Why Energy Benchmarking is Critical for our Economy and Environment

2019 Midwest A&WMA 27th Annual Environmental Technical Conference
October 1, 2019
Chris Philbrick, PE, CEM,
Today’s Discussion on Energy Benchmarking

- What is Energy Benchmarking
- Why do we do it?
- How do we do it?
- Why is it critical to our economy?
- Why is it critical to our environment?
What is Energy Benchmarking?

- It is the process of measuring a building’s energy use over time—allows building owners and occupants to understand their buildings’ operational performance relative to similar buildings.
Why Do We Benchmark?

- Because U.S. Buildings (residential & commercial) account for ¹,²:
  - 40% of the total energy use
  - 70% of electricity consumption
  - 54% of natural gas consumption
  - Account for 40% of GHG emissions

- So we can understand how much energy our facility uses and we can compare it to a norm.
- So we can set goals for improvement and track progress.
- Cities use benchmarking as a tool to help reach environmental goals such as reduced utility use and lower greenhouse gas emission levels.
- Benchmarking leads to reduced energy use!

Benchmarking Provides Owners:

- A starting point for managing building’s energy use.
- Metrics that can be used to rank and compare their building to others.
- A basis for setting performance goals.
- A guide for tracking progress.
How Do We Benchmark?

- Record monthly energy use data (utility bills)
- Record the key features of your building
  - Size in square feet
  - Type of building
  - Occupancy
  - Geographic location
  - Calculate Energy Intensity
Energy Benchmarking Tools

- **ENERGY STAR Portfolio Manager®,** an online tool you can use to measure and track energy and water consumption, as well as greenhouse gas emissions.

- What is the ENERGY STAR score? The ENERGY STAR score is a 1-to-100 assessment of a building’s energy efficiency, as compared with similar buildings nationwide. The score adjusts for climate and business activity.

- Cities have partnered with ENERGY STAR and use the online tool for buildings to use to comply with the benchmarking ordinances.
Benchmarking with ENERGY STAR Portfolio Manager

- EPA Sample Office
  - 123 Main Street, Arlington, VA 22206
  - Portfolio Manager Property ID: 4904900
  - Year Built: 1975

- Energy Use by Calendar Month
  - Energy Use Graph:
    - Natural Gas
    - Electric - Grid

- Four Ways to Enter Bill Data
  1. Manually
  2. Use our example spreadsheet to upload or Copy/Paste
  3. Use our custom spreadsheet (multiple meters + multiple properties)
  4. Find an organization to electronically enter your data into Portfolio Manager

- Your Property is:
  - A Single Building
  - Part of a Building

- Meters Used to Compute Metrics (2)
  - Electric Grid Meter
    - ID: 19562726
    - Energy Type: Electric - Grid
    - Most Recent Bill Date: 01/12/2016
    - In Use?: Yes
  - Natural Gas
    - ID: 19562727
    - Energy Type: Natural Gas
    - Most Recent Bill Date: 01/21/2010
    - In Use?: Yes
U.S. City, County, and State Policies for Existing Buildings:
Benchmarking, Transparency, and Beyond

- Requirements of achieving performance targets or completing additional actions
- Benchmarking policy for public, commercial, and multifamily buildings adopted
- Benchmarking policy for public and commercial buildings adopted

© Copyright 2019 Institute for Market Transformation. Updated 6/2019
Does Benchmarking Effect Energy Usage?

Organizations benchmarking consistently in Portfolio Manager have achieved average energy savings of 2.4% per year, and an average increase in ENERGY STAR score of 2 points per year in their buildings.

EPA – October 2012, ENERGYSTAR PORTFOLIO MANAGER, Data Trends; “Benchmarking and Energy Savings”
Does Benchmarking Effect Energy Usage?

According to a survey of facility managers that were in compliance with the local benchmarking ordinance, 84% of those surveyed had made low cost operational changes to improve building performance as a result of the benchmarking ordinance.

Does Benchmarking Effect Energy Usage?

- Other than the initial reason of complying with the benchmarking ordinance the 84% also list the following reasons for making changes to improve performance.

![Reasons for compliant-facility operational changes](chart)

U.S Energy Spend Big Picture

- U.S. spends over $450 Billion per year in electricity to power homes and commercial buildings\(^1\)
- In 2018 the U.S. spent ~ $8 Billion in utility energy efficiency programs\(^2\)

---

How Benchmarking Impacts the Economy

Benchmarking raises awareness of energy use.

Reduced utility spend shifts $ to other budgets for hiring

Implementing Energy Improvements

Reduced Energy Use = Lower Operating Costs

Supports jobs for industry and manufacturing

“Efficiency investments and savings also generate jobs, including direct jobs installing efficiency measures, indirect jobs upstream in the supply chain, and jobs induced as energy bill savings are spent elsewhere and multiply throughout the economy” (ACEEE 2012).

ACEEE 2012, Energy Efficiency Job Creation; Real World Experience.
Benchmarking Impacts on Economy

- 2018, Focus On Energy worked with 212 school districts across Wisconsin to benchmark 1,223 schools.
- 2018 results were compared to a similar benchmarking from 2006.
- The comparison revealed an average decrease in energy use of 23%.
- Wisconsin public schools collectively spends over $175 million in energy costs each year.
- This is a savings of $40 million.
- Reinvesting Opportunities; hiring teachers, computers & iPads, or energy projects.

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Districts</td>
<td>226</td>
<td>212</td>
</tr>
<tr>
<td>School Buildings</td>
<td>1,293</td>
<td>1,213</td>
</tr>
<tr>
<td>Million Square Feet</td>
<td>109</td>
<td>129</td>
</tr>
<tr>
<td>Total Energy Use (kBTU/ft²)</td>
<td>70.70</td>
<td>54.31</td>
</tr>
<tr>
<td>Heating Fuel Use (kBTU/ft²)</td>
<td>49.60</td>
<td>34.76</td>
</tr>
<tr>
<td>Normalized Heating Fuel Use (kBTU/ft²/Heating Degree Day (HDD))</td>
<td>7.20</td>
<td>5.04</td>
</tr>
<tr>
<td>Electricity Use (kWh/ft²)</td>
<td>6.00</td>
<td>5.73</td>
</tr>
<tr>
<td>Decrease in energy usage between studies</td>
<td>23%</td>
<td></td>
</tr>
</tbody>
</table>

APTIM
Benchmarking Impacts on the Economy

- Of those facility managers that were in compliance with the benchmarking ordinance, **82% made capital investments; i.e. new equipment, as a result of benchmarking.**

  ![](chart.png)

  **LL84-Compliant**
<table>
<thead>
<tr>
<th>Answer</th>
<th>Percentage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>82</td>
<td>114</td>
</tr>
<tr>
<td>No</td>
<td>18</td>
<td>25</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>139</td>
</tr>
</tbody>
</table>

Benchmarking Impacts on the Economy

The following are the types of capital investments that were made to improve energy efficiency in their buildings.

Benchmarking Impacts on the Economy

- Energize Denver 2017 Annual Report
- Projections: Investing an estimated $340 million in improving building energy efficiency could result in 4,000 local jobs and $1.3 billion in energy savings over 10 years.
Environmental Impacts of Building Energy Use

- GHG warm the planet
- Buildings account for 40% of the energy use and ~40% of GHG emissions in the U.S.
- Energy production and use account for two thirds of the world’s GHG emissions

4. EIA 2015, “Energy and Climate Change; World Energy Outlook Special Report”
Benchmarking Leads to Reduced GHG

Chicago 2018 Benchmarking Report; Overall, the carbon emissions per square foot of space (also known as the GHG intensity) continued to decline rapidly and decreased by 22% from 2015 to 2018.

Figure 9: Median GHG Intensity from 2015 – 2018
EPAs Atmospheric Program Partnership Achievements, 2017

<table>
<thead>
<tr>
<th></th>
<th>COST SAVINGS/VALUE CREATED (BILLION 2017 $)¹</th>
<th>ENVIRONMENTAL BENEFITS GHG EMISSIONS REDUCTIONS (MMTCO2e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENERGY STAR</td>
<td>$30.0</td>
<td>$363.7</td>
</tr>
<tr>
<td>Products and Homes</td>
<td>$18.3</td>
<td>$224.2</td>
</tr>
<tr>
<td>Buildings</td>
<td>$9.0</td>
<td>$102.8</td>
</tr>
<tr>
<td>Industrial</td>
<td>$2.7</td>
<td>$36.6</td>
</tr>
<tr>
<td>ENERGY SUPPLY PROGRAMS</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Green Power Partnership</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>METHANE PROGRAMS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural Gas STAR</td>
<td>$3.5</td>
<td>$89.0</td>
</tr>
<tr>
<td>Methane Challenge</td>
<td>$0.1</td>
<td>$0.1</td>
</tr>
<tr>
<td>AgSTAR</td>
<td>$0.1</td>
<td>$1.2</td>
</tr>
<tr>
<td>Landfill Methane Outreach Program (LMOP)</td>
<td>$3.2</td>
<td>$51.8</td>
</tr>
<tr>
<td>Coalbed Methane Outreach Program (CMOP)</td>
<td>$0.5</td>
<td>$23.6</td>
</tr>
<tr>
<td>FLUORINATED GAS PROGRAMS</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$6 Emission Reduction Partnerships for Electric Power Systems</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Responsible Appliance Disposal</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>GreenChill</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$37.4</td>
<td>$529.4</td>
</tr>
</tbody>
</table>

¹ ENERGY STAR program benefits include estimated electricity savings and primary fuel savings due to investment in energy-efficient technologies and services, and the value of those savings. Methane partnership program benefits include the value of the gas mitigated. Prior year dollar amounts included in cumulative savings are adjusted to reflect their value in 2017 dollars.

² The start dates of program data collection vary from 1992 to 2017, impacting the size of cumulative benefits.
Going Forward

- Energy Benchmarking Leads to Reduced Energy Use and Reduced GHG Emissions.
- Benchmarking provides building owners the vision to do more with less.
- Saves Energy and money
- Reduce Carbon Foot Print
- Promotes spending money on growth, like hiring, rather than energy.

Want to talk more about Benchmarking?

- Chris Philbrick,
- Christopher.Philbrick@APTIM.COM
- 312-499-3518