Planning Tools: Utility Data, Management, and Benchmarking

Better Buildings Summit
May 10, 2016
9:45-11:00 AM
Today’s Presenters

Ellen Sargent
Chicago Housing Authority

Jon Braman
Bright Power
Data Jamming at the Chicago Housing Authority
Ellen Sargent
DATA JAMMING AT THE CHICAGO HOUSING AUTHORITY

Ellen Sargent
Director of Sustainable Initiatives and Projects, Property Office
Chicago Housing Authority

A case study for energy benchmarking, reporting and strategic capital planning
Third largest PHA in the U.S.

19,500 traditional housing units categorized into:
- Senior high rise buildings
- Family property row houses or mid-rise buildings
- Scattered site single family homes and various 2-6 unit buildings

Administers over 36,000 housing choice vouchers for apartments in privately owned buildings
Minneapolis, MN:
- Passed 2/2013
- Municipal, Commercial
- Public Disclosure

Washington, DC:
- Passed 7/2008
- Municipal, Commercial, Multi-family
- Public Disclosure
- Mandatory Audits

Philadelphia, PA:
- Passed 6/2012
- Commercial only
- Public & Transactional disclosure

San Francisco, CA:
- Passed 2/2011
- Municipal, Commercial
- Public & Transactional Disclosure
- Mandatory Audits

Berkley, CA:
- Passed 3/2015
- Municipal, Commercial, Multi-family
- Public Disclosure
- Single Family Homes - at Time of Sale (w Audits)

Portland, OR:
- Passed 4/2015
- Municipal, Commercial, Multi-family
- Disclosure

Seattle, WA:
- Passed 1/2010
- Municipal, Commercial, Multi-family
- Tenant & Transactional Disclosure Only

Cambridge, MA:
- Passed 7/2014
- Municipal, Commercial, Multi-family
- Public Disclosure

Boston, MA:
- Passed 5/2013
- Municipal, commercial, multi-family
- Public Disclosure
- Mandatory Audits

New York, NY:
- Passed 12/2009
- Municipal, Commercial, Multi-family
- Public Disclosure
- Mandatory Audits, Retro-commissioning, Lighting upgrades

Chicago, IL:
- Passed 9/2013
- Municipal, Commercial, Multi-family
- Public Disclosure
- Data verification

Kansas City, MO:
- Passed 6/2015
- Municipal, Commercial, Multi-family
- Public Disclosure

Atlanta, GA:
- Passed 4/2015
- Municipal, Commercial, Multi-family
- Public Disclosure

Austin, TX:
- Passed 11/2008
- Municipal, Commercial, Multi-family
- Transactional disclosure
- Mandatory audits for multifamily

Boston, MA:
- Passed 5/2013
- Commercial, Multi-family
- Public Disclosure
- Mandatory Audits

New York, NY:
- Passed 12/2009
- Municipal, Commercial, Multi-family
- Public Disclosure
- Mandatory Audits, Retro-commissioning, Lighting upgrades

Philadelphia, PA:
- Passed 6/2012
- Commercial only
- Public & Transactional disclosure
## The City of Chicago’s Ordinance Requires Benchmarking, Verification and Disclosure

### 1.) Energy Benchmarking
- Non-industrial buildings greater than 50,000 ft² track their energy consumption annually.
- This involves entering basic building info (address, size, space use, occupancy, etc.) and energy use data (kWh, cubic feet gas) into free, web-based software.
- There are exemptions for financial hardship, low occupancy, and new buildings.

### 2.) Data Verification
- In the first and every third year after, buildings have their energy usage data verified by in-house or 3rd party architect, engineer, or other trained professional.
- Verification improves data quality and allows for direct comparisons of similar covered buildings.
- There are also no-cost and low-cost verification options and waivers for financially-strained buildings.

### 3.) Reporting & Disclosure
- Buildings report energy use annually using the automated software tool.
- The City reports annually on our broader efficiency trends.
- The City is authorized to make energy scores public after 2.5 - 4.5 years.
- The City does not disclose the energy data from the first year.
- Initial exemptions for buildings with TV studios, trading floors, or data centers representing 10%+ of square footage.

---

**The Ordinance is information (not investment) focused:** The ordinance is focused explicitly on improving information on overall efficiency. There is no requirement to invest capital in energy efficiency, to retrofit, or to audit the building.
WHAT IS A DATA JAM?
Information needed to Benchmark: property info (building owner, type, address); base building data (gross area, use details, utility details); energy consumption data; plans for data analysis.
Chicago Housing Authority Data Jam

- Meters for Electric, Natural Gas and Water
  - CHA Meter & Residents Meter (common areas and individual units)

- Input can be manual or automatic

- Energy Benchmarking Process
  - Collect building characteristics
  - Collect utility data
  - Input info into tool
  - Gain overall results
  - Analysis and energy conservation measures as necessary
WHAT HAPPENS AFTER BENCHMARKING
NEXT STEPS

- Continued reporting, pursue voluntary benchmarking
- Use energy utilization data for property manager performance incentives
- Improve and monitor preventative maintenance programs
- Enhance Operations Budget Forecasting
- Generate standardized energy usage expectations for new acquisitions
- Implement Strategic Capital planning
  - Attain Energy Star certification
  - Ensure capital investment projects are need based
  - Establish ROI documentation using in house staff and data
**ADDITIONAL RESOURCES**

- City of Chicago Energy Benchmarking homepage and 2015 report:
  

  www.cityofchicago.org/content/dam/city/progs/env/EnergyBenchmark/


- EPA Portfolio Manager home page: www.energystar.gov

- Chicago Housing Authority homepage: www.thecha.org
Energy and Water Benchmarking in Multifamily Buildings
Jon Braman
Energy and Water Benchmarking in Multifamily Buildings

2016 Successes vs. Ongoing challenges

Jon Braman
VP Strategic Initiatives
jbraman@brightpower.com
Energy Management Process

1. Make Commitment
2. Assess Performance & Set Goals
3. Create Action Plan
4. Implement Action Plan
5. Evaluate Progress
6. Recognize Achievements
7. Re-Assess

Benchmarking

Not benchmarking

BENCHMARKING
Takeaways

1. Benchmarking works (i.e. really does help save)
2. Benchmarking is useless (by itself)
3. Sometimes it’s hard just to get (good) data
4. Gradually, the situation is improving
1. Benchmarking works (i.e. really does help save energy and water)

EnergyScoreCards Minnesota:
First experimental multifamily benchmarking impact study at scale.

Results from 550+ building sample in Minnesota (with third-party analysis review from CEE):

Statistically significant energy and water savings were found in *master-metered* buildings receiving the EnergyScoreCards service in comparison to the control group.

- 5% energy savings
- 25% water savings

measured at the 95% confidence interval.
Benchmarking working as first step to reach portfolio goals

Portfolio Measurement and Verification

<table>
<thead>
<tr>
<th>Energy Use</th>
<th>Full Year 2012</th>
<th>Full Year 2014</th>
<th>Difference</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Energy</td>
<td>45,687</td>
<td>42,489</td>
<td>-3,198</td>
<td>-7% mmBTU</td>
</tr>
<tr>
<td>Cooling Energy</td>
<td>2,270</td>
<td>1,805</td>
<td>-465</td>
<td>-20% mmBTU</td>
</tr>
<tr>
<td>Heating Energy</td>
<td>24,469</td>
<td>21,612</td>
<td>-2,857</td>
<td>-12% mmBTU</td>
</tr>
<tr>
<td>Electric Baseload Energy</td>
<td>8,427</td>
<td>8,611</td>
<td>184</td>
<td>2% mmBTU</td>
</tr>
<tr>
<td>Fossil Fuel Baseload Energy</td>
<td>10,521</td>
<td>10,462</td>
<td>-59</td>
<td>-1% mmBTU</td>
</tr>
</tbody>
</table>
2. Benchmarking is useless (by itself)
Where will you take action?

Property Names
Take action.

BRIGHT POWER

- Toilet Replacements - Tank
- Toilet Replacements - Commercial
- Tank toilet fill valve installation
- Tank toilet flush valve & handle
- Toilet rebuilding - Commercial
- Urinal rebuilding
- Kitchen faucet aerator installation
- Bathroom faucet aerator installation
- Faucet leak repair
- Showerhead installation - Deluxe
- Showerhead installation Standard
- In line shower flow control
- Tub spout diverter replacement
- Heating system repairs
# Cost Savings

<table>
<thead>
<tr>
<th></th>
<th>Start Date</th>
<th>End Date</th>
<th>Days Billed</th>
<th>Baseline Charge/day</th>
<th>Usage (HCF)</th>
<th>Water Charge</th>
<th>Sewer Charge</th>
<th>Total Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Historical Baseline</td>
<td>-</td>
<td>-</td>
<td>115</td>
<td>$772.65</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>$88,854.34</td>
</tr>
<tr>
<td>Current Bill</td>
<td>9/11/2014</td>
<td>1/4/2015</td>
<td>115</td>
<td>-</td>
<td>3850</td>
<td>$14,245.00</td>
<td>$22,649.55</td>
<td>$36,894.55</td>
</tr>
</tbody>
</table>

**Total Savings:** $51,959.79
Keep watching.

Uh oh.

So what do I do next?
Can you spot the problem?
Can you see it now?
Can you figure it out over the phone?
More granular data helps.

Red represents increased usage.
But sometimes it takes a midnight detective trip....
Keep watching.
Are there other ways to ‘watch’ your buildings?
3. But sometimes it’s hard to get (good) data

- Data collection pain not (always) correlated with value
- Data collection pain varies a lot between properties/ portfolios
- Let’s start using the easier-to-get data now!
- But keep working on the hard-to-get data
Easy to get: large, master-metered

<table>
<thead>
<tr>
<th>Owner Energy</th>
<th>101 kBTU/ft²/yr</th>
<th>Most Recent Year - Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cooling</strong> Whole Building</td>
<td>B</td>
<td>$ 73,714</td>
</tr>
<tr>
<td><strong>Heating</strong> Whole Building</td>
<td>C</td>
<td>$ 678,730</td>
</tr>
<tr>
<td><strong>Electric Baseload</strong> Whole Building</td>
<td>D</td>
<td>$ 540,103</td>
</tr>
<tr>
<td><strong>Fossil Fuel Baseload</strong> Whole Building</td>
<td>C</td>
<td>$ 427,614</td>
</tr>
<tr>
<td><strong>Water</strong></td>
<td>N/A</td>
<td>$ 0</td>
</tr>
</tbody>
</table>

Electric: $622,907  Gas: $1,106,345  Total Spend: $1,729,253

www.brightpower.com
All that consumption, 4 accounts!

<table>
<thead>
<tr>
<th>Account</th>
<th>Utility Provider</th>
<th># Bills</th>
<th>Rate</th>
<th>Usage/Day, BTU</th>
<th>Last Bill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elec</td>
<td>ConEd - Consolidated Edison - Electricity</td>
<td>68</td>
<td>$0.04/kWh</td>
<td>141,021,014</td>
<td>01/26/2016</td>
</tr>
<tr>
<td>Combine Gas, Account for I &amp; II</td>
<td>ConEd - Consolidated Edison - Gas</td>
<td>35</td>
<td>$5.81/mmBTU (Million BTU)</td>
<td>466,113,693</td>
<td>02/25/2013</td>
</tr>
<tr>
<td>Gas</td>
<td>ConEd - Consolidated Edison - Gas</td>
<td>35</td>
<td>$0.58/Therms</td>
<td>463,624,086</td>
<td>02/25/2013</td>
</tr>
<tr>
<td>Account for I &amp; II</td>
<td>Unknown Oil Utility</td>
<td>23</td>
<td>$0.00/Oil #2 Gallons</td>
<td>3,800,328</td>
<td>09/30/2012</td>
</tr>
<tr>
<td>I &amp; II Cooking</td>
<td>ConEd - Consolidated Edison - Gas</td>
<td>66</td>
<td>$0.49/Therms</td>
<td>22,841,567</td>
<td>10/23/2015</td>
</tr>
</tbody>
</table>
Hard to get: lots of accounts, tenant paid

<table>
<thead>
<tr>
<th>Energy Type</th>
<th>Rating</th>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling Common Area</td>
<td>A</td>
<td>0.1 BTU/ ft²/CDD</td>
<td>$283</td>
</tr>
<tr>
<td>Heating Common Area</td>
<td>A(!)</td>
<td>1.0 BTU/ ft²/HDD</td>
<td>$6,332</td>
</tr>
<tr>
<td>Electric Baseload</td>
<td>B</td>
<td>558 kWh/unit/yr</td>
<td>$9,300</td>
</tr>
<tr>
<td>Fossil Fuel Baseload</td>
<td>N/A</td>
<td>0.00 mmBTU/bdrm/yr</td>
<td>$0</td>
</tr>
<tr>
<td>Water</td>
<td>B</td>
<td>71.6 gal/bdrm/day</td>
<td>$19,788</td>
</tr>
</tbody>
</table>

Total Spend: $35,745
### Owner Accounts

<table>
<thead>
<tr>
<th>Account</th>
<th># Bills</th>
<th>Rate</th>
<th>Usage/Day, BTU</th>
<th>Last Bill</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>$0.24/kWh</td>
<td>8,998</td>
<td>02/08/2016</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>$0.25/kWh</td>
<td>8,316</td>
<td>02/08/2016</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>$0.18/kWh</td>
<td>16,064</td>
<td>02/08/2016</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>$0.22/kWh</td>
<td>9,878</td>
<td>02/08/2016</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>$0.12/kWh</td>
<td>72,303</td>
<td>01/20/2016</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>$0.33/kWh</td>
<td>5,327</td>
<td>02/08/2016</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>$0.06/kWh</td>
<td>-60,157</td>
<td>01/24/2016</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>$0.24/kWh</td>
<td>8,711</td>
<td>02/08/2016</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>$0.36/kWh</td>
<td>4,743</td>
<td>02/08/2016</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>$0.17/kWh</td>
<td>18,159</td>
<td>02/08/2016</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>$0.37/kWh</td>
<td>4,657</td>
<td>02/08/2016</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>$0.25/kWh</td>
<td>8,142</td>
<td>02/08/2016</td>
<td></td>
</tr>
<tr>
<td>#</td>
<td>Rate</td>
<td>Usage</td>
<td>Date</td>
<td></td>
</tr>
<tr>
<td>----</td>
<td>-------------</td>
<td>--------</td>
<td>--------------</td>
<td>----------</td>
</tr>
<tr>
<td>42</td>
<td>$0.27/kWh</td>
<td>7,263</td>
<td>02/08/2016</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>$0.09/kWh</td>
<td>964,976</td>
<td>02/10/2016</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>$0.29/kWh</td>
<td>6,392</td>
<td>02/08/2016</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>$0.22/kWh</td>
<td>10,001</td>
<td>02/08/2016</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>$0.31/kWh</td>
<td>5,728</td>
<td>02/08/2016</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>$0.15/kWh</td>
<td>25,554</td>
<td>02/08/2016</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>$0.44/kWh</td>
<td>3,729</td>
<td>02/08/2016</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>$0.12/kWh</td>
<td>66,541</td>
<td>02/08/2016</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>$0.22/kWh</td>
<td>9,816</td>
<td>02/08/2016</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>$0.42/kWh</td>
<td>-326</td>
<td>02/08/2016</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>$2.31/Therms</td>
<td>46,794</td>
<td>01/20/2016</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>$0.00/Gallons</td>
<td>0.00</td>
<td>12/31/2015</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>$0.00/Gallons</td>
<td>0.00</td>
<td>12/31/2015</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>$0.00/Gallons</td>
<td>0.00</td>
<td>12/31/2015</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>$0.00/Gallons</td>
<td>0.00</td>
<td>01/31/2016</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>$0.00/Gallons</td>
<td>0.00</td>
<td>01/31/2016</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>$0.00/Gallons</td>
<td>0.00</td>
<td>12/31/2015</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>$0.00/Gallons</td>
<td>0.00</td>
<td>12/31/2015</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>$0.00/Gallons</td>
<td>0.00</td>
<td>12/31/2015</td>
<td></td>
</tr>
<tr>
<td>#</td>
<td>Rate Per Gallon</td>
<td>Quantity</td>
<td>Date</td>
<td>Model</td>
</tr>
<tr>
<td>----</td>
<td>----------------</td>
<td>----------</td>
<td>------------</td>
<td>-------</td>
</tr>
<tr>
<td>37</td>
<td>$0.00/Gallons</td>
<td>0.00</td>
<td>12/31/2015</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>$0.00/Gallons</td>
<td>0.00</td>
<td>12/31/2015</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>$0.00/Gallons</td>
<td>273</td>
<td>11/17/2015</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>$0.01/Gallons</td>
<td>227</td>
<td>11/17/2015</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>$0.01/Gallons</td>
<td>219</td>
<td>11/20/2015</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>$0.01/Gallons</td>
<td>220</td>
<td>11/17/2015</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>$0.00/Gallons</td>
<td>258</td>
<td>11/17/2015</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>$0.00/Gallons</td>
<td>477</td>
<td>11/17/2015</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>$0.00/Gallons</td>
<td>255</td>
<td>11/24/2015</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>$0.00/Gallons</td>
<td>2,710</td>
<td>11/17/2015</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>$0.00/Gallons</td>
<td>3,433</td>
<td>11/17/2015</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>$0.01/Gallons</td>
<td>269</td>
<td>11/20/2015</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>$0.00/Gallons</td>
<td>761</td>
<td>11/17/2015</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>$0.01/Gallons</td>
<td>225</td>
<td>11/17/2015</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>$0.00/Gallons</td>
<td>369</td>
<td>11/17/2015</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>$0.01/Gallons</td>
<td>219</td>
<td>11/17/2015</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>$0.01/Gallons</td>
<td>114</td>
<td>11/17/2015</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>$0.00/Gallons</td>
<td>387</td>
<td>11/17/2015</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>$0.01/Gallons</td>
<td>243</td>
<td>11/17/2015</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>$0.00/Gallons</td>
<td>310</td>
<td>11/17/2015</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>$0.00/Gallons</td>
<td>339</td>
<td>11/17/2015</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>$0.00/Gallons</td>
<td>0.00</td>
<td>11/17/2015</td>
<td></td>
</tr>
</tbody>
</table>
And that was just the owner accounts
4. Gradually, the situation is improving

- New benchmarking laws spur utility improvements
- New tools (EPA and HUD) to find utilities with whole building data
- Options for services to help collect data
- Options for services to help curate, analyze, interpret data
- Multifamily Portfolio Manager Score, water score in the works
- City resources and reports online
What do you think?

NEWHAB benchmarking survey! Last day to complete....
Discussion