Deciphering the Data:
Using Your Building's Story to Make Sustainability Gains

Moderator:
Brendan Hall
Public Sector Program Manager, EPA ENERGY STAR Commercial & Industrial Branch

Presenters:
Jeffrey Salay, PE, CEM, LEED AP
Senior Principal, GHT Limited

Zack Moore
SVP Customer Solutions & Co-Founder,
SOL VISTA
1. Participants will understand how aggregated utility data for ENERGY STAR and benchmarking compliance can be transformed into actionable insights to make building improvements while increasing profitability.

2. Participants will be able to apply lessons learned from energy audits to create savings opportunities, increase asset values and bring buildings back on track from changes to their ENERGY STAR scores.

3. Participants will understand the value of portfolio-wide energy monitoring and how it can improve decision-making at the individual property level.

4. Participants will understand and be able to apply strategies to assure local compliance, maximize cost reduction and achieve an ENERGY STAR score of 75 or higher to target local government building leases.
Jeffrey Salay, GHT Limited
Senior Principal & OES Studio Leader
- Oversees Operations & Energy Services studio
- 26+ years' experience in mechanical design and energy management strategies
- BS in Mechanical Engineers; LEED AP and Certified Energy Manager

Zack Moore, SOL VISTA
SVP Customer Solutions & Co-Founder
- Oversees SOL VISTA's technical and engineering efforts
- Heads SOL VISTA's business development and customer management activities
- BS in Chemical Engineering; MBA in Technology Management

Our Panel

MODERATOR:
Brendan Hall, Environmental Protection Agency (EPA) Public Sector Program Manager, ENERGY STAR Commercial & Industrial Branch
- Serves as national lead to colleges & universities and co-lead to local governments
- Offers tools, resources & support to help organizations and buildings eliminate energy waste
ENERGY STAR Score Updates & Review Period

Why updates to 1-100 ENERGY STAR scores were needed: rebalancing the distribution after market improvement
What We Looked At & Why

Provide information about building performance based on the most up-to-date market data available

- 2012 Commercial Energy Consumption Survey was released by EIA (prior scores were based on 2003 survey)
- 2012 survey shows lower aggregate energy intensity as compared with 2003

Re-assess key drivers of energy use

- Have the relationships between operating characteristics and energy intensity changed in the last 10 years?
- Are there new variables in CBECs that we should be adjusting for going forward?

Same purposes behind scores and certification
Property Types

Property types updated in August 2018:

K-12 Schools, Offices, Retail, Supermarkets, Hotels, Warehouses, Houses of Worship

Property types not impacted

Multi-family, Data Centers, Hospitals, Senior Care
Additional Details

Other changes made August 2018:

Property types with August 2018 updates:
  • Changes to property use details required for 1-100 ENERGY STAR scores and certification
  • Offices, K-12 Schools, and Warehouses now eligible for scores and certification if 1,000 ft² or larger – previous minimum was 5,000 ft²

All property types:
  • New national source factor for electricity: from 3.1 to 2.8
  • Additional factor updates
  • New option to estimate out energy use of data centers located in other buildings

Changes applied to all historical scores and source metrics in Portfolio Manager

Previous ENERGY STAR certifications are not affected
How Did We Get Here?

ENERGY STAR Program

Prior versions of CBECS

New CBECS Data
Then vs. Now

2017 - Your Building
ENERGY STAR Score: 78

2019 - Your Building
ENERGY STAR Score: 66
So what can we do?

A Sample Project

10-story commercial office building in Bethesda

ENERGY STAR Score: 67

👍 not eligible for GSA leases

👎 difficulty attracting new tenants

👎 loss of tax rebates & incentives
Understand energy usage

- utility bills
- average peak loads
- water & sewage history
Analyze schedule trends

- building operations schedules
- average peak usage
- opportunities
Configure for occupancy counts

- confirm actuals
- occupancy surveys
Account for building amenities

- garage, data center, fitness center
LET'S TALK...
Optimization strategies

- percent reductions ---> bump in score
- how much bump?
  1% - 10% - 15%
SOL VISTA Intro:

- building energy & water experts
- in-house Skywalk analytics platform & on-site projects

goals: reduce utility waste and cost improve building performance
Roots in Montgomery County:

- **SOL VISTA:**
  - Year founded: 2010
  - MoCo/MD innovation & energy awards
  - Customers across US & Caribbean

**Doubletree Bethesda (hotel)**
**Parkview Spring Street (office bldg)**
building performance

- four key steps
  1. data analysis
  2. demand-side efforts
  3. supply-side efforts
  4. ongoing monitoring
1. **data analysis**

- utility bill analysis
- peer benchmarking
- energy use anomalies
- operations and equipment data

### Performance Summary

<table>
<thead>
<tr>
<th></th>
<th>Previous Yr</th>
<th>Current Yr</th>
<th>Variance</th>
<th>Dec-2012</th>
<th>Dec-2013</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENERGY STAR Rating*</td>
<td>70</td>
<td>70</td>
<td>-1.3%</td>
<td>71</td>
<td>69</td>
<td>-2.8%</td>
</tr>
<tr>
<td>Energy Use</td>
<td>MBtu</td>
<td>22,679</td>
<td>23,055</td>
<td>2,002</td>
<td>2,064</td>
<td>3.1%</td>
</tr>
<tr>
<td>Energy Use Intensity (EUI)**</td>
<td>kBtu/sf</td>
<td>66.6</td>
<td>67.8</td>
<td>5.89</td>
<td>6.07</td>
<td>3.1%</td>
</tr>
<tr>
<td>Water Use Intensity (WUI)</td>
<td>gal/sf</td>
<td>30.7</td>
<td>29.7</td>
<td>2.3</td>
<td>2.6</td>
<td>13.3%</td>
</tr>
<tr>
<td>GHG Emissions</td>
<td>MtCO2e</td>
<td>1,655</td>
<td>1,676</td>
<td>141</td>
<td>145</td>
<td>2.5%</td>
</tr>
</tbody>
</table>

* ENERGY STAR rating for Previous and Current Years are the annual ave.

** EUI weather normalized for Previous and Current Years.
1. data analysis

- identify largest and easiest recoverable dollars first
- maximize cost and time efficiencies

### Utility Cost Summary

<table>
<thead>
<tr>
<th></th>
<th>Previous Yr</th>
<th>Current Yr</th>
<th>Variance</th>
<th>Dec-2012</th>
<th>Dec-2013</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Utility Spend</strong></td>
<td>$780,540</td>
<td>$730,011</td>
<td>-6.5%</td>
<td>$60,323</td>
<td>$60,015</td>
<td>-0.5%</td>
</tr>
<tr>
<td><strong>Cost per Occupied Room</strong></td>
<td>$6.43</td>
<td>$5.98</td>
<td>-7.0%</td>
<td>$6.40</td>
<td>$6.05</td>
<td>-5.3%</td>
</tr>
<tr>
<td><strong>Cost Impact from Use</strong></td>
<td>-$2,800</td>
<td></td>
<td></td>
<td></td>
<td>$2,747</td>
<td></td>
</tr>
<tr>
<td><strong>Cost Impact from Rates</strong></td>
<td>-$47,729</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$3,054</td>
</tr>
</tbody>
</table>

### Charts

- **Total Utility Spend**
- **Utility Cost Impact**
POLL QUESTION

Are you using a data analytics platform that compares your property to peer buildings, and normalizes for weather, occupancy, and other factors?
2. demand-side efforts

- assessment
- retrocommissioning
- project implementation
- incentives
2. demand-side: assessment

- ASHRAE level I or II
  - central plant/BAS
- financial considerations
  - assessment payback
  - no/low cost operational fixes
- capital intensive opportunities
- additional focus
  - known issues and projects
  - renewable energy
  - incentives

<table>
<thead>
<tr>
<th>EEO #</th>
<th>Description</th>
<th>Costs</th>
<th>Annual Savings</th>
<th>Simple Payback (yr)</th>
<th>IRR</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Low-flow Aerators</td>
<td>$5,359</td>
<td>$6,780</td>
<td>0.8</td>
<td>138.5%</td>
<td>$51,514</td>
</tr>
<tr>
<td>2</td>
<td>Rooftop Pipe Insulation</td>
<td>$1,961</td>
<td>$764</td>
<td>2.6</td>
<td>56.3%</td>
<td>$4,623</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>$7,320</td>
<td>$7,544</td>
<td>1.0</td>
<td>117.3%</td>
<td>$51,514</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EEO #</th>
<th>Description</th>
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<th>IRR</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Chiller Upgrade</td>
<td>$317,717</td>
<td>$60,527</td>
<td>5.2</td>
<td>30.8%</td>
<td>$225,215</td>
</tr>
<tr>
<td>4</td>
<td>Laundry Water and Heat Recovery</td>
<td>$273,195</td>
<td>$58,612</td>
<td>4.7</td>
<td>34.4%</td>
<td>$248,065</td>
</tr>
<tr>
<td>5</td>
<td>Retrocommissioning (RCx)</td>
<td>$76,879</td>
<td>$17,000</td>
<td>4.5</td>
<td>35.4%</td>
<td>$74,001</td>
</tr>
<tr>
<td>6</td>
<td>Low-Flow Showerheads</td>
<td>$24,300</td>
<td>$26,161</td>
<td>0.9</td>
<td>121.5%</td>
<td>$195,622</td>
</tr>
<tr>
<td>7</td>
<td>Guestroom Thermostats</td>
<td>$177,977</td>
<td>$24,605</td>
<td>7.2</td>
<td>21.9%</td>
<td>$49,097</td>
</tr>
<tr>
<td>8</td>
<td>LED Lighting Retrofit</td>
<td>$77,823</td>
<td>$21,089</td>
<td>3.7</td>
<td>42.2%</td>
<td>$107,060</td>
</tr>
<tr>
<td>9</td>
<td>Kitchen Range Hood Controls</td>
<td>$41,925</td>
<td>$12,883</td>
<td>3.3</td>
<td>46.8%</td>
<td>$70,285</td>
</tr>
<tr>
<td>10</td>
<td>Booster Pump VFDs</td>
<td>$15,984</td>
<td>$2,697</td>
<td>5.9</td>
<td>27.3%</td>
<td>$8,446</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>$1,005,800</td>
<td>$223,573</td>
<td>4.5</td>
<td>35.6%</td>
<td>$977,792</td>
</tr>
</tbody>
</table>
2. demand-side: retro-commissioning

- building-wide “tune-up” of equipment and controls
- many new buildings are not efficiently commissioned
- meters/sensors fall out of calibration
- new control technologies available
- low capex, good savings
- occupant discomfort
POLL QUESTION

Have you completed an ASHRAE audit or retrocommissioning at your property?
2. demand-side: project implementation

- central plant upgrades
  - variable-capacity chillers
  - high-efficiency boilers
  - water pre-heating
  - condensate Hx
  - free cooling
2. demand-side: project implementation

- controls
  - building automation systems
  - variable frequency drives
  - co/CO₂ sensors
  - occupancy-based thermostats
  - demand-based hood controls
2. demand-side: project implementation

- lighting
  - LED lamp replacement
  - LED parking fixture placement
  - T8 LED replacement kits
  - occupancy sensors
  - no piggy-backed savings
2. demand-side: project implementation

- water
  - pool/spa, cooling tower, toilet leaks
  - faucets, showerheads, toilets
  - kitchen sinks and sprayers
  - laundry rinse water recovery
  - satellite based irrigation controls
  - sub-meters: cooling towers, irrigation credits
2. demand-side: project implementation

- onsite generation:
  - solar PV
  - solar hot water
  - gen sets
  - microturbines
  - reduce use first!
- onsite storage:
  - battery banks (see white paper)
2. demand-side: incentives

- incentive groups:
  - utility companies
  - regional programs
  - tax deductions/rebates (if applicable)
  - get creative, go custom

- incentive requirements:
  - project sequencing
  - baseline/M&V
3. supply-side efforts

energy procurement
3. supply-side - energy procurement

- electricity and gas:
  - start bidding 180-days out
  - fixed or variable contract
  - term length
  - compare to historic pricing
  - current market conditions
  - easy way to save money!
POLL QUESTION

Are you taking advantage of deregulated markets to secure lower electricity and gas pricing?
4. ongoing monitoring

- project impact verification
- ongoing issue alerts
- reporting and budgeting
- regulatory compliance
4. ongoing monitoring - project impact verification

- data:
  - utility bill analysis
  - submetering
  - BAS and equipment logs

- variables:
  - occupancy
  - weather
  - fluctuating utility rates
  - operational impacts to savings
4. ongoing monitoring - issue alerts

- supply side:
  - utility bill errors
  - supplier bill errors
  - bad meters

- demand side:
  - equipment failures
  - operational changes
  - normalize for weather, occupancy, other variables
4. ongoing monitoring - reporting & budgeting

- monthly:
  - YOY/MOM performance

- groups:
  - location, building type

- annual:
  - budget season!
  - normalize for weather, occupancy, other variables
  - monthly impact from rate changes and efficiency projects

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**Building Name**

1234 10th Street, NW  
Washington, DC 20037  

<table>
<thead>
<tr>
<th>Facility Type:</th>
<th>Hotel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Space (sf):</td>
<td>248,450</td>
</tr>
<tr>
<td>Guest Rooms:</td>
<td>335</td>
</tr>
<tr>
<td>Owner/Manager:</td>
<td>Ownership Group</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Utility Cost Impacts Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weather:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Top Positive Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas</td>
</tr>
<tr>
<td>Electricity</td>
</tr>
<tr>
<td>Elec Demand</td>
</tr>
</tbody>
</table>

Utility spend decreased 4.5% (or $3.1k) compared to the same period last year. Decreased use, while water costs rose 2.6% from increased temperatures lowered utility costs by $0.1k.
4. ongoing monitoring - regulatory compliance

- annual benchmarking compliance:
  - cities, counties, districts, states across US
- penalties/fines:
  - $500-$2000/yr
  - $300/day
- growing rapidly!
# Results - Parkview Spring Street

## Savings Realized

*Numbers verified by Skywalk:*

- Electricity Use: \(\downarrow 34\%\)
- Water Use: \(\downarrow 20\%\)
- Electricity Costs: \(\downarrow $146,000/yr\)
- Water Costs: \(\downarrow $12,000/yr\)

## Environmental Impact

*Annual greenhouse gas emissions & water use reductions equivalent to:*

- 1,189,706 miles driven by the average passenger vehicle
- 261,250 toilet flushes

---

**ENERGY STAR score:**

+38 points!
Results - DoubleTree Bethesda

**Savings Realized**

*Numbers verified by Skywalk:*
- Electricity Use: ↓ 8.1%
- Natural Gas Use: ↓ 2.2%
- Water & Sewer Use: ↓ 8.8%
- Electricity Costs: ↓ $33,000
- Natural Gas Costs: ↓ $11,000
- Water & Sewer Costs: ↓ $12,000

**Environmental Impact**

*DoubleTree Bethesda reduced greenhouse gas emissions & water use equivalent to:*
- 434,887 miles/yr. driven by the average passenger vehicle
- 194,129 lbs of coal burned
- 352,483 toilet flushes

**ENERGY STAR score:**
+20 points!
POLL QUESTION
Have you already submitted your benchmarking compliance data?
Takeaways

- use data to focus efforts
- remain ROI driven
- find an implementation partner you can trust
- retrocommission if it makes sense
- engage local utilities early-on in review process
- don’t forget about energy procurement
- use data to verify success and find ongoing opportunities
- don’t let local benchmarking compliance sneak up on you!
Questions + Answers

Thank you!
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Zack Moore, SVP
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SOL VISTA

GHT LIMITED
CONSULTING ENGINEERS