

ENVIRONMENT, NATURAL RESOURCES AND ENERGY DIVISION

ENRE Facilitated Discussion (S805): Best Practices in Energy Benchmarking

Saturday, April 18, 2015 • 2:30-3:45 p.m.

WSCC—Hall 4C-3

CM | 1.25

American Planning Association 2015 National Planning Conference

Moderator: Malika Hainer • Presenters: Lindy Wordlaw (Overview); Nicole Ballinger, (Seattle); Adam Mays, (Chicago)

Today's Facilitated Discussion

- Overview on energy benchmarking
- Seattle: Leading the pack!
- Chicago: Year 1 in the books!
- Discussion with panel and participants



What is benchmarking?

"Benchmarking is...

...the process of accounting for and comparing a building's current energy performance with its energy baseline, or comparing a buildings energy performance with the energy performance of similar types of buildings. Benchmarking can be used to compare performance over time, within and between peer groups, or to document top performers." Source: Building Energy Use Benchmarking Guidance EISA Section 432, Benchmarking of Federal Facilities



Benchmarking Basics-Inputs

- Building information
 - ➢ Use
 - ≻ Year built
 - Square footage
 - Conditioned/Unconditioned space
- Occupancy information
 - > Hours of operation (nonresidential)
 - > Number of occupants (or units)
- Energy; water data
 - > Monthly energy data (electricity; natural gas; fuel oil)
 - > Monthly water data

Benchmarking Basics-Outputs

Energy Use Intensity (EUI)



Benchmarking Basics-Outputs

Energy Star Score

- 1 to 100
- Allows simple comparison to other buildings
 - e.g. 65 = your building performs better than 65% of all other buildings



Benchmarking Basics-Outputs

Energy Star Score

- 1 to 100
- Allows simple comparison to other buildings
 - e.g. 65 = your building performs better than 65% of all other buildings





Why should we be benchmarking?



Why benchm You can't manage what you don't measure! J' economy



Why benchmark buildings?

- Reduce energy consumption + costs
- Strategically target resources
- Support local "green" economy

WHY BENCHMARK BUILDINGS?

Reduce energy consumption + costs

• "Know better, do better"

Strategically target resources

- Identify buildings that could improve performance
- Identify buildings to publicize for above-par performance
- With portfolio of buildings, use to set priorities for investment and staffing priorities, based on what efforts will achieve the most impact

WHY BENCHMARK BUILDINGS?

Support your local "green" economy

- Construction; trade groups
- Engineers + architects

NOTE: Energy in buildings comprises up to 70% of a community's GHG.

 Benchmarking should be considered as a tool or strategy
Redute to help meet community-scale reduction goals

• Support local green economy

Where is benchmarking happening?



U.S. Building Benchmarking and Transparency Policies

Building Area (in Square Feet) Covered Annually



Building Rating

Comparison of U.S. Commercial Building Energy Benchmarking and Disclosure Policies



	Legislation				Building Type & Size Threshold			Disclosure				Rating System		Additional Elements		
	Jurisdiction	Short Name	Enacted	First Compliance Deadline	Municipal	Commercial	Multifamily	To Gov't	On Public Website	Time of Transaction	To Current Tenants	Energy Star	Other	Utility Req't	Water Use Tracking	Additional Requirements
Cities	Austin	Energy Conservation Audit & Disclosure (ECAD) Ordinance	Nov 2008	June 2011	*	10K SF+	Audits	*	÷	Buyers	*	*	ACLARA	4	R	Audits & mandatory upgrades for multifamily buildings
	Berkeley	Building Energy Saving Ordinance	Mar 2015	Oct 2016	25K SF+	25K SF+	25K SF+	*	*	Buyers, Lessees	*	×	÷	÷		Energy report every 5 years for large buildings, every 8 years for medium and small buildings
	Boston	Boston Energy Reporting and Disclosure Ordinance	May 2013	May 2014	×	35K SF+	35+ units or 35K SF+	×	*	-		4	•	-	*	Periodic energy assessments and/or actions
	Cambridge	Building Energy Use Disclosure Ordinance	July 2014	December 2014	10K SF+	25K SF+	50+ units	*	*	-		+	•	•	×	
	Chicago	Chapter 18-14. Building Energy Use Benchmarking Ordinance	Sept 2013	June 2014	50K SF+	50K SF+	50K SF+	*	~	-	-	×	÷.	4	-	Verification of benchmarking data by licensed professional 1 st year, then every 3 years
	District of Columbia	Clean and Affordable Energy Act of 2008	July 2008	April 2013	10K SF+	50K SF+	50K SF+	*	*	÷	÷	*	Energy Star Target Finder	*	×	
	Minneapolis	Chapter 47.190. Commercial Building Rating and Disclosure Ordinance	Jan 2013	May 2014	25K SF+	50K SF+	40	*	*	£	4	*	-	36		
	New York City	Local Law 84 (additional requirements in LL 87, LL 88)	Dec 2009	August 2011	10K SF+	50K SF+	50K SF+	*		1	1	×	÷	÷	*	ASHRAE level It audits & RCx (LL 87), lighting upgrades & submetering (LL 88)
	Philadelphia	§9-3402 of the Philadelphia Code	June 2012	October 2013	50K SF+	50K SF+	-2-	*	*	Buyers, Lessees	2	4	4	-	*	
	San Francisco	Existing Commercial Buildings Energy Performance Ord.	Feb 2011	October 2011	10K SF+	10K SF+	сф.	*	*	†Buyers, Lessees, Lenders	*	*	•	+	4	ASHRAE level I or II audits or RCx every 5 years
	Seattle	CB 116731	Jan 2010	October 2011	20K SF+	20K SF+	20K SF+	*	÷	† Buyers, Lessees, Lenders	*	*	-	*	·9	

+ Required by previous action

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Commercial Buildings < 50ft² • 1st year: 86% compliance rate 6 55 • 1700 buildings / 250M ft² / 25%of t footage <u>a ee ee t</u>

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Commercial Buildings > 50ft² Lst year: 86% compliance rate 1700 buildings / 250M ft² / 25%of . footage

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Commercial Buildi 1st year: 86% com 1700 buildings footage

Food Sale

Health Care

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Public Assembly

Laboratory

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Energy Intensity (Source EUI)

Total Energy Reduction of 23% Across 1600+ Buildings and 3.5% Citywide



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NEXT STEPS: INVESTMENT

Of those buildings eligible for an ENERGY STAR score, over 200 facilities (40 million square feet of floor space) performed at or below the citywide average.

Buildings that score at or above the citywide average (and those that aren't ratable under the ENERGY STAR system) can be candidates for low-cost audit and retro-commissioning programs, too.

Benchmarking Scores by Building Size



On Site: Ten Penn Center

Improvements:
≻ Lighting
> VFDs in HVAC system
> 90/90 rule (reduce demand in peak hours)
Save \$300k/year

Energy Upgrades: Investment vs. Savings



Investment vs. savings for 7 energy-efficiency measures implemented at Ten Penn Center.

• 1st Energy Star building in Philly; score: 75 (2003)

Today's Energy Star score: 90













- Buildings > 50ft²
- By year three: 84% compliance rate
- 23,000 buildings
 - 1.1B ft² multifamily
 - > 384M ft² office

Median Energy Star Score: 70

- Buildings > 50ft² (including residential)
- By year three: 84% compliance rate
- 23,000 buildings
 - 1.1B ft² multifamily
 - > 384M ft² office

Median Energy Star Score: 70




13% reduction in energy use among office properties





13% reduction in energy use among office properties

[Fig. 27] Three Year Median EUI for Office and Multifamily Properties

Limited to Properties reporting in all Three Years



23% reduction in heavy fuel oil in multifamily properties Benchmarking data shows the impact of public policies, including the program to end heavy heating oil use.

23% reduction in heavy fuel oil in multifamily properties

On Site: Jennings Hall (Brooklyn)



Measure	Cost		MMBtu Savings	kWh Savings	\$ Savings		Payback
Jpgrade the boiler and controls	\$	200,000	2366	-3408	\$3	36,009	5.55
Install low-flow water fixtures	\$	3,500	200	0	\$	3,044	1.15
Whole Building Air Sealing	\$	75,000	970	176	\$1	14,763	5.08
al & Balance Ventilation System	\$	70,000	809	-703	\$1	12,312	5.69
Window Upgrade	\$	240,000	88	1209	\$	1,339	179.2
Roof Insulation	\$	78,404	235	-565	\$	3,577	21.92
Common Are Lighting Upgrade	\$	98,000	-225	73872	\$1	10,342	9.48
Clothes Washer Upgrade	\$	1,800	1	1044	\$	250	7.2
Elevator Upgrade	\$	1,000	0	100	\$	14	71.43
New Refrigerators	\$	37,500	-114	53676	\$1	1,272	3.3
TOTAL	\$	926,240	4330	125401	\$9	92,922	

Source: Steven Winter Associates, NYC

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GHG Inventory

2010

oto Source/Credit:

GHG Inventory

2010

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2012



- Commercial Buildings > 50ft²
- Public-Owned Buildings > 25ft²
- Results public after 2015 (private buildings)

2009-2012: City of Minneapolis bldgs saved \$6M (cumulative)



On Site: Midtown Exchange

• Built in 1928 (Sears)

- 1M ft² commercial bldg (condo; office; retail)
- Energy Star score: 96
- Improvements:
 ➤ Lighting
 ➤ Insulation/leaks
 ➤ Behavior: janitorial services daytime
 Save \$30k/year

Photo credit: Midtown Community Works Source: City of Minneapolis website

2006

Source/Photo Credit: Wikimedia Commons, U.S. Navy Sgt. Andy Dunaway

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2006

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Source/Photo Credit: Wikimedia Commons, U.S. Navy Sgt. Andy Dunaway

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2010 Cimate Action Plan

Draft for Public Discussion September 2010

Climate of Opportunity

A Climate Action Plan for the District of Columbia

GOVERNMENT OF THE DISTRICT OF COLUMBIA



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Source/Photo Credit: Wikimedia Commons, U.S. Navy Sgt. Andy Dunaway

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Source/Photo Credit: Wikimedia Commons, U.S. Navy Sgt. Andy Dunaway

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2012

and a start

• Commercial Buildings > 50ft²

Public-Owned Buildings >10ft²
83% compliance rate
Public Disclosure online, after 2nd year of data

erage Energy Star score: 70

as the rgy savings 2010-2012. 6%

Source/Photo Credit: Wikimedia Commons, U.S. Navy Sgt. Andy Dunaway

As utility rates continued to rise, the cost per square foot for utilities steadily declined due to operational changes and technology upgrades.

MARK JENSEN

Engineering Manager

> Source: Resource Media; Washington DC SEU



Photo Credit: Washington Post

Energy Star score: 77 to 89
Improvements:
Operational (13% savings w/ \$0 investment)
Lighting; LED lighting in garage
VFDs Save \$100k+/year

Who is doing benchmarking?

- Municipal staff: planners; sustainability coordinators; buildings department; others
- Individual building staff: engineers, energy or building managers
- Third- party agencies



How do we get it done?

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- (Part 1): Process—Considerations for implementing community-scale benchmarking ordinance
- (Part 2): Practice—What is Energy Star Portfolio Manager?

How, Part 1: Considerations for Introducing & Implementing a Benchmarking Ordinance

- Political support
- Legal considerations
- Financial considerations

got goals?

How, Part 1: Considerations for Introducing & Implementing a Benchmarking Ordinance

Anatomy of a benchmarking ordinance:

- Buildings covered
- Exceptions
- Benchmarking tool/software
- Verification requirements
- Public disclosure requirements

How, Part 2: Benchmarking with ENERGY STAR Portfolio Manager

- Free tool of U.S. Department of Energy
- Each building: energy use intensity (EUI); Energy Star rating
 - ✓ Track changes in energy use over time in single buildings, groups of buildings, or entire portfolios
 - ✓ Track cost savings and CO₂ emissions
 - ✓ Track water usage
- Normalizes for weather; changes in building operating conditions

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How, Part 2: Benchmarking with ENERGY STAR Portfolio Manager

 Compare buildings against national sample of similar buildings

Photo credits: Cook County website

 Compare all of your buildings of a similar type to each other



Recap + Next

- What, Why, Where, Who and How's of Benchmarking
- City Energy Project
- Seattle and Chicago

Chicago Energy Benchmarking

2015 APA Convention April 18, 2015



ELEVATE ENERGY Smarter energy use for all



We promote smarter energy use for all.



We give people the resources they need to make informed energy choices.



We design and implement efficiency programs that lower costs, and protect the environment.



We ensure the benefits of energy efficiency reach those who need them most.



SUSTAINABLE CHICAGO ACTION AGENDA



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- Save Money
- Create Local Jobs
- Protect Our Health
- Lead the Nation

SOURCES OF CHICAGO GREENHOUSE GAS EMISSIONS (2010)





Chicago Building Energy Use					
	All Chicago	Large Buildings (>50,000 ft²)			
	buildings	Amt.	%		
Total Buildings	450,000+ buildings	~3,000 buildings	<1%		
Total Energy Use (million kBtu)	220,000+ MkBtu	~43,000 MkBtu	~20%		
Total Electricity (million kWh)	20,000+ MkWh	~6,000 MkWh	~30%		

Source: Chicago Building Retrofit Acceleration project September 2011 (2010 data)





• Commercial, Municipal, and Residential over 50,000 ft²





- Benchmark and report every year
- Verify the data every three years

Building sector	Building size (ft²)	Benchmark by June 1 of:					
		2014	2015	2016	2017		
Non-	≥ 250,000	*			*		
Residential	≥ 50,000		*				
Residential	≥ 250,000		*				
	≥ 50,000			*			

- 348 buildings
- 260 million ft2



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- 90%+ compliance rate
- Median ENERGY STAR score of 76
- Performance similar to peer cities

ENERGY BENCHMARKING UNCOVERS ANNUAL SAVINGS POTENTIAL OF UP TO \$77M

BY TAKING ACTION TO IMPROVE ENERGY EFFICIENCY, CHICAGO'S LARGEST BUILDINGS ARE MAKING OUR CITY MORE:

Livable Competitive Sustainable



ENERGY BENCHMARKING HELPS BUILDINGS TAKE CONTROL OF ENERGY USE

Chicago buildings spend \$3 BILLION

per year on energy



Building evergy use drives 71% of citywide greenhouse gas (GHG) emissions



ANNUAL SAVINGS POTENTIAL IDENTIFIED TO DATE*



13% to 23% energy savings



\$44 million to \$77 million cost savings



460,000 to 844,000 avoided tons of GHGs (equivalent to removing 95,000 to 175,000 cars from the road)



Investment to achieve these savings could create more than 1,000 jobs

*Savings estimate from improving buildings' energy intensity to the 50th or 75th percentile, by sector

of Buildings by Community Area (Including Voluntary and Early Reporting):

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IDENTIFY Buildings



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RADIO & FLYER



NOTIFY Owners & Managers

SAMPLE 2015 Notice of Obligation to Comply

Chicago Building Energy Use Benchmarking Ordinance - Municipal Code of Chicago §18-14

Chicago Energy Benchmarking ID: 999999 Address: 123 SAMPLE STREET

According to City records, a building under your ownership or management must comply with the Building Energy Use Benchmarking Ordinance of the City of Chicago in 2015:

- Address: 123 SAMPLE STREET
- Chicago Energy Benchmarking ID (required for compliance): 999999
- Primary Occupancy Use: COMMERCIAL or RESIDENTIAL
- Gross Square Footage: ≥ 50,000 SQUARE FEET (COMMERCIAL) or ≥ 250,000 SQUARE FEET (RESIDENTIAL)

All completed benchmarking submissions received by August 1, 2015 will be treated as in compliance with the ordinance this year. After 2015, June 1st will remain the ongoing annual deadline.

In 2014, more than 340 buildings reported under the Ordinance. In 2015, the Ordinance expands to include commercial and municipal buildings larger than 50,000 ft² and residential buildings larger than 250,000 ft².

What do I need to do?

You must take immediate action. As a first step, we strongly recommend that you appoint a benchmarking lead for your building by May 8, 2015. Simply follow the steps described on the enclosed Compliance Checklist.

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Your building must comply with the ordinance this year.

Questions? We Can Help!

- · Guidance, training, and other free resources: www.CityofChicago.org/EnergyBenchmarking
- Chicago Energy Benchmarking Help Center: (855) 858-6878 or Info@ChicagoEnergyBenchmarking.org



TRAIN Them How to Benchmark

1. Get Started - Suggested 2015 Completion Date: May 8, 2015				
Determine whether your building(s) must comply in 2015	 Commercial and municipal buildings 50,000-250,000 square feet and residential buildings 250,000 square feet and larger must benchmark (Step #2), verify (Step #3), and report (Step #4). 			
	 Commercial buildings 250,000 square feet and larger that complied in 2014 must benchmark (Step #2) and report (Step #4). 			
ldentify a benchmarking lead	 Designate a building staff member or 3rd party partner. Arrange for in-house or 3rd party data verification (Step #3). 			

	2. Benchmark Your Building(s) - Suggested 2015 Completion Date: May 29, 2015					
	Create a Portfolio Manager account		 Visit <u>http://www.energystar.gov/portfoliomanager</u> You may use existing Portfolio Manager accounts and profile(s) 			
	Gather basic information required by Portfolio Manager and set up property profile(s)		 Required info for various property use types is available at: <u>http://www.energystar.gov/buildings/tools-and-resources/list-portfolio-manager-property-types-definitions-and-use-details</u> Refer to the <i>Benchmarking Guide</i> at <u>http://www.CityofChicago.org/EnergyBenchmarking</u> 			
	Obtain monthly, whole-building energy use data for January-December 2014 (all fuel types)					
		Electricity: Request whole-building 2014 electricity use through ComEd's Energy Use Data System: www.ComEd.com/EnergyUsageData				
		Natural Gas: Request whole-building 2014 natural gas use data from Peoples Gas: www.PeoplesGasDelivery.com/Business/Aggregation.aspx				
		Other Fuel Types: Refer to monthly bills for other fuel types (ex: chilled water, steam, diesel, oil, etc.)				
	Note: Buildings may also enter monthly energy use data directly from energy bills.					
	Enter property uses & details into profile(s)		 On the DETAILS tab, use the ADD ANOTHER TYPE OF USE menu to select a property use. Click ADD and enter requested info, and repeat for add'l property uses. 			
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Inbound calls and emails handled by the Help Center For 2014









REPORT on Findings



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MOTIVATE Energy Efficiency Action









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PEOPLES GAS NATURAL GAS SAVINGS PROGRAMSM REDUCE TODAY. SAVE TOMORROW.

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Building Owners & Operators



