by existing chilled water/steam system
ECM Modeling Results

- 39% energy usage reduction from 2008 Baseline
- ~ $2,000,000/yr cost savings from 2008 Baseline
- 47% energy usage reduction from Adjusted Baseline
- ~ $1,100,000/yr cost savings from Adjusted Baseline
Energy-related (O&M) Savings

Baseline / Existing Conditions
  • Multiple Plants (3 separate locations)
  • Vintage Equipment; “Breakdown” Maintenance following BRAC decision
  • High Pressure Steam Boilers (24/7 monitoring)
  • Actual O&M Expenditures, FY2009 (NGA)

Savings Opportunities
  • Consolidate Plant Equipment
  • Capture Near-Term Repair/Replacement Cost Avoidance
  • Condensing Boilers => Manpower Reductions
  • Bottoms-up Performance-Based Costing

O&M Savings Value
  • $2.4M for Central Plant (Year 1 value)
  • $2.1M for Campus Buildings (Year 1 value)
Lessons Learned

Combined Financing contributed to the mission capabilities of the Campus

Earlier Calibration with all stakeholders
  • Contractual Requirements
  • Design Efforts
  • Scope Gaps

Scheduling Constraints

Required Instant and Continuous Communication
Additional Examples

Humphreys Engineering Center

USACE Managed Site Adjacent to Ft Belvoir
Combination of Secure/Non-Secure Facilities
Aging Infrastructure
  • Large Capital Improvement Needs
Detailed Feasibility Study 2015
  • Focused on Cude/Cude Annex Renovation
Proof of Concept for Multi-phase DER Project using Combined Financing
## HEC Financial Summary

<table>
<thead>
<tr>
<th>#</th>
<th>ECM Title</th>
<th>Utility Savings (USD)</th>
<th>Operational Savings (USD)</th>
<th>Total Savings (USD)</th>
<th>Price (USD)</th>
<th>Simple Payback (yrs)</th>
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<tbody>
<tr>
<td>1.1</td>
<td>Install Condensing Boilers</td>
<td>$22,486</td>
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<td>$22,486</td>
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<td>2.1</td>
<td>Chiller Plant Optimization</td>
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<td>3.1</td>
<td>Programmable Thermostats</td>
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<td>3.2</td>
<td>BAS Upgrade</td>
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<td>$182,532</td>
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<td>4.1</td>
<td>AHU Replacement</td>
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<td>$4,479,996</td>
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<td>12.1</td>
<td>Water Conservation: Lowflow Toilets, Sinks</td>
<td>$11,752</td>
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<td>$114,238</td>
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<td>12.3</td>
<td>NonChem Water Treatment</td>
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<td>Cost of Feasibility Study</td>
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<td>$340,149</td>
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<td>Project Totals</td>
<td>$260,965</td>
<td>$110,210</td>
<td>$371,175</td>
<td>$7,403,649</td>
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**Required $1.2M Capital Contribution => 50% Energy Savings**
Conclusions

• Energy Performance Contracting (EPC) represents a viable means for enhancing energy performance in Federal new construction and/or major renovations.

• EPC can be used to provide funding for Deep Energy Retrofits that might otherwise be unaffordable.

• Blending of EPC and appropriated funding is challenging on many levels – needs buy-in from all stakeholders.

• Specific methodology can be adapted during execution to meet evolving program requirements.

• Early consideration of blending EPC with appropriations in facilities acquisition strategy development is recommended.
Questions?

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