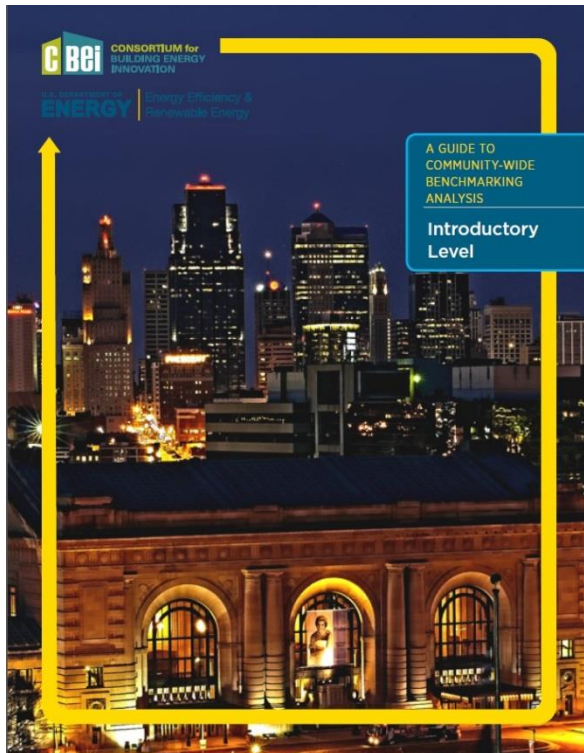


CBEI - Improving Benchmarking Data Quality

2015 Building Technologies Office Peer Review



Project Summary

Timeline:

Start date: 5/1/2014

Planned end date: 4/30/2016

Key Milestones:

1. Analysis of 2013 Philadelphia benchmarking data; Evaluation of Proficiency in Benchmarking Certificate program; Draft engagement strategy for Baltimore; 6/30/2014
2. Final Guide to Community-Wide Benchmarking Analysis, facts sheets and web content; Final training materials for Proficiency in Benchmarking Certificate program; Baltimore case study; 4/30/2015

Key Partners:

CBEI - Penn State
CBEI - New Jersey Institute of Technology
CBEI - Morgan State
CBEI - Carnegie Mellon

Budget:

Total DOE \$747,204; to date: \$538,426

Total future DOE \$: \$200,000

Target Market/Audience:

Benchmarking Stakeholders:

- Municipalities
- Housing Authorities
- Owners of large building portfolios
- Utilities
- Energy Service Providers

Project Goal:

Provide technical support to cities and other organizations which currently have, or plan to have in the near term, energy benchmarking programs as a way of accelerating benchmarking adoption in the nation.



Vision:

By 2030, deep energy retrofits that reduce energy use by 50% in existing SMSCB, which are less than 250,000 sq ft

Mission:

Develop, demonstrate and deploy technology systems and market pathways that permit early progress (20-30% energy use reductions) in Small and Medium Sized Commercial Buildings



Our Goals:

- Enable deep energy retrofits in small to medium sized commercial buildings
- Demonstrate energy efficient systems tailored for SMSCBs in occupied buildings – living labs
- Develop effective market pathways for energy efficiency with utilities and other commercial stakeholders: brokers, finance, service providers.
- Provide analytical tools to link state and local policies with utility efficiency programs

 <p>Industry</p>	 <p>Economic Development Organizations</p>	 	 <p>Universities</p>
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Purpose and Objectives

Problem Statement:

Improved analytical tools and training are needed to provide consistent, high quality and transparent energy performance data to evaluate building energy efficiency and drive energy retrofits in existing commercial buildings.

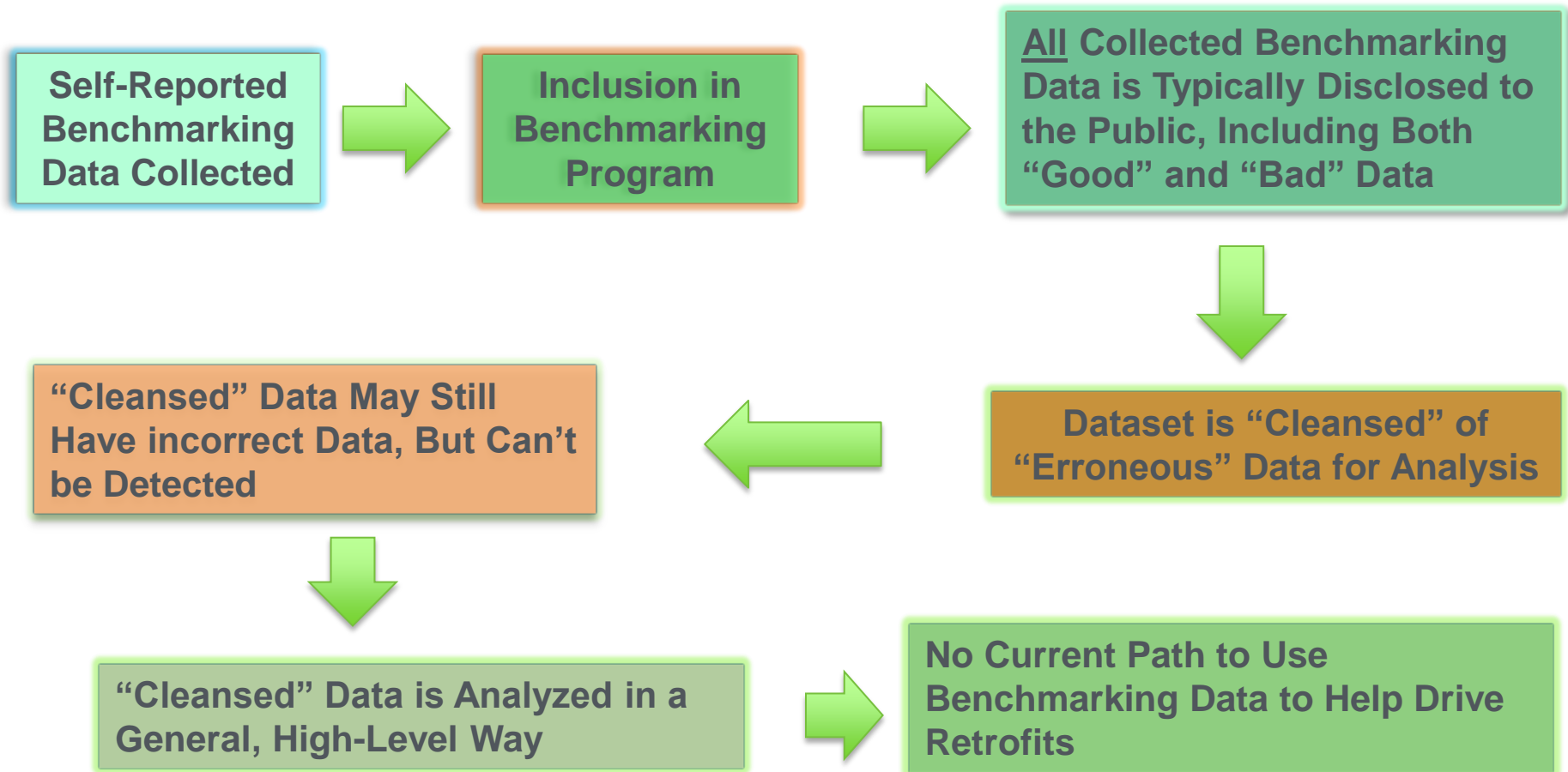
Target Market and Audience:

1. Organizations that currently have, or are planning on having, energy benchmarking programs as a means of improving the energy efficiency of building portfolios:
 - Municipalities (especially smaller ones) benchmarking the energy use of their building stock
 - Housing Authorities with significant numbers of multi-family buildings
 - Owners of building portfolios such as REITs

2. Organizations or individuals that could benefit from access to energy benchmarking data:
 - Energy Service Providers with various EE projects
 - Utilities and incentive program administrators with various incentive programs
 - Real estate brokers looking to buy or sell buildings
 - Individual building owners wanting to improve the efficiency of their building

Current Challenges for Utilizing Benchmarking Data:

Typical Energy Benchmarking and Data Transparency Process for Municipalities in the U.S. with Benchmarking Programs



Current Challenges for Utilizing Benchmarking Data

Benchmarking Data Issues and Challenges:

1. **Benchmarking data collected for a benchmarking program is typically self-reported by building owners/operators:** Self-reported data can contain significant errors which negatively impact energy efficiency metrics such as the Energy Utilization Index (EUI) and Energy Star Portfolio Manager score.
2. **All benchmarking data submitted to a benchmarking program is made transparent to the public:** This means both “good” and “bad” data is provided to the public as reported.
3. **For the purpose of analysis, most of the erroneous data is “cleansed” from the “raw” benchmarking dataset:** After the “cleansing” process, little effort is expended to provide feedback to the building owners/operators that supplied “bad” data.
4. **Even after data “cleansing,” benchmarking datasets can still contain incorrect data:** However, it is very difficult to identify and remove this incorrect data.
5. **Analysis of benchmarking data is done in a general, high level way:** This level of analysis doesn't generate “actionable” information nor lead to a path for using benchmarking data to drive energy efficiency retrofits .

Potential Solutions to Benchmarking Data Challenges

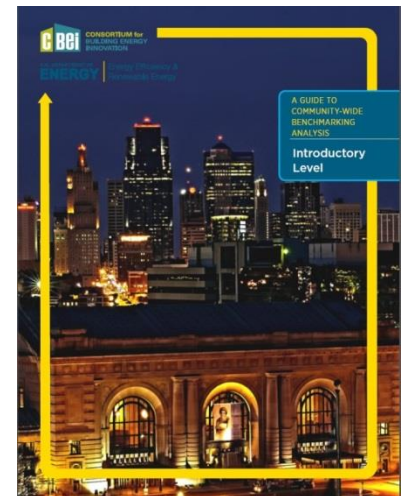
Potential Solutions to Benchmarking Data Challenges:

1. **Benchmarking data collected for a benchmarking program is typically self-reported by building owners/operators:** Increase data quality on the “front-end” during data collection prior to inclusion in the program.
2. **All benchmarking data submitted to a benchmarking program is made transparent to the public:** Increase data quality on the “front-end” of the program prior to inclusion in the program; provide feedback to building owners/operators that supplied “bad” data.
3. **For the purpose of analysis, most of the erroneous data is “cleansed” from the “raw” benchmarking dataset:** Understand why data was “bad” and provide feedback to building owners/operators that supplied “bad” data.
4. **Even after data “cleansing,” benchmarking datasets can still contain incorrect data:** Increase data quality on the “front-end” of the program prior to inclusion in the program.
5. **Analysis of benchmarking data is done in a general, high level way:** Provide analyses that are tailored for driving energy efficiency retrofits.

Purpose and Objectives – General Impact

Impact of Project:

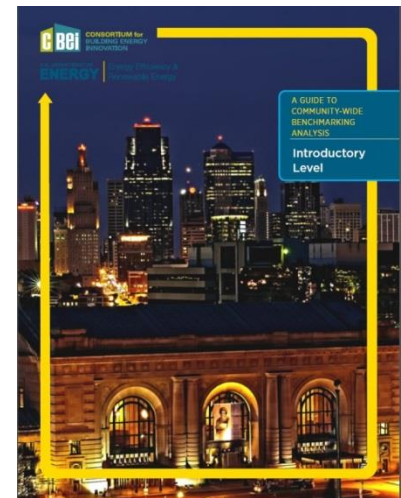
1. Provides the ability to improve the quality of collected benchmarking data prior to inclusion in a benchmarking program:
 - via New Jersey Institute of Technologies' online Proficiency in Benchmarking Certificate program
 - via CBEI/WIPO's Guide to Community-Wide Benchmarking Analysis – *building owner feedback developed from data quality section*
2. Provides the ability to offer better quality benchmarking data to the public (transparency):
 - via New Jersey Institute of Technologies' online Proficiency in Benchmarking Certificate program
 - via CBEI/WIPO's Guide to Community-Wide Benchmarking Analysis - *building owner feedback developed from data quality section*



Purpose and Objectives – General Impact (Con't)

Impact of Project:

3. Provides the ability to eliminate the hard-to-detect incorrect data from benchmarking datasets:
 - via New Jersey Institute of Technologies' online Proficiency in Benchmarking Certificate program
4. Provides the ability to perform consistent analyses of benchmarking data to improve the value of transparency and provide information to drive retrofits:
 - via CBEI/WIPO's Guide to Community-Wide Benchmarking Analysis - *data quality section and energy performance analyses*
5. Providing program and stakeholder engagement advice to Baltimore's Office of Sustainability as they develop their benchmarking program:
 - Summarized in Morgan State University case study
 - Will be used as a test-bed for Items #1 and #2 above



Purpose and Objectives – Planned Impact

Planned Impact of Project:

After dissemination of the Proficiency in Benchmarking Certificate program and the Guide to Community-Wide Benchmarking Analysis, impact of this project will continue with each “cycle” of benchmarking (e.g., required compliance of an annual benchmarking program):

Near Term:

Adoption of Certificate Program and use of Benchmarking Guide by target market and audience



Intermediate
- Term:

Initial improvement of benchmarking data quality and increased use of benchmarking data to drive retrofits for first three years' worth of collected benchmarking data



Long - Term:

Sustained improvement of benchmarking data quality and significant use of benchmarking data to drive retrofits for benchmarking programs operating in the long term

Approach

Approach:

- Guide to Community-Wide Benchmarking Analysis:
 - Detailed analysis of 2012 and 2013 Philadelphia benchmarking data and assessment of data analyses used for NYC, Philadelphia and Chicago
 - Interviews of program administrators from NYC, Philadelphia and Wash DC about data quality and using benchmarking data to drive retrofits; meeting with PECO Energy rebate administrators about using benchmarking data to increase rebates
 - Developed methodologies for generating feedback for building owners/operators that may have supplied suspect data
 - Developed analyses to begin using benchmarking data to drive retrofits
- Online Proficiency in Benchmarking Certificate program
 - Marketing program by:
 - Continuing the process of reaching out to professionals from different sectors
 - Collecting background information about users as they register and receive credential to help understand program's target market
- Development of City of Baltimore's Benchmarking Program
 - Multiple meetings with Baltimore Office of Sustainability involving program scoping

Approach: Key Issues and Distinctive Characteristics

Key Issues:

- Improving quality of data collected for benchmarking programs; positively impacts the value of transparency
- Using benchmarking data to help drive retrofits; increases overall value of benchmarking programs and generates energy savings
- Getting benchmarking certificate program to be part of a benchmarking program's requirements; will result in greater "clean up" of suspect data

Distinctive Characteristics:

- Develops detailed information as to why critical benchmarking metrics (e.g., EUI and ESPM score) were not provided in early cycles of benchmarking programs (has not been done before for municipalities with benchmarking programs);
- Provides methodologies for stakeholders to analyze benchmarking data such that potential energy savings are easily assessed (has not been done before for municipalities with benchmarking programs).

Progress: Lessons Learned and Accomplishments

Lessons Learned:

- Quality of benchmarking data is “worse” than originally anticipated
- In general, feedback loops to individual building owners/operators via program administrators are minimal, with little intent of improving the loop
- Little thought has been given to actually using benchmarking data to drive retrofits or benchmark complex building campuses
- In order for benchmarking certificate programs to have the largest impact, they must be integrated into benchmarking programs as a program requirement

Accomplishments:

- Provided analysis for generating information from Portfolio Manager to help resolve data quality issues
- Developed a guide to help smaller municipalities and organizations typically not having the resources to utilize a “professional” statistician(s) perform benchmarking data analytics
- Benchmarking credential program was launched at the end of 2014 and included additional training vignettes focused on typical areas where benchmarkers would experience issues
- In February 2015, the National Building Benchmarkers Registry was launched

Progress: Market Impact and Awards/Recognition

Market Impact:

- Provide data analytics guide to members of DOE's Energy Data Accelerator program
- Provide data analytics guide to Philadelphia, Baltimore and Montgomery Co, MD
- Benchmarking Proficiency Program:
 - 256 individuals have been trained through the program
 - 44 professionals have received the credential

Project Integration and Collaboration

Project Integration:

- Working with the cities of Philadelphia, Baltimore and Montgomery Co, MD to incorporate data analytics guide into their benchmarking work
- Working with the City Energy Project and NRDC to help integrate benchmarking credential program into various benchmarking programs

Partners, Subcontractors, and Collaborators:

- Benchmarking Data Analytics Guide: NREL and WIPO
- Benchmarking Proficiency Program: USEPA, NRDC, DOE and Cadmus Group

Communications:

- Delivered two webinars to market the benchmarking proficiency program
- Exhibited the benchmarking proficiency program at Globalcon 2015

Next Steps and Future Plans

Next Steps and Future Plans:

- Will be incorporating benchmarking data analytics guide into DOE benchmarking help desk project for 2015/2016
- Benchmarking Certificate program:
 - Will be adding two more facility-specific training modules
 - Addressing the needs of individuals who have participated in the program and the
 - Addressing the concerns of municipalities with benchmarking ordinances.
 - Creating a business plan to ensure the longevity of the credential after the next project year

REFERENCE SLIDES

Project Budget

Cost to Date: For CBEI BP4 (5/1/2014 to 4/30/2015); project expenditures to date are \$538,426 (72% of total)

Additional Funding: \$5,000 from NRDC’s City Energy Project

Budget History

CBEI BP3 (past)
2/1/2013 – 4/30/2014

CBEI BP4 (current)
5/1/2014 – 4/30/2015

CBEI BP5 (planned)
5/1/2015 – 4/30/2016

DOE

Cost-share

DOE

Cost-share

DOE

Cost-share

\$200,000

\$747,204

\$5,000

\$200,000

CBEI – Consortium for Building Energy Innovation (formerly EEB Hub)

BP – Budget Period

Project Plan and Schedule

Project Schedule												
Project Start: 5/1/2014	Completed Work											
Projected End: 4/30/2015	Active Task (in progress work)											
	◆ Milestone/Deliverable (Originally Planned) use for missed											
	◆ Milestone/Deliverable (Actual) use when met on time											
	BP3 (2013-14)				BP4 (2014-15)				CBEI BP5 (2015-16)			
Task	Q1 (Feb-Apr)	Q2 (May-Jul)	Q3 (Aug-Oct)	Q4 (Nov-Apr)	Q1 (May-Jul)	Q2 (Aug-Oct)	Q3 (Nov-Jan)	Q4 (Feb-Apr)	Q1 (May-Jul)	Q2 (Aug-Oct)	Q3 (Nov-Jan)	Q4 (Feb-Apr)
Past Work												
Q1 Milestone: Example 1												
Q2 Milestone: Example 2												
Q3 Milestone: Example 3												
Q4 Milestone: Example 4												
Q1 Milestone: Example 5												
Current/Future Work												
Q1 Milestone: M6.2.a Phila. data analyst, Cert. Prog. Evaluation, Balt. Engagement Strategy					◆							
Q2 Milestone: M6.2.b SEED data loading, Bx exp. Of NYC, Phila and Wash DC, update Cert. Prog.,						◆		◆				
Q3 Milestone: M6.2.c Draft Bx data guide, new training modules for Cert. Prog, Balt. Lessons learned								◆				
Q4 Milestone: M6.2.c Final Bx data guide, final Cert. Prog, Balt. Case study								◆				
Insert more Milestones as needed												

BP – Budget Period for Consortium for Building Energy Innovation (formerly EEB Hub)