



2015 REPORT

CITY OF CHICAGO BUILDING ENERGY BENCHMARKING

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EXECUTIVE SUMMARY

This report presents the second year of findings from the Chicago Building Energy Use Benchmarking Ordinance (Chicago Energy Benchmarking), which calls on Chicago's largest institutional, commercial, and residential buildings to track, verify, and report whole-building energy use. Chicago Energy Benchmarking provides the foundation for an accurate and actionable understanding of building energy performance across properties and over time.

Even more importantly, benchmarking is engaging building owners, managers, tenants, service providers, policy makers, and the public on building energy use. By bringing standard energy metrics, analysis, and transparency to Chicago's built environment, benchmarking holds potential to unlock energy savings, increase asset value, and protect the environment.

“

The City of Chicago is synonymous with leading architecture, from the world's first modern skyscrapers to the forefront of modern design. Through information, transparency, and action on building energy efficiency, Chicago is adapting this legacy to the economic and environmental needs of the 21st century.”

– MAYOR RAHM EMANUEL



KEY FINDINGS:

With expanded coverage and partnership in 2015, Chicago Energy Benchmarking data offer insight into the energy performance of Chicago properties. More than 1,800 properties tracked and reported energy information in 2015; with a median ENERGY STAR score of 58, reporting properties performed above national median levels. Nonetheless, Chicago data also highlighted opportunities to save \$100–184 million per year through improved energy efficiency.



1 Reach

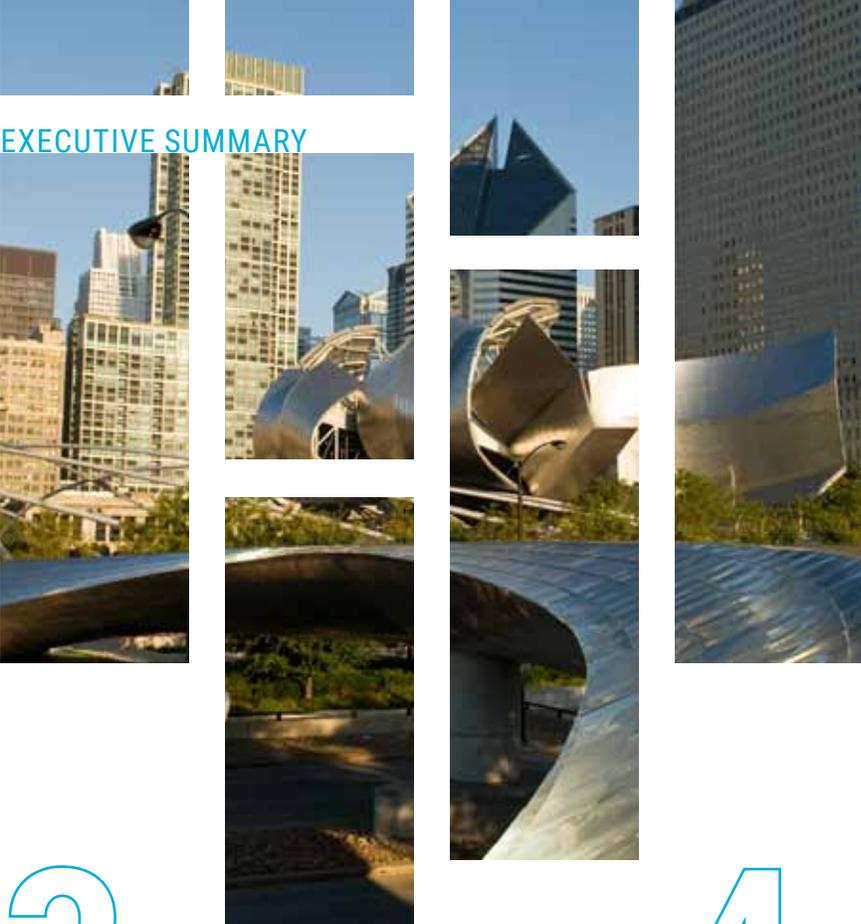
In 2015, **1,840 commercial, institutional, and residential properties spanning 614 million square feet** participated in Chicago Energy Benchmarking, a five-fold increase in the number of properties that reported in 2014 due to second-year ordinance phase-in during 2015:

- ★ **All 77 Chicago neighborhoods** had at least one property that reported in 2015; 44 neighborhoods had more than 10 properties, and six neighborhoods had more than 50 properties.
- ★ Compliance continued at a high level; **84% of all required properties reported in 2015**, with reporting rates higher than 90% among the commercial and multifamily buildings larger than 250,000 square feet and a reporting rate of 99% for covered municipal buildings. By square footage, the reporting rate for all building sectors was 92%.
- ★ Covered buildings that reported in 2015 represent approximately **20% of citywide building energy use**.

2 Performance

Overall, buildings reported energy performance scores higher than national median levels, highlighting strong sector performance while also identifying building sectors with improvement potential.

- ★ Chicago properties that were eligible for the 1-100 ENERGY STAR score reported a **median rating of 58**, which is 16% higher than the national median score of 50; Chicago medians vary by sector:
 - ▶ Offices, K-12 schools, retail, and ‘other’ properties reported median ENERGY STAR scores higher than the national median.
 - ▶ Multifamily, lodging, and healthcare reported median ENERGY STAR scores lower than the national median.
- ★ Multi-year data, available for the first time for properties that reported in both 2014 and 2015, indicated a **slight decrease in weather-normalized site energy use**.
- ★ As in 2014, data reported in 2015 showed **no significant correlation between property size or age and energy performance**.



EXECUTIVE SUMMARY

2015 ANALYSIS OF REPORTED CHICAGO BUILDING DATA FOR JANUARY THROUGH DECEMBER, 2014 ILLUSTRATES BUILDING ENERGY PERFORMANCE AND UNCOVERS SAVINGS OPPORTUNITIES AT AN UNPRECEDENTED SCALE. THE FOLLOWING PAGES EXPLORE HOW THE ENERGY USE OF LARGE BUILDINGS INFLUENCES CHICAGO'S ROLE AS ONE OF THE WORLD'S MOST LIVABLE, COMPETITIVE, AND SUSTAINABLE CITIES.

3 Opportunity

Despite generally high levels of energy performance, the range of energy use intensity reported by properties of the same type reveals savings potential from raising energy performance to median and above-average levels:

- ★ Potential annual savings include a **13-24% decrease in energy use, \$100-184 million in energy cost reduction**, and avoided greenhouse gas emissions equivalent to removing **167,000-306,000 cars** from the road. Investment to achieve these reductions could produce as many as 2,000 local jobs.
- ★ Chicago's Energy Benchmarking Ordinance authorizes the City to **share building-specific data with the public**, beginning with buildings' second year of reported information; this will provide the real estate industry, energy stakeholders, and the general public with information to help identify and take action on specific savings opportunities.

4 Support

The City and partners provided extensive outreach and direct building support, including a full-time help center, free training, and pro-bono assistance to facilitate successful second-year Chicago Energy Benchmarking implementation:

- ★ The Chicago Energy Benchmarking Help Center facilitated more than **4,800 phone, email, and web-based interactions** with covered buildings and other stakeholders.
- ★ 150 individuals participated in **20 free, public Chicago Energy Benchmarking trainings** and drop-in support sessions.
- ★ **More than 60 buildings spanning 8.9 million square feet received pro-bono assistance** on energy benchmarking and verification from local energy experts and service providers.

★ ★ UNLOCKING BUILDING ENERGY SAVINGS ★ ★

FIVE-FOLD INCREASE IN 2015 CHICAGO ENERGY BENCHMARKING PARTICIPATION REVEALS POTENTIAL SAVINGS OF \$184 MILLION

★ Energy Use Information and Transparency Make Chicago More Livable, Competitive and Sustainable

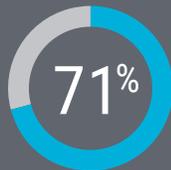


★ Seizing the Opportunity

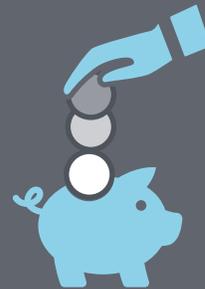
to strengthen Chicago's economy and environment



Chicago buildings spend **\$3 BILLION** per year on energy



Building energy use drives **71% OF CITYWIDE GREENHOUSE GAS (GHG) EMISSIONS**



Energy accounts for up to **30% OF BUILDING OPERATING COSTS**

★ Annual Savings Potential from raising building sector performance

★ All 77 Chicago Neighborhoods have buildings that reported energy use



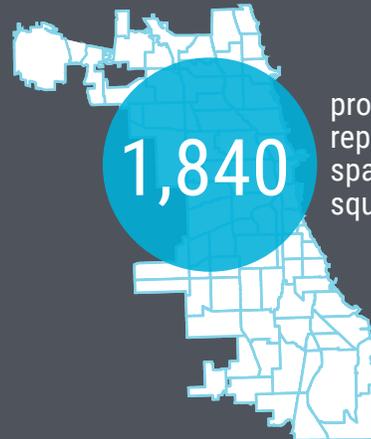
13-24% ENERGY SAVINGS



\$100MM-184MM COST SAVINGS



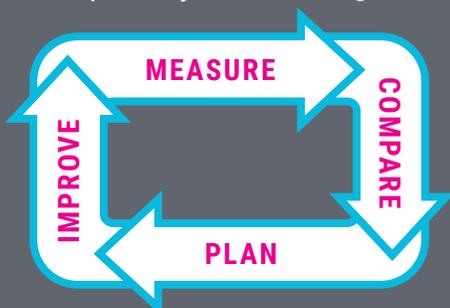
795,000-1.4MM TONS OF AVOIDED GHG EMISSIONS (equivalent to removing 167,000-306,000 cars from the road)



properties reported in 2015, spanning 614MM square feet

★ Take Action Now

to improve your building's energy performance



- ▶ Learn more: www.CityofChicago.org/EnergyBenchmarking
- ▶ Compare 2015 building performance: www.CityofChicago.org/2015EnergyData
- ▶ Make a plan to reduce energy costs: 1.usa.gov/1NS3QqN

Next Reporting Deadline: **June 1, 2016**

CHICAGO ENERGY BENCHMARKING BACKGROUND

The Chicago Building Energy Use Benchmarking Ordinance¹ (Chicago Energy Benchmarking) advances a strong history of urban environmental leadership that is rooted in the *Chicago Climate Action Plan*² and the *Sustainable Chicago 2015 Action Agenda*.³ These strategies – which reflect Chicago’s long-term climate ambition as well as specific, near-term goals – emphasize energy efficiency as a critical priority to make Chicago a more livable, competitive, and sustainable city. Collectively, Chicago residents and businesses spend more than \$3 billion each year on energy, and building energy use represents 71% of citywide greenhouse gas emissions.⁴

Early in his first term, Mayor Emanuel called for enhanced local policies to support greater transparency in energy use and building energy performance. In 2013, the Chicago City Council adopted the Building Energy Use Benchmarking Ordinance to improve awareness of energy use and costs, increase access to energy use information, and to accelerate the adoption of cost-effective energy efficiency improvements.

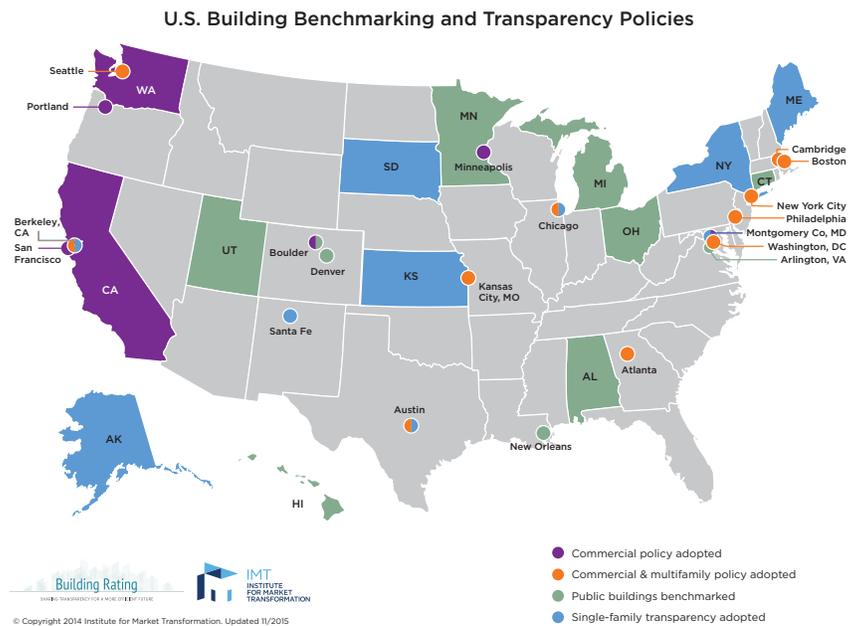
BUILDING ENERGY USE ACCOUNTS FOR 71% OF CHICAGO GREENHOUSE GAS EMISSIONS

The Chicago Energy Benchmarking Ordinance is one of the City’s many efforts to improve energy efficiency and increase the use of clean energy technologies across Chicago. In 2012, the City of Chicago launched Retrofit Chicago to promote and celebrate voluntary energy efficiency leadership in commercial, residential, and municipal buildings.⁵ The City is also accelerating renewable energy installations through programs such as Chicago Solar Express and the Solar Chicago bulk purchase program.⁶

Energy benchmarking is a growing trend across the U.S. There are now fifteen cities, two states, and one county with energy reporting policies (Figure 1). Five of the fifteen cities adopted these policies in 2015, bringing total covered square footage to 6.6 billion square feet.⁷ While Chicago shares common benchmarking policy elements with other jurisdictions, Chicago Energy Benchmarking is the first ordinance in the nation to include data verification.

CHICAGO SPENDS \$3 BILLION EVERY YEAR ON ENERGY IN BUILDINGS

Figure 1: U.S. Building Benchmarking and Transparency Policies



1 Chicago Building Energy Use Benchmarking Ordinance: www.cityofchicago.org/energybenchmarking
 2 *Chicago Climate Action Plan*: <http://www.cityofchicago.org/content/dam/city/progs/env/CCAP/CCAP.pdf>
 3 *Sustainable Chicago 2015 Action Agenda*: http://www.cityofchicago.org/city/en/progs/env/sustainable_chicago2015.html
 4 Chicago 2010 Regional Greenhouse Gas Emissions Inventory: www.cityofchicago.org/content/dam/city/progs/env/CCAP/Chicago_2010_Regional_GHG_Inventory.pdf
 5 Retrofit Chicago: http://www.cityofchicago.org/city/en/progs/env/retrofit_chicago.html
 6 Chicago Solar Express and Solar Chicago: http://www.cityofchicago.org/city/en/progs/env/solar_in_chicago.html
 7 Square footage information from www.BuildingRating.org: <http://buildingrating.org/graphic/us-building-area-covered-annually>

CHICAGO ENERGY BENCHMARKING ORDINANCE REQUIREMENTS

Chicago Energy Benchmarking requires existing institutional, commercial, and residential buildings larger than 50,000 square feet to:

- 1 **TRACK** whole-building energy use (monthly)
- 2 **REPORT** to the City (annually)
- 3 **VERIFY** data accuracy (every three years), beginning with the first year of reporting

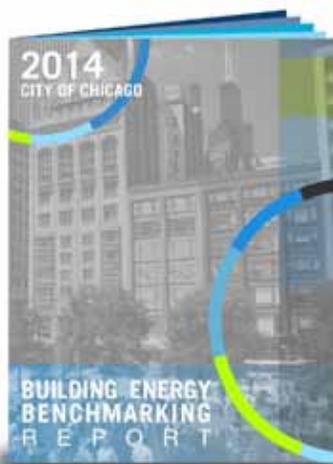
Property representatives conduct energy tracking and reporting using ENERGY STAR Portfolio Manager, a free online benchmarking tool provided by the U.S. Environmental Protection Agency (EPA). In each reporting year, properties track and report building attributes and monthly energy use for the previous calendar year. First-time compliance requirements phase-in over a three-year period from 2014-2016, as shown in Figure 2.

Figure 2: Phased Ordinance Implementation: 2014-2017

BUILDING TYPES	BUILDING SIZE (gross floor area in square feet)	BENCHMARKING IMPLEMENTATION TIMELINE			
		2014	2015	2016	2017
Commercial & Institutional	≥ 250,000	★			★
	≥ 50,000		★		
Residential	≥ 250,000		★		
	≥ 50,000			★	

■ = Years in which benchmarking and reporting are required (annual, ongoing)

★ = Years in which verification is required (every 3 years, ongoing)



2014 CHICAGO ENERGY BENCHMARKING FINDINGS

The first year of Chicago Energy Benchmarking implementation required commercial and institutional properties larger than 250,000 square feet to track, verify, and report to the City by June 1, 2014. Almost 350 properties spanning over 260 million square feet reported in 2014, representing approximately 11% of citywide energy use. Seventy-seven of these properties reported voluntarily.

With a reporting rate of more than 90%, 2014 benchmarking participation and implementation provided a foundation for subsequent ordinance roll-out

and support to additional building sizes and sectors. 2014 results also indicate an enormous savings potential totaling up to 23% energy reduction for 2014 reporting properties.

Initial data also suggest that Chicago Energy Benchmarking may have positive spillover benefits beyond the ordinance’s jurisdiction. According to the U.S. EPA, 2014 saw a 7% increase in the number of ENERGY STAR certified properties, along with a 17% increase in properties tracked in ENERGY STAR Portfolio Manager across the entire Chicago metropolitan area.⁸



For more information about 2014 results, please refer to the 2014 Chicago Energy Benchmarking Report online at: www.CityofChicago.org/EnergyBenchmarking.

8 U.S. EPA. ENERGY STAR 2014 Snapshot: Measuring Progress in the Commercial and Industrial Buildings Sector, August 2015: http://www.energystar.gov/sites/default/files/tools/2014%20Snapshot%208-14-15_0.pdf



FEATURED
BUILDINGS

564 WEST RANDOLPH

“

Sterling Bay recognized the potential in this seven story vacant property when we purchased it in 2011, and it was redeveloped with tenancy and efficiency in mind. While the building was going through significant remodeling, Sterling Bay also spent time evaluating and upgrading the property's building systems. In 2014, we installed a new boiler and took advantage of a rebate program in which Peoples Gas surveyed steam traps and replaced those that were no longer effective. Not only did this program ensure long-term efficiency improvements, but it was also partially funded by Peoples Gas.

Immediately following the renovation, Sterling Bay brought the building's occupancy to 100%. Using our energy benchmarking results, Sterling Bay was better able to identify new energy improvement opportunities as well as track the impact of recent property upgrades. To date, the efficiency measures implemented resulted in a five point increase to our ENERGY STAR score in the last 18 months. Through benchmarking, we have also received well deserved recognition for these efforts by gaining ENERGY STAR certification 2014 and in 2015.”

– Sterling Bay

ADDRESS

564 West Randolph

NEIGHBORHOOD

West Loop

CONSTRUCTED

1908

BUILDING OWNER / MANAGER

Sterling Bay

ARCHITECT

Huehl & Schmid

BUILDING SIZE

119,829 square feet



Above left: 564 West Randolph. Above (left to right): Martin Huttenlocker – Property Manager and Patrick Biesty – Engineering Manager.
Photos courtesy of Sterling Bay.

OUTREACH, BUILDING SUPPORT, AND ADDITIONAL ENGAGEMENT

Due to the phasing-in of additional property sizes and sectors in 2015, more than five times the number of properties reported in 2015 as compared to 2014. To support broader policy coverage, the City of Chicago and partner organizations expanded building engagement and support efforts.

OUTREACH

In 2015, the City of Chicago and energy benchmarking partners conducted outreach to numerous stakeholders, including:

- ★ 20 industry groups or trade associations in the commercial and residential sectors;
- ★ 60+ energy service providers;
- ★ 2 labor unions with members working in covered buildings, the Service Employees International Union (SEIU) Local 1, and the International Union of Operating Engineers (IUOE) Local 399;
- ★ 75 Neighborhood Business Development Centers (NBDCs), reached through the Chicago Department of Business Affairs and Consumer Protection. NBDCs are typically Chambers of Commerce or business organizations with strong neighborhood networks.⁹

Many of these organizations shared information about energy benchmarking and available support resources with their members through newsletters, seminars, website updates, and social media. Examples include the Community Associations Institute, the Midwest Energy Efficiency Alliance Building

Operator Certification program, the Chicagoland Apartment Association, SEIU Local 1, IUOE Local 399, the Greater Southwest Development Corporation, and the Lakeview Chamber of Commerce. Numerous private sector firms also reached out to their contacts to provide ordinance updates and to share information on available benchmarking resources.

In addition, the Chicago Energy Benchmarking Help Center completed more than 500 outbound phone calls and emails to representatives of covered building portfolios to drive compliance.

BUILDING SUPPORT

Utility Data Access

Chicago Energy Benchmarking requires covered properties to track monthly whole-building energy use for all fuel types consumed at their facilities. To help their customers address the challenge of aggregating electricity and natural gas data across multiple accounts, both of Chicago's local utilities - Commonwealth Edison (ComEd) and Peoples Gas - offer whole-building energy use data at no additional cost. This is a critical service to properties with multiple occupants, where owners and managers may not have access to utility bills for sub-metered spaces.



ComEd EUDS PARTICIPATION INCREASED BY **127%** SINCE THE ORDINANCE PASSED

500+ PROPERTIES RECEIVED 2015 WHOLE-BUILDING NATURAL GAS DATA FROM PEOPLES GAS, A 7-FOLD INCREASE FROM 2014



ComEd EUDS:
www.ComEd.com/EnergyUsageData

Peoples Gas Large Building Energy Use Data Aggregation:
www.PeoplesGasDelivery.com/Business/Aggregation.aspx

⁹ For a full list of all NBDCs, please visit: <http://www.cityofchicago.org/city/en/depts/bacp/sbc/neighborhoodbusinessdevcenters.html>

OUTREACH, BUILDING SUPPORT, AND ADDITIONAL ENGAGEMENT

Since 2008, ComEd has provided whole-building data through the Energy Usage Data System (EUDS)¹⁰, a secure, online service that allows property managers to request electricity consumption data online and schedule recurring data requests. EUDS participation by Chicago properties has increased by 127% since the ordinance passed in 2013. Currently, EUDS serves 859 property owners/managers and more than 3,400 properties in the City of Chicago.

In response to customers' need for whole-building natural gas data, Peoples Gas created the Large Building Energy Use Natural Gas Data Aggregation offering.¹¹ In 2014, approximately 70 properties enrolled in this program. This year, more than 500 properties received monthly natural gas use data directly from Peoples Gas.

Help Center

The Chicago Energy Benchmarking Help Center (Help Center) provides full-time phone and email support to covered properties and other Chicago Energy Benchmarking stakeholders. The Help Center, operated by Elevate Energy,¹² also identifies buildings that are covered by the ordinance; works in partnership with the City of Chicago to notify covered buildings of ordinance requirements; and creates written instructions and guidance materials to support compliance.



CHICAGO ENERGY BENCHMARKING

HELP CENTER



Photos courtesy of Elevate Energy

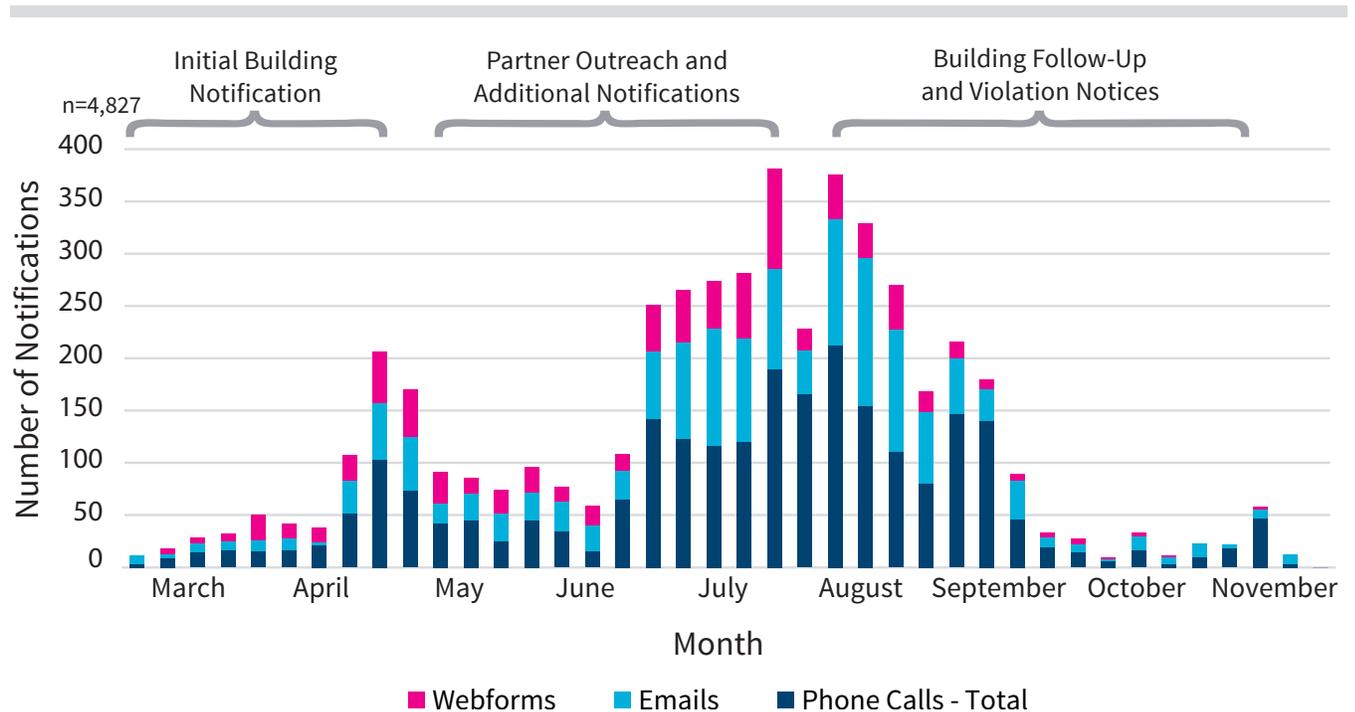
10 EUDS: <https://www.comed.com/business-savings/energy-tools/Pages/energy-usage-data.aspx>

11 Peoples Gas Large Buildings Energy Use Data Aggregation Program: <http://www.peoplesgasdelivery.com/business/aggregation.aspx>

12 Elevate Energy helps people do more with less energy. They design and implement efficiency programs that lower costs, protect the environment, and ensure the benefits of energy efficiency reach those who need them most. For more information, visit: www.ElevateEnergy.org

OUTREACH, BUILDING SUPPORT, AND ADDITIONAL ENGAGEMENT

Figure 3: 2015 Chicago Energy Benchmarking Help Center Interactions



In 2015, the Help Center staff conducted more than 4,800 interactions by phone, email, and web form, in addition to nearly 1,000 interactions in 2014. Building representatives and other stakeholders frequently turned to the Help Center for information on:

- * Ordinance background and requirements;
- * Using ENERGY STAR Portfolio Manager;
- * Accessing whole-building energy data;
- * Updating building information and/or applying for an exemption; and
- * Additional resources, such as referrals to the pro-bono program.

This year, the Help Center introduced online forms to facilitate common requests. The Help Center also conducted a rolling review of reported ENERGY STAR Portfolio Manager data to identify incomplete submissions or reports with data errors, and set up a system to notify building representatives in a timely manner about the need to complete or correct their submissions.

As a key partner in implementation of the Chicago Energy Benchmarking Ordinance, Elevate Energy also manages submitted building data and conducts data analysis. The Elevate Energy team delivers a high level of service to building representatives and other stakeholders, which helps to drive compliance and energy efficiency investment.

4,800+
INTERACTIONS IN 2015
(PHONE CALLS, EMAILS,
AND WEBFORMS)

AVERAGE CALL TIME:
4 MINUTES,
52 SECONDS

AVERAGE CALLER
WAIT TIME:
20 SECONDS

TOTAL PHONE SUPPORT:
197 HOURS,
38 MINUTES

OUTREACH, BUILDING SUPPORT, AND ADDITIONAL ENGAGEMENT

Training

To provide crucial benchmarking support, the U.S. Green Building Council – Illinois Chapter (USGBC-Illinois)¹³ has worked with a number of partners, including the American Institute of Architects – Chicago chapter (AIA-Chicago), the ASHRAE – Illinois chapter (ASHRAE-IL), the Midwest Energy Efficiency Alliance (MEEA), and over 50 professional volunteers to provide building outreach, energy benchmarking training and pro-bono data verification services to increase compliance and drive energy efficiency action in Chicago’s building stock.

In 2014 and 2015, 25 volunteers provided 35 free trainings on the Chicago Energy Benchmarking Ordinance requirements and the

ENERGY STAR Portfolio Manager tool to approximately 575 building representatives, including building owners/managers, building operating engineers, and energy service providers. This year, USGBC-Illinois collaborated with MEEA to record the training as a free two-part on-demand webinar.¹⁴

Pro-bono Data Verification

To ensure that data verification is not a barrier to compliance with the Chicago Energy Benchmarking Ordinance, USGBC-Illinois and ASHRAE-Illinois developed a pro-bono data verification program for qualifying buildings with demonstrated need. This year, pro-bono data verification volunteers worked with over 60 properties and reviewed benchmarking data for 8.9 million square feet.

A variety of organizations - including affordable housing facilities, schools, nonprofit organizations, community centers, and faith-based groups - took part in the program.

Pro-bono data verification partners developed innovative methods to engage participants, including a DataJam event and Office Hours. Designed to engage large-scale portfolios, Chicago’s first DataJam included pro-bono volunteers and staff members from the Chicago Housing Authority (CHA). Complete with music and professional networking, the event shared best practices in data collection and analysis as participants entered CHA data into ENERGY STAR Portfolio Manager. USGBC-Illinois held subsequent DataJams for other Chicago portfolios, and the concept has expanded to other U.S. cities.

PRO-BONO

DATAJAMS



Photos courtesy of USGBC-Illinois and the Institute for Market Transformation

13 USGBC-Illinois is a non-profit, membership-driven organization that advances buildings and communities that are sustainable, prosperous and healthy: <http://www.usgbc-illinois.org/>

14 The webinar is available at: www.cityofchicago.org/energybenchmarking



DROP-IN OFFICE HOURS



Photos courtesy of USGBC-Illinois and Marc PoKempner

Drop-in Office Hours provided another opportunity for covered properties to receive one-on-one support from volunteer experts. This approach was particularly helpful for smaller portfolios seeking customized assistance.

Energy Service Provider Directory

This year, USGBC-Illinois created an online directory of companies that offer fee-for-service support for energy benchmarking, data verification, and other efficiency efforts. Though the Chicago Energy Benchmarking Ordinance does not require properties to hire outside support, the USGBC-IL created this directory to help interested properties find firms that provide benchmarking-related services.¹⁵ To view the USGBC-IL database, please visit: <http://www.usgbc-illinois.org/resources/energy-services-database/>.

ADDITIONAL ENGAGEMENT

To follow up with reporting properties and to encourage additional energy efficiency action, the City of Chicago sent private, customized messages to all properties that reported in 2014. These individual reports provided each property with a summary of its January – December 2013 energy performance, a comparison with other similar properties, and suggestions on specific actions to improve energy efficiency. The City is planning similar communications to all properties reporting in 2015.

Building upon these 2015 outreach and support opportunities, Chicago will continue to engage with reporting properties to encourage and support additional action on energy efficiency.

PROPERTY OWNERS,
PROPERTY MANAGERS,
BUILDING OPERATING
STAFF, AND OTHER BUILDING
REPRESENTATIVES:
SEE PAGES 17-18 FOR
ADDITIONAL IDEAS ON
HOW TO TAKE ACTION ON
ENERGY EFFICIENCY.

¹⁵ Please note that this directory contains self-reported service provider information. Buildings should exercise all due diligence when selecting an energy service provider. The City of Chicago does not guarantee the quality or pricing of the work provided by these firms, and the firms listed in the directory do not have any affiliation with the City of Chicago



FEATURED BUILDINGS

SWEDISH COVENANT HOSPITAL

“

Swedish Covenant Hospital is proud to be recognized once again for our continuous effort to benchmark energy performance and maximize energy efficiency. Due to our strong commitment to energy conservation, we have benchmarked our buildings and have performed retrocommissioning for the campus since 2009 to achieve energy efficiency improvements.

During this time, antiquated chillers were replaced with new, energy efficient chillers; the Foster Medical Pavilion, a LEED Gold Building, was opened; both the Mayora Rosenberg Women’s Health Center and the basement of Pro Plaza were built out with energy efficient lighting and building controls and many other projects were completed. We have benefited from rebates from ComEd and the Illinois Clean Energy Community Foundation (ICECF) and were recently recognized by the American Society for Healthcare Engineering (ASHE) with the Energy to Care Award for our consistent commitment to reducing energy consumption by 10% or more since 2009. To date, we have achieved 10% energy reduction since 2009 and have saved over \$190,000 per year on energy costs due to these efforts.”

– Swedish Covenant Hospital

ADDRESS

5145 N. California Avenue

NEIGHBORHOOD

North Side of Chicago

CONSTRUCTED

1916, with major additions in 1928, 1951, 1977, 1978, 1997, 2004, 2007, and 2012

BUILDING OWNER / MANAGER

Covenant Ministries of Benevolence

ARCHITECT

Various

BUILDING SIZE

799,492 square feet



Above Left: Swedish Covenant Hospital. Above (left to right): Saher Ibrahim – Lead Engineer, Dave Hoffmann – Assistant Chief Engineer, and Mark Pollina – Building Engineer. Photos courtesy of Swedish Covenant Hospital.

TAKING ACTION ON ENERGY EFFICIENCY

Benchmarking provides standardized metrics for energy efficiency that enable energy performance tracking over time and comparisons of energy performance among similar properties. Benchmarking information helps property owners, buyers, managers, operations staff, tenants, and other groups to make better-informed decisions on energy efficiency and utility cost management.

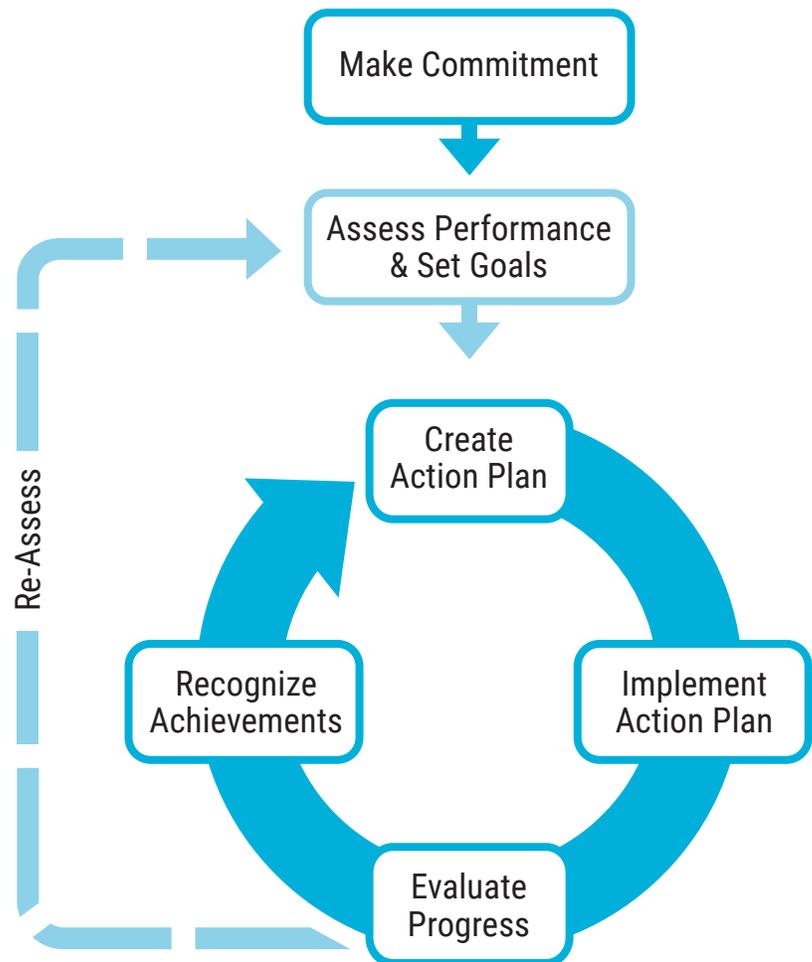
Chicago Energy Benchmarking results from 2014 and 2015 indicate significant savings potential in properties covered by the benchmarking ordinance, including up to 13-24% reduction in energy consumption by bringing all properties to median or above-median levels for energy intensity (see page 34).

One of the first steps toward capturing possible savings is understanding the end-use of energy consumption in properties. In the Midwest, the greatest end-use of energy is space heating, consuming approximately 50% of energy in commercial and residential properties, followed by lighting.¹⁶

While benchmarking provides valuable information regarding a property's performance over

time and relative to other, similar properties, additional steps are needed to capture the energy and cost savings available. The following suggestions outline concrete actions property owners/managers, operating staff, and tenants, brokers, and real estate attorneys can take to begin improving energy performance.

Figure 4: Seven Steps for Continuous Energy Improvement



Source: US EPA ENERGY STAR Guidelines for Energy Management¹⁷

16 Commercial Buildings Data Source: U.S. Energy Information Administration. Commercial Buildings Energy Consumption Survey, 2003 Data. Table E1A, for the Midwest, East North Central Region. (Note that updated CBECs information is scheduled for release in 2016): http://www.eia.gov/consumption/commercial/data/archive/cbecs/cbecs2003/detailed_tables_2003/2003set19/2003pdf/e1a-e11a.pdf
Residential Buildings Data Source: U.S. Energy Information Administration. Residential Energy Consumption Survey, 2009 Data. Table CE3.3, for the Midwest area and for multifamily properties 4,000 square feet or greater (the largest floor area size group available): <http://www.eia.gov/consumption/residential/data/2009/index.cfm?view=consumption#end-use>
17 <https://www.energystar.gov/buildings/about-us/how-can-we-help-you/build-energy-program/guidelines>

PROPERTY OWNERS AND MANAGERS



Are you a property owner or manager?
Do you set the overall strategy and manage the team?
Are you responsible for the budget?

Consider the tips below as ways to build strong teams and effectively manage cost.

Tip 1

Create an Energy Team and Develop a Management Strategy

- ★ *Designate one or more champions to form an energy team for each facility or organization. Energy champions are responsible for planning, implementing, monitoring, and evaluating the energy management program. For tips, download the ENERGY STAR *Teaming Up to Save Energy* guide.*
- ★ *Develop a strategic energy management program. To get started, review the ENERGY STAR *Guidelines for Energy Management*, a step-by-step road map for continuous improvement.*

Tip 2

Engage Tenants on Energy Efficiency:

- ★ *Develop a tenant engagement plan. Consider steps such as increasing energy transparency, raising awareness and educating tenants, and developing deeper partnerships. For specific ideas, review *Eight Great Strategies to Engage Tenants on Energy Efficiency*.*

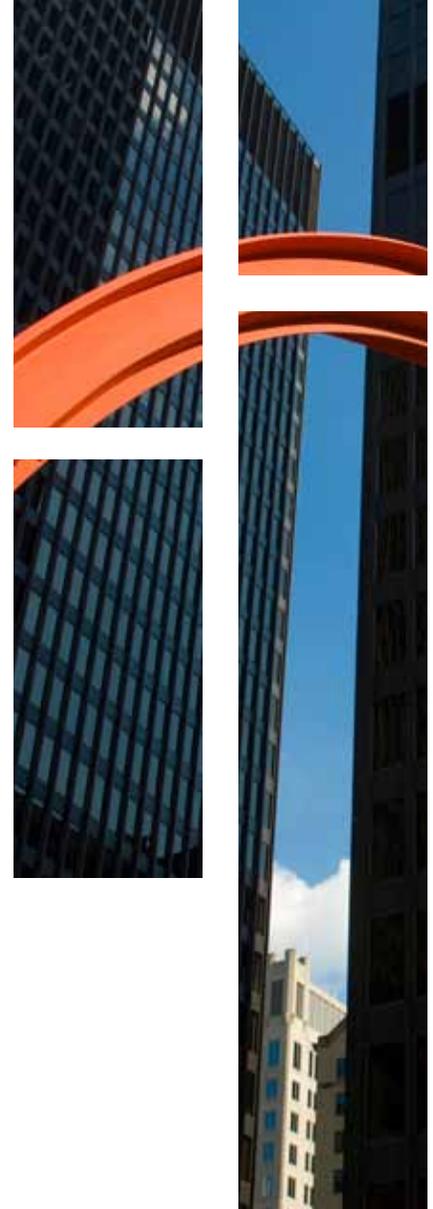
ONLINE RESOURCES



ENERGY STAR *Teaming Up to Save Energy* guide:
<https://www.energystar.gov/buildings/tools-and-resources/teaming-save-energy>

ENERGY STAR *Guidelines for Energy Management*:
<https://www.energystar.gov/buildings/about-us/how-can-we-help-you/build-energy-program/guidelines>

Eight Great Strategies to Engage Tenants on Energy Efficiency:
<https://www.energystar.gov/buildings/tools-and-resources/8-great-strategies-engage-tenants-energy-efficiency>



OPERATIONS TEAM MEMBERS



Are you the one with detailed knowledge of building systems and operations? Are you tasked with implementing energy efficiency measures? Are you trying to maximize the impact of your annual budget?

The tips below include ideas on how to find, finance, and implement energy efficiency solutions.

Tip 1

Investigate Financial Incentives:

Investigate utility and tax incentive programs. For an example of a property that used incentives to help fund efficiency improvements, see the Building Feature on page 15.

Tip 2

Identify and Implement Energy Efficiency Opportunities:

- ★ *Perform an energy audit to identify savings opportunities (including low-cost and no-cost actions).*
- ★ *Perform retro-commissioning on existing systems to maximize efficiency, ensure efficient operations, and increase occupancy comfort. Take advantage of the current ComEd/Peoples Gas Retro-commissioning Program.*

Tip 3

Enhance Operations:

- ★ *Improve operations and maintenance practices by regularly checking and maintaining equipment to ensure it is functioning efficiently. Optimize start-up time, power-down time, and equipment sequencing. Learn other tips by reviewing the *Operations & Maintenance Best Practices* guide.*

ONLINE RESOURCES



Financial Incentives:

- ★ ComEd: <https://www.comed.com/business-savings/programs-incentives/pages/default.aspx>
- ★ Peoples Gas: <http://www.peoplesgasdelivery.com/business/rebates.aspx>
- ★ DSIRE Policies and Incentives database: <http://www.dsireusa.org/>

Energy Audits: To find possible service providers for energy audits, visit the USGBC-IL service provider directory: <http://www.usgbc-illinois.org/resources/energy-services-database/>

ComEd/Peoples Gas Retro-Commissioning Program: <https://www.comed.com/business-savings/programs-incentives/Pages/retro-commissioning.aspx>

Operations & Maintenance Best Practices guide from the Federal Energy Management Program: <http://energy.gov/eere/femp/downloads/operations-and-maintenance-best-practices-guide>



TENANTS



*Do you work to identify, lease, and manage space for your organization?
Do you ensure that high-performing facilities and teams are available to support your business goals?*

Consider the tips below for maximizing the value of leased space.

Tip 1

- * *Review energy performance information with the property manager.* Request the most recent energy performance metrics for the property or review publicly-available data on the City's Data Portal. If the property is not covered by the Chicago Benchmarking Ordinance, explore ways to conduct benchmarking to track energy performance.

Tip 2

- * *Develop energy efficiency guidelines for fit-outs.* Ensure that future fit-outs meet best practices for energy efficiency. For more information, review *Working Together for Sustainability: The RMI-BOMA Guide for Landlords and Tenants*.

Tip 3

- * *Work with your broker to develop energy-aligned leases (also called green leases).* Green leasing addresses the financial and energy incentives of building owners and tenants so they can work together to save money and ensure efficient buildings operations. Visit the Green Lease Library to learn more.

ONLINE RESOURCES



City of Chicago Data Portal - 2015 Energy Benchmarking Data: www.CityofChicago.org/2015EnergyData

Working Together for Sustainability: The RMI-BOMA Guide for Landlords and Tenants:
<https://www.boma.org/sustainability/inforesources/Documents/WorkingTogetherforSustainability.pdf>

Green Lease Library: <http://www.greenleaselibrary.com>



APPRAISERS, BROKERS, AND REAL ESTATE ATTORNEYS



Do you appraise the value of properties? Do you put the deal together? Do you look for ways to develop long-term value for your client?

Wasted energy is wasted money. Consider the tips below for transaction leverage.

Tip 1

- * *Educate your clients on the value of energy efficiency. A more efficient building lowers operating costs. For more information on how green building practices and energy efficiency drive up commercial property values, please visit IMT's Green Building and Property Value website.*

Tip 2

- * *Incorporate use of energy benchmarking information in leasing decisions. Consider reviewing a property's energy performance at the time of a lease renewal or lease negotiation. To find energy metrics for Chicago properties publicly shared by the City, visit the Chicago Data Portal.*

Tip 3

- * *Work with your clients to develop energy-aligned leases (also called green leases). Green leasing addresses the financial and energy incentives of building owners and tenants so they can work together to save money and ensure efficient buildings operations. For more information, please visit the Green Lease Library.*

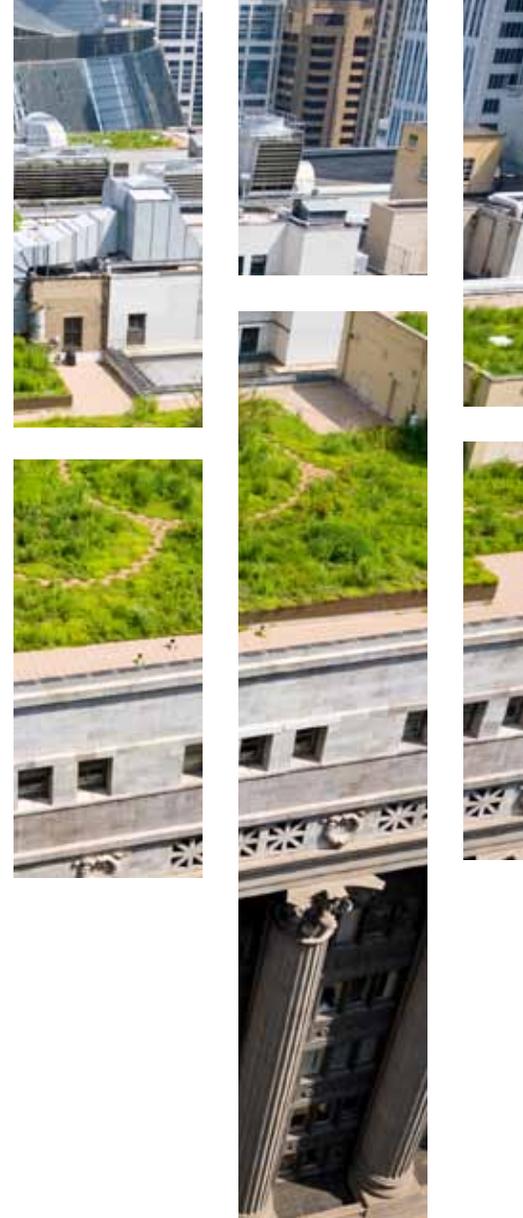
ONLINE RESOURCES



Institute for Market Transformation (IMT) Green Building and Property Value website: <http://www.imt.org/finance-and-real-estate/green-building-and-value>

City of Chicago Data Portal - 2015 Energy Benchmarking Data: www.CityofChicago.org/2015EnergyData

Green Lease Library: <http://www.greenleaselibrary.com>





FEATURED BUILDINGS

CHICAGO HOUSING AUTHORITY

“

With support and training from the Pro-Bono Volunteer Program, the Chicago Housing Authority (CHA) benchmarked 51 properties in 2015, including 38 buildings that voluntarily complied one year early.

To start using the benchmarking results to drive energy savings, the CHA implemented innovative performance-based contracts; property management firms contracted by the CHA now receive a monthly financial incentive for meeting minimum energy usage levels, or a disincentive if energy consumption increases over the minimum. The CHA utilized energy benchmarking results to develop minimum energy efficiency levels for the properties, a critical component of the new contracts.

Based on initial projections, the CHA estimates energy savings of 500,000 therms per year from the performance-based incentives, and will continue to use benchmarking as a tool to track energy performance improvements at each property.”

– Chicago Housing Authority

ADDRESS

Multiple

NEIGHBORHOODS

The CHA has properties in most Chicago neighborhoods

CONSTRUCTED

1930s – 1990s

BUILDING OWNER / MANAGER

Chicago Housing Authority

ARCHITECT

Various

BUILDING SIZE

12,056,767 total square feet

NUMBER OF PROPERTIES

51



Above left: Patrick Sullivan Apartments, CHA Senior Building Portfolio. Above: Thurston Stimage, CHA Chief Operating Engineer. Photos courtesy of Will Nunnally, Videographer/Producer, Chicago Housing Authority

2015 ANALYSIS & FINDINGS

In 2015, commercial and institutional properties 50,000 square feet or greater and multifamily properties 250,000 square feet or greater were required to benchmark and report calendar year 2014 energy use. In total, 1,840 properties spanning over half a billion square feet across eight building sectors¹⁸ reported in 2015, which is five times the number of properties that reported in 2014 due to phased implementation.^{19, 20} Of these 1,840 properties, 242 facilities (13%), reported voluntarily (i.e. were not required to comply).

Data cleansing and analysis of the information reported in 2015 was completed by key members of the Chicago Energy Benchmarking Working Group, including the C40 Cities Climate Leadership Group, the City Energy Project, and Elevate Energy.

1,840
TOTAL REPORTING
PROPERTIES

242 PROPERTIES
REPORTED VOLUNTARILY

614 MILLION
SQUARE FEET

~20% OF CITYWIDE
ENERGY CONSUMPTION



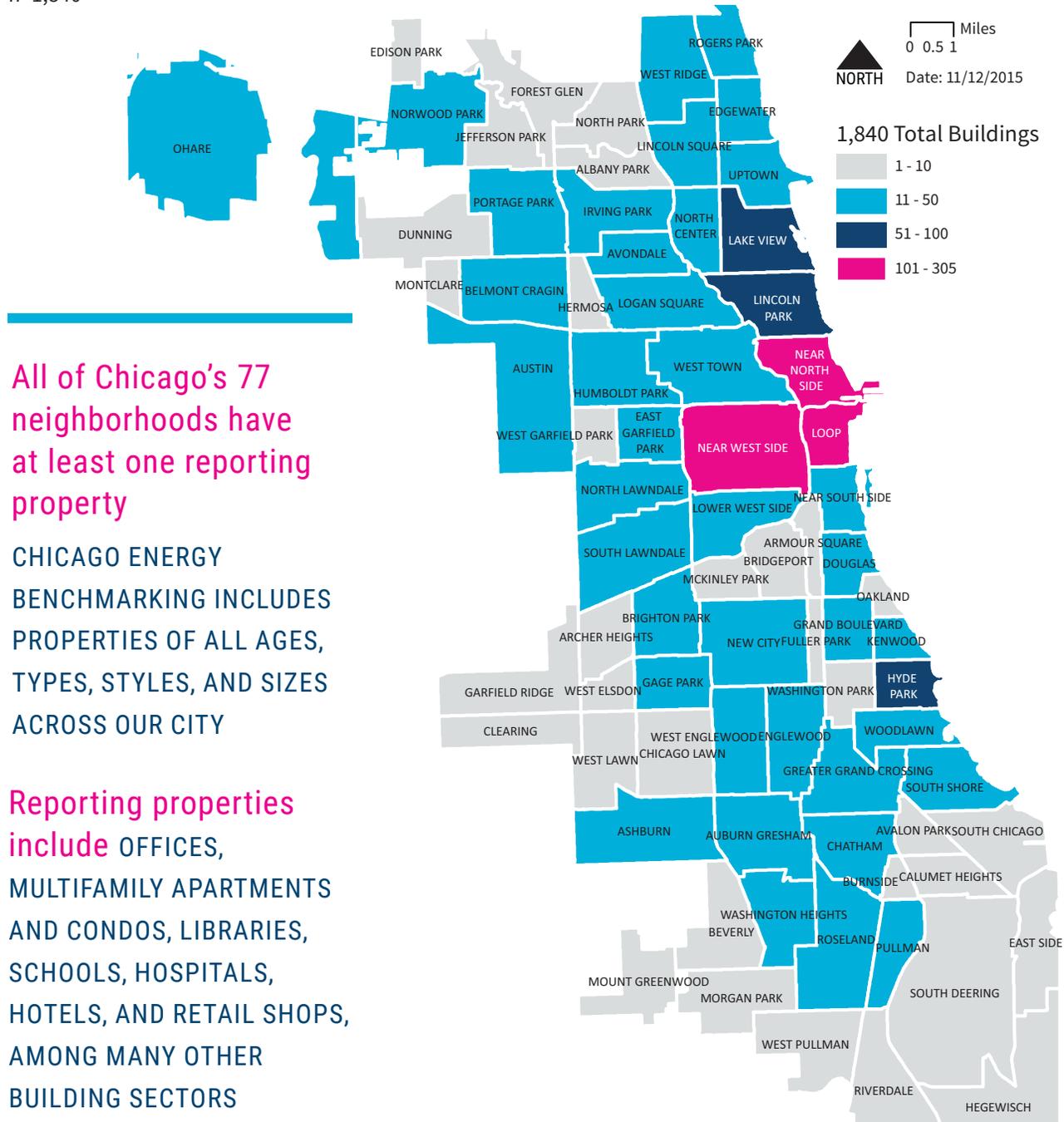
18 Please see the Appendix for the full list of building sectors and the ENERGY STAR Portfolio Manager property types included in each sector
19 Please see page 8 to review the building sizes and sectors required to comply in 2014, 2015, and 2016
20 As of November 1, 2015

CHICAGO ENERGY BENCHMARKING ACROSS OUR NEIGHBORHOODS

All of Chicago's 77 neighborhoods have at least one property that participated in 2015 Chicago Energy Benchmarking (Figure 5).

Figure 5: Reporting Properties by Neighborhood

n=1,840



All of Chicago's 77 neighborhoods have at least one reporting property

CHICAGO ENERGY BENCHMARKING INCLUDES PROPERTIES OF ALL AGES, TYPES, STYLES, AND SIZES ACROSS OUR CITY

Reporting properties include OFFICES, MULTIFAMILY APARTMENTS AND CONDOS, LIBRARIES, SCHOOLS, HOSPITALS, HOTELS, AND RETAIL SHOPS, AMONG MANY OTHER BUILDING SECTORS

COMPLIANCE

In 2015, Chicago identified 2,122 properties that were required to comply with the ordinance. A total of 1,774 of these properties reported information to the City or received a temporary exemption for 2015,²² yielding an overall reporting rate of 84%.²³ This represents particularly strong compliance, given that 2015 was the first year in which most properties were required to comply. However, as shown in Table 1, the reporting rate varied by building type and size. The 2015 reporting rate by square footage was 92%, due to higher reporting rates among larger properties.

Table 1: Reporting Rate by Building Type and Size

BUILDING TYPE AND SIZE	REPORTING RATE BY NUMBER OF PROPERTIES	REPORTING RATE BY SQUARE FOOTAGE
Commercial and Institutional Properties ≥ 250,000 ft ²	95%	98%
Commercial and Institutional Properties 50,000 – 250,000 ft ²	65%	68%
Residential Properties ≥ 250,000 ft ²	91%	92%
Municipal Properties ≥ 50,000 ft ²	99%	99%
All Properties	84%	92%

Most commercial and institutional properties larger than 250,000 square feet that reported in 2015 also reported in 2014, with the addition of several newly-identified properties and properties that previously received temporary exemptions. These reporting rate of these large properties (95%) reflects the cumulative impact of two years of outreach by the City and benchmarking partners and possible experience with benchmarking prior

to the ordinance’s requirement. Smaller commercial and institutional properties from 50,000-250,000 square feet had the lowest reporting rate (65%) of any 2015 building cohort; this may reflect initial challenges in identifying and contacting these smaller facilities. The City of Chicago and partners will continue to engage these properties with the goal of maximizing compliance, and this segment may benefit from additional targeted outreach and direct support.

2,122
COVERED PROPERTIES

1,774 PROPERTIES
SUBMITTED REPORTS
OR RECEIVED TEMPORARY
EXEMPTIONS

84% REPORTING RATE,
REPRESENTING **92%** OF
COVERED SQUARE FOOTAGE

22 The Chicago Energy Use Benchmarking Ordinance grants temporary exemptions for new construction and properties experiencing low occupancy or financial distress: www.CityofChicago.org/EnergyBenchmarking

23 As of November 1, 2015. The City continues to receive submissions and exemption requests from buildings that have not yet reported.

DATA VERIFICATION

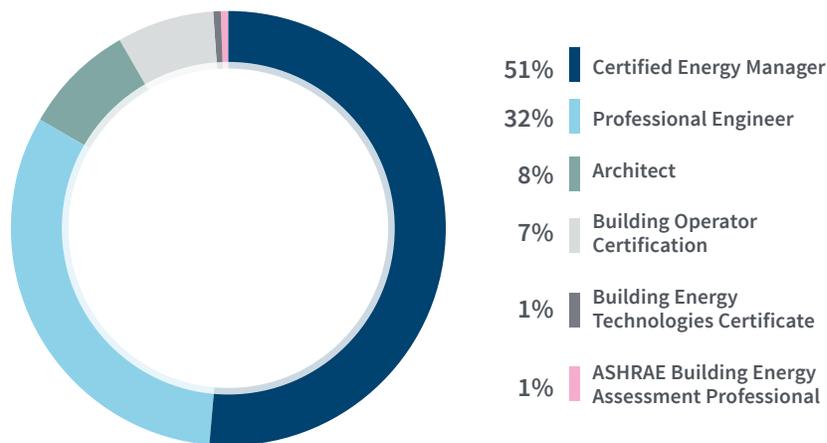
Based on specific policy goals and learning from other markets, Chicago Energy Benchmarking was the first municipal policy to require data verification by an individual who holds a City-recognized license or training credential.²⁴ City of Chicago-recognized credential programs must include training that covers benchmarking and the use of ENERGY STAR Portfolio Manager, as well as energy-efficient operations, measures, and technology.

Each covered property must ensure that an eligible data verifier reviews and signs off on reported benchmarking information in the first year of required reporting and every third year thereafter. Data verification takes the form of a signed Data Verification Checklist, a standard report generated automatically by the ENERGY STAR Portfolio Manager tool.²⁵ Covered properties are not required to submit the signed Checklist, but they are required to include data verifier contact and credential details in the Property Notes field of their reported ENERGY STAR Portfolio Manager data. The ordinance requires covered properties to maintain benchmarking and data verification records for three years

and to produce a copy of the signed Data Verification Checklist upon request by the City. Data verifiers are not required to be third-party professionals, and verification may be completed by in-house personnel. Figure 6 shows the breakdown of reported 2015 data verifier credentials.

In 2015, more than 60 properties totaling 8.9 million square feet (including faith-based groups, nonprofit organizations, and other buildings in-need) received pro-bono data verification support from volunteer energy professionals and service providers. See page 13 for more details on pro-bono Chicago Energy Benchmarking building support.

Figure 6: Credentials Used for 2015 Data Verification



24 As of 2015, the City of Chicago recognized six eligible data verifier licenses and training credentials, including: Building Operator Certification (BOC) - Midwest Energy Efficiency Alliance; Building Energy Technology Certificate (BET) - City Colleges of Chicago; Building Energy Assessment Professional Certification (BEAP) - ASHRAE; Certified Energy Manager Certification (CEM) - Association of Energy Engineers; Professional Engineer (PE) - State of Illinois; Licensed Architect - State of Illinois; see www.CityofChicago.org/EnergyBenchmarking for additional information

25 Verifiers are not required to complete the Indoor Environmental Standards section of the Data Verification Checklist, but are required to complete all other sections

DATA QUALITY

2015 Chicago Energy Benchmarking implementation included four specific efforts to ensure high levels of reported data quality, including:

- 1 Extensive outreach, guidance materials, training, and building support (described in more detail on page 10);
- 2 The Chicago Energy Benchmarking data verification requirement (described earlier);
- 3 Use of new data quality alerts provided by ENERGY STAR Portfolio Manager; and
- 4 Customized follow-up messages from the Chicago Energy Benchmarking Help Center sent to properties that submitted questionable data.

In 2015, the U.S. EPA created several new user-facing alerts in the ENERGY STAR Portfolio Manager benchmarking tool to flag common data quality problems, such as missing utility data or missing square footage information. Using these alerts and other data quality screens, the Chicago Energy Benchmarking Help Center, operated by Elevate Energy, sent customized emails to every property after their reports were submitted, and described any data quality issues, along with instructions on how to review and correct any issues. Approximately half of the properties that received emails regarding data quality corrected and resubmitted their reports, or confirmed the data in their initial report were correct. Properties with no alerts or data quality issues received an email confirming their complete 2015 benchmarking submission.

Despite implicit challenges in assessing the accuracy of a newly-generated dataset, Chicago Energy Benchmarking analysis suggests generally high levels of data quality. In 2015, only 9% of analyzed

properties reported estimated energy data. Also, only 5% of analyzed properties used temporary energy values. About 40% of analyzed properties reported default property attributes (as permitted by Chicago's ordinance), but many of these defaults applied to inputs that were not required by the Chicago Energy Benchmarking Ordinance (such as water use).

A total of 1,549 properties that were required to report in 2015 submitted ENERGY STAR Portfolio Manager data by September 24, 2015.²⁶ Of these 1,549 properties, 98 (6%), were excluded from data analysis, including 18 properties (1%) that reported no electricity data, and 80 properties (5%) with extremely high or extremely low energy use or ENERGY STAR scores.²⁷ However, not all of the properties with extreme values have data quality issues; some of these properties simply have unusually high or low energy use. Subsequent analysis in this report focuses on energy data for the remaining 1,451 properties, 1,123 of which were also eligible to receive 1-100 ENERGY STAR scores.

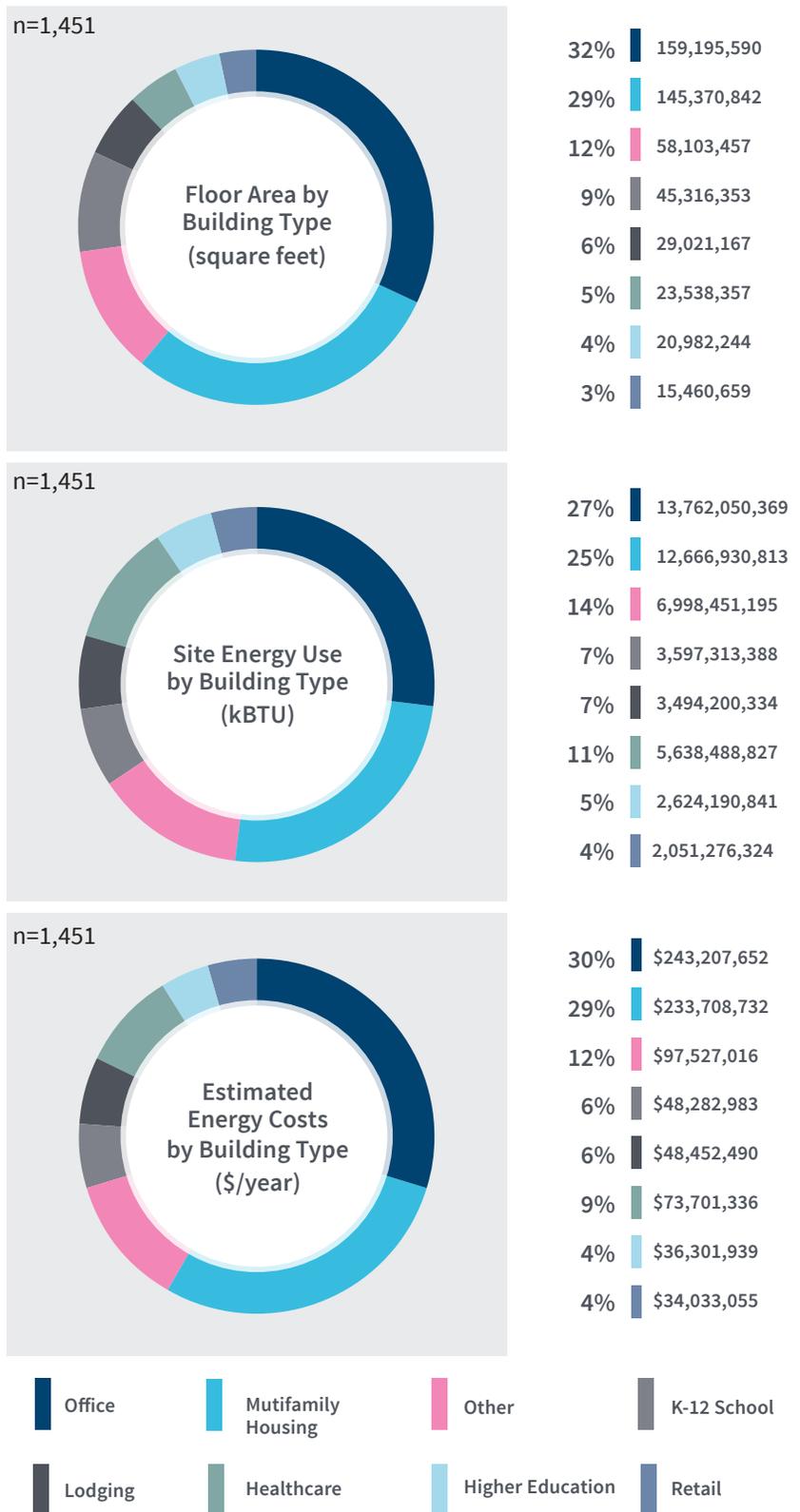
²⁶ An additional 51 properties submitted data between 9/24/2015 and 11/1/2015; these are included in the overall 2015 reporting rate but excluded from detailed analysis

²⁷ Please see the Appendix for a full explanation of the analysis methodology, including methodology for removal of extreme values

OVERVIEW OF PROPERTIES ANALYZED IN 2015

Figure 7 shows a breakdown of total floor area, energy use, and estimated energy cost for all analyzed properties,²⁸ by building sector. Chicago’s benchmarking ordinance covered multifamily and lodging sectors for the first time in 2015, and this report includes new sector-specific analysis of retail buildings (which were included among “other” properties in 2014). The total energy use of all analyzed properties represents approximately 20% of citywide energy use.

Figure 7: Floor Area, Total Energy Use, and Energy Costs by Building Sector



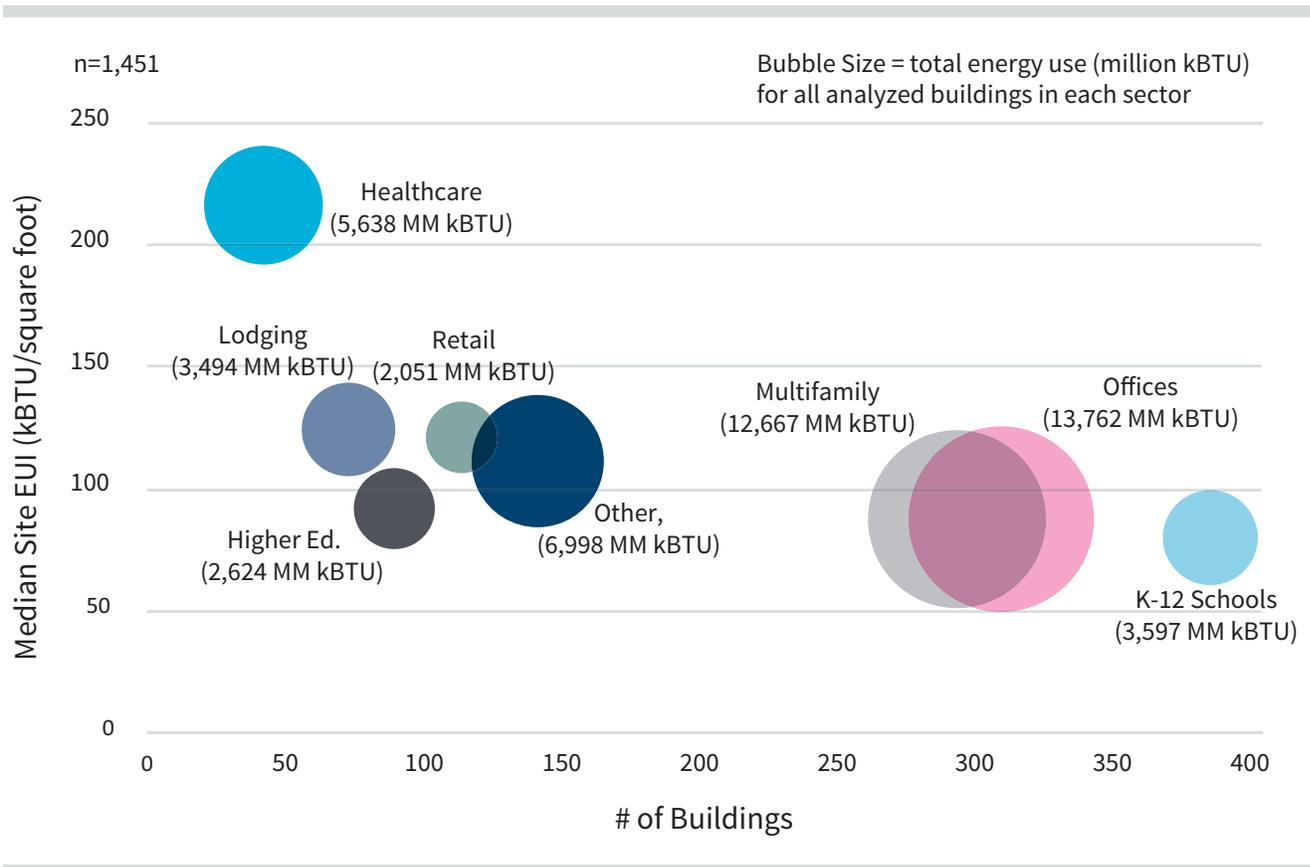
28 “Analyzed properties” includes 1,451 properties that submitted information by September 24, 2015

2015 ANALYSIS & FINDINGS

An overview of reporting properties by building sector (including the total number of properties, median energy use intensity, and total site energy use) is provided in Figure 8. K-12 schools had the largest number of properties with 27% of reporting facilities, but these properties had relatively low energy intensity compared to other building sectors. The building sectors with the greatest square footage represented in 2015 reported data - office and multifamily - together comprised 42% of reporting buildings and 55% of total site energy use.

Energy performance and other key energy metrics varied greatly by building sector, similar to the results found in the 2014 Chicago Energy Benchmarking Report. Some of these key terms and metrics are described in more detail below, along with more detailed descriptions of the performance within each building sector (refer to Appendix, Table 2 for more information).

Figure 8: Median EUI and Total Site Energy by Number of Buildings for Each Building Sector



OVERALL ENERGY PERFORMANCE

Of 1,451 analyzed properties, 1,123 received an ENERGY STAR rating, which is provided on a scale of 1-100, with 50 indicating the national median level of energy performance and 100 indicating extremely high performance.²⁹ The 1-100 ENERGY STAR rating controls for variations in climate, building space uses, operating characteristics, and other use-specific building attributes. The U.S. EPA continues to provide ENERGY STAR scores for additional property types as new datasets become available; for example, the EPA made the 1-100 ENERGY STAR score available for multifamily housing in 2014.

The 2015 Chicago median ENERGY STAR score was 58 for all building sectors (Figure 9), which is 16% higher than the national median of 50. Chicago property scores, however, varied greatly by sector. Properties in some building sectors (including offices, K-12 schools, retail, and ‘other’) reported median ENERGY STAR scores above the national median, and others (including multifamily, lodging, and healthcare) reported median scores below national medians (see Figure 10).

Properties with scores of at least 75 may be eligible for national recognition by the U.S. EPA as ENERGY STAR-certified properties.

Although some facilities are ineligible to receive 1 to 100 ENERGY STAR scores, these buildings can still benefit from tracking and reporting other energy performance metrics. In fact, a property’s most useful benchmark is its own energy use over time.

Figure 9: ENERGY STAR Score Distribution (All Building Sectors)

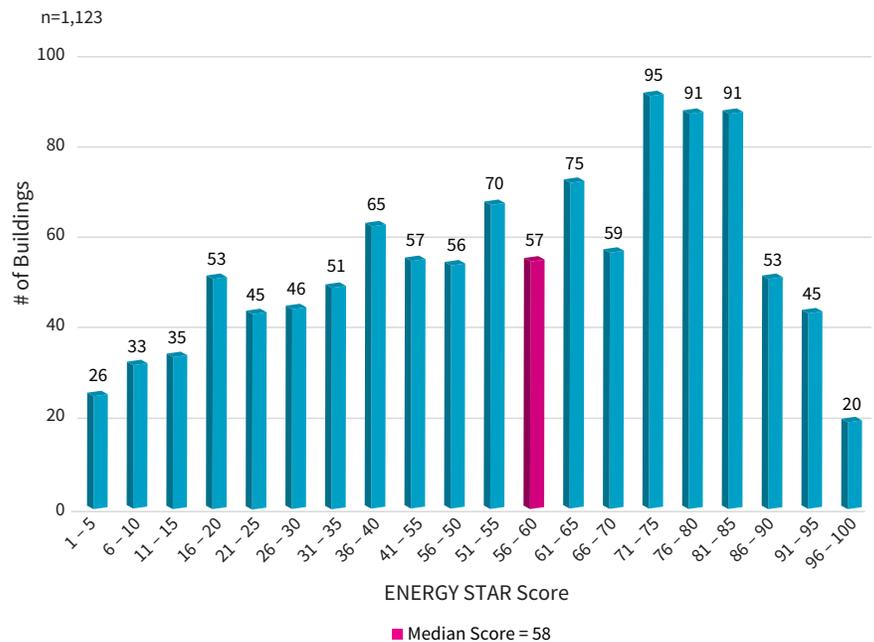
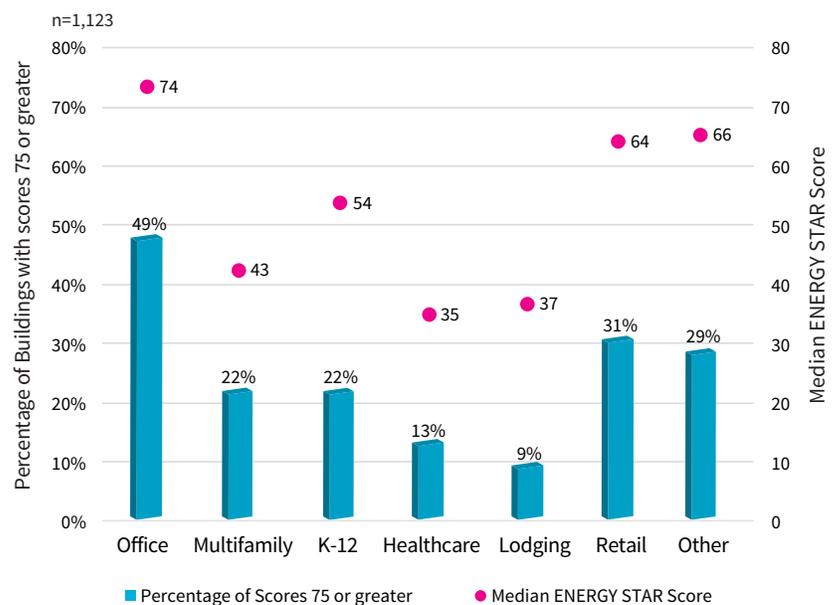
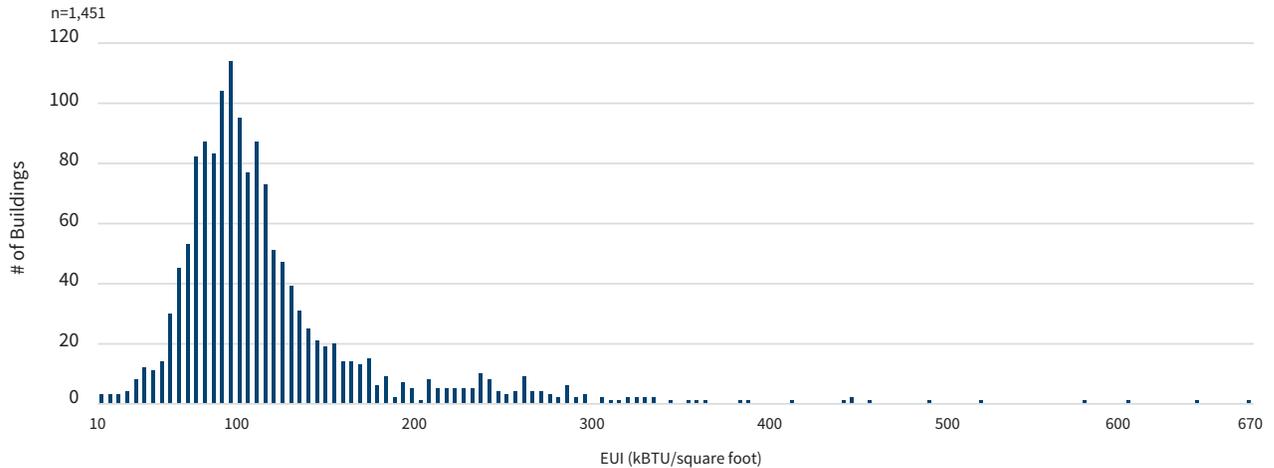


Figure 10: ENERGY STAR Scores by Building Sector



29 The remaining 328 properties included in the data analysis are some of the less-common property types that are not currently eligible to receive an ENERGY STAR score

Figure 11: Site EUI Distribution



One performance metric that can be tracked for all property types is energy use intensity (EUI), calculated as total annual energy consumption per square foot of floor area. For the 1,451 analyzed buildings, the median site EUI was 83 kBTU per square foot. 2015 reported data suggest that Chicago’s most energy-intensive buildings used up to eight times more energy per square foot than the median. Many of these high energy-intensity buildings are in sectors that typically use more

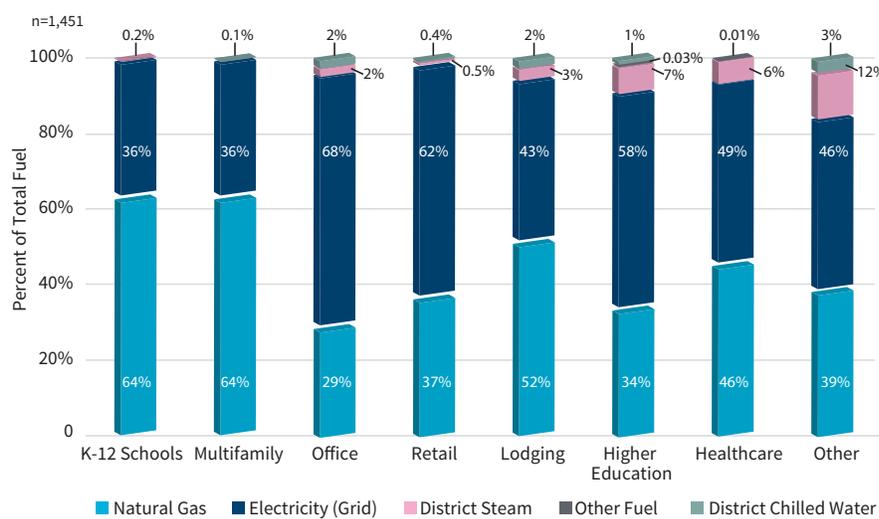
energy, such as healthcare, “other” property types such as laboratories, and data centers.

Fuel Mix

Fuel mix — the percentage of a building’s energy use provided by different energy sources (electricity, natural gas, etc.) — varied by building sector (Figure 12). For example, offices had a relatively low portion of energy from natural gas, at only 30%, in part due to

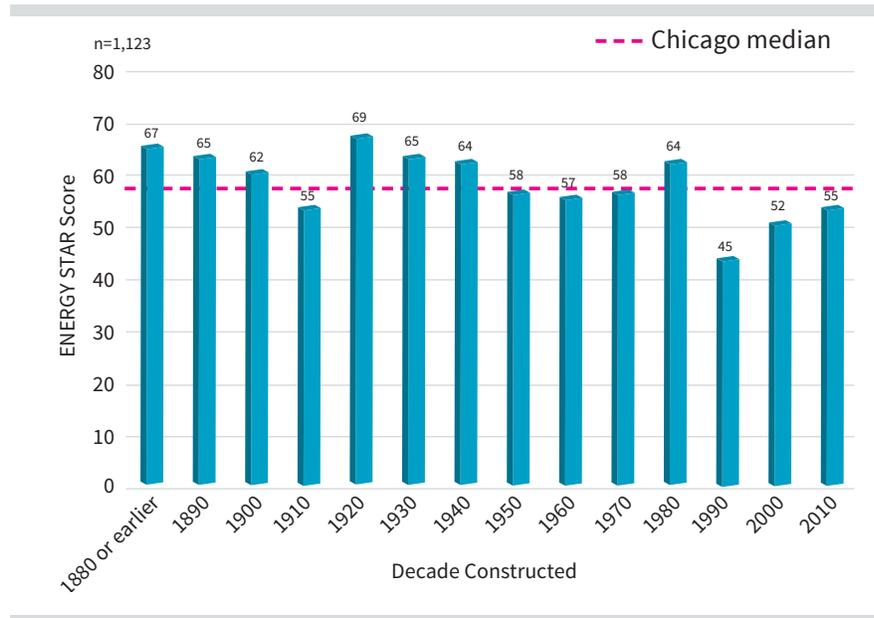
the high prevalence of all-electric office buildings, which make up about a third of all reporting offices. In contrast, K-12 schools and multifamily buildings used natural gas for approximately 60% of total energy use and few of these properties rely solely on electricity. Fuel mix directly impacts energy costs, as well as greenhouse gas emissions associated with building energy use.

Figure 12: Average Fuel Mix by Building Sector



ENERGY EFFICIENCY PROGRAM DESIGNERS AND POLICY MAKERS: FUEL MIX RESULTS COULD BE USED TO DEVELOP TARGETED ENERGY ANALYSES, ENERGY CONSERVATION MEASURES, AND BUILDING SUPPORT EFFORTS TO MATCH FUEL MIX.

Figure 13: ENERGY STAR Scores by Decade of Construction



Property Age

2015 reported data showed no statistical correlation between property age and energy performance.

Figure 13 depicts comparatively high median ENERGY STAR scores (suggesting higher energy performance) for buildings constructed before 1950, but individual property analysis reveals high and low performers among buildings of every age.

Figure 14 displays higher source EUI among newer properties than their older counterparts, which likely results from a higher share of electricity in the fuel mix of properties constructed since 1970. Site EUI (which excludes transmission losses) has no evident correlation with building age.

Figure 14: Median EUI by Decade of Construction

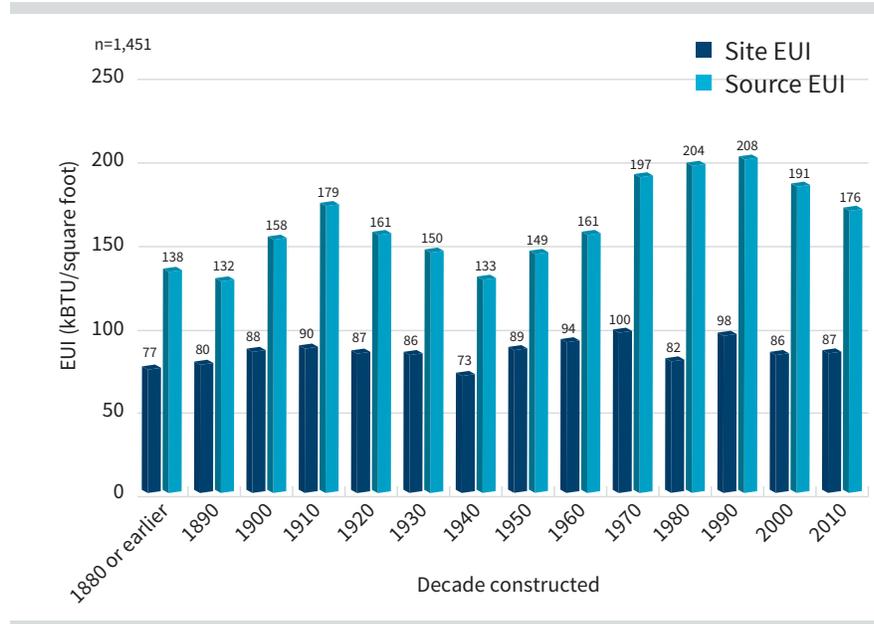
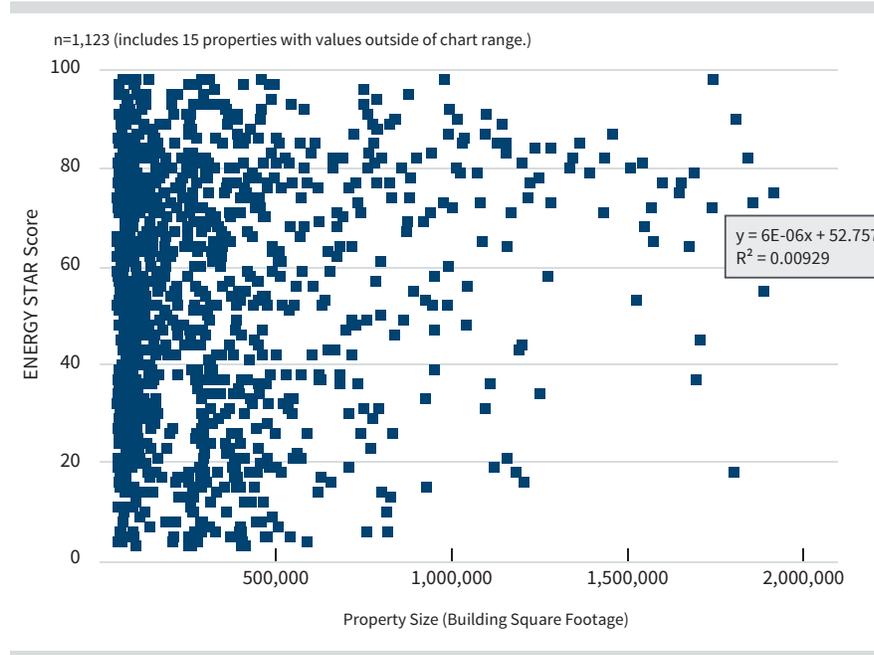


Figure 15: Median ENERGY STAR Scores by Property Size



Property Size

2015 reported data showed no statistical correlation between property size and ENERGY STAR score (Figure 15), Site EUI, or Source EUI (Figure 16). This reinforces last year’s preliminary finding based on 2013 energy use and building data.

Figure 16: Site and Source EUI by Property Size

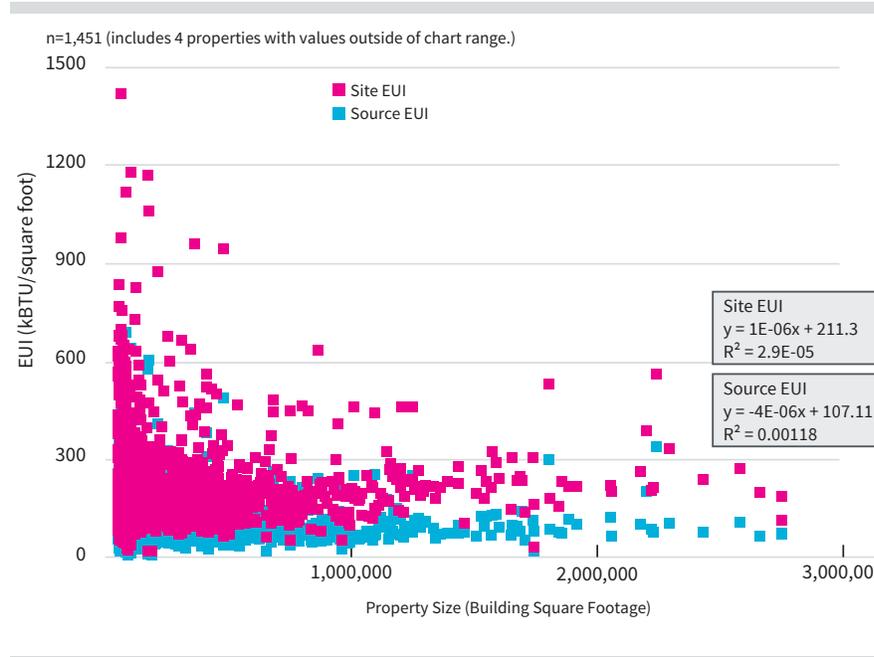
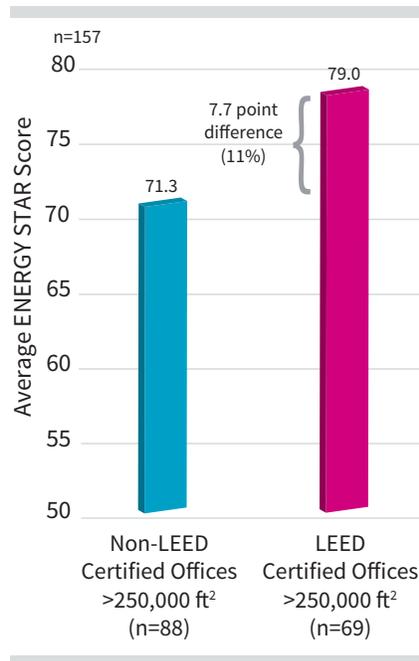


Figure 17: Average ENERGY STAR Scores for LEED-Certified and Non-LEED Certified Reporting Properties



Green Building Certifications – LEED & ENERGY STAR

Leadership in Energy and Environmental Design (LEED) is one of the most widely-recognized property certifications for sustainable design and operations, including energy efficiency.³⁰ Although LEED Certification is available for numerous property types, it is especially common among Chicago’s largest office buildings. Among 157 office properties larger than 250,000 square feet that reported benchmarking data in 2015, 69 achieved LEED certification within the last 10 years. With an average ENERGY STAR score of 79, these LEED-certified buildings outperformed similar non-certified properties by 11% (Figure 17). While many factors impact LEED certification, higher ENERGY STAR scores among certified properties provide quantitative evidence in support of green building goals.

Of the 1,123 reporting properties that received 1-100 ENERGY STAR scores in 2015, 322 scored at least 75, making them potential candidates for ENERGY STAR certification. However, only 101 of those properties (32%) actually received the ENERGY STAR designation in 2014 or 2015, which suggests opportunity for national recognition among the remaining 221 facilities.

Trend Analysis

Data from the properties required to report in both 2014 and 2015, which includes the nonresidential

buildings larger than 250,000 square feet, provide an opportunity to analyze energy use trends from January 2013 – December 2014 in a portion of Chicago’s largest facilities.

Analysis of 212³¹ properties shows a decrease in total weather-normalized³² site energy use of 1.6%, indicating a slight increase in energy efficiency from calendar year 2013 to calendar year 2014. However, these results should be considered preliminary, due to the small sample size of properties with multi-year energy data. Future benchmarking reports will provide additional insights into the energy performance of Chicago’s buildings over time.

Cross-City Comparison

Reported Chicago building energy performance was generally in-line with national medians and with results from other cities with benchmarking ordinances, including Boston, New York City, Philadelphia, and Washington, D.C. Sector-specific median performance among buildings of similar sizes and space uses, however, varied significantly across cities that have published individual building energy performance data (Figure 18).³³

For example, median ENERGY STAR scores for the healthcare and retail sectors across these five cities ranged from 29-59 (healthcare) and 40-75 (retail). In other building sectors, median scores showed less variability. Among office buildings, median ENERGY STAR scores in all five cities were higher than 70 and fell within a nine-point range (70-79), and median scores for lodging all fell within a 15 point range (33-48).³⁴

30 U.S. Green Building Council, Leadership in Energy and Environmental Design: <http://leed.usgbc.org/leed.html>

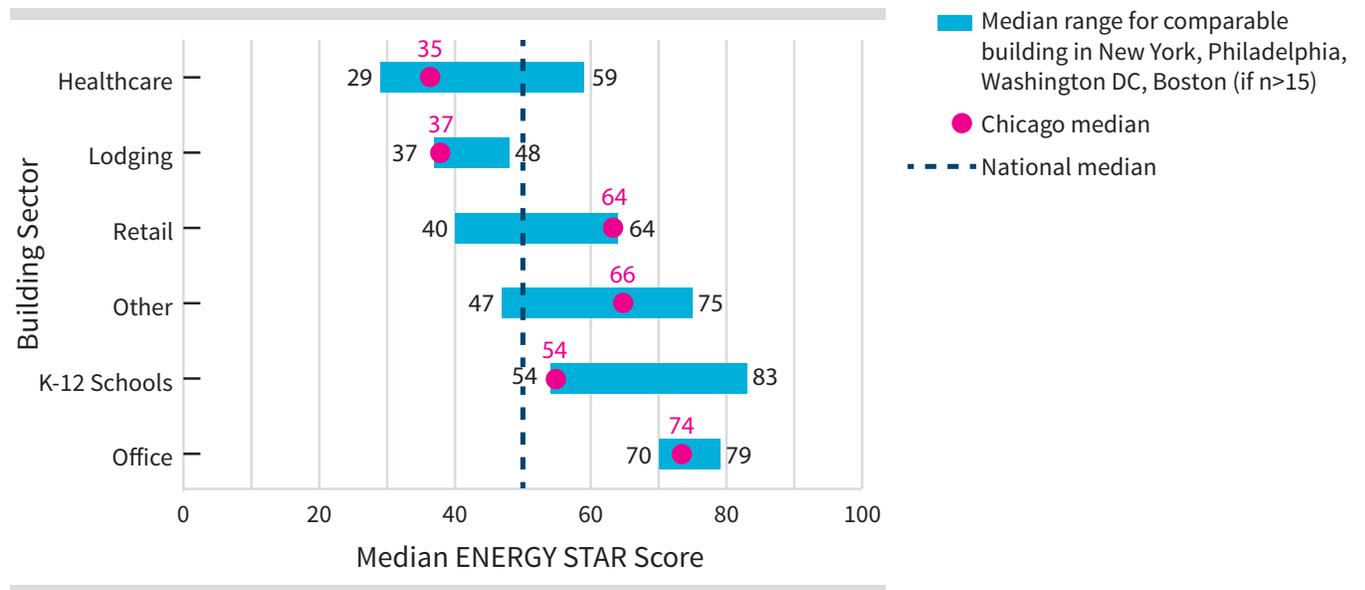
31 See Appendix page 54 for an explanation of the methodology for the trend analysis

32 Weather-normalized metrics control for weather variations such as an unusually hot summer, and allow for easier comparisons of energy use over time

33 The multifamily and higher education building sectors are not included in Figure 18. Properties in the higher education sector are not eligible to receive ENERGY STAR scores. Also, most other cities with benchmarking policies have not yet released data for the multifamily building sector because the ENERGY STAR score for this property type was not available until Fall 2014

34 For the full range of median scores and the number of properties included in each sector for the four cities, please see the Appendix

Figure 18: Range of Median ENERGY STAR Scores, by Sector, Based on Building Energy Use Benchmarking Data From Chicago, Boston, New York City, Philadelphia and Washington, DC



SAVINGS OPPORTUNITY

Detailed energy performance analysis showed that the least efficient properties within each building sector may use up to seven times the energy per square foot than the most efficient properties within that sector. This vast range of energy use intensities among similar facility types suggests that significant savings could result from improving Chicago’s most energy-intensive properties’ energy performance to match the median or 75th percentile intensity levels of other properties in the same sector.

Similar to 2014 Chicago analysis and calculations by other cities,³⁵ Chicago energy data imply the following savings potential among properties that reported in 2015:³⁶

- * 13–24% reduction in site energy use (total of 6.59–12.3 million MMBTU/year)
- * \$100–184 million in energy cost savings
- * 795,000–1,400,000 tons of avoided greenhouse gas emissions, equivalent to removing 167,000–306,000 cars from the road
- * Estimated energy efficiency investment of \$350–643 million³⁷
- * More than 2,000 jobs could result from investments to achieve these savings³⁸

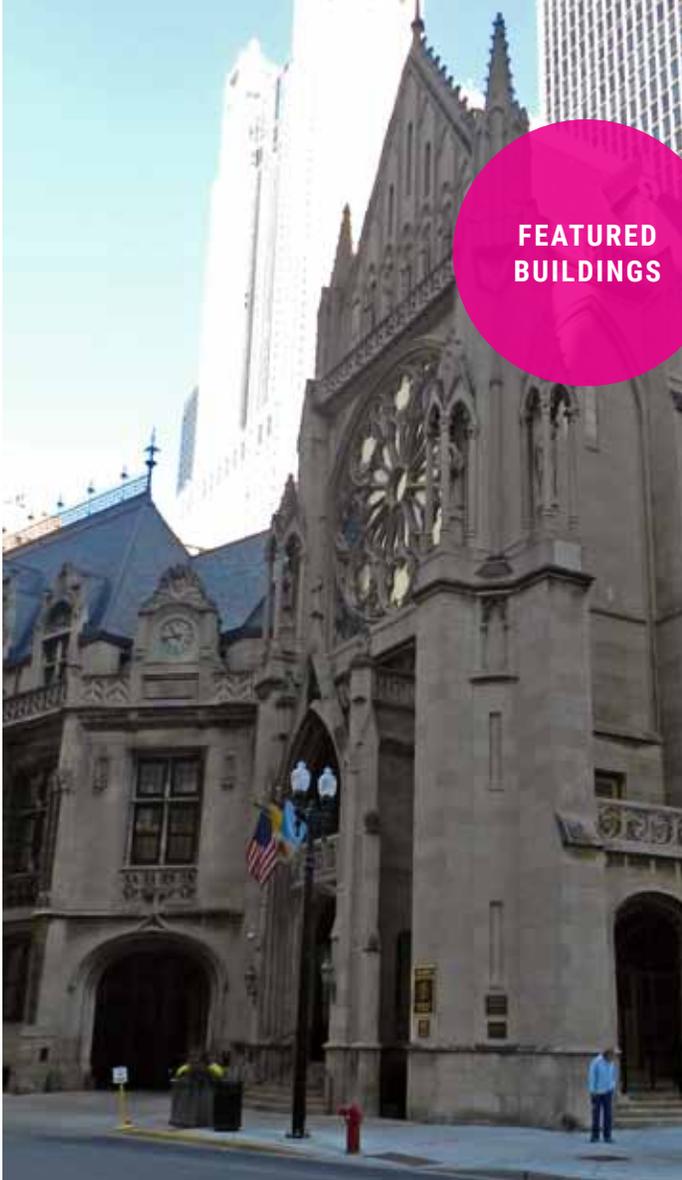
In addition to these savings projections, reducing the energy use intensity of high-performing properties by just 2% could yield an additional \$3.4 million in savings per year.

35 New York, Seattle, Philadelphia

36 Savings are based on comparisons of properties within each of the 85 ENERGY STAR Portfolio Manager property types. For example, Libraries are compared to other Libraries, Hospitals are compared to other Hospitals, etc.

37 Estimated energy efficiency investment results from multiplying potential energy cost savings by an investment multiplier of 3.5

38 Estimated jobs are based on an assumption that 50% of energy efficiency investments are used for labor costs. Labor costs are based on an estimated annual salary of \$70,000, informed by data from the U.S. Bureau of Labor Statistics.



FEATURED BUILDINGS

CATHOLIC ARCHDIOCESE of CHICAGO

“

The Catholic Archdiocese of Chicago considers environmental stewardship to be an important responsibility. In 2015, the Archdiocese began benchmarking for the first time and completed 18 properties covered by the Chicago Benchmarking Ordinance, partnering with the Pro-Bono Volunteer Program to complete data verification.

Already, the Archdiocese is using the benchmarking results to inform long-term facility planning and management, and to find short-term solutions to reduce energy usage and costs in the parishes.

Building upon this early success, the Archdiocese is now voluntarily benchmarking 700 properties that are not covered by the ordinance, and is the first Archdiocese in the U.S. with a goal of benchmarking all properties in its 2,700-building portfolio. The U.S. EPA estimates the Archdiocese, which has annual energy costs of \$30 million, may be able to save \$3 to \$9 million per year through best practices and ongoing energy benchmarking.”

– *The Catholic Archdiocese of Chicago*

ADDRESS

Multiple

NEIGHBORHOODS

15, including Ashburn, Auburn Gresham, Edison Park, Hyde Park, Humboldt Park, Lake View, Logan Square, Norwood Park, West Lawn, and others

CONSTRUCTED

1905 - 1992

BUILDING OWNER / MANAGER

Catholic Archdiocese of Chicago

ARCHITECT

Various

BUILDING SIZE

1,794,201 total square feet

NUMBER OF PROPERTIES

18

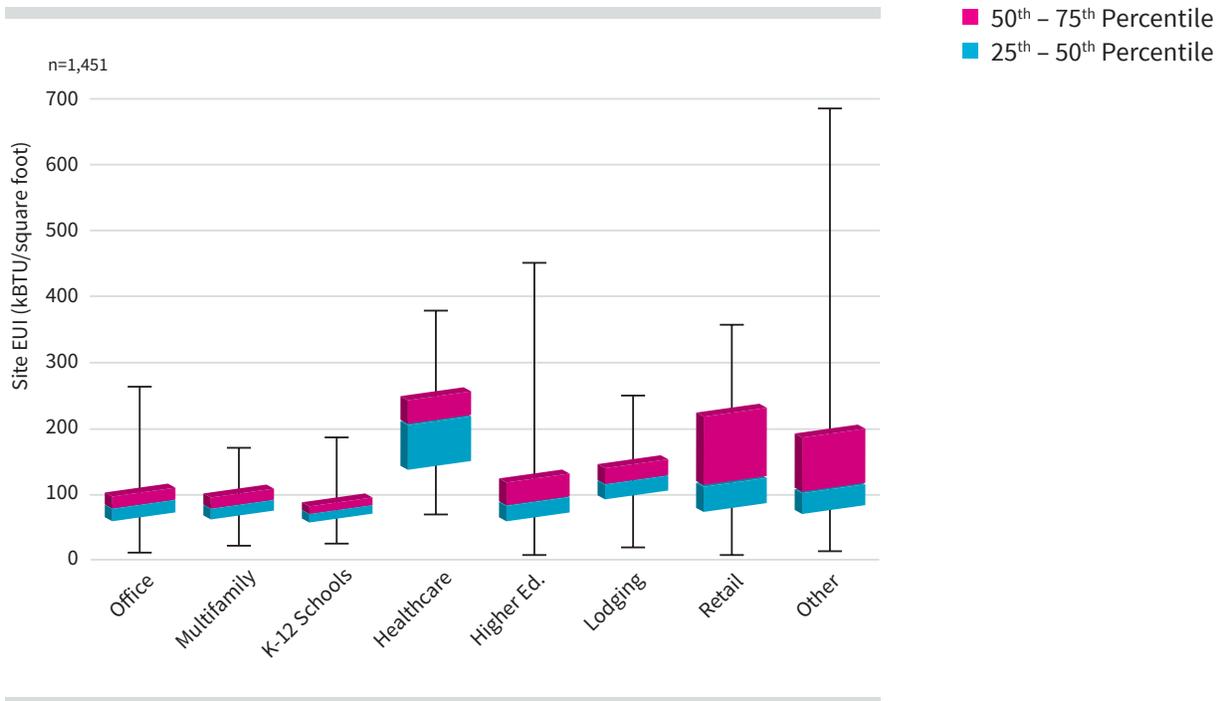


Above left: Quigley Building. Above (left to right): Nick Fernandez – RE Data Administrator and Jacob Preciado – Facilities Construction Manager.

Photos courtesy of Archdiocese of Chicago

SECTOR-SPECIFIC BUILDING ENERGY PERFORMANCE

Figure 19: Range of Site EUI by Building Sector



The following pages contain analyses of reported energy performance and property characteristics for each of the eight Chicago building sectors identified in this report. Figure 19 depicts the range of site energy intensities within each building sector, by quartiles. The blue and pink shaded bars indicate the range of energy use intensity within the second and third quartile for each building sector, with lines indicating the range of the first and fourth quartiles.

Several of the sectors, including offices, multifamily housing, and K-12 schools have limited range of EUI values, indicating the relative homogeneity of the energy use within these sectors. The healthcare, lodging, and 'other' building sectors show greater variability in EUIs. The higher education, healthcare, and 'other' building sectors also had higher maximum EUI levels, which is typical for the energy-intensive space uses in these property types.

A summary of the reporting properties and key findings about energy performance in each sector are provided below.

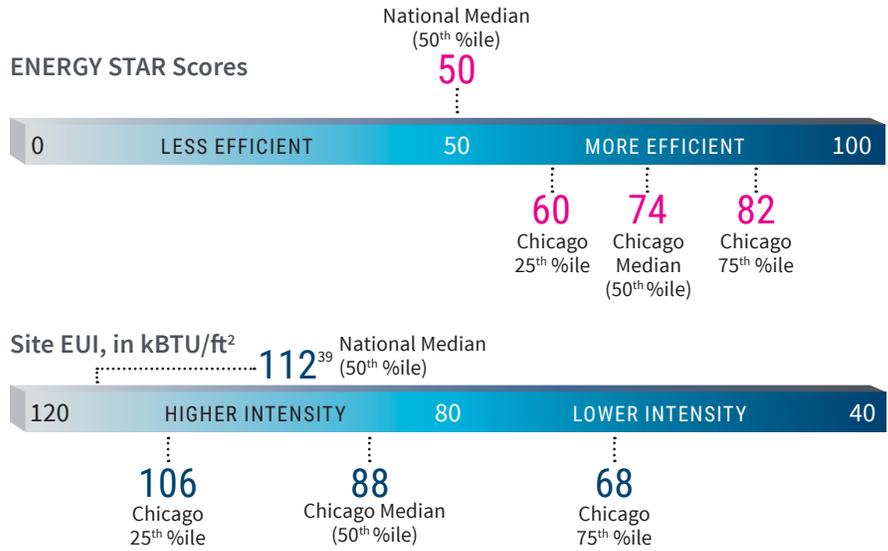
SECTOR-SPECIFIC BUILDING ENERGY PERFORMANCE

OFFICES

OF PROPERTIES: 310

TOTAL PROPERTY FLOOR AREA (EXCLUDING PARKING)
159,195,590 square feet

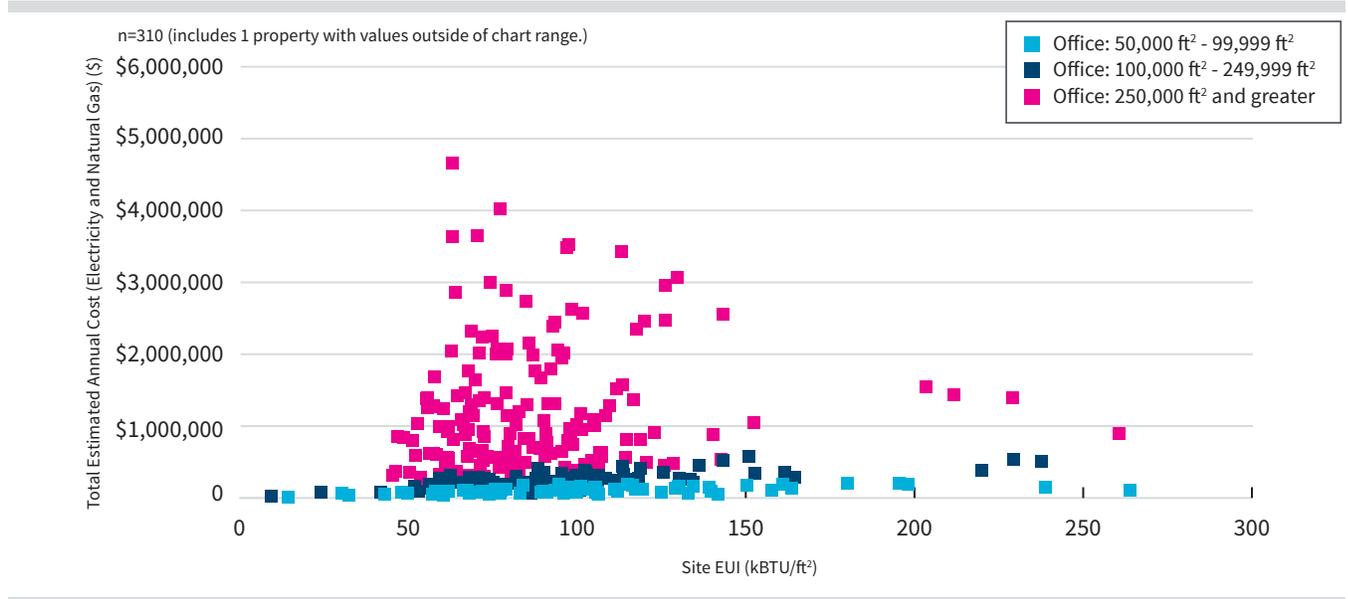
TOTAL 2014 GREENHOUSE GAS EMISSIONS
2,146,081 metric tons CO₂ equivalent



Chicago’s office sector reported performance that was higher than national levels and other Chicago properties, with the highest median ENERGY STAR score (74) of any Chicago building sector. 49% of offices also had ENERGY STAR scores of 75 or greater and may be eligible for ENERGY STAR certification.

Despite overall strong energy performance, the office sector included many underperforming properties. Some of these facilities include offices smaller than 100,000 square feet, which had a median ENERGY STAR score nine points lower than the median for all offices.

Figure 20: Site EUI and Estimated Energy Cost for Office Properties



39 The national median site EUI values for Offices and all other sectors in this report are the average of Portfolio Manager’s “National Median Site EUI” for all reporting Chicago properties included in the sector analysis

MARKET
PERSPECTIVE

ENERGY MANAGEMENT
OPPORTUNITIES FOR
COMMERCIAL REAL ESTATE

“

Because energy consumption represents the largest controllable operating expense for a commercial office building, benchmarking is an integral part of a successful energy management strategy. BOMA/Chicago provides resources to help member buildings use their energy consumption data to help drive energy efficiency, including information on the development of energy management strategies; energy audits and retro-commissioning studies to help pinpoint efficiency opportunities; and utility incentives to help defray the costs of efficiency projects. In addition to engaging buildings directly on energy use tracking, BOMA/Chicago has many affiliate members that support all phases of energy efficiency project planning and execution. Effective benchmarking demonstrates that monitoring monthly energy usage enables operators to make even better energy decisions. Beyond monthly energy tracking, BOMA/Chicago is also piloting the use of real-time, sub-metered energy data to accelerate new energy- and money-saving technologies.”

– Building Owners and Managers Association
of Chicago (BOMA/Chicago)

BOMA/Chicago (www.bomachicago.org) is a trade association that has represented the interests of the Chicago office building industry since 1902. Membership includes 247 commercial office, institutional and public buildings and 157 companies that provide commercial building services to support operational excellence. BOMA/Chicago members make up approximately 95 percent of downtown’s total rentable building area and 100 percent of rentable space in Class A buildings downtown.

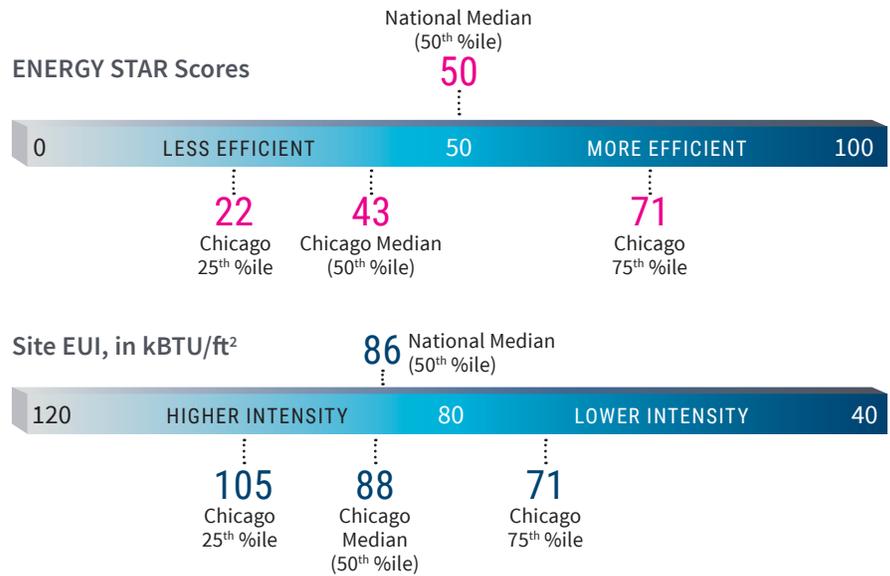
SECTOR-SPECIFIC BUILDING ENERGY PERFORMANCE

MULTIFAMILY HOUSING

OF PROPERTIES: 294

TOTAL PROPERTY FLOOR AREA (EXCLUDING PARKING)
145,370,842 square feet

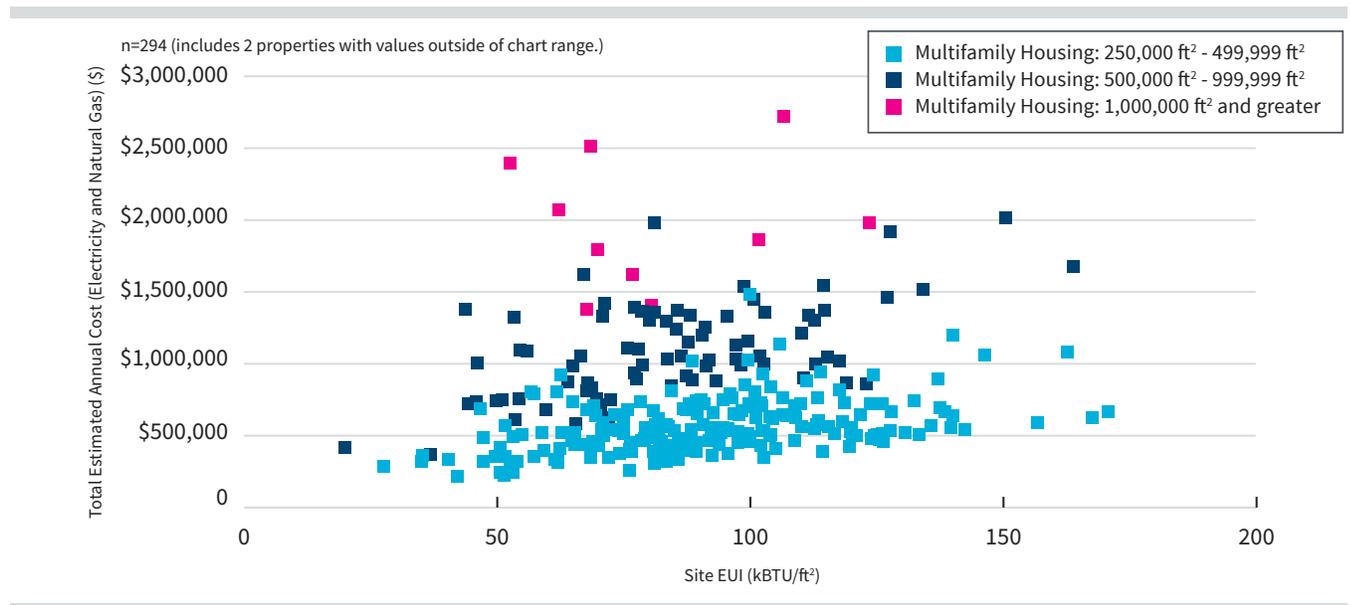
TOTAL 2014 GREENHOUSE GAS EMISSIONS
1,302,845 metric tons CO₂ equivalent



Multifamily properties larger than 250,000 square feet were required to benchmark, verify, and report for the first time in 2015, and multifamily properties larger than 50,000 square feet will be required to comply in 2016. This year's covered multifamily buildings reported energy performance slightly below the national median, with a median ENERGY STAR score of 43.

Some local multifamily buildings, however, demonstrated clear energy efficiency leadership. Three of the first 17 multifamily buildings in the U.S. to earn ENERGY STAR certification were located in Chicago, providing important case studies to other multifamily buildings seeking to improve energy performance.⁴⁰

Figure 21: Site EUI and Estimated Energy Cost for Multifamily Properties



40 For more details, see: <http://yosemite.epa.gov/opa/admpress.nsf/0/F991A0E771FB375D85257D8F00563D5D>

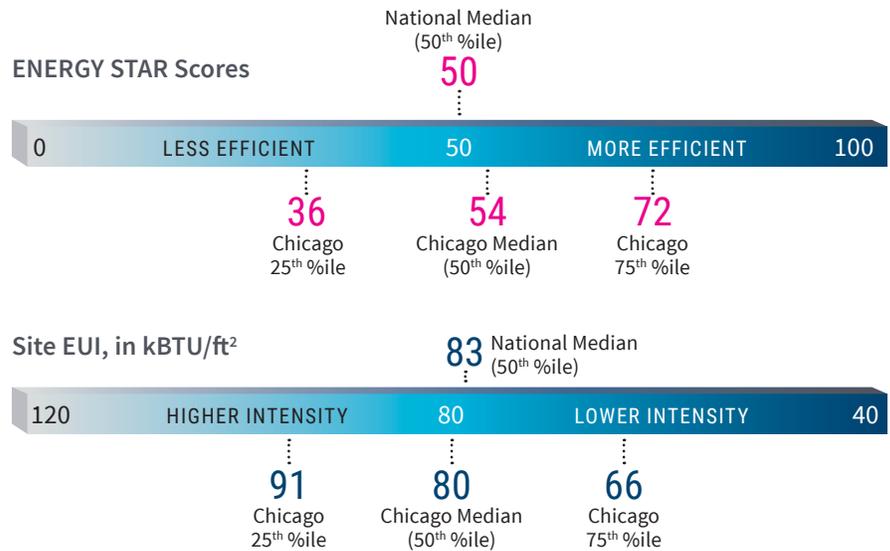
SECTOR-SPECIFIC BUILDING ENERGY PERFORMANCE

K-12 SCHOOLS

OF PROPERTIES: 386

TOTAL PROPERTY FLOOR AREA (EXCLUDING PARKING)
45,316,353 square feet

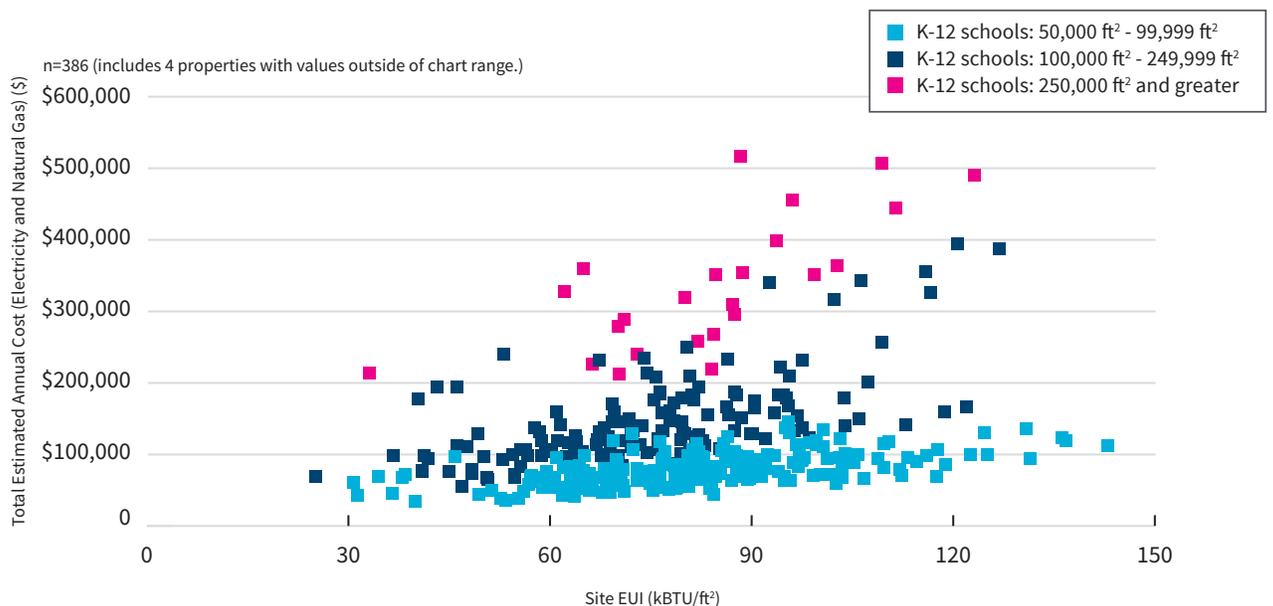
TOTAL 2014 GREENHOUSE GAS EMISSIONS
377,165 metric tons CO₂ equivalent



Chicago’s K-12 school properties are typically smaller, older, and slightly less energy-intensive than properties in other building sectors. Comprising more than a quarter (27%) of all reporting buildings, K-12 schools represented only about 7% of total site energy use.

K-12 schools were performing at about the national median, with a median ENERGY STAR score of 54. However, approximately 45% of all K-12 schools received a score of 50 or less, indicating there is significant opportunity to continue improving the performance of these properties.

Figure 22: Site EUI and Estimated Energy Cost for K-12 School Properties



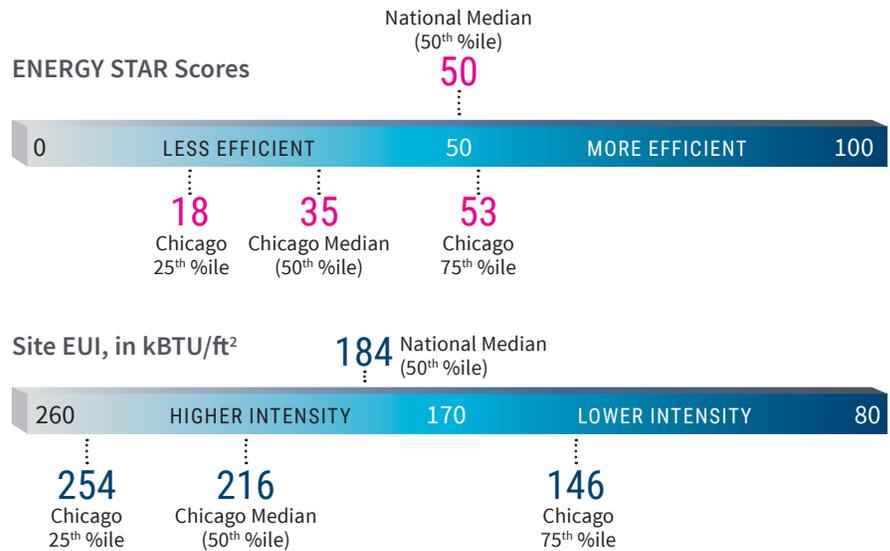
SECTOR-SPECIFIC BUILDING ENERGY PERFORMANCE

HEALTHCARE

OF PROPERTIES: 42

TOTAL PROPERTY FLOOR AREA (EXCLUDING PARKING):
23,538,357 square feet

TOTAL 2014 GREENHOUSE GAS EMISSIONS:
644,603 metric tons CO₂ equivalent



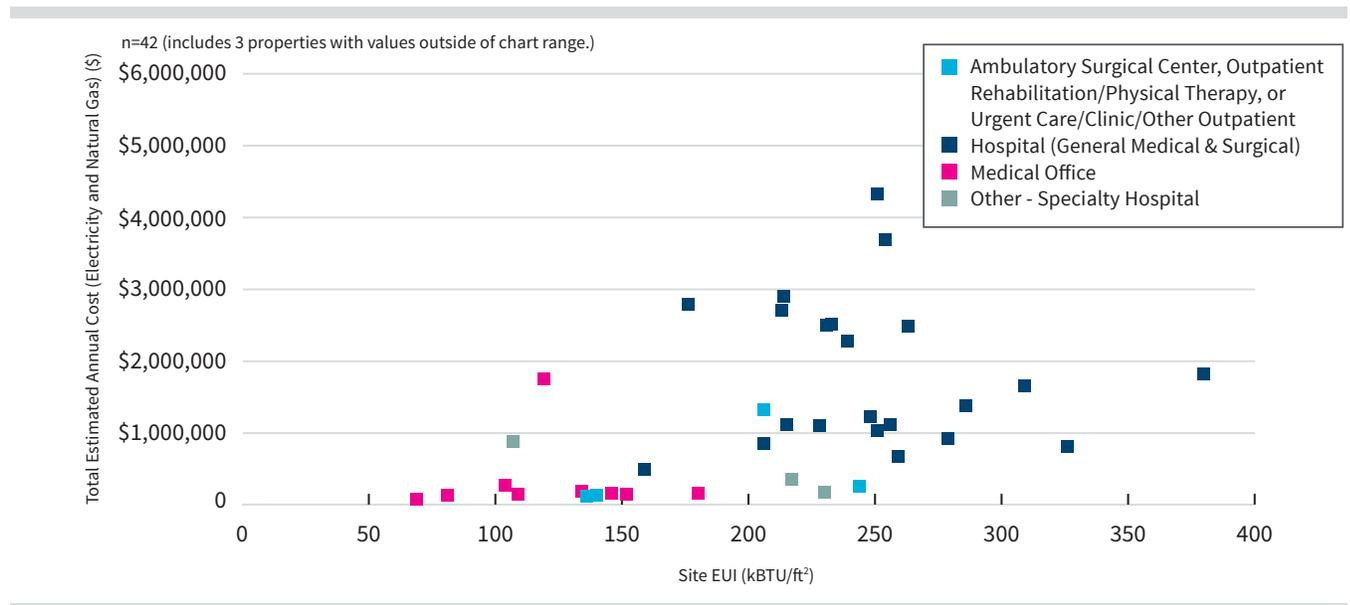
Representing 5% of total reported property floor area and 11% of total reported site energy use, Chicago's healthcare sector (which includes medical offices, hospitals, surgical centers, urgent care clinics, and other healthcare facilities specified in ENERGY STAR Portfolio Manager) includes many of Chicago's most energy-intensive properties. Energy use in hospitals, which comprised 21 of the 42

reported Chicago healthcare sector properties, accounted for unique equipment use in these facilities (e.g. number of MRI machines) and staffed beds per square foot, along with other building and operating characteristics.⁴¹

Overall, Chicago's healthcare properties reported lower energy performance than the national median for similar facilities, with a Chicago median ENERGY STAR score

of 35. Within this group, medical offices reported a median ENERGY STAR score of 26, (10 points below the overall Chicago healthcare median). Chicago data for medical offices also reflected a national trend; the average ENERGY STAR score among all 5,422 medical offices using ENERGY STAR Portfolio Manager nationwide is 41, which suggests widespread improvement potential for this property type.⁴²

Figure 23: Site EUI and Estimated Energy Cost for Healthcare Properties



41 ENERGY STAR Data Trends – Energy Use in Hospitals: https://www.energystar.gov/sites/default/files/tools/DataTrends_Hospital_20150129.pdf
 42 ENERGY STAR Data Trends – Energy Use in Medical Offices: https://www.energystar.gov/sites/default/files/tools/DataTrends_MOB_20150129.pdf

SECTOR-SPECIFIC BUILDING ENERGY PERFORMANCE

HIGHER EDUCATION

OF PROPERTIES: 90

TOTAL PROPERTY FLOOR AREA (EXCLUDING PARKING)
20,982,244 square feet

TOTAL 2014 GREENHOUSE GAS EMISSIONS
310,697 metric tons CO₂ equivalent

Note: ENERGY STAR Portfolio Manager does not calculate ENERGY STAR Scores for property types within the higher education sector.



Chicago's higher education facilities showed a wide range of energy intensities, reflecting the variety of activities housed in these buildings. Based on EUI metrics, these properties appeared to be performing better than the national median level.

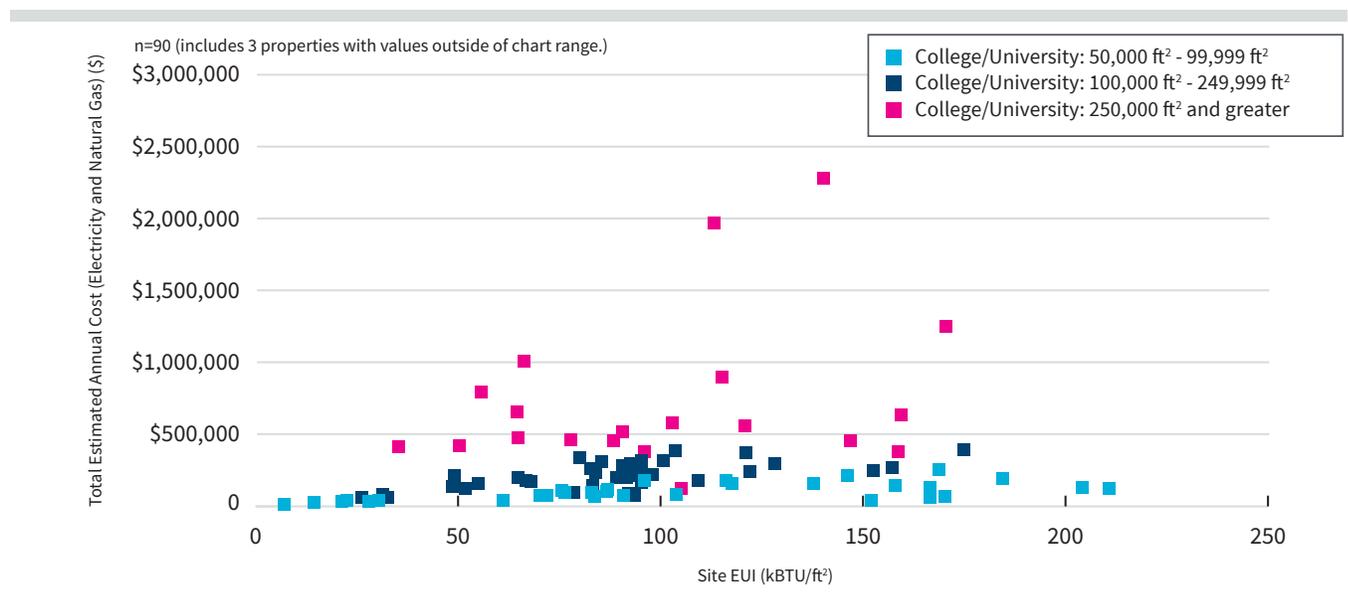
Many of Chicago's colleges and universities have joined the Alliance to Retrofit Higher Education (ARCH) Initiative, a collaborative

developed in 2012 through the Global Philanthropy Partnership and local energy experts to identify and deploy best practices in energy management, with support from the Joyce Foundation, the Comer Foundation, and the Chicago Community Trust.⁴³

The ARCH initiative has found that most new construction or deep renovations in this sector are highly energy efficient, but many older, existing facilities provide

great opportunities for energy reductions. Another finding from the ARCH initiative is the importance of tailoring solutions for different types of institutions; for example, large research institutions, small private universities, and community colleges each have varying needs and savings potential. Finally, ARCH has discovered that collaboration among institutions, with support from local government and utilities, can produce significant energy reductions.⁴⁴

Figure 24: Site EUI and Estimated Energy Cost for Higher Education Properties



43 Information on the ARCH Initiative from Driving Efficiency in Legacy Buildings on University Campuses, a case study by Joel Freehling: <http://stateenergyreport.com/2015/02/12/driving-efficiency/>

44 Driving Energy Efficiency Through Higher Education Collaboration: <http://www.global-philanthropy.org/wp-content/uploads/2015/10/Driving-EE-Through-Higher-Ed-Proof-09.pdf>

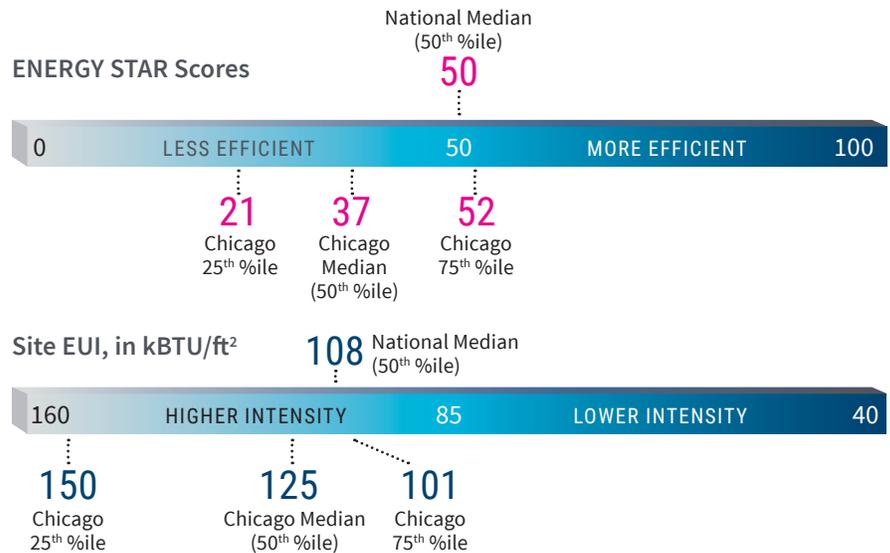
SECTOR-SPECIFIC BUILDING ENERGY PERFORMANCE

LODGING

OF PROPERTIES: 73

TOTAL PROPERTY FLOOR AREA (EXCLUDING PARKING)
29,021,167 square feet

TOTAL 2014 GREENHOUSE GAS EMISSIONS
399,777 metric tons CO₂ equivalent



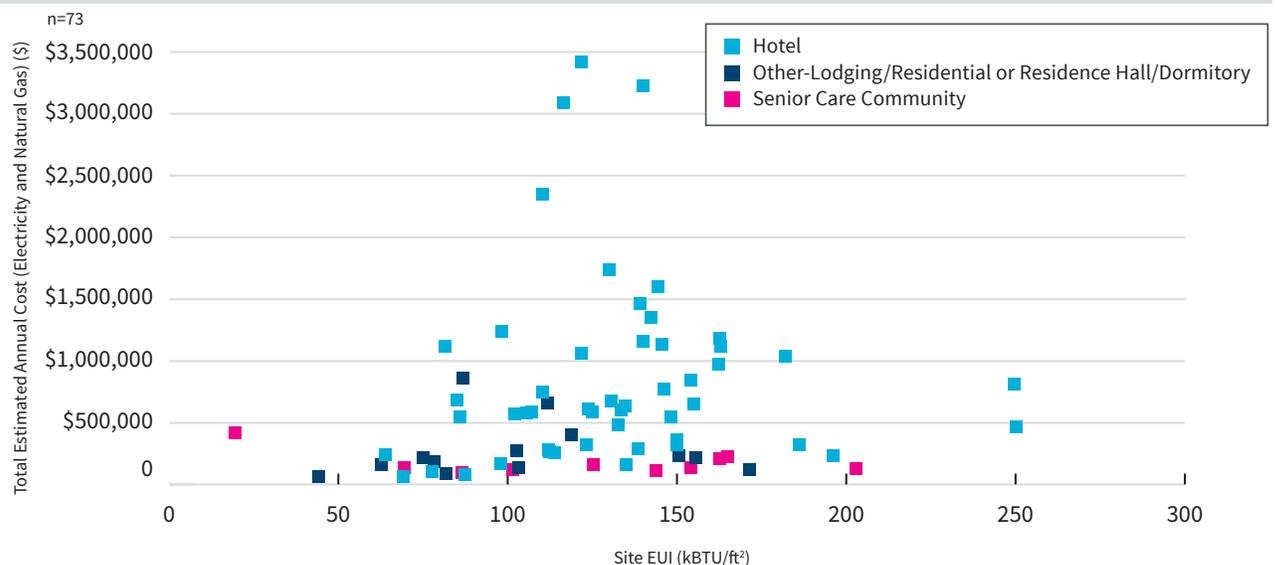
Approximately two-thirds of the properties in the lodging sector are hotels, and the remaining properties include senior care communities, residence halls/dormitories, and other types of housing. With an overall median ENERGY STAR score of 37, the lodging sector performed well below national and Chicago medians. The subgroup of Chicago properties with the best performance in this sector was the residence halls, with

a median score of 54, followed by hotels (median score of 37) and senior care communities (median score of 19). The data on residence halls/dormitories mirror national trends; on average, residence halls tend to consistently score higher than 50, the national median for all properties.⁴⁵

The 50 hotels in this sector have over 24,000 guest rooms available, a

significant portion of Chicago's hotel industry - Choose Chicago currently tracks an estimated 39,000+ rooms.⁴⁶ Chicago is also among the top three U.S. cities for hotel room demand and occupancy, with demand growth as high as 7.6% per quarter.⁴⁷ Implementing additional cost-effective energy efficiency solutions in this sector will continue to increase the competitiveness of Chicago's hospitality industry by cutting monthly utility bills.

Figure 25: Site EUI and Estimated Energy Cost for Lodging Properties



45 ENERGY STAR Data Trends – Energy Use in Residence Halls / Dormitories:

https://www.energystar.gov/sites/default/files/tools/DataTrends_Dormitory_20150129.pdf

46 Choose Chicago. Current Chicago Hotel Supply: <http://www.choosechicago.com/articles/view/Current-Chicago-Hotel-Supply-/73/>

47 Choose Chicago. "Mayor Emanuel and Choose Chicago Announce Record Tourism Demand for First Quarter 2015." April 22, 2015:

<http://www.choosechicago.com/articles/view/MAYOR-EMANUEL-AND-CHOOSE-CHICAGO-ANNOUNCE-RECORD-TOURISM-DEMAND-FOR-FIRST-QUARTER-2015/1504/>

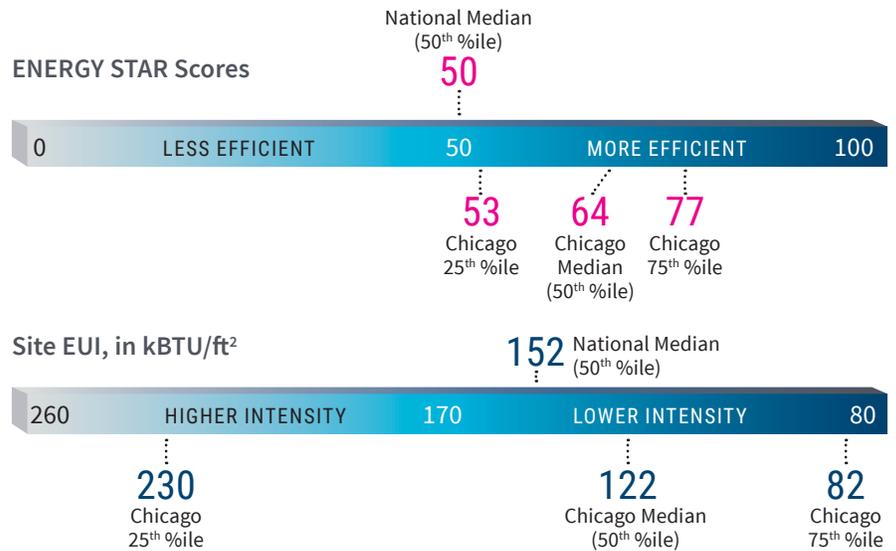
SECTOR-SPECIFIC BUILDING ENERGY PERFORMANCE

RETAIL

OF PROPERTIES: 114

TOTAL PROPERTY FLOOR AREA (EXCLUDING PARKING)
15,460,659 square feet

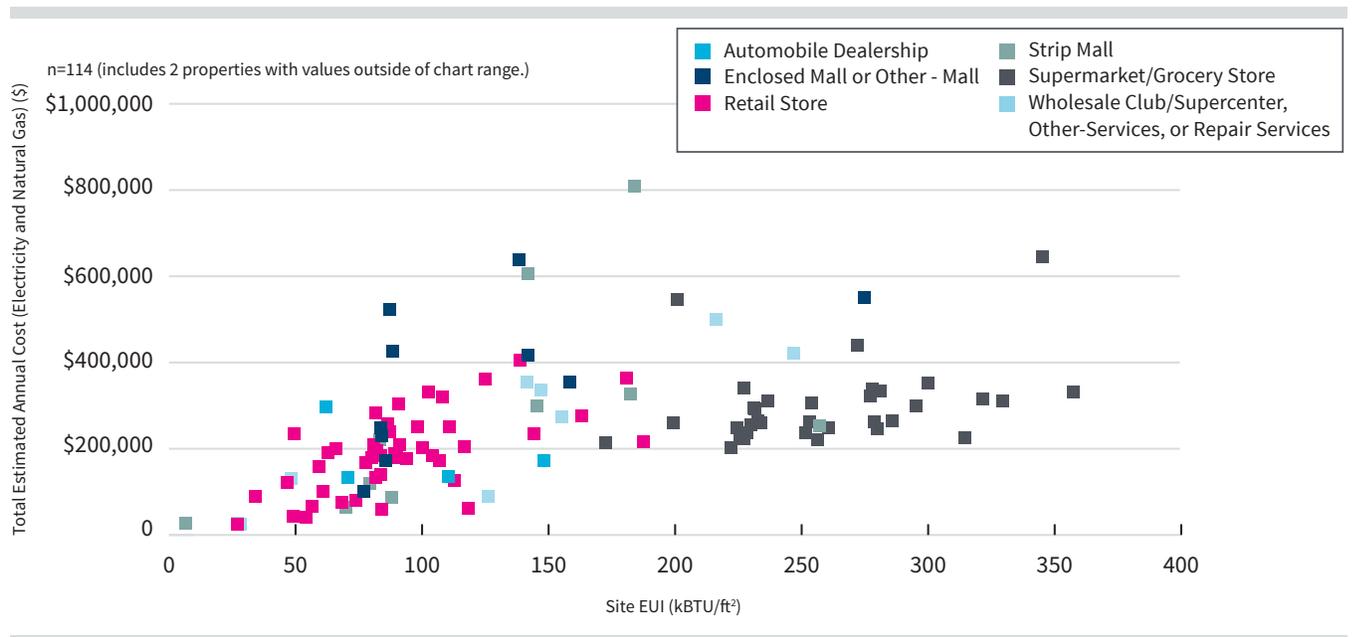
TOTAL 2014 GREENHOUSE GAS EMISSIONS
291,995 metric tons CO₂ equivalent



The retail sector includes enclosed malls, strip malls, and large stand-alone retail stores. Within Chicago’s retail sector, the ENERGY STAR Portfolio Manager property type of retail store had the highest median ENERGY STAR score at 72, which follows national trends; on average, retail stores across the U.S. have a median ENERGY STAR score of 64.⁴⁸

The wholesale club/supercenter property type had the lowest retail median ENERGY STAR score at 56, which is lower than the sector median of 64. These properties may have the greatest opportunities to improve energy performance.

Figure 26: Site EUI and Estimated Energy Cost for Retail Properties



48 ENERGY STAR Data Trends – Energy Use in Retail Stores: https://www.energystar.gov/sites/default/files/tools/DataTrends_Retail_20150129.pdf

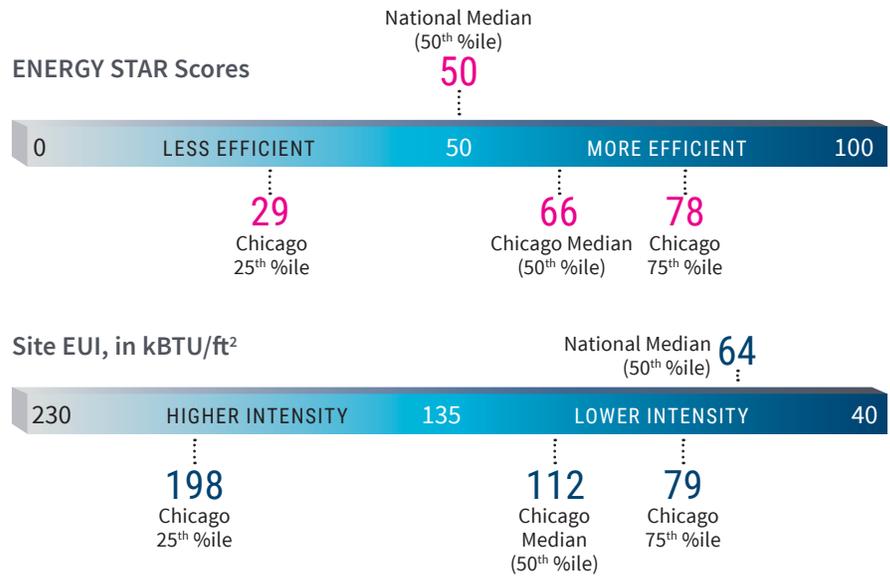
SECTOR-SPECIFIC BUILDING ENERGY PERFORMANCE

“OTHER”

OF PROPERTIES: 142

TOTAL PROPERTY FLOOR AREA (EXCLUDING PARKING):
58,103,457 square feet

TOTAL 2014 GREENHOUSE GAS EMISSIONS:
855,724 metric tons CO₂ equivalent



The ‘other’ building sector includes many different property types, such as: gyms/health clubs; laboratories; libraries; movie theaters; worship facilities; and many other space use types. Due to the specialized activities in many of these facilities, comparisons across this building sector may be less meaningful,

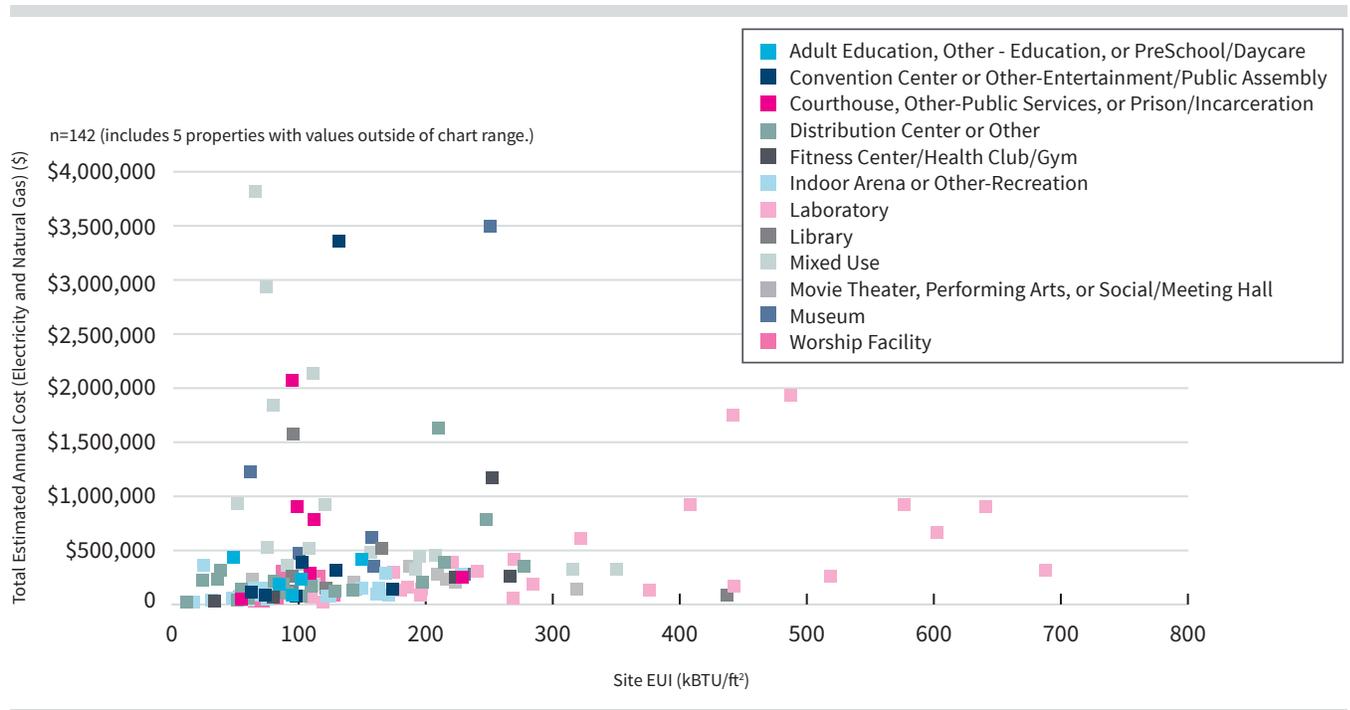
except when comparing buildings of the same property type (i.e. libraries compared to other libraries).

Like other Chicago building sectors, ‘other’ properties that reported in 2015 demonstrated a wide range of energy use intensities, even among properties within the same ENERGY

STAR Portfolio Manager property sub-types, which suggests potential opportunity for lower-performing properties to improve.

Approximately 10% of Chicago’s ‘other’ buildings were eligible to receive an ENERGY STAR score; these properties had a median score of 66.

Figure 27: Site EUI and Estimated Energy Cost for ‘Other’ Properties



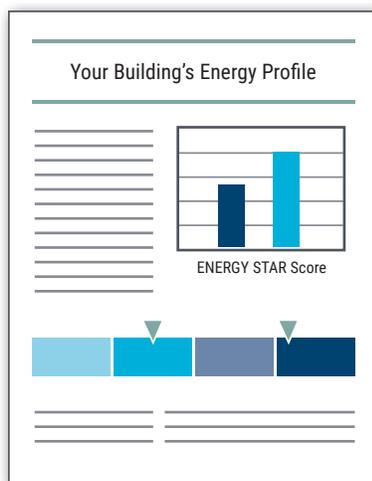
NEXT STEPS

1 Public Data Release

Concurrent with this report, the City of Chicago has released building-specific information for the approximately 250 properties that were required to report in both 2014 and 2015. (The City is authorized to publish building-specific data after the second year a property is required to comply with the ordinance.)

By increasing access to energy information, building owners, managers, tenants, and other stakeholders may more easily track and understand the energy consumption within their properties. Residents, business owners, and others may be interested in working to improve energy consumption upon reviewing the scores for their properties, whether they are top performers, or receiving below-median scores.

Tenants, Brokers, and Real Estate Attorneys:
See pages 19-20 for additional ideas on how to use public benchmarking data in leasing decisions.



2 Building-Specific Communications

Following upon the customized building performance emails sent to all properties that reported in 2014, the City of Chicago plans to send building-specific Energy Profiles to all properties that reported in 2015.

The Energy Profiles are designed to communicate back to the property representative the key

energy performance information that was reported, while also providing additional context and a comparison to the performance of similar buildings. To encourage additional action on energy efficiency, the Energy Profiles will include suggested next steps toward improving energy efficiency.

3 2016 Reporting

JUNE 2016						
Su	M	T	W	Th	F	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

By June 1, 2016, all commercial, institutional, and residential properties over 50,000 square feet will be required to benchmark and report. Multifamily residential properties from 50,000 to 250,000 square feet will be complying for the first time, and will be required to benchmark, and report, and also complete data verification.

Building on a strong foundation developed in 2014 and 2015, the Chicago Energy Benchmarking Working Group, a collaboration of local and national partners, will continue to provide extensive support to complying buildings, including the Help Center, free trainings, and the Pro-Bono Data Verification Program.

4 Ongoing Collaborations

Building upon multiple existing partnerships and networks, the City of Chicago will continue to collaborate with local, regional, and national organizations to share energy benchmarking data and to promote data-driven efficiency action.

As Chicago Energy Benchmarking data become publicly-available under the terms of the ordinance, the data will be eligible for inclusion in the U.S. Department of Energy’s Buildings Performance Database, a free tool that comprises the nation’s largest dataset of energy-related building characteristics.⁴⁹ Chicago will also continue to participate in cross-city efforts through the C40 Cities Climate Leadership Group, the City Energy Project, and the Urban

Sustainability Directors’ Network to collaborate on best practices for outreach, benchmarking implementation, and data analysis.

In partnership with USGBC-Illinois, C40, City Energy Project, Elevate Energy, and other groups, the City is also developing a new Beyond Benchmarking Working Group to explore additional outreach, training, and resources that could further assist building owners and managers in using their benchmarking results to inform energy efficiency improvements.

Finally, the City of Chicago will work with interested organizations to explore the possibility of incorporating benchmarking data into other datasets to maximize the value of this information.



Photo courtesy of USGBC-Illinois

49 Buildings Performance Database: <http://energy.gov/eere/buildings/building-performance-database>

ACKNOWLEDGEMENTS

The City of Chicago appreciates the many organizations and individuals that have helped make Chicago Energy Benchmarking a success. Expansion of ordinance coverage to more than 1,500 properties was a major milestone in the policy roll-out, offering an opportunity for additional building outreach, training, resources, and other support. Thank you to the Chicago Energy Benchmarking Working Group and the additional organizations that supported this effort. Thanks also to the 50+ volunteers who led trainings, worked with pro-bono participations, and completed other tasks to help facilitate compliance and to ensure a high level of data quality.

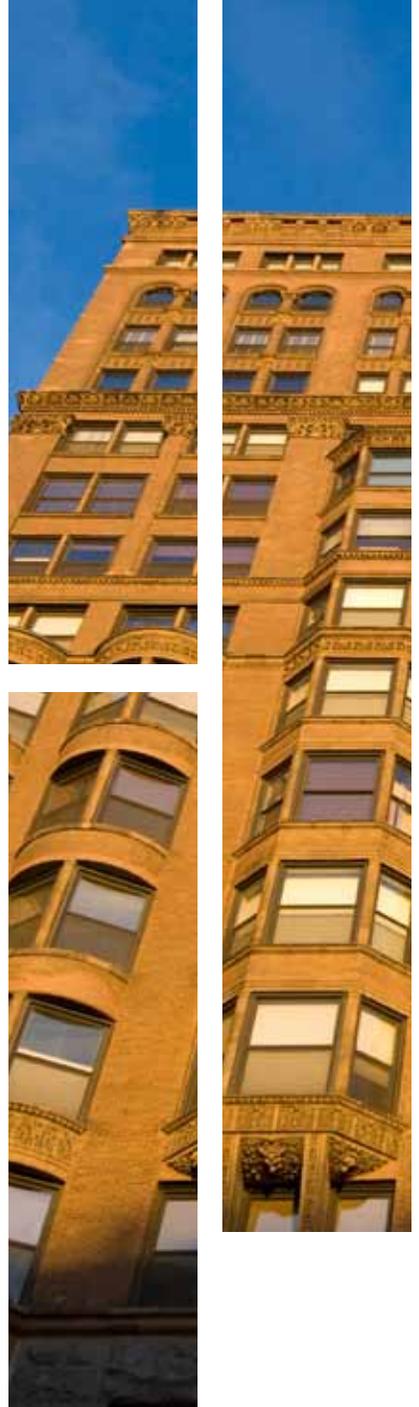
To building owners, managers, operating engineers, service providers, and other stakeholders who tracked, reported, and verified benchmarking information this year – thank you for your efforts. We are especially indebted to the 85+ organizations that supported Chicago’s benchmarking ordinance from its inception, including dedicated private sector and nonprofit advocates who testified to the Chicago City Council on this policy’s behalf.

Whole-building energy benchmarking would also not be possible without noteworthy efforts by Commonwealth Edison Company (ComEd) and Peoples Gas to provide their customers with aggregate energy data, as well as real estate industry association partners – including BOMA/Chicago – whose outreach helped to facilitate building participation.

Chicago Energy Benchmarking also benefits from support from multiple city departments and civic advisors, including the Office of the Mayor, the Department of Business Affairs and Consumer Protection, the Department of Buildings, the Department of Innovation and Technology, the Mayor’s Sustainability Council, and the Chicago Green Ribbon Committee.



Karen Weigert
Chief Sustainability Officer
Office of the Mayor
City of Chicago
December 2015



CHICAGO ENERGY BENCHMARKING WORKING GROUP

The Chicago Energy Benchmarking Working Group continues to provide critical support to properties covered by the ordinance. Working Group members include: ASHRAE – Illinois; the American Institute of Architects – Chicago Chapter; the C40 Cities Climate Leadership Group; the City Energy Project; Elevate Energy; the Institute for Market Transformation; the Midwest Energy Efficiency Alliance; the Natural Resources Defense Council; Seventhwave; and the U.S. Green Building Council – Illinois Chapter.



ACKNOWLEDGEMENTS

PEER REVIEWERS

The City of Chicago is also grateful to the 19 individuals from 14 local and national organizations who participated in a peer review of Chicago's data analysis: Alon Abramson (Center for Building Energy Innovation), Emma Berndt (University of Chicago), Leslie Billhymer (Center for Building Energy Innovation), Matt Campo (Rutgers University), Leslie Cook (U.S. Environmental Protection Agency), David Hsu (Massachusetts Institute of Technology), Laurie Kerr (Urban Green Council), Caroline Keicher, (Institute for Market Transformation), Jen King (American Council for an Energy Efficient Economy), Richard Leigh (Urban Green Council), Paul Mathew (Lawrence Berkeley National

Laboratory), Ralph Muehleisen (Argonne National Laboratory), Karen Palmer (Resources for the Future), Robert Rosner (University of Chicago), Brent Stephens (Illinois Institute of Technology), Cody Taylor (U.S. Department of Energy), Scott Wagner (Center for Building Energy Innovation), Margaret Walls (Resources for the Future), Paige Weber (Yale University).

Peer reviewers' input was incorporated into the analysis to the greatest extent possible, and it contributed to a stronger understanding of 2015 Chicago Energy Benchmarking findings.



CHICAGO ENERGY BENCHMARKING REPORT

The 2015 Chicago Energy Benchmarking Report was created with input, analysis, and other support from the following organizations and individuals:

City Energy Project

Amy Jewel

C40 Cities Climate Leadership Group

Jamie Ponce

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Help Center Team

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ASHRAE-Illinois

Mallory Schaus
Maria Lupo

American Institute of Architects AIA-Chicago 2030 Working Group

Rand Ekman
Jose Rodriguez

SocialRaise

Kevin LaManna
Cassie Dennis
Meggan Kehrli

APPENDIX

GLOSSARY / KEY BENCHMARKING TERMS⁵⁰

ENERGY STAR Portfolio Manager



Free, online software developed by the U.S. EPA to help buildings benchmark, verify, and report energy use and property information (www.EnergyStar.gov/PortfolioManager).

ENERGY STAR Score

A 1 to 100 rating calculated by Portfolio Manager to assess a property's overall energy performance, based on national data to control for differences among building uses and operations. Twenty-one property types are currently eligible for an ENERGY STAR score. A score of 50 represents the national median, while 100 represents a top performer; a score of at least 75 may make buildings eligible for ENERGY STAR Certification.

Fuel Mix (Energy Use by Fuel Type)

A summary of the average annual consumption of energy from various fuel types, such as electricity or natural gas, expressed as the percentage of the total provided by each fuel type.

Greenhouse Gas (GHG) Emissions

Carbon dioxide (CO₂) and other gases released as a result of energy generation, transmission, and consumption. GHG emissions contribute to climate change and are expressed in metric tons of carbon dioxide equivalent (CO₂e). GHG emissions are also released due to other activities in buildings, such as refrigeration and cooling, but those emissions are not calculated from energy benchmarking.

Gross Floor Area (Building Size)

Total interior floor space between the outside surfaces of a building's enclosing walls, expressed in square feet. This includes tenant space, common areas, stairwells, basements, storage, and interior parking.

Site Energy Use

Energy consumed on-site at a building, as measured by utility bills, and expressed in thousands of British Thermal Units (kBtu).

Source Energy Use

Energy required to operate a property, including on-site consumption, as well as energy used for energy generation, transmission, and distribution; expressed in kBtu.

Weather-Normalized Energy Use

Site and/or source energy (kBtu) that a property would have consumed under 30-year average weather conditions, based on actual energy use for a given time period. This metric controls for temperature fluctuation (such as a very warm summer in a particular year) and allows energy comparisons over time.⁵¹

⁵⁰ Based on U.S. EPA's ENERGY STAR Portfolio Manager definitions: see <https://portfoliomanager.energystar.gov/pm/glossary>

⁵¹ For more information on weather normalization, see the ENERGY STAR Portfolio Manager Technical Reference on Climate and Weather: <https://portfoliomanager.energystar.gov/pdf/reference/Climate%20and%20Weather.pdf>

DATA ANALYSIS METHODOLOGY

Data Cleansing

Data cleansing was completed to ensure that properties with possible data quality issues were excluded from the analysis in this report. The first step in the data cleansing process was to remove properties with duplicate submissions, which can occur in rare circumstances, such as when multiple facility managers submit reports for the same property. The dataset included 1,840 reporting properties after duplicates were removed.

Of these 1,840 reporting properties, 1,598 properties were required by the ordinance to report in 2015 (“covered properties”), and 242 properties (13%) reported voluntarily (i.e. were not required to comply). To avoid any reporting bias, voluntarily-reported data were not included in energy performance analysis. Out of 1,598 covered properties’ data submissions, 49 were received after the September 24, 2015 cutoff date for data analysis.

From the remaining 1,549 covered properties that submitted reports by September 24th, 98 were removed as outliers. These records with possible data errors included 18 properties that reported no electricity use and 80 properties that reported the following extreme values for key energy metrics:

- ★ 1 property: Site EUI of less than 3 kBtu/square foot
- ★ 2 properties: Site EUI more than 3 standard deviations above or below the median site EUI for the property’s building sector (see page 52 for more details on the 8 building sectors included in this analysis)
- ★ 77 properties: ENERGY STAR score of 1, 2, 99, or 100. Properties with scores of 99 or 100 were removed if they had not been ENERGY STAR certified in 2014 or 2015. All properties with scores of 1 or 2 were removed

Data cleansing resulted in 1,451 covered building data submissions that provide the basis for energy performance analysis presented in this report.

Building Sectors

Table 2 shows the eight building sectors included in this report’s analysis and the ENERGY STAR Portfolio Manager property types included in each sector. The number of properties analyzed, total floor area, median ENERGY STAR scores, and median site and source EUI values are also provided for each Portfolio Manager property type.

All of the property type groupings in Table 2 include at least four properties to ensure data confidentiality of the individual reporting properties. In two cases, property type groupings had less than four properties with ENERGY STAR scores. In these cases, the data on ENERGY STAR scores were redacted to ensure data confidentiality.

Savings Opportunity Methodology

Total potential energy savings are the sum of the individual energy use reductions that would result from all buildings’ achieving site EUI equivalent to the 50th or 75th percentile performance for all analyzed buildings of the same ENERGY STAR Portfolio Manager property type. Properties that reported site EUI performance at or above the 75th percentile were also analyzed to determine the potential energy savings that would result from reducing these properties’ site EUI by 2%. Savings opportunity analysis was applied to properties within each of the ENERGY STAR Portfolio Manager property types listed in Table 2.

Table 2: Detailed Building Sector Description and Energy Performance Metrics by Sector

BUILDING SECTOR	SIZE OF COVERED PROPERTIES	PRIMARY ENERGY STAR PORTFOLIO MANAGER PROPERTY TYPE(S)	NUMBER OF PROPERTIES INCLUDED IN ANALYSIS	TOTAL FLOOR AREA (Gross Square Feet)	MEDIAN SITE EUI (kBtu/square foot)	MEDIAN SOURCE EUI (kBtu/square foot)	MEDIAN ENERGY STAR SCORE (1-100 rating)
Office	50,000 ft ² and greater	Bank Branch and Financial Office	9	5,102,592	112	259	49
		Office, 50,000 ft ² – 99,999 ft ²	65	4,742,207	96	207	65
		Office, 100,000 ft ² – 249,999 ft ²	78	12,644,560	94	206	71
		Office, ≥ 250,000 ft ²	158	136,706,231	81	204	77
Multifamily Housing	250,000 ft ² and greater	Multifamily Housing, 250,000 – 499,999 ft ²	199	69,792,627	90	153	42
		Multifamily Housing, 500,000 ft ² – 999,999 ft ²	82	56,731,499	84	148	42
		Multifamily Housing, ≥ 1,000,000 ft ²	13	18,846,716	76	147	47
K-12 Schools	50,000 ft ² and greater	K-12 School, 50,000 ft ² – 99,999 ft ²	212	15,732,257	82	141	52
		K-12 School, 100,000 ft ² – 249,999 ft ²	148	21,090,131	75	130	55
		K-12 School, ≥ 250,000 ft ²	26	8,493,965	84	142	57
Healthcare	50,000 ft ² and greater	Ambulatory Surgical Center; Outpatient Rehabilitation/Physical Therapy; and Urgent Care/Clinic/Other Outpatient	4	715,169	173	391	NA
		Hospital (General Medical & Surgical)	25	20,873,181	251	461	36
		Medical Office	9	1,345,334	119	287	26
		Other - Specialty Hospital	4	604,673	162	358	NA
Higher Education	50,000 ft ² and greater	College/University, 50,000 ft ² – 99,999 ft ²	32	2,298,293	93	231	NA
		College/University, 100,000 ft ² – 249,999 ft ²	37	5,754,635	92	191	NA
		College/University, ≥ 250,000 ft ²	21	12,929,316	103	208	NA
Lodging	250,000 ft ² and greater	Hotel	50	23,452,317	132	252	37
		Other - Lodging/Residential and Residence Hall/Dormitory	13	3,056,534	103	188	54
		Senior Care Community	10	2,512,316	135	227	19
Retail	50,000 ft ² and greater	Automobile Dealership	4	565,850	91	201	NA
		Enclosed Mall and Other - Mall	11	2,834,809	88	264	NA
		Retail Store	46	7,274,641	85	208	72
		Strip Mall	10	1,370,204	115	256	NA
		Supermarket/Grocery Store	34	2,343,871	253	599	63
		Wholesale Club/Supercenter; Other – Services; and Repair Services (Vehicle, Shoe, Locksmith, etc.)	9	1,071,284	142	317	56
Other	50,000 ft ² and greater	Adult Education; Other – Education; and Preschool/Daycare	5	1,011,875	95	226	NA
		Convention Center and Other-Entertainment/Public Assembly	8	11,580,169	100	214	NA
		Courthouse; Other - Public Services; and Prison/Incarceration	7	7,455,211	109	209	Redacted
		Distribution Center; Not Available; and Other	19	3,820,370	91	191	Redacted
		Fitness Center/Health Club/Gym	5	802,615	224	359	NA
		Indoor Arena and Other - Recreation	16	2,112,743	99	169	NA
		Laboratory	23	3,360,262	284	589	NA
		Library	7	1,936,717	96	270	NA
		Mixed Use	24	20,440,954	103	236	67
		Movie Theater; Performing Arts; and Social/Meeting Hall	12	1,516,941	144	324	NA
		Museum	6	2,992,326	158	328	NA
		Worship Facility	10	1,073,274	83	111	23
		TOTAL			1,451	496,988,669	89

For example, within the lodging sector, an individual hotel's potential savings opportunity represents the energy use reduction that would result from that property's achieving the 50th or 75th percentile site EUI for all Chicago hotels included in the analysis. In some cases, ENERGY STAR Portfolio Manager property types were combined due to small sample sizes. In the healthcare sector, for example, the Portfolio Manager property types of ambulatory surgical center, outpatient rehabilitation/physical therapy, and urgent care/clinic/other outpatient were combined; together, these three property types included four analyzed properties.

For building sectors with large sample sizes for specific Portfolio Manager property types (including office, multifamily housing, K-12 schools, and higher education), properties were subdivided by building square footage to further refine performance comparisons and calculated savings opportunity.

As with all analysis in this report, properties removed through the data cleansing process were excluded from the analysis of potential savings (see page 51 for more details on data cleansing).

Energy Savings

The first step of calculating the energy saving metrics includes calculation of site energy use reductions for each property; these site energy use reductions are then converted to source energy use reductions based on property-specific ratios of source energy use to site energy use.

Energy Cost Savings

The metrics for cost savings and investments needed to achieve those cost savings are based on reductions of site energy, because energy costs are tied more directly to site energy use than source energy use. The percentage of potential annual site energy use reduction in each property was calculated. This percentage reduction in site energy use was then applied to electricity and natural gas use to calculate the annual reduction of these two fuels in each property.

These potential electricity and natural gas reductions were multiplied by estimated Chicago energy costs for each fuel and building type. For all property types except multifamily housing, the analysis used commercial energy rates of \$0.074/kWh of electricity and \$9.249 per 1,000 cubic feet of natural gas. For the multifamily housing properties, the analysis used estimated residential energy rates of \$0.109/kWh of electricity and \$11.687 per 1,000 cubic feet of

natural gas. Estimated energy rates are based on the average January – December, 2014 commercial and residential electricity and natural gas costs in the State of Illinois, as published by the U.S. Department of Energy's Energy Information Administration.⁵² To reflect local Chicago energy market conditions (including some properties' ability to negotiate lower energy rates), the 2014 average state commercial energy prices were reduced by 15% and residential energy prices were reduced by 5%.

Avoided Greenhouse Gas Emissions

The percentage of annual site energy use reduced in each property was multiplied by annual greenhouse gas (GHG) emissions (as calculated by Portfolio Manager), to find annual GHG reductions in each property, expressed in metric tons of carbon dioxide equivalent (CO₂e). Portfolio Manager's GHG calculations account for regional electricity grid-average emissions factors, based on EPA's Emissions & Generation Resource Integrated Database (eGRID). The conversion from GHG reductions to the cars removed from the road is based on the assumption that one car emits 4,750 kg CO₂e per year, taken from the EPA calculator found at: <http://www.epa.gov/cleanenergy/energy-resources/refs.html>

52 U.S. Department of Energy Energy Information Administration average 2014 electricity and natural gas rates for the State of Illinois: http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_6_a, http://www.eia.gov/dnav/ng/ng_sum_lsum_dcu_sl_m.htm

Energy Savings Investments and Estimated Job Creation

An investment multiplier of 3.5 was applied to energy cost savings to calculate estimated investments needed to achieve the calculated energy reductions.

The number of jobs resulting from the investments is based on the assumption that 50% of the energy savings investments would be used for labor costs, and that the average salary for a skilled laborer implementing energy efficiency projects is \$70,000/year. The assumed salary is a conservative estimate, informed by data published by the U.S. Bureau of Labor Statistics.

Trend Analysis Methodology

The trend analysis presented on presented below in Table 3 applies to individual properties that reported in both 2014 and 2015. Weather-normalized site EUI was used for the trend analysis to control for weather variations between the two calendar years.⁵³ The analysis was based on reported information for calendar years 2013 and 2014.

A total of 250 covered properties reported in both 2014 and 2015. 10 properties were removed from the analysis through data cleansing (see page 51 for details on 2015 data cleansing). Weather-normalized metrics for calendar years 2013 or 2014 were not available for an additional 21 properties. Seven

more properties were removed from the analysis due to unusually-large changes in weather-normalized site EUI from calendar years 2013 to 2014 (more than 50%). This leaves 212 properties that were included in the multi-year analysis.

The change in total weather-normalized site energy use from 2013-2014 reflects the difference between these 212 properties' total weather-normalized site energy use (KBTU) from January – December 2013 and those same properties' total weather-normalized site energy use from January – December 2014. This calculation suggests a decrease in total weather-normalized site energy use of 1.6% from 2013 to 2014 (Table 3).

Table 3: Year-Over-Year, Same Building Trend Analysis

METRIC	Weather-normalized site energy use (kBTU) for 212 properties
2014 REPORTED DATA (from CY 2013)	20,139,584,372 kBTU
2015 REPORTED DATA (from CY 2014)	19,824,235,664 kBTU
CHANGE BETWEEN 2014 TO 2015 REPORTED DATA	(315,348,708) kBTU
PERCENTAGE CHANGE	-1.6%

53 For more information, see the ENERGY STAR Portfolio Manager Technical Reference on Weather and Climate: <https://portfoliomanager.energystar.gov/pdf/reference/Climate%20and%20Weather.pdf>

Cross City Comparison Methodology

As discussed in the Cross City Comparison (pages 33-34), the Chicago median ENERGY STAR score for each building sector was compared to median sector scores from Boston, New York City, Philadelphia, and Washington, DC. Each of these cities also has a benchmarking and transparency policy,⁵⁴ and the availability of publicly-released data under these policies allowed the comparison.⁵⁵

In order to ensure an apples-to-apples comparison of buildings in different cities, each of the datasets was filtered to only include ENERGY STAR Portfolio Manager property types and property sizes (in gross square footage) that corresponded to the Chicago dataset for each building sector shown in Table 2.

The median ENERGY STAR scores calculated for each building sector in each of the five cities are shown in Table 4. Due to the different policy implementation schedules among the five cities, data from three cities represent calendar year 2013, while data from two cities represent calendar year 2014.

Multifamily and higher education building sectors were excluded from cross-city analysis. Properties in the higher education sector are not eligible to receive ENERGY STAR scores, and the pool of publicly-available data for multifamily and properties is very small. City / sector sample sizes of less than 15 were also excluded from the analysis; these are indicated with an asterisk in Table 4.

Table 4: Median ENERGY STAR scores for Boston, Chicago, New York City, Philadelphia, and Washington, DC by Building Sector

					MEDIAN ENERGY STAR SCORES BY SECTOR				
SECTOR	SIZE OF BUILDINGS	AVERAGE MEDIAN SCORE (for cities & sectors with n >15)	MAX	MIN	CHICAGO	NEW YORK CITY	PHILA.	WASH., DC	BOSTON
					CY 2014 Data	CY 2013 Data	CY 2013 Data	CY 2013 Data	CY 2014 Data
K-12 Schools	≥ 50,000 ft ²	64.3	83	54	54 (n=379)	71** (n=1,380)	56 (n=190)	NA*	83 (n=70)
Office	≥ 50,000 ft ²	75.6	79	70	74 (n=286)	76 (n=1,122)	70 (n=165)	79 (n=274)	79 (n=174)
Retail	≥ 50,000 ft ²	62.3	64	60	64 (n=74)	60 (n=88)	63 (n=55)	75* (n=2)	40* (n=11)
Lodging	≥ 250,000 ft ²	41.4	48	37	37 (n=64)	43 (n=65)	38 (n=21)	41 (n=17)	48 (n=18)
Healthcare	≥ 50,000 ft ²	42.5	59	29	35 (n=32)	59 (n=74)	47 (n=34)	52* (n=3)	29 (n=19)
Other	≥ 50,000 ft ²	62.7	75	47	66 (n= 14)	47 (n=71)	75 (n=46)	44* (n=9)	66* (n=11)

* Indicates city / sector samples sizes of fewer than 15 properties

** New York City data for K-12 Schools includes private sector data for CY 2013 and municipal building data for CY 2014

54 City of Boston Energy Reporting and Disclosure Ordinance: <http://www.cityofboston.gov/eeos/reporting/>
 City of New York Local Law 84 - Benchmarking: <http://www.nyc.gov/html/gbee/html/plan/ll84.shtml>
 City of Philadelphia Building Energy Benchmarking: <http://www.phillybuildingbenchmarking.com>
 Washington, DC District Department of Energy & Environment - Energy Benchmarking Disclosure: <http://doee.dc.gov/page/energy-benchmarking-disclosure>

55 Data Sources:

City of Boston CY 2014 Benchmarking Dataset: https://d3n8a8pro7vvhmx.cloudfront.net/greenovateboston/pages/460/attachments/original/1443708687/Energy_Reporting_Data_1Oct2015.xlsx?1443708687
 City of New York CY 2013 Benchmarking Dataset: http://www.nyc.gov/html/gbee/html/plan/ll84_scores.shtml
 City Philadelphia CY 2014 Dataset: <https://data.phila.gov/api/views/rxi8-wx2m/rows.csv?accessType=DOWNLOAD>
 Washington, DC CY 2013 Dataset: <http://doee.dc.gov/node/970312>



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