A replicable model for energy optimization

Process for base buildings and tenants integrates stakeholder engagement, integrated timeline, comprehensive energy saving solutions and strong ROI

<table>
<thead>
<tr>
<th>Identify opportunities</th>
<th>Evaluate measures</th>
<th>Create packages</th>
<th>Model iteratively</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 60+ energy efficiency ideas were narrowed to 17 implementable projects</td>
<td>• Net present value</td>
<td>• Maximize net present value</td>
<td>• Iterative energy and financial modeling process to identify final eight recommendations</td>
</tr>
<tr>
<td>• Team estimated theoretical minimum energy use</td>
<td>• Greenhouse gas savings</td>
<td>• Balance net present value and CO₂ savings</td>
<td></td>
</tr>
<tr>
<td>• Developed eQUEST energy model</td>
<td>• Dollar to metric ton of carbon reduced</td>
<td>• Maximize CO₂ savings for a zero net present value</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Calculated for each measure</td>
<td>• Maximize CO₂ savings</td>
<td></td>
</tr>
</tbody>
</table>
Motivation: Define the economics behind whole building energy efficiency retrofits and high performance tenant installations.

- Create and communicate the business case
- Model investment and monitor and verify return
- Payback in a short period
  - Landlords
  - Tenants
- Better energy data and management
- Drive decision making based on economics
- Enhance competitive position
- High quality tenants and informed tenant advisors
Achieve financial return and energy reduction
Clear quantifiable business case

15-Year NPV of Package versus Cumulative Energy Savings

A solution that balances energy reductions and financial returns is in this range.

There are diminishing (and expensive) returns for greater efficiency.
Investment and Return

Capital Budget Adjustments for Energy Efficiency Projects

- 2008 Capital Budget for Energy-Related Projects = $93m + 0% Energy Savings
- Sum of adds / changes / deletes = +$13m
- 3.1 year payback on incremental cost
- New Capital Budget w/ Efficiency Projects = $106m + 38% Energy Savings
The Empire State Building
A groundbreaking energy and sustainability program

• Reduce energy use by 38 percent
• Annual savings of $4.4M
• 3.1 year payback
• Energy Star 90
• Energy Performance Contract
• Quantifiable transparent results
• Serve as a model for owners of existing buildings
• Visit www.esbsustainability.com
Integration of efficiency measures: Building Retrofit

The key to the ESB process is integrating the right steps in the right order. There is no “silver bullet”, there are “silver buckshot”…

Annual Energy Savings by Measure

38% Reduction
The business case for an integrated approach

More than half the savings exist within tenant spaces. To achieve deep energy savings, projects must develop a strategy for tenant spaces.

Energy Savings: Base Building vs. within Tenant Space

- Retrofit Chiller
- Balance of DDC
- Tenant DCV
- Radiative Barrier
- Tenant Energy Management
- Bldg Windows
- VAV AHU's
- Tenant Daylighting/Lighting/Plugs

Measures that only affect the Base Building

Measures within Tenant Space
# Lease Cycle Energy Optimization Process

<table>
<thead>
<tr>
<th>TENANT</th>
<th>BUILDING OWNER</th>
</tr>
</thead>
</table>
| • Select an office space in a high performance building | • Develop an energy performance marketing/fact sheet  
• Include energy aligned clause and energy criteria in the lease |
| • Put together project team  
• Define energy goals and EPMs  
• Model projected energy use  
• Review costs and incentives  
• Perform Value Analysis  
• Review EPM budget and make decisions  
• Build out space | • Provide energy design contact to review design criteria and facilitate energy optimization  
• Pre-build a high performance office space  
• Provide access to an energy model |
| | • Sub-meter tenant spaces  
• Provide an energy management dashboard  
• Host tenant energy best practice workshops  
• Schedule an annual energy meeting with each tenant |

The timeframe for each lease cycle phase will vary. A general estimate for pre-lease is one year or less, design and construction one to two years, and tenant lease terms ranging between 5 and 15 years. The value proposition to the tenant and building owner increases as the lease term increases.
# Investment and Return: Coty

## Build-Out (4 Floors)

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leased Premises</td>
<td>159,335 sq. ft.</td>
</tr>
<tr>
<td>Modeled Energy Reduction</td>
<td>32%</td>
</tr>
<tr>
<td>Total Electricity Savings over Lease Term</td>
<td>6,300,000 kWh</td>
</tr>
<tr>
<td>Incremental Implementation Cost (w/o incentives)</td>
<td>$288,401</td>
</tr>
<tr>
<td>State Incentives (net of review and filing costs)</td>
<td>$39,582</td>
</tr>
<tr>
<td>Energy Modeling Soft Cost</td>
<td>$9,000</td>
</tr>
<tr>
<td>Adjusted Incremental Implementation Cost</td>
<td>$257,819 ($1.62/ft$^2$)</td>
</tr>
<tr>
<td>Total Electricity Cost Savings over Lease Term</td>
<td>$1,096,635</td>
</tr>
<tr>
<td>Present Value of Electricity Cost Savings over Lease Term</td>
<td>$727,267</td>
</tr>
<tr>
<td>Net Present Value of Project Investment</td>
<td>$447,093</td>
</tr>
<tr>
<td>Return on Investment (ROI) over Lease Term</td>
<td>182%</td>
</tr>
<tr>
<td>Annual Rate of Return</td>
<td>24%</td>
</tr>
<tr>
<td>Payback Period</td>
<td>4.0 years</td>
</tr>
</tbody>
</table>
## Investment and Return: LFUSA

### Phase 1 Build-Out (3 Floors)

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leased Premises</td>
<td>137,400 sq. ft.</td>
</tr>
<tr>
<td>Modeled Energy Reduction</td>
<td>28%</td>
</tr>
<tr>
<td>Total Electricity Savings over Lease Term</td>
<td>3,273,780 kWh</td>
</tr>
<tr>
<td>Incremental Implementation Cost (w/o incentives)</td>
<td>$164,370</td>
</tr>
<tr>
<td>State Incentives (net of review and filing costs)</td>
<td>$36,940</td>
</tr>
<tr>
<td>Energy Modeling Soft Cost</td>
<td>$6,600</td>
</tr>
<tr>
<td>Adjusted Incremental Implementation Cost</td>
<td>$134,030 ($0.98/ft$^2$)</td>
</tr>
<tr>
<td>Total Electricity Cost Savings over Lease Term</td>
<td>$566,495</td>
</tr>
<tr>
<td>Present Value of Electricity Cost Savings over Lease Term</td>
<td>$392,002</td>
</tr>
<tr>
<td>Net Present Value of Project Investment</td>
<td>$257,972</td>
</tr>
<tr>
<td>Return on Investment (ROI) over Lease Term</td>
<td>192%</td>
</tr>
<tr>
<td>Annual Rate of Return</td>
<td>27%</td>
</tr>
<tr>
<td>Payback Period</td>
<td>3.5 years</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>1</td>
<td>Windows Retrofit</td>
</tr>
<tr>
<td>2</td>
<td>Radiator Insulation and Steam Traps</td>
</tr>
<tr>
<td>3</td>
<td>BAS Retrofit</td>
</tr>
<tr>
<td>4</td>
<td>Chiller Plant Retrofit</td>
</tr>
<tr>
<td>5</td>
<td>Tenant Energy Management</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
</tr>
</tbody>
</table>
Measurement & Verification

Reduction in ESB’s 2007 Baseline Electric Utility Costs During Performance Period

YOY Electric Utility Costs

<table>
<thead>
<tr>
<th>Year</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>$14,694,108</td>
</tr>
<tr>
<td>2008</td>
<td>$12,853,869</td>
</tr>
<tr>
<td>2009</td>
<td>$11,697,544</td>
</tr>
<tr>
<td>2010</td>
<td>$11,710,160</td>
</tr>
<tr>
<td>2011</td>
<td>$9,609,506</td>
</tr>
<tr>
<td>2012</td>
<td>$9,874,215</td>
</tr>
</tbody>
</table>
Median NYC Office Building EUI ↓ 213.3, ESB EUI ↓ 71

CBEC 2003:
Northeast Region
EUI for Office Building = 210

Median NYC EUI = 213.3
## Value of Energy Efficiency versus “Green”

<table>
<thead>
<tr>
<th>Energy Optimization</th>
<th>Green</th>
<th>Other Sustainability Metrics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantifiable metrics</td>
<td>Renewable, recycled content, reused and local materials</td>
<td>Bicycle racks</td>
</tr>
<tr>
<td>Transparent analysis</td>
<td>Indoor air quality</td>
<td>Showers</td>
</tr>
<tr>
<td>Guaranteed savings</td>
<td>Recycling</td>
<td>Water features</td>
</tr>
<tr>
<td>Measurable payback and ROI</td>
<td>Water efficiency</td>
<td>Plant walls</td>
</tr>
<tr>
<td>Reduce loads</td>
<td>Green cleaning</td>
<td>Employee engagement</td>
</tr>
<tr>
<td>Reduce energy usage</td>
<td>Integrated pest management</td>
<td>Carbon disclosure</td>
</tr>
<tr>
<td>Optimize system efficiency</td>
<td>Access to daylight and views</td>
<td>REC’s</td>
</tr>
<tr>
<td>Reduce operating costs</td>
<td>Improved comfort</td>
<td>Ergonomic workstations</td>
</tr>
<tr>
<td>M&amp;V</td>
<td></td>
<td>Preferred parking: low emission vehicles</td>
</tr>
</tbody>
</table>