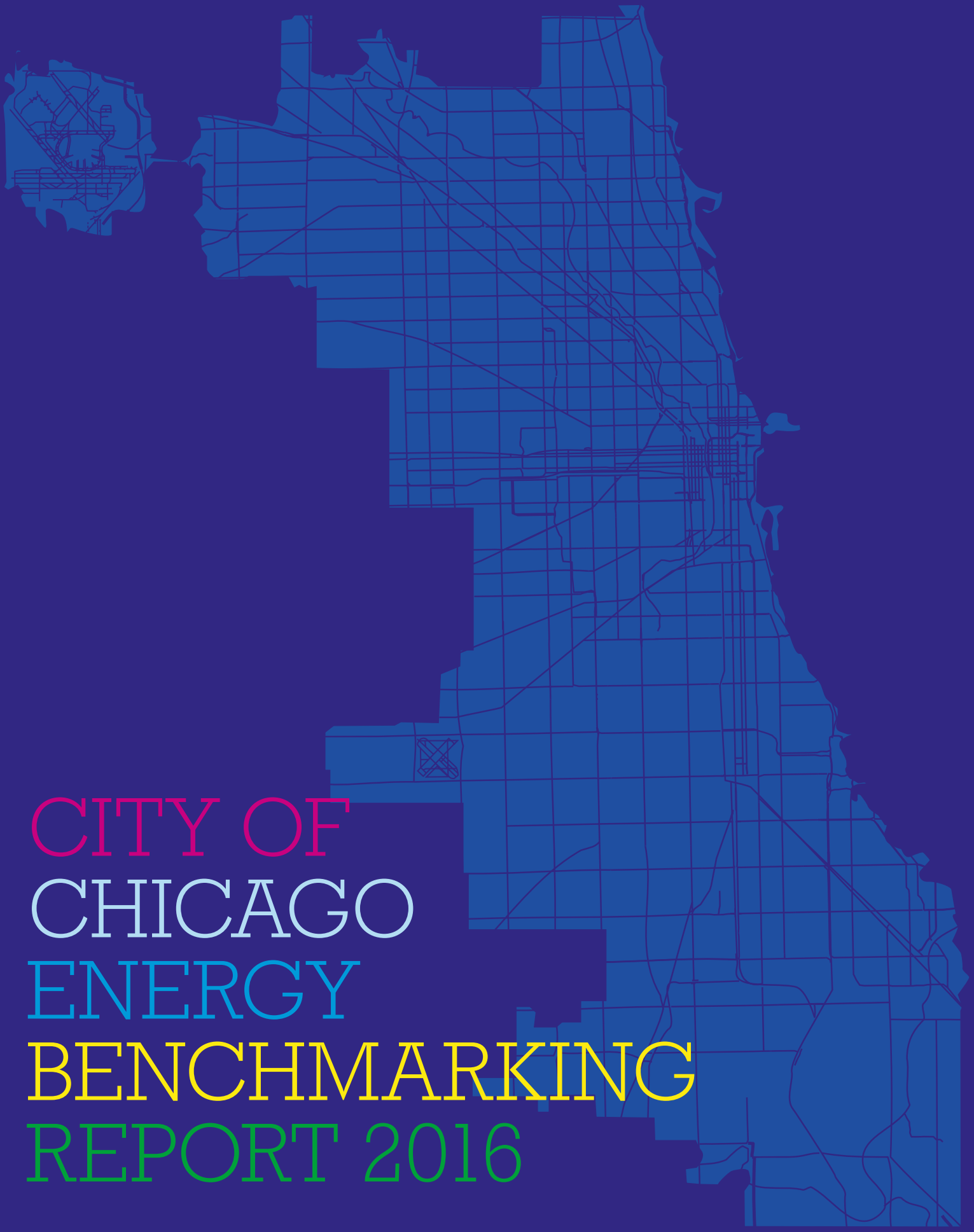


CITY OF CHICAGO ENERGY BENCHMARKING REPORT 2016

Chicago Energy Benchmarking:

Opening doors to achieving over $17 million in energy savings while supporting clean, high-wage jobs and reducing pollution

Initial 3 years of measuring Chicago buildings' energy use led to concrete savings with potential to grow to over $200MM/year

Next Reporting Deadline:
June 1, 2017

www.CityofChicago.org/EnergyBenchmarking
www.RetrofitChicago.net

2,650+ properties are now measuring, reporting, and verifying energy use, representing a wide array of buildings in every neighborhood.

So what do those who save have in common?

A Commitment to Success

Dedication to reducing energy and taking action.

Leveraging Available Resources

Taking advantage of low- and no-cost options to identify improvement opportunities.

Following Through

Implementing cost-effective changes to increase efficiency, and tracking outcomes.

Types of results achieved

Lowered Utility Bills

With up to 25% of energy wasted, improving performance could save $110-$214MM/year across the city.

Optimal System Performance

Equipment can work better and can also improve indoor comfort and health for tenants and visitors.

Recognition

Increasing the performance and ENERGY STAR score for your property provides a marketplace advantage and can result in a national certification.

What can you do?

Know the Score

Review the key metrics for your building and for nearby properties.

Make a Commitment

Develop a plan to increase your building's efficiency.

Take the Challenge

Participate in the Retrofit Chicago Energy Challenge.

Office of the Mayor

Dear Fellow Chicagoans,

Three years ago in 2013, we passed the Chicago Energy Benchmarking Ordinance, landmark legislation designed to unlock energy and cost savings opportunities for businesses and residents. By raising awareness of energy performance through information and transparency, building owners, tenants, and others are enabled to make better decisions about how energy is used to power our buildings.

Since then, we have worked closely with our partners to move towards this goal by tracking and increasing the visibility of energy use in large buildings – both private and public – across our city. The owners of over 2,600 properties across every neighborhood in Chicago now participate in ongoing energy reporting. More importantly, the property teams that are tracking energy use are also now making smarter decisions about energy management, and are saving millions of dollars in utility costs per year.

The progress summarized in this report continues to demonstrate that we can collaborate to strengthen our economy; support clean, high-wage jobs; and protect the environment. Improving energy efficiency is a key strategy that is good for business, good for residents, and good for strengthening our neighborhoods.

We look forward to continuing to work together to reduce energy waste throughout our city, cut carbon pollution, and make Chicago even more efficient and sustainable.

Sincerely,

Rahm Emanuel
Mayor, City of Chicago

Table of Contents

Featured Buildings

Executive Summary

By harnessing market forces, such as increased visibility and awareness of energy use, the Chicago Energy Benchmarking Ordinance is accelerating improvements to the energy performance of our city's buildings. In 2016, the City of Chicago passed a major milestone by reaching the end of a three year phase-in process for the benchmarking policy. Results from the past three years reveal the tremendous benefits available from energy benchmarking over time.

Key Findings

With nearly 2,700 properties now tracking and reporting energy use, the importance of the energy used in buildings is gaining in prominence. Already, this increased scrutiny and the improved transparency of energy use information is having a major impact. An estimated $17.8 million has already been saved from the energy bills of the 1,200+ properties that have benchmarked and reported for either two or three consecutive years. These results provide concrete evidence that regular benchmarking and reporting helps support increased efficiency, leading to lower utility costs, and improved building performance.

1. Reach

In 2016, 2,695 properties spanning nearly three-fourths of a billion square feet tracked and reported energy use, a 45% increase from 2015, and a 7-fold increase from 2014.

- There is at least one reporting property in each of Chicago's neighborhoods, and 87% of neighborhoods have five or more reporting properties.
- Over 3,500 properties are now included in the policy's coverage.
- Reporting properties represent 23% of citywide energy use.
- Compliance continued at a high rate, with a reporting rate of 91% by floor area and 80% by number of properties.

2. Impact

With three years of results, energy benchmarking reports are now indicating that regular tracking and reporting have a significant impact on supporting energy management:

- Properties that have reported consistently for three consecutive years have reduced energy use by 4%, leading to an estimated savings of $11.6 million per year. This group of buildings have also improved their ENERGY STAR scores by 6.6%
- Properties with two consecutive years of reporting saw a collective energy reduction of 1.9%, saving an estimated $6.2 million per year. Overall, this group improved their ENERGY STAR scores by 7.8%.

3.Performance and Opportunity

Chicago's buildings continue to demonstrate a high level of energy performance, but much opportunity still exists to address energy waste.

- With a median ENERGY STAR score of 59, one point higher than the 2015 median of 58, Chicago's reporting buildings are performing better than national medians.
- Up to 25% of energy in buildings may be wasted, and addressing this waste could save from $110 to $214 million per year.

4. Partnership and Support

The success of Chicago Energy Benchmarking would not be possible without our many partners and supporters.

- The Chicago Energy Benchmarking Help Center has now facilitated more than 10,000 phone calls and emails since 2014, an enormous level of support to the local real estate community.
- Local volunteers have provided more than 40 trainings and drop-in help sessions.
- 100 properties spanning over 12 million square feet including nonprofit organizations, houses of worship, and affordable housing properties have received pro-bono assistance for energy benchmarking and data verification.

The City of Chicago and its partners will continue to support energy benchmarking, and will also increase efforts to empower owners, operators, managers, and occupants to use benchmarking results to take further action on energy efficiency.

By continuing to accelerate energy efficiency in buildings across our neighborhoods, the City of Chicago's residents and business will not only reduce their costs, but will also benefit from improved economic competitiveness, increased comfort and health within their buildings, and an improved environment through reduced pollution.

What's Next

Now that you have benchmarked your building, what is next? The following suggestions provide concrete actions that you and your team can take to begin improving energy performance.

Four Steps to Energy Savings

1. **Understand Your Performance**
2. **Dive Deeper into Data**
3. **Train Your Team**
4. **Take the Challenge**

1. Understand Your Performance: Review Your Property's Results.

Review the building's energy benchmarking results, starting with two key metrics – energy use intensity (EUI) and the 1-100 ENERGY STAR Score.[1] If you are responsible for benchmarking a building, simply log into the ENERGY STAR Portfolio Manager tool to view this information – see the sample screen shot of the Portfolio Manager Metrics Summary below. Otherwise, you may need to review publicly-available information or ask the property owner or manager for the information.[2]

Next, understand your property's performance in light of results from similar properties:

Local Results:

- Review your numbers and the averages for your property type on pages 66-67 of the Appendix
- Use the interactive Building Energy Performance Map, which shows results for properties that have reported data for two or more years in Chicago: http://cityenergyproject.github.io/chicago/

National Results:

- To review data from similar properties across the nation, use the free Building Performance Database: https://bpd.lbl.gov/#explore

2. Dive Deeper into Data: Understand Energy Use in the Building.

Comparisons of monthly or annual usage from different time periods can start to provide more insights into your property's energy use. For example, a spike in usage at a specific time could be a red flag that building equipment is not performing correctly.

In addition, more detailed reviews of energy-consuming equipment and operations can help you gain a better understanding of possible improvements. Start by **conducting an energy assessment** if you have not done so in the last two to three years. The process will help you identify low-cost and no-cost opportunities specific to your property. Both of the local utilities, ComEd and Peoples Gas, offer **free** energy assessments to qualifying buildings. To find out more, contact the utilities today:

ComEd:

- Phone: 855-433-2700
- Website: https://www.comed.com/WaysToSave/ForYourBusiness/Pages/Other.aspx

Peoples Gas:

- Phone: 855-849-8928
- Website: http://www.peoplesgasdelivery.com/business/rebates.aspx

Metrics Summary — Change Time Period

Metric	Dec 2012 (Energy Baseline)	Sep 2016 (Energy Current)	Change
ENERGY STAR score (1 100)	54	87	33(61.1%)
Source EUI (kBtu/ft²)	143.9	111.4	-32.5(-22.6%)
Site EUI (kBtu/ft²)	118.6	91.2	-27.4(-23.1%)
Energy Cost ($)	28,851.78	27,317.99	-1533.79(-5.3%)
Total GHG Emissions (Metric Tons CO2e)	710.2	531.5	-178.7(-25.2%)
Water Use (All Water Sources) (kgal)	720,570.0	76,579.8	-643990.2(-89.4%)
Total Waste (Disposed and Diverted) (Tons)	57.33	58.26	0.93(1.6%)

Screenshot from a sample ENERGY STAR Portfolio Manager Metrics Summary Table, Courtesy of the U.S. EPA.

[1]For more explanation of these metrics and how they can be used to gauge energy performance over time, please see the Appendix.
[2]The link to the public database of energy benchmarking information is available here: www.CityofChicago.org/EnergyBenchmarking

3. Train Your Team: Learn How to Capture Savings Through Energy Efficient Operations.

Numerous courses are available to provide training on how to identify and implement energy-saving projects. Consider one of the City-recognized trainings for energy benchmarking data verification, which are chosen to focus not just on benchmarking, but also how to identify and implement energy saving improvements and technologies. The full list of credentials is available online at: https://www.cityofchicago.org/EnergyBenchmarking

Additional resources and training opportunities are also listed on the City's website, ranging from a monthly ComEd Energy Efficiency Program newsletter, to local workshops and seminars, to guidance materials from the ENERGY STAR program and the Department of Energy. For more details, please visit: https://www.cityofchicago.org/city/en/depts/mayor/supp_info/chicago-energy-benchmarking/Chicago_Energy_Benchmarking_Guidance_Matls.html#UtilityIncentives

4. Take the Challenge: Develop a Longer-Term Commitment to Energy Savings.

RETROFIT CHICAGO
SAVING GREEN BY GOING GREEN

The **Retrofit Chicago Energy Challenge** is a free, voluntary program available to any property owner or manager in the City of Chicago. The Energy Challenge (formerly known as the Commercial Building Initiative) is designed to provide recognition and support to those who are leading the way on energy efficiency efforts in Chicago. Current participants have reduced energy use by nearly 12%, saving approximately $6.4 million in energy costs per year.

As of fall 2016, the Energy Challenge has 62 participating properties spanning 43 million ft^2 of building space, and the City has a goal to expand to 80 participants by the middle of 2017. Teams from all building types and sizes are welcome to join.

Upon joining the Energy Challenge, participants agree to:

- Reduce energy usage in one or more buildings by 20% over five years
- Begin actions to improve energy efficiency within six months (if not already started)
- Track progress and share successes
- Serve as an efficiency ambassador

If you would like to learn more, please visit: http://www.retrofitchicago.net

To request a one-on-one meeting or conference call with program staff to discuss if the program might be right for you, please send an email to: Info@RetrofitChicago.net

Looking for more support?

If you are looking for a service provider to perform an energy assessment or assist in analyzing data, visit the U.S. Green Building Council-Illinois Energy Service Provider Directory.

This resource is an online database of companies that offer fee-for-service support for energy benchmarking, data verification, and other efficiency services. To view the database, please visit: http://www.usgbc-illinois.org/resources/energy-services-database/

Tenants, Appraisers, Brokers, and Real Estate Attorneys

Are you wondering what energy benchmarking means for you, or how to use benchmarking results in properties that you rent or work with? Tenants and their representatives can work closely with property owners and managers to improve whole-building energy performance.

One simple step is to ask about the property's 1-100 ENERGY STAR rating and its energy use intensity at the time of leasing or the lease renewal. To take a step further, consider developing a green lease.

Learn more at: www.greenleaselibrary.com

Get Recognized For Your Leadership on Energy Efficiency

Green Lease Leaders

If you have already developed a green lease as a tenant, broker, property manager, or as a leasing team, get recognized for your leadership! Apply to win the annual Green Lease Leaders recognition.

Learn more at: http://www.greenleaselibrary.com/green-lease-leaders.html

New EPA Tenant Recognition

The U.S. EPA is currently working to develop a new recognition for tenants under the ENERGY STAR program. One aspect of this program will provide recognition for energy efficient tenant spaces at the design and construction phase. The EPA is hoping to finalize the structure of the recognition program by the end of 2016 and to start offering the recognition to office tenants in 2017, followed soon after by an offering for retail and warehouse tenants.

A separate recognition for energy efficient use of occupied tenant spaces is also planned, but it may take several years to develop this recognition due to the rigorous data collection and assessment protocols that are needed.

To learn more, visit: https://www.energystar.gov/buildings/tenants/about_tenant_star

To access all of EPA's ENERGY STAR resources for tenants, visit: www.energystar.gov/buildings/tenants

Photo courtesy of Catholic Charities

Featured Buildings:
Multifamily – Affordable Senior Housing

Catholic Charities

ADDRESS
Multiple

NEIGHBORHOOD
Catholic Charities has properties in several neighborhoods, including Auburn Gresham, Burnside, East Garfield Park, Englewood, North Central, South Deering, and West Pullman.

CONSTRUCTED
1920s - 2015

BUILDING OWNER / MANAGER
Catholic Charities

ARCHITECT
Various

BUILDING SIZE
931,349 square feet across 11 properties

"Through the City of Chicago's program, USGBC-Illinois volunteers provided pro-bono assistance to Catholic Charities for energy benchmarking and data verification of several senior housing properties that needed to comply with the Chicago Energy Benchmarking Ordinance this year.

With limited previous experience in benchmarking or energy management, the Catholic Charities team increased their internal capacity by participating in the pro-bono program, and specifically learned how to track their buildings' energy use, complete benchmarking, and start identifying ways to save energy at their properties. Working with the volunteers was a great experience, and Catholic Charities is now equipped to fully complete future energy benchmarking reports. Also, Catholic Charities will look to benchmark other facilities in Chicago and the surrounding suburbs that could benefit from the process of tracking and reporting energy use on a regular basis."

– Catholic Charities

Roneta Stubbs, Maintenance Office Manager

Introduction to Chicago Energy Benchmarking

Background

The Chicago Energy Benchmarking Ordinance[3] is a key strategy developed to increase energy efficiency in the existing building stock throughout the city. Energy benchmarking includes regular tracking and reporting of energy use, often a key first step, and the foundation, for improving energy performance and managing energy costs. Chicago Energy Benchmarking also increases the transparency of energy use information so that decision makers (property owners, managers, tenants, utilities, and others) can begin to pinpoint and implement energy improvements and make more informed decisions regarding energy-related operating costs.

Across the city, electricity, natural gas, and consumption of other fuels within buildings costs our residents and businesses $3 billion/year, and energy used in buildings represents 71% of citywide carbon emissions. Yet, analysis shows that up to 25% of this energy may be wasted, and improving energy efficiency could save millions of dollars per year.[4] Reducing utility costs and putting the savings to other uses would improve the competitiveness of real estate across all of Chicago's neighborhoods, and could be especially important for mission-driven organizations such as affordable housing, nonprofits, community centers, and houses of worship.

A common analogy is that energy benchmarking provides basic information about energy use in buildings, similar to the miles-per-gallon (MPG) ratings available for most vehicles in the U.S. These MPG ratings, which are relatively easy to find, allow consumers to understand and weigh the fuel-related costs of operating different vehicles. Similarly, energy benchmarking provides information about the energy use per square foot (also known an energy use intensity, or EUI) for different property types. Many buildings that are benchmarked also receive a 1-100 ENERGY STAR score indicating their general energy performance. These metrics can help inform decisions about ongoing energy costs and basic energy management.

[3]For full details about the ordinance history, benchmarking requirements, instructions on how to comply, and a list of resources such as free benchmarking trainings, please visit: www.CityofChicago.org/EnergyBenchmarking

[4]For more details on the potential savings, see the 2014 and 2015 Chicago Energy Benchmarking reports, online at: https://www.cityofchicago.org/city/en/depts/mayor/supp_info/chicago-energy-benchmarking/Chicago_Energy_Benchmarking_Reports_Data.html

- 2,695 total reporting properties
- 103 properties reported voluntarily
- 733 million ft^2
- ~23% of citywide energy consumption
- 80% reporting rate

Overview of the Chicago Energy Benchmarking Ordinance

Initially passed in 2013 with the first reporting period in 2014, Chicago Energy Benchmarking requires all commercial, institutional, and multifamily residential properties 50,000 square feet (ft^2) or greater to measure and report whole-building energy use once per year, and to verify the accuracy of reported data once every three years. Currently, approximately 0.5% of the citywide building stock in Chicago is required to comply under the ordinance. Reporting buildings represent about 23% of citywide energy use. To date, 17 other U.S. cities and one county also require energy benchmarking.

Building teams (or their representatives) at covered properties comply by gathering whole-building energy use, which includes the energy used in all common areas as well as any tenant spaces. The local utilities serving Chicago, Commonwealth Edison (ComEd) and Peoples Gas, provide this data free of charge upon request. Electricity, natural gas, and other fuels are all included in the reporting.

Energy consumption data are entered into the U.S. Environmental Protection Agency's (U.S. EPA's) free ENERGY STAR Portfolio Manager online software tool, along with basic building information such as address, square footage, and space use types. The information is reported electronically to the City of Chicago through Portfolio Manager once per year. Each building team or their representative must also verify the data once every three years.

The Portfolio Manager software provides several key metrics to building teams based on the reported information. For a summary of key metrics and terms used in this report, please refer to the Appendix.

Compliance Summary

The 2016 reporting year marked the first time that all properties covered by the Chicago Energy Benchmarking Ordinance were required to submit energy benchmarking reports, due to the phasing-in of the ordinance from 2014-2016 (see Table 1). This year in 2016, property owners and managers from multifamily residential properties from 50,000 – 250,000 ft^2 in area were required to benchmark, verify information, and report for the first time. Property representatives from buildings of other sizes and sectors were required to report for their second or third consecutive year. All property representatives were required to submit data reflecting energy use in calendar year 2015 by June 1, 2016.

In total, 3,538 properties are covered by the ordinance. As of October 25, 2016, 2,695 properties encompassing nearly three-quarters of a billion ft^2 of building space submitted reports to the City of Chicago, or 855 more properties than reported in 2015. Of these 2,695 properties, 103 reported on a voluntary basis and are not required to comply with the City's ordinance. An additional 222 properties received temporary exemptions, leading to a total of 2,814 properties reporting or exempt in 2016, for a reporting rate of 80%.

This reporting rate of 80% represents strong compliance, and is similar to the reporting rates observed in other cities with energy benchmarking ordinances, particularly for the first year in which all properties are required to comply. Similar to the reporting rate in 2015, the number and total square footage of properties that reported in 2016 varied by property size and sector (see Table 2).

Table 1: Chicago Energy Benchmarking Compliance Schedule and Reporting Rates, 2014-2016

Building Sector	Building Size	2014	2015	2016	2017
Commercial and Institutional	≥ 250,000 ft²	★	✓		★
	50,000 ft² - 250,000 ft²		★	✓	
Multifamily Residential	≥ 250,000 ft²		★	✓	
	50,000 ft² - 250,000 ft²			★	✓
Annual Summary		**2014**	**2015**	**2016**	**2017**
Total Covered Buildings		277	2,122	3,538	Not yet available
Citywide Reporting Rate	By number of properties	92%	84%	80%	
	By square footage	95%	92%	91%	

Years in which benchmarking and reporting is required
★ Data verification required
✓ City of Chicago authorized to begin sharing building-specific data

Table 2: Reporting Rate by Property Type and Size

	2015		2016	
Property Type and Size	**Reporting Rate by Number of Properties**	**Reporting Rate by Square Footage**	**Reporting Rate by Number of Properties**	**Reporting Rate by Square Footage**
Commercial and Institutional Properties ≥ 250,000 ft²	95%	98%	97%	98%
Commercial and Institutional Properties 50,000 – 250,000 ft²	65%	68%	82%	83%
Residential Properties ≥ 250,000 ft²	91%	92%	97%	98%
Residential Properties 50,000 – 250,000 ft²	Not applicable (not required to comply in 2015)	Not applicable (not required to comply in 2015)	61%	67%
Municipal Properties ≥ 50,000 ft²	99%	99%	100%	100%
All Properties	84%	92%	80%	91%

While the reporting rate by the number of properties has decreased slightly from 2014 and 2015, the number of covered buildings has increased 12-fold since 2014, leading to additional outreach and resources necessary to support compliance. Because larger buildings tend to participate at higher rates, the reporting rate by square footage remains at over 90%, and has been fairly consistent from 2014-2016.

Importantly, the reporting rate (by both number of properties and by square footage) increased from 2015 to 2016 for all property types and sizes that were subject to the benchmarking ordinance in both years, including a 17% increase in the reporting rate (by number of properties) for commercial and institutional properties 50,000 – 250,000 ft^2 in area. This increase in participation is likely a result of ongoing outreach as well as efforts to improve the contact information for property owners and managers at each covered property.

The lowest reporting rate (61% by number of properties) is seen in the residential properties from 50,000 – 250,000 ft^2 in area; however, similar to the commercial / institutional properties in this size range, increased compliance will likely be observed in 2017 once they are required to comply for a second consecutive year.

Reaching Across All Neighborhoods

Citywide, every neighborhood has at least one reporting building, and 87% of neighborhoods have five or more reporting buildings.

With the final expansion of the policy coverage in 2016, 65% of neighborhoods now have 10 or more reporting buildings, compared to only 60% last year. Some of the neighborhoods with the largest increases in reporting buildings from 2015 to 2016 are Albany Park, Edgewater, Hyde Park, Kenwood, Lakeview, and South Shore.

The areas with the highest density of reporting buildings are located downtown, and also are located along the lakeshore to the north and south of the downtown area (See Figure 1).

Schedule for Energy Transparency

The City of Chicago is authorized to share building-specific results after the second year that the property team submits data. Thus, in 2016, the City will share data for properties that reported for the first time in 2014 or 2015, and then complied again in 2016.

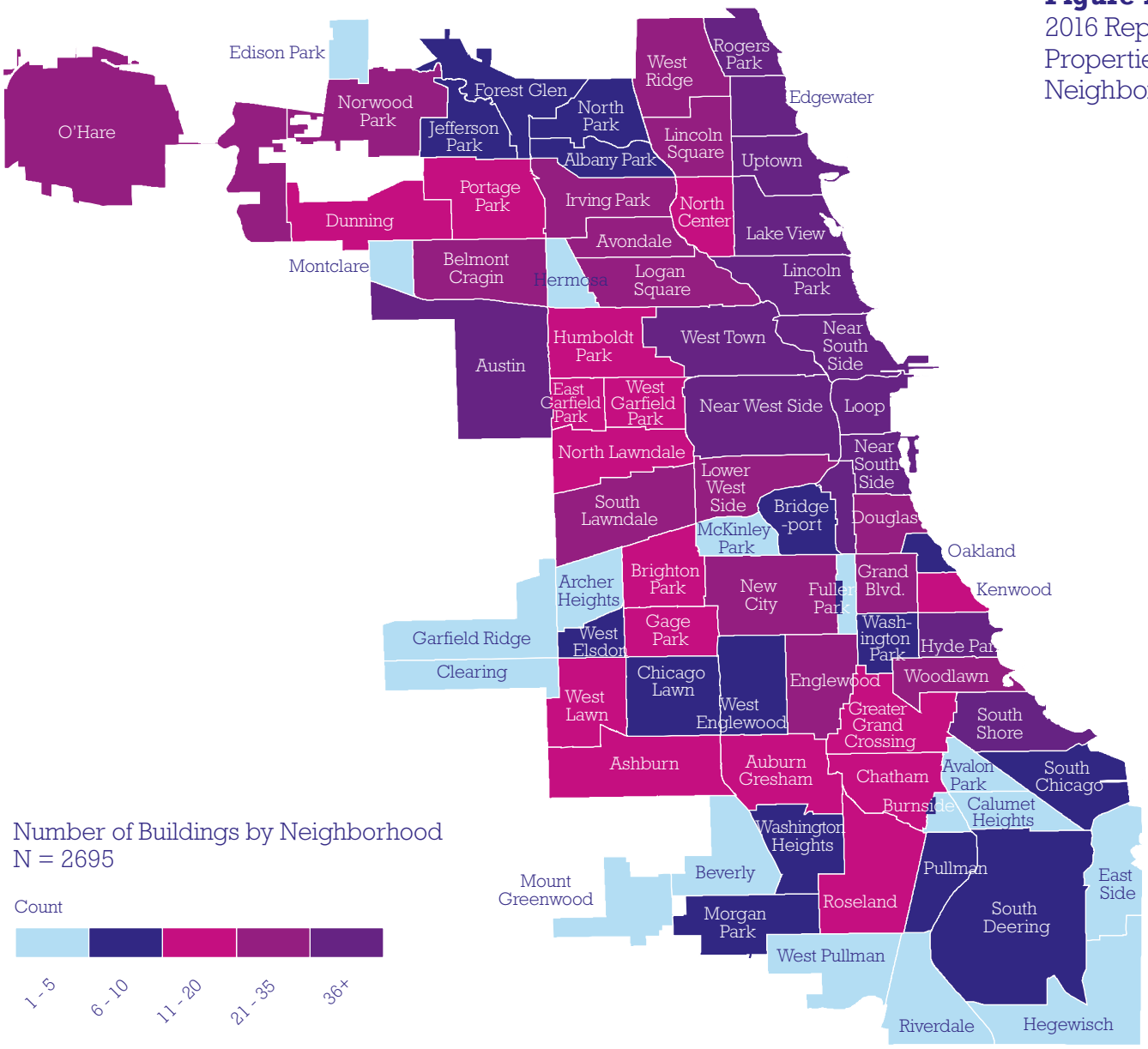


Figure 1: 2016 Reporting Properties by Neighborhood

The City of Chicago and its partners have published an interactive map of the buildings that reported data for the first time in 2014 and 2015. To use the map and view building results, including the buildings in your neighborhood, please visit: http://cityenergyproject.github.io/chicago/

Don't see your building on the online map yet? Note that next year, the City of Chicago will be authorized to share information for the buildings that reported for the first time in 2016.

Featured Buildings:
Higher Education – Community College

City Colleges of Chicago – Wilbur Wright College

ADDRESS
4300 North Narragansett

NEIGHBORHOOD
Dunning

CONSTRUCTED
1993

BUILDING OWNER / MANAGER
City Colleges of Chicago

ARCHITECT
Bertrand Goldberg

BUILDING SIZE
544,380 square feet
across 4 buildings

"Housed in a beautiful park-like setting, Wright College serves more than 23,000 students enrolled in associate degree and certificate programs, free GED and ESL classes, and personal and professional development courses. The College's curriculum includes the Environmental Technology Program, which prepares students for technical and managerial positions in the energy efficiency, emergency management, sustainability, and environmental health & safety fields. One key offering is the Building Energy Technologies (BET) certificate, one of the credentials currently recognized by the City of Chicago for completing the required data verification of energy benchmarking submissions.

The College not only teaches students about energy technologies, but has also applied the lessons of energy efficiency to its own campus. The Wright College team uses real-time energy monitoring along with a Building Automation System to track and improve energy usage. Under the leadership of Vice Chancellor of Administrative Services, Diane Minor, the College also recently completed several energy retrofit projects to re-clad the library building, add insulation, and upgrade lighting. From FY2014 to FY2016, the College has achieved annual energy reductions of 17% of natural gas usage (57,000 therms) and 19% of electricity usage (1,300,000 kWh), saving approximately $78,000 per year."

- City Colleges of Chicago

Michael Dompke, Wright College Chief Engineer

Photos courtesy of Amy Jewel, City Energy Project

Ongoing Outreach and Support Through Partnerships

In 2016, approximately 1,400 properties across the City were required to comply for the first time due to the final phase-in of covered buildings under the City's ordinance, a 67% increase in covered buildings from 2015 (see Table 1 on page 21). Almost all of the properties required to comply for the first time in 2016 were multifamily residential properties from 50,000 – 250,000 ft^2 in floor area.

Building upon extensive outreach and support available in 2014 and 2015, the City of Chicago continued to partner closely with several organizations to raise awareness about the need to comply and to provide free resources and training to covered buildings in 2016.

Outreach

Similar to 2014 and 2015, the City sent two compliance notices to representatives of all buildings required to comply this year prior to the June 1st deadline. If an email address was available, contacts also received email reminders. Any building representative out of compliance after the reporting deadline of June 1st also received notices of violation by mail and email. The City's Behavioral Design Team, staffed by the nonprofit behavioral science firm ideas42 (www.ideas42.org), and other partners helped the City test different versions of these notices to encourage compliance.

The City of Chicago also worked with over 100 partners to conduct outreach. Many of these groups shared information about the ordinance with their members or their networks. Key groups included energy or environmental nonprofit organizations; industry or trade groups; energy service providers; labor unions; and neighborhood business development centers.[5]

To reach the broader set of multifamily residential buildings required to comply for the first time in 2016, the City conducted significant outreach through the Chicago Housing Authority, which works indirectly or directly with affordable housing building owners and property managers throughout the city.

The City and its partners also worked with key residential groups such as:

- Chicagoland Apartment Association (CAA)
- Community Associations Institute (CAI)
- Community Investment Corporation (CIC)
- Illinois Housing and Development Authority (IHDA)
- Institute for Real Estate Management (IREM)
- International Facility Managers Association (IFMA)
- Service Employees International Union (SEIU) Local 1 and their partner organization, ABOMA.

Other important partners that assisted with outreach or hosted events included:

- American Institute of Architects – Chicago Chapter
- ASHRAE – Illinois Chapter
- Association of Energy Services Professionals (AESP)
- Building Owners and Managers Association (BOMA)
- Elevate Energy
- International Union of Operating Engineers, Local 399
- Midwest Energy Efficiency Alliance
- U.S. Green Building Council - Illinois

The City and its partners also collaborated to increase outreach conducted through social media, issuing more tweets than ever before to remind property teams of the need to comply, and providing sample tweets and suggested content to our partners for Facebook posts, LinkedIn articles, etc.

Building Support

Utility Data Access

Energy benchmarking relies on the analysis of whole-building energy consumption information. However, for properties with multiple meters, some of which are controlled by tenants, building owners or property managers are not expected to go door-to-door to their tenants to request utility bills. Instead, the two utilities providing service in Chicago – ComEd and Peoples Gas – offer whole-building energy use data at no additional cost to property representatives. Energy benchmarking would not be possible without the continued collaboration of ComEd and Peoples Gas in providing this critical information in a timely, efficient manner to their customers.

ComEd provides whole-building data upon request to building owners or their representative through the Energy Usage Data System (EUDS)[6], a secure, online service. Currently, EUDS serves over 860 property owners/managers and more than 3,300 properties in the City of Chicago. For a summary of EUDS enrollment from 2014-2016, see Figure 2.

[5]For a full list of all neighborhood business development centers, please visit: http://www.cityofchicago.org/city/en/depts/bacp/sbc/neighborhoodbusinessdevcenters.html
[6]EUDS: https://www.comed.com/WaysToSave/LearnMore/Pages/EnergyUsageData.aspx

Peoples Gas provides whole-building natural gas consumption information through the Large Building Energy Use Natural Gas Data Aggregation offering[7]. In 2014, approximately 70 properties enrolled in this program, and the number grew to more than 500 properties in 2015. As of fall 2016, more than 1,300 properties have utilized this service from Peoples Gas (see Figure 2).

- Annual enrollment in ComEd EUDS increased 10-fold since the first year of ordinance implementation in 2014; currently over 860 property owners and 3,300 properties are enrolled in the EUDS system
- 1,300+ properties received 2016 whole-building natural gas data from Peoples Gas, a 160 percent increase from 2015

Help Center

The Chicago Energy Benchmarking Help Center (Help Center), operated by Elevate Energy[9], has been continuously providing benchmarking support since 2014. The Help Center is available year-round, 9am-5pm on weekdays by phone or by email (with the exception of major holidays). A crucial resource available to answer any question about Chicago Energy Benchmarking, the Help Center responds to numerous types of requests, such as whether or not a building is required to comply, or how a building team can obtain their six digit Chicago Energy Benchmarking ID number. Help Center staff also provide detailed guidance for any step of the benchmarking process, from gathering initial information all the way through to instructions on how to electronically submit the final benchmarking report to the City of Chicago.

In addition to responding to phone calls, emails, and processing online forms (webforms), the Help Center works in partnership with the City of Chicago to identify and notify covered buildings under the ordinance, and also issues benchmarking compliance confirmations.

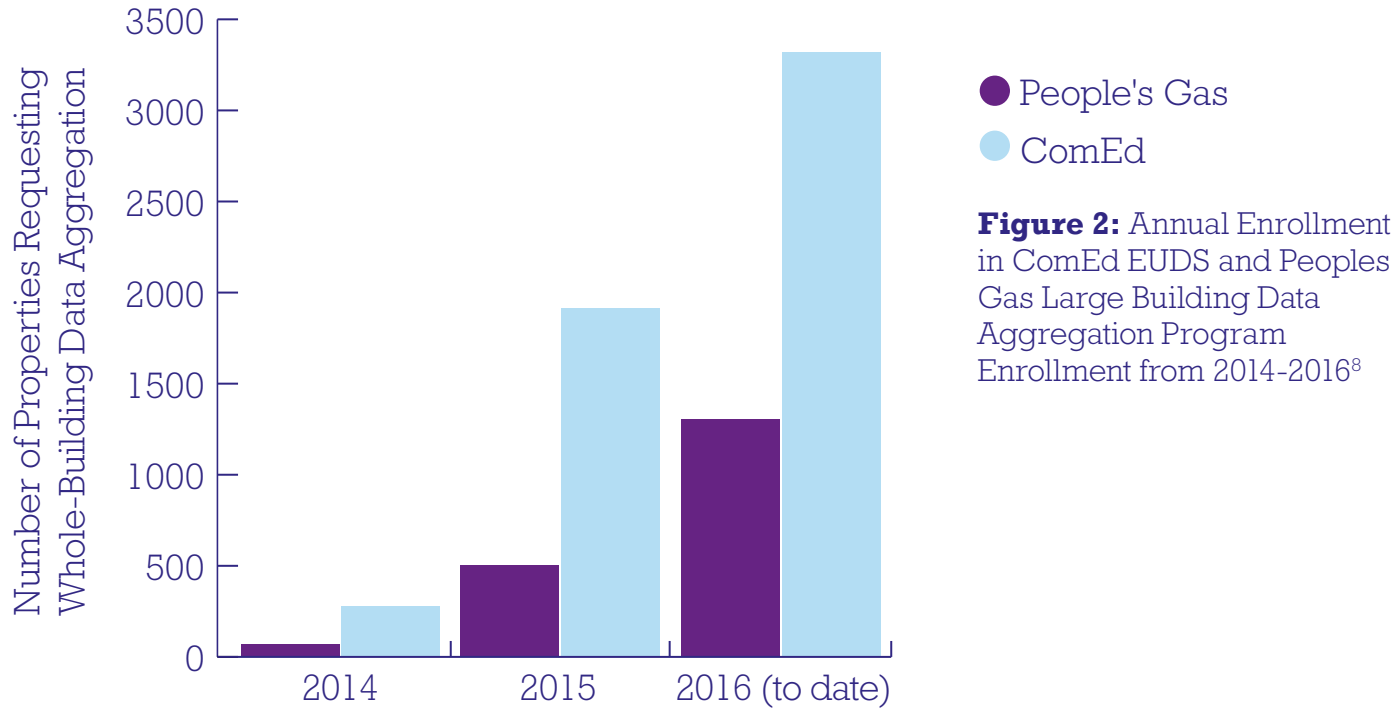
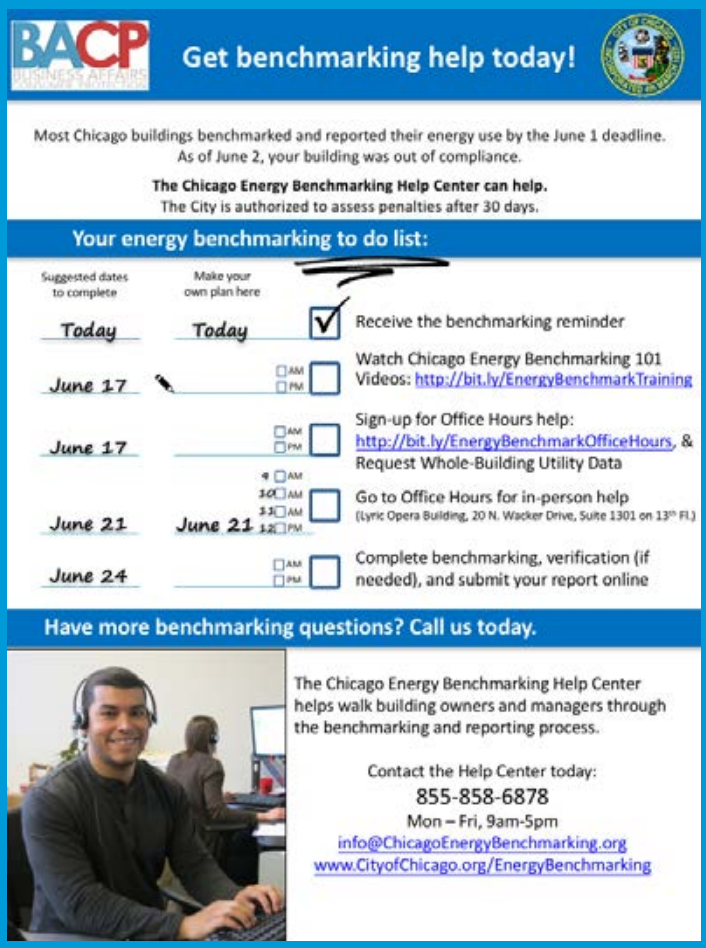


Figure 2: Annual Enrollment in ComEd EUDS and Peoples Gas Large Building Data Aggregation Program Enrollment from 2014-2016[8]

[7]Peoples Gas Large Buildings Energy Use Data Aggregation Program: http://www.peoplesgasdelivery.com/business/aggregation.aspx
[8]Note: Enrollment in the ComEd EUDS program is higher than the Peoples Gas Large Building Data Aggregation program for several reasons. First of all, Chicago has many all-electric buildings that do not use natural gas. Also, many buildings that do utilize natural gas only have 1-2 accounts, so that data aggregation across multiple accounts is not necessary.
[9]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

Improving Compliance Through Communications Using Behavioral Science Insights

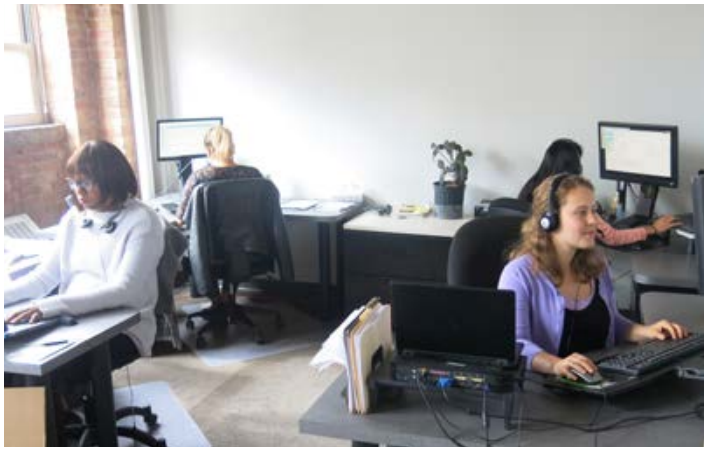


The City of Chicago and its partners tested various communications to improve energy benchmarking compliance messaging. One of the key partners in this effort is the City's Behavioral Design Team, staffed by the nonprofit behavioral science consulting firm ideas42 (www.ideas42.org).

In 2016, the Behavioral Design Team found that a streamlined checklist encouraging people to make their own task plan helped improve compliance by 4.5 percent, as opposed to a longer, more complex checklist. This difference was statistically significant at the building level, but not statistically significant when clustered at the building owner/manager level.

The partners will continue to test communications to determine more effective messaging approaches.

For more information about the testing completed on benchmarking compliance notices, as well as the testing of Chicago Energy Profiles, see "Using Nudges and Energy Benchmarking to Drive Behavior Change in Commercial, Institutional, and Multifamily Residential Buildings", found online at: http://aceee.org/files/proceedings/2016/data/papers/8_271.pdf



Chicago Energy Benchmarking Help Center

- 10,845 interactions from 2014 - 2016 (phone calls, emails, and webforms)
- Average 2016 call time: 6 minutes, 19 seconds
- Average 2016 caller wait time: 28 seconds
- Total 2016 phone support: 182 hours, 34 minutes
- Total 2016 estimated email and webform support: 502 hours, 25 minutes

In 2016 (to-date), the Help Center has conducted over 4,600 interactions, as shown in Figure 3. The average number of interactions per building required to comply has been steadily declining from 2014 to 2016. In fact, the total number of 2016 interactions is expected to be less than 2015 interactions, even though the number of covered buildings has increased. This decline in interactions per building may reflect the extensive outreach and support provided over the past three years, which has helped increase overall awareness and knowledge of Chicago Energy Benchmarking. The interactions per building are expected to continue to decline in 2017, as energy benchmarking continues to become a routine element of building operations.

Training and Office Hours

The U.S. Green Building Council – Illinois Chapter (USGBC-Illinois)[10] continues to partner with the City of Chicago to provide high-quality, easily accessible education around energy benchmarking and the use of the ENERGY STAR Portfolio Manager software tool. A key offering provided by USGBC-Illinois is the basic energy benchmarking training, created and delivered in collaboration with the American Institute of Architects – Chicago chapter (AIA-Chicago), the ASHRAE – Illinois chapter (ASHRAE-IL), and the Midwest Energy Efficiency Alliance (MEEA). Relying solely on volunteer instructors, the trainings are always provided free-of-charge.

From 2014 - 2016, 15 USGBC-Illinois volunteers provided over 40 free trainings on the Chicago Energy Benchmarking Ordinance requirements and the ENERGY STAR Portfolio Manager tool to approximately 660 stakeholders, including both in-person trainings and online webinar offerings. The trainings are also available as free online videos, which have been viewed 1,180 times.[11]

In 2016, USGBC-Illinois also held six free drop-in sessions where building representatives could receive additional, hands-on assistance to complete and submit their benchmarking reports.

Pro-bono Data Verification

While the Chicago Energy Benchmarking Ordinance does not require hiring a third party for the required data verification, the person completing the data verification does need to have a City-recognized license or training credential. Since some smaller firms or property ownership groups may not have resources to have a staff member become licensed, data verification could lead to the use of a third party, requiring a small fee.

To ensure that data verification is not an undue financial burden to any building, the City of Chicago partnered with USGBC-Illinois and ASHRAE-IL to provide free data verification for qualifying buildings with demonstrated need. Similar to the free energy benchmarking trainings offered in Chicago,

[10]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/

[11]The online trainings are available on YouTube at: http://bit.ly/BenchmarkingTraining

Figure 3: 2016 Chicago Energy Benchmarking Help Center Interactions

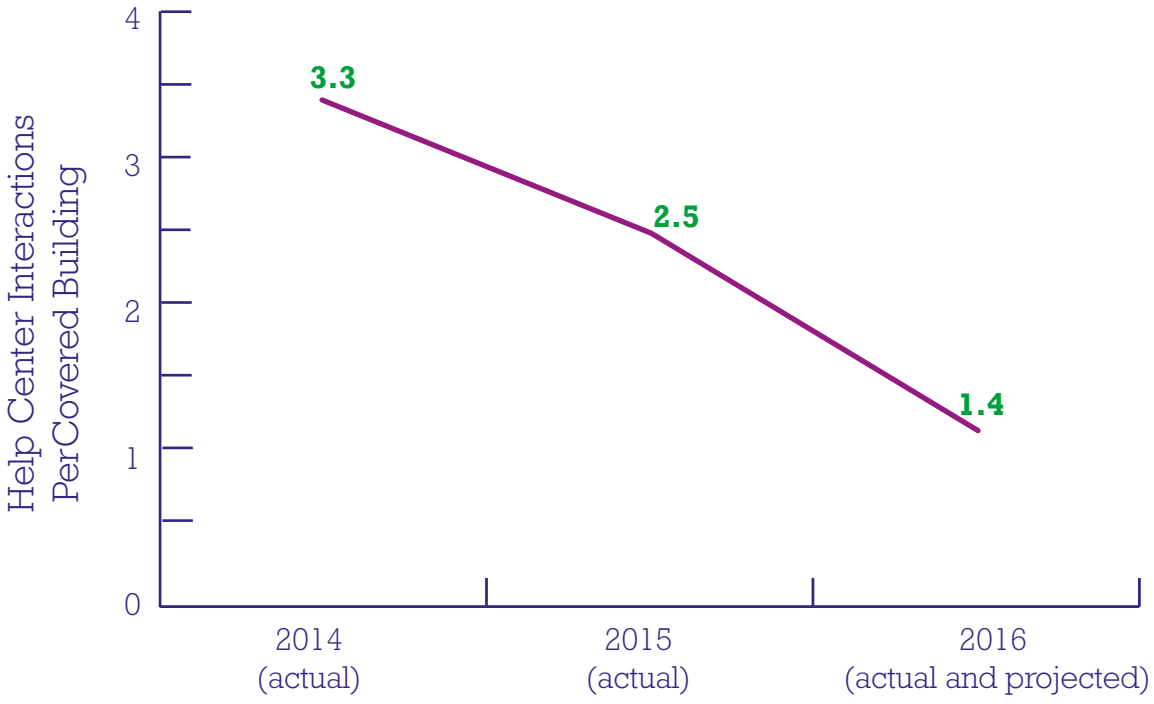


Figure 4: Annual Help Center Interactions Per Covered Building

A Pro-Bono Data Verification Team

the pro-bono data verification program relies on the significant contributions of professional volunteers, who are recruited through the membership networks of USGBC-Illinois or ASHRAE-IL. To date, 45 volunteers have participated in the program.

Since 2014, volunteers have worked with over 100 properties encompassing over 12 million ft^2 to review and verify reported information. This year in 2016, a number of organizations and facilities took part in the program for the first time, such as groups providing affordable senior housing, assisted living for persons with disabilities, correctional centers, and houses of worship. Several of these participating organizations provide critical community services and representatives from multiple groups have stated they would not have been able to complete energy benchmarking and reporting without the pro-bono program.

Two of the property teams that took part in the pro-bono program this year are featured in this report; see pages 16-17 and 34-35 for more details.

- Over 100 properties have received pro-bono assistance encompassing 12 million ft^2 of building space since 2014
- 45 specialized volunteers with one of the credentials recognized by the City of Chicago for data verification have provided free support to qualifying buildings with financial need

Photos courtesy of the Safer Foundation

Featured Buildings:
Nonprofit Orginization - Work Release Center

Safer Foundation – Crossroads Work Release Center

ADDRESS
3210 West Arthington

NEIGHBORHOOD
Lawndale

CONSTRUCTED
1911

BUILDING OWNER / MANAGER
Safer Foundation

ARCHITECT
Nimmons & Fellows

BUILDING SIZE
127,263 square feet

"Safer Foundation turned the old Sears Roebuck YMCA into a community-based work release center, opening Crossroads Adult Transition Center (ATC) in 1983. It is one of two work release centers Safer Foundation operates on behalf of the Illinois Department of Corrections. Since buying the 105-year-old building, which has historic value to the city, Safer has been committed to making it energy efficient and is proud to be recognized for our benchmarking efforts.

In recent years, our facilities management has included upgrading the heating and cooling systems, tuck-pointing, installing new roofing and the ongoing retrofitting of the lighting system from T12 fluorescents to T8 LEDs. In 2015, we replaced 8 of 10 HVAC units with new high-performance, energy efficient models and installed two new boilers.

By implementing these improvements, Safer Foundation has seen its energy bills cut by 25 percent. As we continue to maximize energy efficiency, Safer will use the benchmarking results and the encouragement from the City of Chicago's Pro-Bono Volunteer Program to drive our efforts."

- Safer Foundation - Crossroads Work Release Center

Rick Sears, Building Manager

2016 Benchmarking Results

Overview of Properties Analyzed in 2016

Over 2,600 properties reported energy use information in 2016, providing a wealth of information that has never before been available. Energy benchmarking reports from 2,259 properties are included in this analysis, and these buildings are referred to as "analyzed properties."[12] Similar to the 2015 Chicago Energy Benchmarking Report, properties are assigned to one of eight property groups, based on self-reported information about how space is used at each building.[13]

Figure 5 shows a breakdown of total floor area, weather-normalized source energy use, and greenhouse gas emissions for each building sector that reported this year. The total energy use of these properties represents about 0.5% of the total number of buildings in the city and approximately 23% of citywide energy use.

A more detailed summary of the analyzed properties is shown in Figure 6. Due to the additional multifamily properties phased into compliance this year, the number of multifamily reporting buildings (1,019) is now far greater than any other building type, with a total of 45% of all properties. This unprecedented number of properties reporting will continue to provide deeper insights into how energy is used by large apartment and condominium properties across the City. Also, because these buildings have fairly low energy use per square foot (also known as energy use intensity, or EUI), the total energy consumed by these properties is only 34% of total reported energy use.

[12]In 2016, a total of 2,544 property representatives submitted benchmarking reports by the analysis cutoff date of July 6, 2016. Of those properties, 92 complied on a voluntary basis, and were removed from data analysis. An additional 193 properties were found to have incomplete reports or possible errors, and were also excluded from analysis. The remaining 2,259 property reports comprise the dataset used for the analysis in this report. For more details on the data cleansing methodology, please see the Appendix.
[13]Properties with multiple uses are typically assigned to the space use that comprises 50% or more of the total floor area. If no single space use makes up 50% or more of the property's floor area, then the property is considered to be Mixed Use, which is included in the "Other" property type category.

Figure 5: Floor Area, Total Energy Use, and Total Greenhouse Gas Emissions by Building Sector

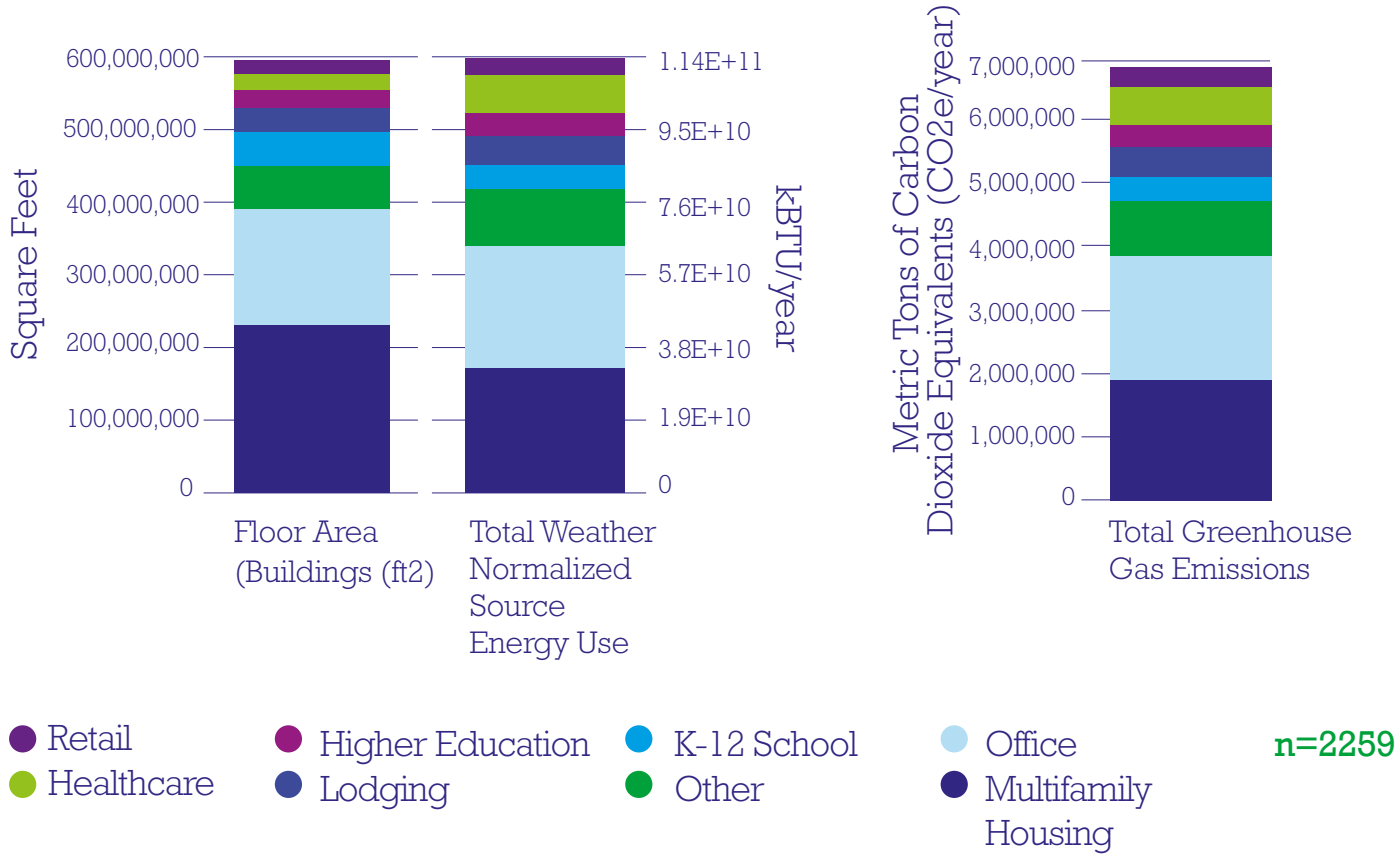
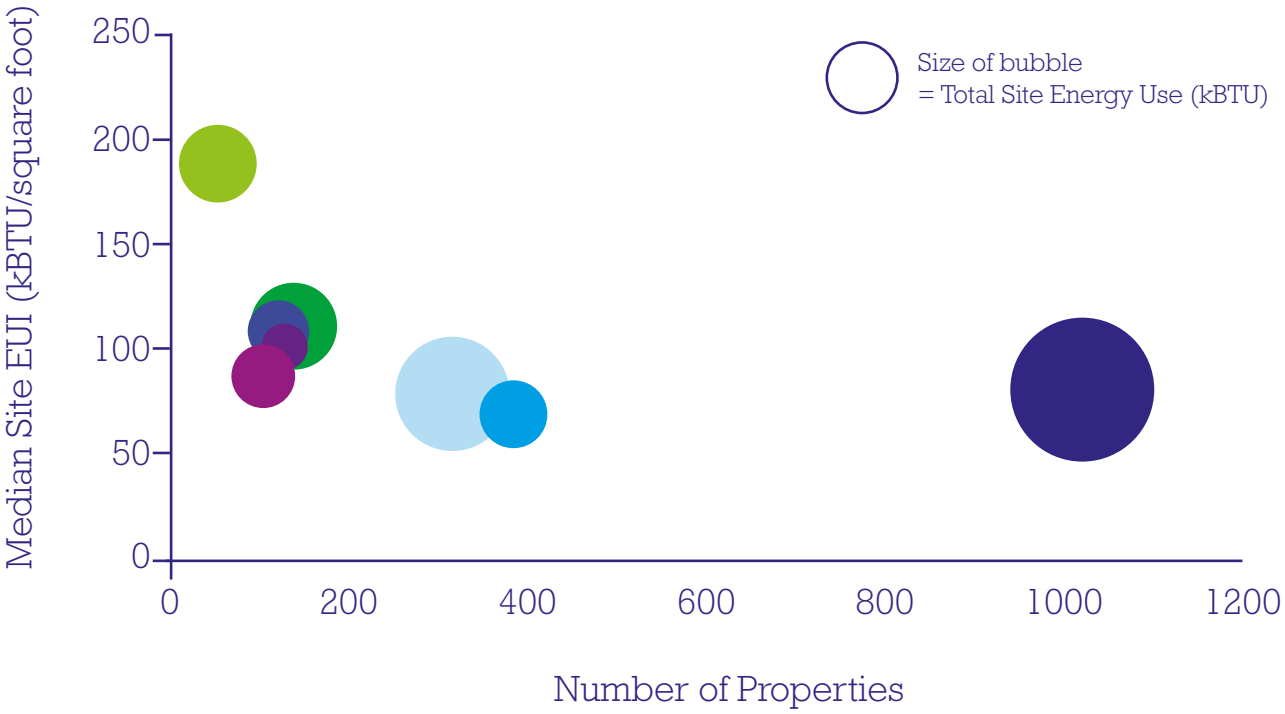


Figure 6: Median Site EUI and Total Site Energy Use by Number of Properties



Building Age and Size

The total floor area of analyzed properties, by decade of construction, is shown in Figure 7, along with the median ENERGY STAR score for each decade. While there are reporting buildings that were constructed as early as the 1840s, the decades with the largest floor areas are the 1920s, 1970s, and 2000s; these three decades comprise almost half (46%) of all the floor area from analyzed properties.

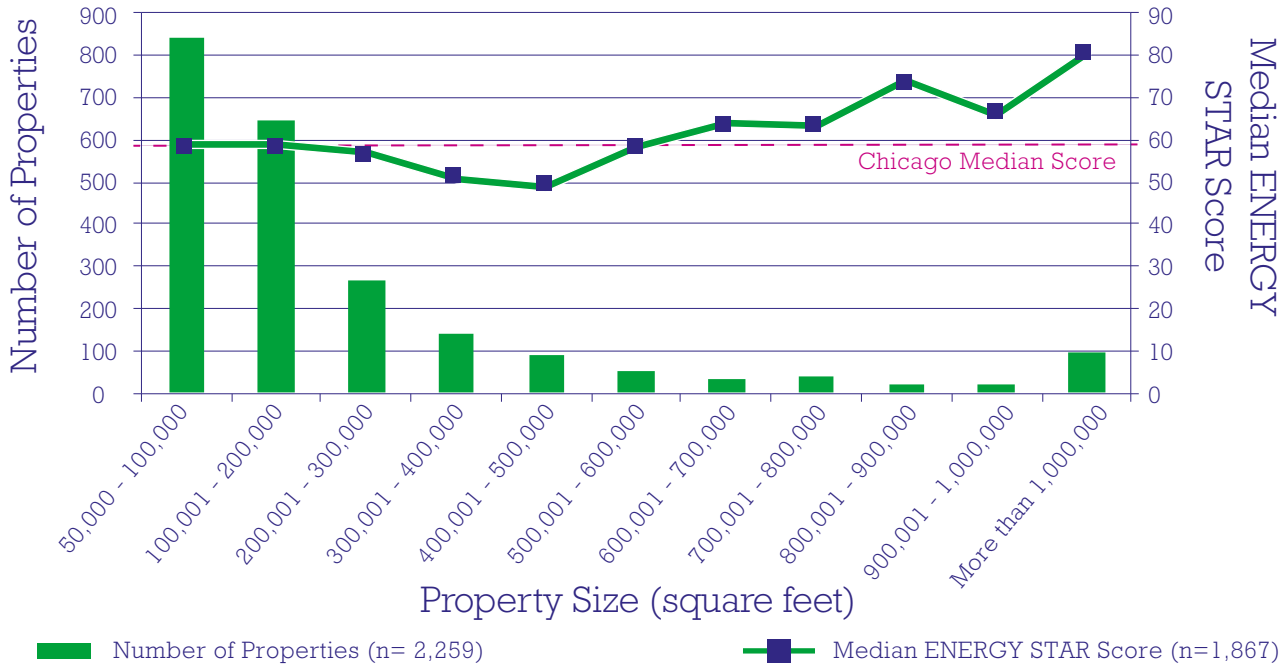
Similar to findings in the 2014 and 2015 Chicago Energy Benchmarking Reports, and also similar to results found in other cities, the decade of construction has little to no relationship to the property's energy performance. As evident in Figure 7, the median ENERGY STAR score for properties constructed in different time periods does not differ greatly from decade to decade. Some of the older analyzed properties have some of the better median scores, along with newer properties constructed from 2010 - present.[14]

The breakdown of analyzed properties based on size of the reporting building(s)[15] as well as the median ENERGY STAR score by property size are shown in Figure 8. While approximately two-thirds (66%) of analyzed properties are from 50,000 – 200,000 ft^2 in area, Chicago does have some very large buildings, including 98 properties that are over 1,000,000 ft^2.

[14]The ENERGY STAR Score is a 1-100 rating of energy performance, with 100 being a top performer. For more details, see the Appendix.
[15]In some cases, one property may have multiple buildings included in the same report. This may occur if multiple buildings share energy-consuming equipment, and is a common scenario on campus-style properties.

Figure 7: Property Floor Area and Median ENERGY STAR Scores by Decade of Construction

Figure 8: Number of Properties and Median ENERGY STAR Scores by Floor Area



Overall Energy Performance

Out of the 2016 analyzed properties, 83% (1,867 properties) received an ENERGY STAR score.[16] In 2016, the Chicago median ENERGY STAR score was 59 for all building sectors (Figure 9), which is one point higher than the 2015 Chicago median score of 58. About a third of the analyzed properties that received an ENERGY STAR score (610 buildings) received scores of 75 or greater, indicating a high level of energy performance.

In addition, the median ENERGY STAR score increased for almost all of the 8 property sectors from 2015 to 2016. Similar to results in previous years, Chicago property scores, continued to vary greatly by sector (See Figure 10).

With an increase of 12 points, Multifamily Housing properties had the greatest gain in the median ENERGY STAR score. However, this property type only included 274 properties last year, since only the buildings 250,000 ft^2 or greater were required to comply in 2015. This year in 2016, the multifamily housing properties 50,000 – 250,000 ft^2 reported data, and there are now 952 multifamily properties with ENERGY STAR scores – almost three and a half times more than received scores in 2015. Because of the differing property sizes and sample sizes from 2015 to 2016, comparisons in this particular building sector may not be as meaningful as other sector comparisons.

The other sectors with large ENERGY STAR score gains include Healthcare (6 point increase) and K-12 Schools (5 point increase). Two sectors saw decreases in their median scores: Lodging (1 point decrease) and Retail (5 point decrease).

Another key metric beyond the ENERGY STAR score is energy use intensity (EUI), or the total energy used per square foot of building space. This metric is available for all reporting properties, and may be used as a rough comparison for energy use among similar building types. In addition, weather normalized EUI controls for major weather variations from year to year (such as an extremely hot summer or very cold winter) and can be used to compare performance of a single building to itself over time.

The Chicago median weather normalized site EUI for the analyzed properties is 85.2 kBTU/ square foot. The distribution of this metric over all analyzed properties reveals that many properties with extremely high EUIs fall outside of the normal distribution, or outside of the typical bell-shaped curve. These are high-intensity properties that may benefit from additional scrutiny of energy consumption (see Figure 11).

[16]The remaining 392 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 9: ENERGY STAR Score Distribution (All Building Sectors)

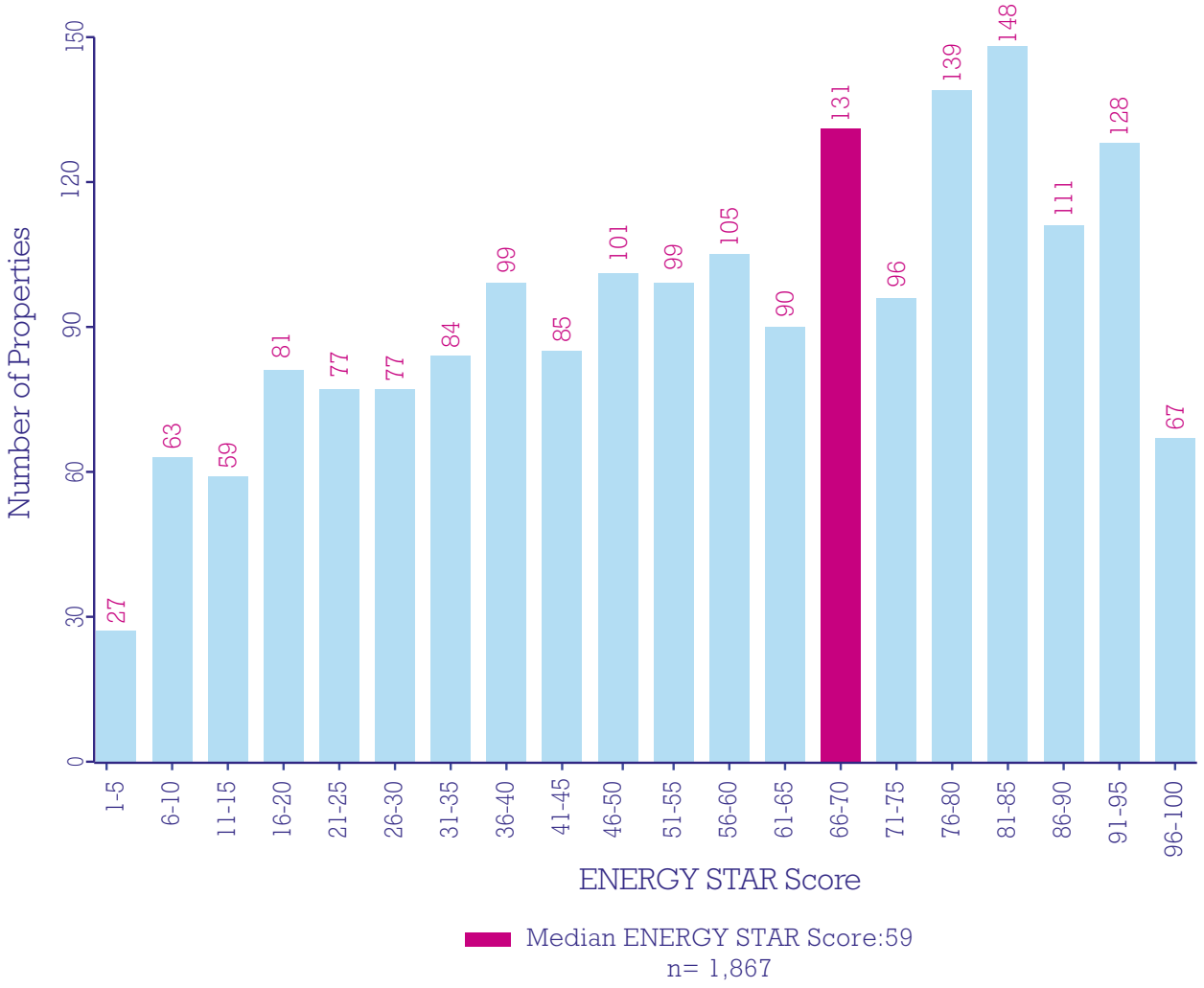


Figure 10: ENERGY STAR Scores by Building Sector Reported from 2015-2016

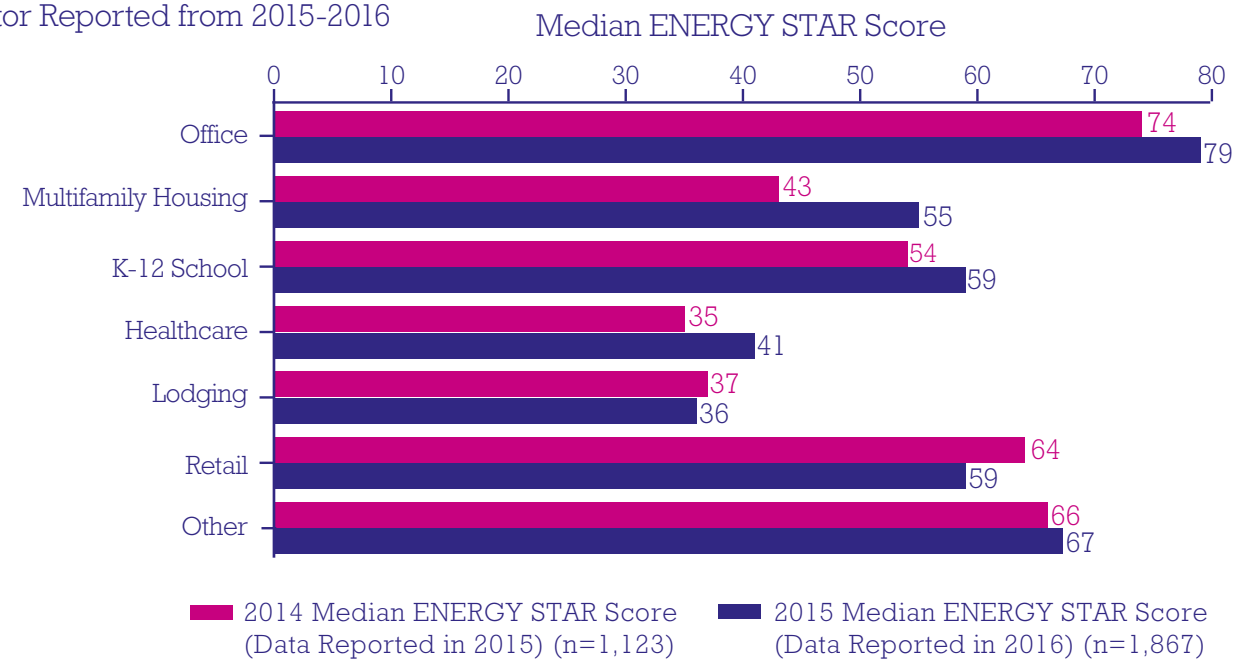
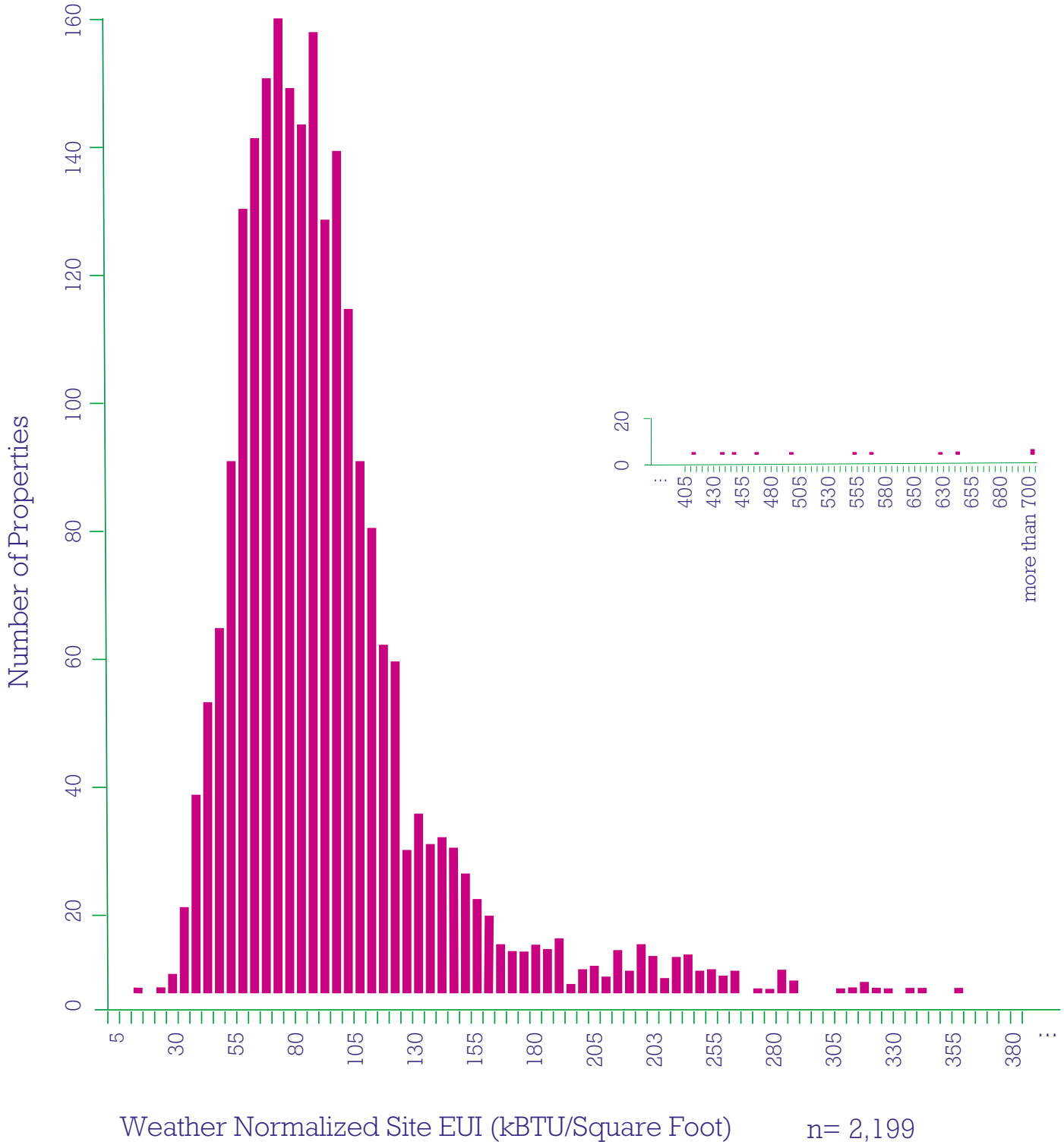


Figure 11: Weather Normalized Site EUI Distribution



Green Building Certifications – LEED & ENERGY STAR

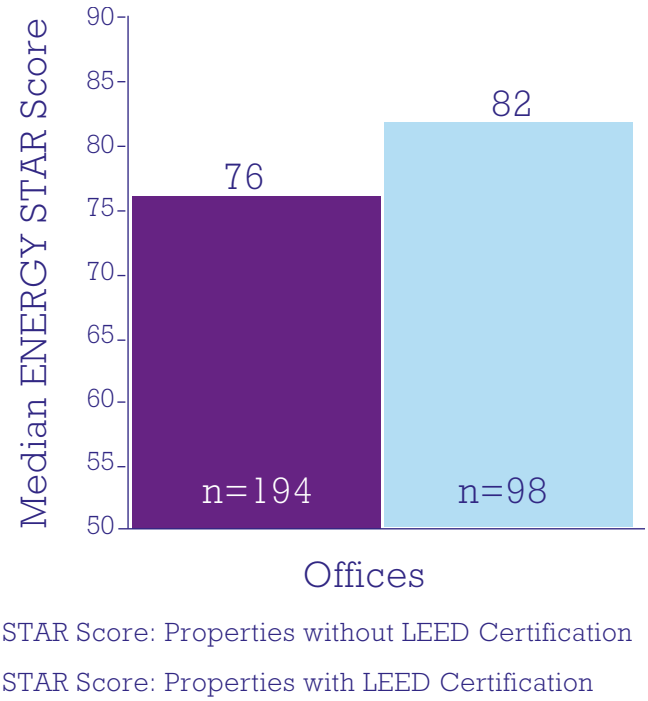
Leadership in Energy and Environmental Design (LEED) is a well-known green building certification program. To become LEED certified, a property must meet certain prerequisites, and must also earn points on the LEED rating system. Some of the points available can be earned if the building demonstrates high energy efficiency.[17] Out of the 2,259 analyzed properties, 163 properties were LEED certified between the years 2011 – 2015 under a whole-building LEED Rating System.[18] The Chicago property types that were LEED certified most frequently included: Offices (98 certifications), K-12 Schools (26 certifications), and Multifamily Housing (24 certifications).

Similar to results from previous years, LEED certified Office buildings in Chicago appear to have higher energy performance than non LEED-certified properties.

Figure 12 compares the median ENERGY STAR scores of LEED-certified and non LEED-certified Office properties; those that are LEED-Certified achieved an ENERGY STAR score 6 points higher than the non-certified properties.

While the same trend was not visible in K-12 Schools, the sample size of K-12 properties with LEED certification is very small (only 26 properties, compared to 349 without LEED certification).

Figure 12: Median ENERGY STAR Scores for LEED-Certified and Non LEED Certified Office Properties



[17]U.S. Green Building Council, Leadership in Energy and Environmental Design: http://leed.usgbc.org/leed.html

[18]The LEED Rating Systems considered to be whole-building systems are: LEED for Schools; LEED Building Design + Construction; LEED Operations & Maintenance; and LEED Core and Shell.

Cross-City Comparison

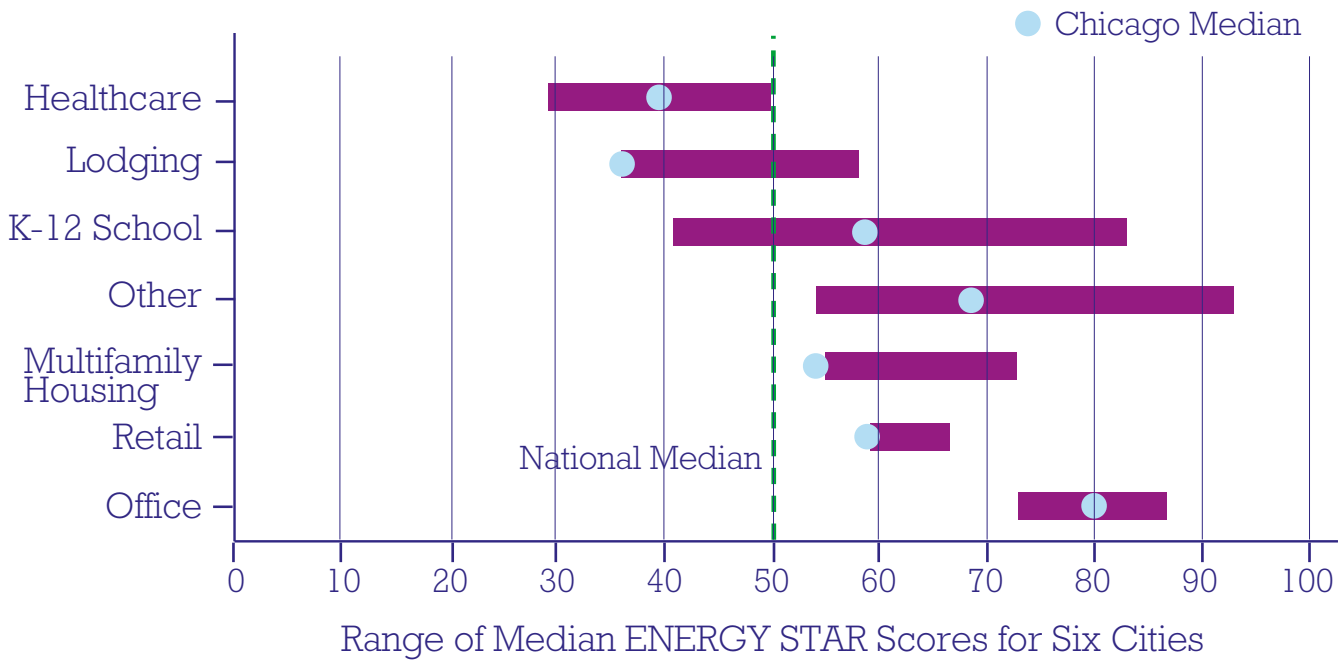
Chicago's buildings continue to demonstrate energy performance at similar levels as properties in other markets with benchmarking and transparency requirements, including Boston, New York City, Minneapolis, Philadelphia, and Washington, D.C. (See Figure 13).

In order to create a meaningful comparison of performance across multiple cities, publicly-available data were downloaded from the five cities listed above and filtered to include the same property sizes and sectors that are included in Chicago's dataset. Filtering the publicly-available data is an important step so that properties of the same sizes and sectors are compared.

However, the data for Chicago's analyzed properties has been cleansed to remove outliers and reports with possible errors. It was not possible to complete data cleansing using the same methodology for each of the publicly-available datasets. Thus, the results shown below should be considered as initial rough comparisons, and not as exact 'apples to apples' comparisons.

Similar to results published in the 2015 Chicago Energy Benchmarking Report, certain sectors appear to have similar energy performance across multiple cities. For example, median ENERGY STAR scores for the healthcare sectors across these six cities ranged from 29-50. Similar to other findings, the office sector continues to be the highest performer, with median ENERGY STAR scores from 73-87 across the six cities.[19]

Figure 13: Range of Median ENERGY STAR Scores, by Sector, Public Data From Chicago, Boston, Minneapolis, New York City, Philadelphia and Washington, DC



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

ENERGY STAR Score

A 1-100 ENERGY STAR score is a key metric provided to most buildings representatives after they have benchmarked their facilities using the ENERGY STAR Portfolio Manager tool. A score of 50 indicates energy performance at the national median, while a score of 100 represents extremely high energy performance. The 1-100 ENERGY STAR rating allows comparisons across property types, and across different geographies because it normalizes for differences in energy use (such as climate or annual weather patterns, building space uses, operating characteristics, and other variables).

Get Recognized!

Properties with an ENERGY STAR score of 75 or higher may be eligible for national recognition by the U.S. EPA as ENERGY STAR-certified properties, but only 20% of the 610 analyzed properties with high scores are currently certified.

Once certified, the property will be listed on a national EPA database, and will receive a plaque to display on the property's façade or in the lobby, as well as other recognition opportunities. If you worked with a property that received a score of 75 or greater, learn more about getting certified at www.EnergyStar.gov/Buildings

Did You Know?

Chicago is currently one of the EPA's ENERGY STAR Top Cities and is ranked #6 in the U.S. by the number of ENERGY STAR certified buildings, trailing the #5 city by only 22 properties. If your building has a score of 75 or greater, then help our City move up to the top five in the future rankings by getting your property certified today!

Using ENERGY STAR Portfolio Manager to Track Water and Waste Usage

ENERGY STAR Portfolio Manager can be used to track water consumption and solid waste / recycling generation at your property. Approximately 19% of analyzed properties in Chicago are already tracking their water usage in ENERGY STAR Portfolio Manager, although tracking water (or waste) is not required by the Chicago Energy Benchmarking Ordinance.

Measuring energy, water, and waste in one tool can help you to develop and manage sustainability goals. Also, by placing all the data into one tool, you can streamline your management process and gain a better understanding of your property's environmental impacts and associated costs.

To learn more about Water Tracking Data Trends, please visit: https://www.energystar.gov/sites/default/files/buildings/tools/DataTrends_Water_20121002.pdf

To learn about tracking waste, visit: www.energystar.gov/trackwaste

Featured Buildings:
Multifamily – Condominium

Thorndale Beach South Condominium

ADDRESS
5855 N. Sheridan

NEIGHBORHOOD
Edgewater

CONSTRUCTED
1967

BUILDING OWNER
Thorndale Beach South Condominium Association

BUILDING MANAGER
Chicagoland Community Management

ARCHITECT
Dunbar

BUILDING SIZE
287,849 square feet

"The energy benchmarking process was extremely valuable in helping the Thorndale Beach South Condominium Association Board understand the property's current energy performance. Based on the benchmarking results, which indicated a significant potential for energy savings, the Condo Association Board decided to begin several energy efficiency upgrade projects in this all-electric building.

Some of the current retrofits include a garage lighting upgrade that replaced over 200 fixtures; installation of nearly 100 LED fixtures with prismatic lenses; and replacement of 2 electrical panels. The property is also considering various water conservation initiatives. Looking forward, energy benchmarking will now provide a valuable tool for tracking the impact of these improvements on the performance of the building."

– Thorndale Beach South Condominium Association

Left to right: Brandi Green, Property Manager, Thorndale Beach South, Matt Terzic, Building Engineer, Thorndale Beach South, Barbara Miller, Board President, Thorndale Beach South, Atica Sabovic, Property Supervisor, Thorndale Beach South, Hans Herrmann, Energy Manager, Alternative Utility Services, Inc.

Photo courtesy of: Maurice Lawson

Photo courtesy of: Hans Herrmann

Energy Use Trends and Potential Savings

Trend Analysis

Results from other cities with energy transparency ordinances[20] and conversations with local management firms indicate that properties tend to start seeing decreases in energy use and cost savings after the first one to two years that they have benchmarked. Many property managers could be focusing on compliance during the first one to two years that they are required to benchmark under a new energy transparency policy. However, once the property's data have been entered consistently for one to two years, there may be less focus on the benchmarking process itself as it is integrated into regular reporting and compliance tasks.
In Chicago, benchmarking data appear to confirm this trend. Benchmarking reports for properties that have benchmarked for three consecutive years show a higher energy savings than those that have benchmarked consistently for two consecutive years.

This increase in savings over time points to the possibility that benchmarking provides increased value after the first one to two years of reporting are complete.

Buildings With Three Years of Benchmarking Results

Under the three-year phase-in period of Chicago Energy Benchmarking, commercial and institutional properties that are 250,000 ft^2 or greater have now been required to benchmark for three years in a row, from 2014-2016.

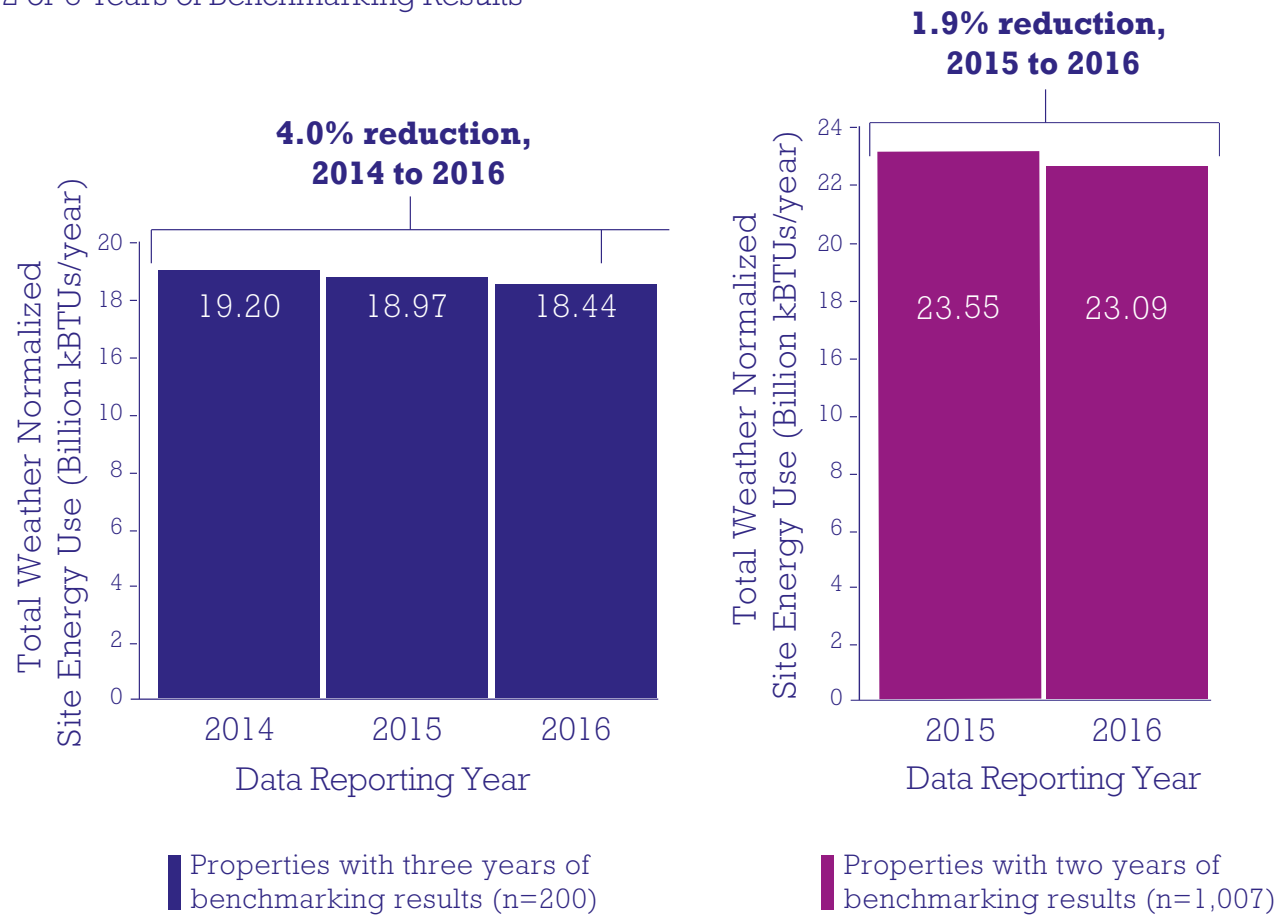
Last year in 2015, an analysis of 212 property reports indicated a 1.6% decrease in weather normalized[21] site energy use. This year in 2016, data from a slightly smaller subset, a group of 200 properties, shows a 4.0% decrease in weather normalized site energy use over three years (from calendar year 2013 to calendar year 2015 – see Figure 14). At the same time, the properties' ENERGY STAR scores increased by 6.6% from a median score of 76 to a median score of 81.[22]

These energy savings equate to a reduction of 187,576 metric tons of GHG emissions, as well as an estimated cost savings of $11.6 million per year.

Future benchmarking reports will provide more insights as to whether these initial energy savings and increases in ENERGY STAR scores will persist over time. In addition, these 200 properties are large buildings, comprised of a majority of office buildings, and may not be representative of the results available from properties of other sizes and sectors.

[20]For example, see the City of Minneapolis 2014 Energy Benchmarking Report (February 2016) and New York City's Energy And Water use 2013 Report (August 2016).
[21]Weather-normalized metrics control for weather variations such as an unusually hot summer, and allow for comparisons of energy use over time
[22]See the Appendix for an explanation of the methodology for the trend analysis

Figure 14: Energy Reduction Trends, Buildings with 2 or 3 Years of Benchmarking Results



Buildings With Two Years of Benchmarking Results

Two years of energy consumption data are now available for multifamily residential properties, specifically those over 250,000 ft^2, as well as commercial and institutional properties from 50,000 – 250,000 ft^2.

A total of 1,007 properties that reported data in both 2015 and 2016 showed a decrease in total weather-normalized site energy use of 1.9%; at the same time, the median ENERGY STAR score for the buildings that reported for two consecutive years increased by 7.8%, from a median score of 51 to 55 points. A breakdown of the median ENERGY STAR scores by property type for buildings that reported consecutively in 2015 and 2016 is shown in Figure 15.

The cost and emissions savings for these 1,007 properties are sizable, due to the scale of properties that are collectively reducing energy use. As a group, the cost savings are estimated at $6.2 million per year with a reduction of 189,550 metric tons of GHG emissions per year.

Savings Opportunity

The U.S. EPA estimates that up to 30% of the energy used in buildings is wasted. Similarly, in Chicago, analysis of benchmarking reports lead to a similar conclusion: up to 25% of energy can be reduced in buildings across the City. While Chicago's building stock is demonstrating an overall high level of energy performance, there are some high energy users in each of Chicago's building sectors. For example, a few office buildings are consuming twice the energy use per square foot as the median level for office

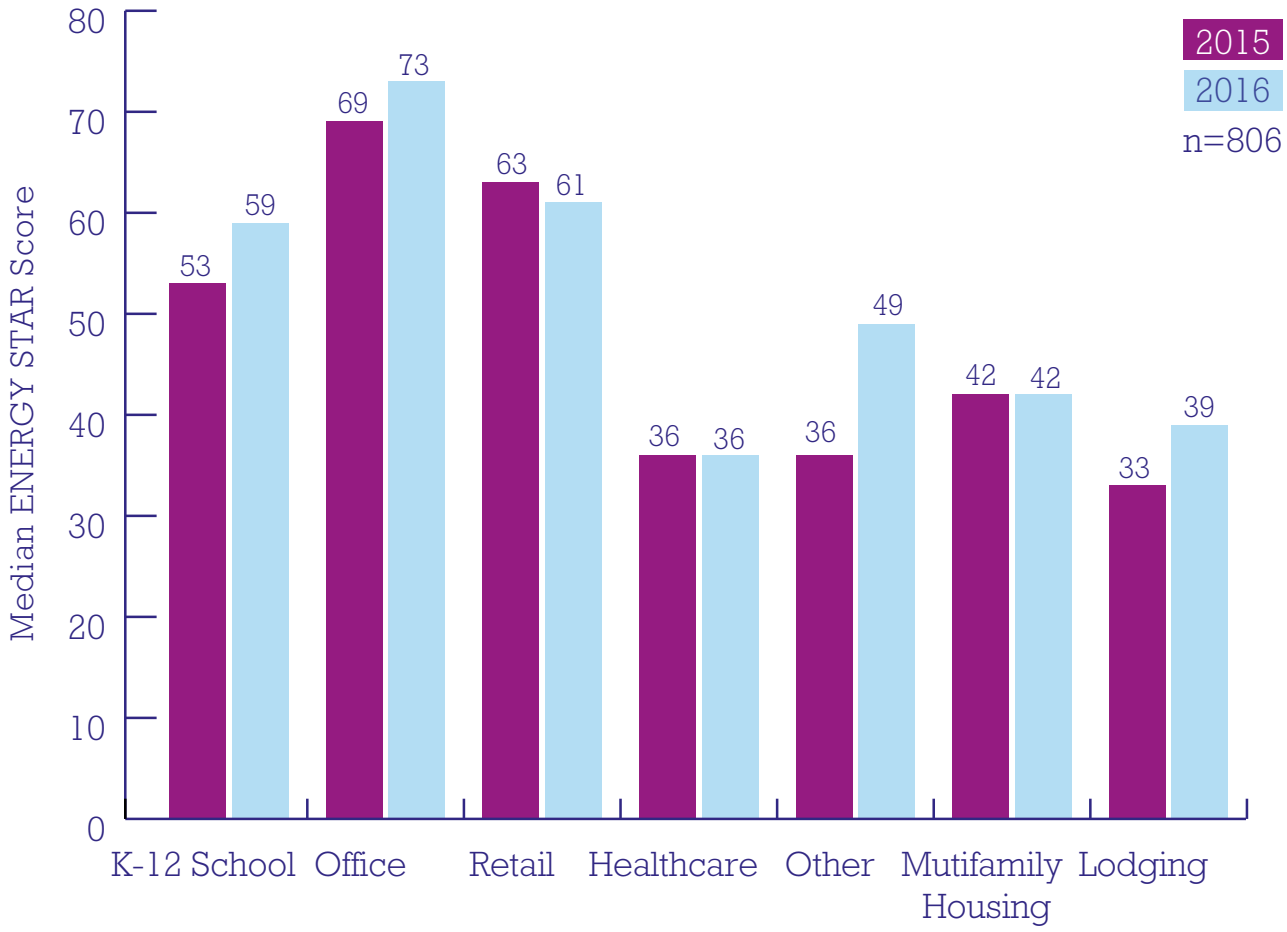
buildings in Chicago. These properties do not appear to have highly energy-intensive space uses such as data centers, and may have large opportunities for improvements. Also, there are many properties with energy use well below the median, indicating a high level of performance. For the full distribution of energy use intensities by building sector, see Figure 16.

If all the properties near or above median energy use intensities were to reach lower energy use intensity values for their property type, then the energy reductions could be as high as 25%, as well as additional savings of:[23]

- 14-25% reduction in site energy use
- $110–214 million in energy cost savings
- 845,000 – 1.6 million tons of avoided greenhouse gas emissions, equivalent to removing 178,000 – 328,000 cars from the road
- Estimated energy efficiency investment of $387–751 million[24]
- More than 3,500 jobs could result from investments to achieve these savings.[25]

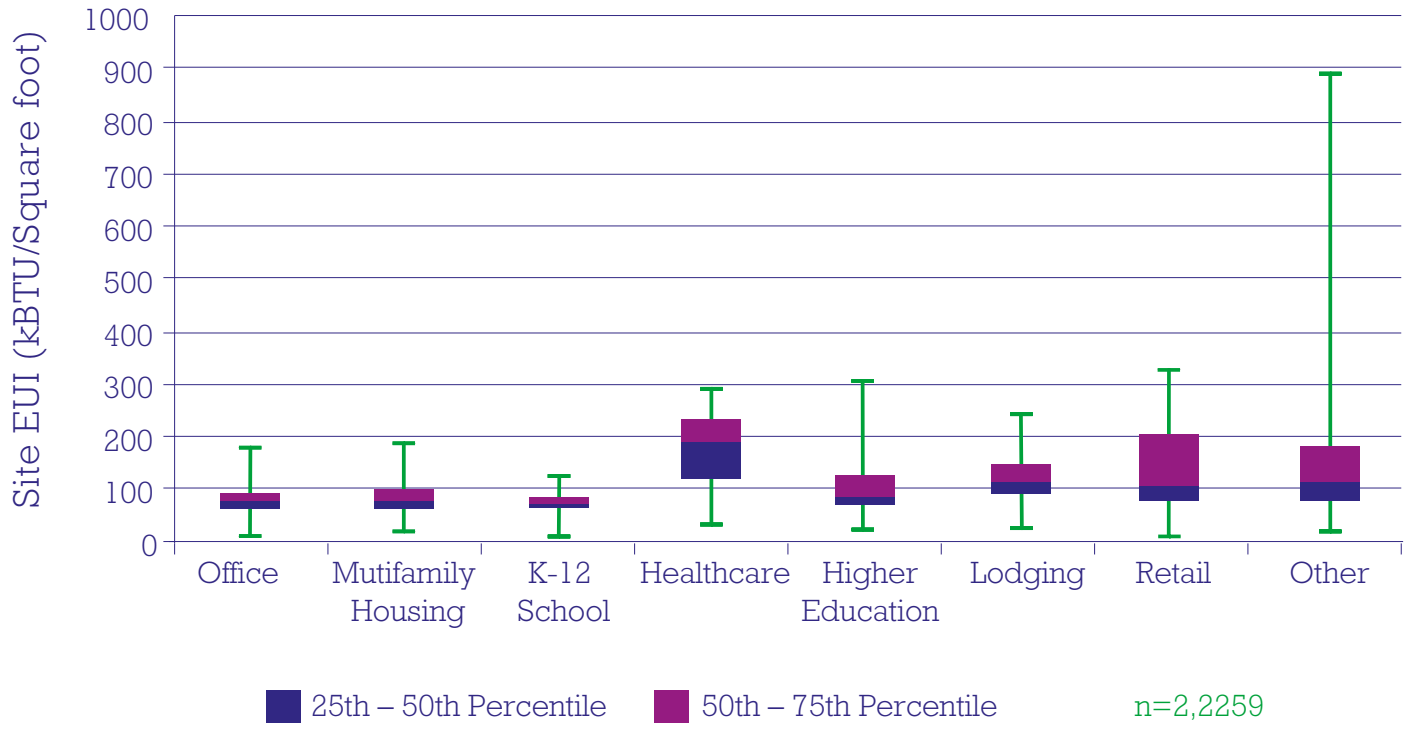
In addition to these savings projections, reducing the energy use intensity of high- performing properties by just 2% could yield an additional $3.6 million in savings per year.

Figure 15: Median ENERGY STAR Scores for Buildings with Two Years of Benchmarking Results



[23]Savings are based on comparisons of properties within each of the ENERGY STAR Portfolio Manager property types. For example, Libraries are compared to other Libraries, Hospitals are compared to other Hospitals, etc.
[24]Estimated energy efficiency investment results from multiplying potential energy cost savings by an investment multiplier of 3.5
[25]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.

Figure 16: Range of Site EUI by Building Sector



ENERGY SAVINGS

The U.S. EPA estimates that up to 30% of the energy used in buildings is wasted.

Energy consumption data from the Chicago Energy Benchmarking Ordinance confirm these estimates and indicate that up to 14-25% of energy savings are possible across all building sectors.

From Information to Action: How Energy Benchmarking Results are Transforming the Market

Benchmarking provides a wealth of information about energy consumption, building characteristics, and other property details that simply were not previously available in the marketplace. The real estate and energy communities are starting to harness the benchmarking data in new, creative ways to drive action on improving efficiency. Below are three examples of how benchmarking is helping to inform larger efforts around energy management.

Better Data When Selling Buildings: CoStar's Partnership with the Department of Energy

In May of 2016, the Department of Energy and CoStar Group, Inc. announced a new partnership to expand and increase the visibility of energy use in U.S. commercial real estate markets. Through the partnership, CoStar, a provider of data and intelligence solutions to commercial real estate professionals, will begin providing energy data on commercial properties to its customers throughout the real estate and financial services industries. Specifically, CoStar will collect publicly available building energy information generated by state and local government benchmarking policies and integrate that information into its property records. This integration will occur first in the Chicago and Washington DC markets, followed by other markets where such information is available.

According to the CoStar website, providing additional energy data "means CoStar customers, including brokers, owners, investors and lenders, will have access to first-hand intelligence about the environmental attributes of property investment and finance opportunities – which can help them make smart investment decisions that foster economically-friendly business practices."

CoStar and the Department of Energy also plan to perform new, cutting-edge research to evaluate the impact of energy efficiency and sustainability on real estate valuation; building operating income and expenses; tenant health, comfort, and productivity; and other topics.[26]

[26]For more information, please visit the following websites.
Costar: http://www.costargroup.com/insights/insights-article-detail/insights/2016/05/31/CoStar-Partners-with-U.S.-Department-of-Energy-to-Promote-Eco-Friendly-Buildings
The Department of Energy: http://energy.gov/eere/articles/energy-department-announces-partnership-costar-group-inc-expand-visibility-energy

Tenant Engagement in Affordable Housing: Green Resident Engagement Collaborative

The members of the Green Resident Engagement Collaborative set out to create self-sustaining resident engagement and education programs in multifamily housing properties, with a focus on promoting green lifestyles that conserve energy and water, and decrease tenant and owner-paid utility bills. The Collaborative is made up of three Chicago-based affordable housing providers – Bickerdike Redevelopment Corporation, Hispanic Housing Development Corporation, and Heartland Housing. Enterprise Community Partners supports the collaborative through grant funding and technical assistance and YR&G Consulting currently serves as a consultant in developing the collaborative. Enterprise is a national nonprofit that works to create opportunity for low- and moderate income people through affordable housing in diverse, thriving communities.

Efforts to engage multifamily housing residents in green living can positively impact people's lives, benefit the environment and stabilize utility costs for building owners and residents. In addition to environmental concerns, energy costs are also a concern for owners of subsidized affordable housing stock, which tends to rely on limited annual budgets that do not account for increasing utility costs. Water costs are also increasing, despite the perception that water is not a concern for businesses and residents in the region.

With these environmental and economic realities in mind, the Green Resident Engagement Collaborative focuses on ways to work with residents to reduce their overall energy and water consumption, giving Chicago residents the tools and motivation to reduce greenhouse gas emissions and save money on their own utility bills. The project includes development of a resident engagement plan, a library of visually-oriented resident education materials appropriate for a diverse audience, and a volunteer driven resident engagement program that will be rolled out at several collaborative properties this fall. The education materials were based on Enterprise Community Partners' comprehensive resident engagement toolkit and was customized to meet the needs of Chicago-based affordable multifamily owners.[27] US Green Building Council – Illinois chapter members will serve as initial volunteers to further support Chicago's participating multifamily buildings in engaging residents.

The resident engagement activities of the collaborative also build upon a larger initiative by Chicago affordable housing owners to embrace sustainability as a core operating principle. Bickerdike Redevelopment, Heartland Housing and Hispanic Housing Development Corporation also participate in the Enterprise Sustainability Exchange (ESE), which is a green capacity building initiative for nonprofit housing owners and developers in Chicago. Currently, ESE supports ten affordable housing owners who manage approximately 9,300 units of housing in the Chicago area. Efforts supported through ESE include benchmarking, energy and water assessments and retrofits, and special projects such as renewable energy system development and green design support for new and existing buildings. Elevate Energy provides additional technical support to the program.

Initial results from the program are encouraging. To date, seven out of ten ESE participants currently use benchmarking software to measure monthly gas, electric and water usage across 4,370 units. Five of those groups first worked on benchmarking through participation in the program. In addition, Elevate Energy has conducted energy assessments on 67% of the 9,300 units and water assessments on 14% of the units. Out of units assessed for energy efficiency, 62% (3,881 units) were retrofitted with improved features and out of those assessed for water efficiency, 84% (1,128 units) were retrofitted. Based on what is learned from ongoing benchmarking, plus from assessments of energy and water usage, owners expect to implement additional retrofits through the end of next year.

[27]To view the Enterprise Community Partners Resident Engagement toolkit, please visit: http://www.enterprisecommunity.org/solutions-and-innovation/enterprise-green-communities/resources/resident-engagement

Photos from Green Resident Engagement Collaborative and the Enterprise Sustainability Exchange, courtesy of Enterprise Community Partners

Project partners

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Informing the Design of New Buildings: The Accelerate Performance Initiative

While benchmarking results are typically used to inform energy management decisions for existing buildings, the unprecedented data now available from energy benchmarking can also help inform the planning and design of new properties. The **Accelerate Performance**[28] initiative, led by building performance consultant and research nonprofit Seventhwave, is one example of how building owners and design teams are using benchmarking data to improve the energy performance of new construction.

Seventhwave and its partner, the National Renewable Energy Laboratory, entered an agreement with the U.S. Department of Energy to pilot Accelerate Performance through utility new construction programs across the country, including the ComEd Energy Efficiency Program in Chicago and northern Illinois. This approach empowers owners and developers to achieve desired energy performance goals and to stabilize operating budgets for energy consumption by changing how they procure their buildings.

When participating in Accelerate Performance, building owners prioritize project goals at the outset. Importantly, they specify an energy performance requirement in the pre-planning phase, and often before the architect is selected for the project. This requirement is typically a specific target for energy use intensity (EUI), or the energy use per square foot, that will be achieved once the building is fully occupied.

To facilitate this process, Seventhwave developed a free online tool, EUI Analyzer, based on benchmarking data to support owners in identifying an aggressive yet achievable energy performance target. The tool also compares the proposed project with peer buildings, as well as with properties within their own portfolio.

Following this goal setting exercise, the building owner includes the target in the contract and selects the design and contractor teams based on their ability to meet the energy performance target (along with other project requirements). The teams then measure the energy performance to verify that the contract requirement is met.

Pioneering this approach, the University of Chicago developed an energy performance target for its new 390,000 square foot dorm, the Campus North Residential Commons. The University included an EUI goal in their Request for Proposals and design teams responded based on how they could best meet that target within a fixed budget. Studio Gang Architects and Mortenson Construction were selected as the design-build team and the project completed in the fall of 2016. Based on the success of this project, the University plans to integrate this approach within their future design and facilities standards.

Accelerate Performance drives innovation and illustrates the value of transparency in the building design process. By leveraging energy benchmarking data, building owners can now make better decisions regarding their investment in sustainability for new construction projects.

[28]For mote details see, http://www.seventhwave.org/accelerateperformance

EUI Analyzer Tool Screen Shot

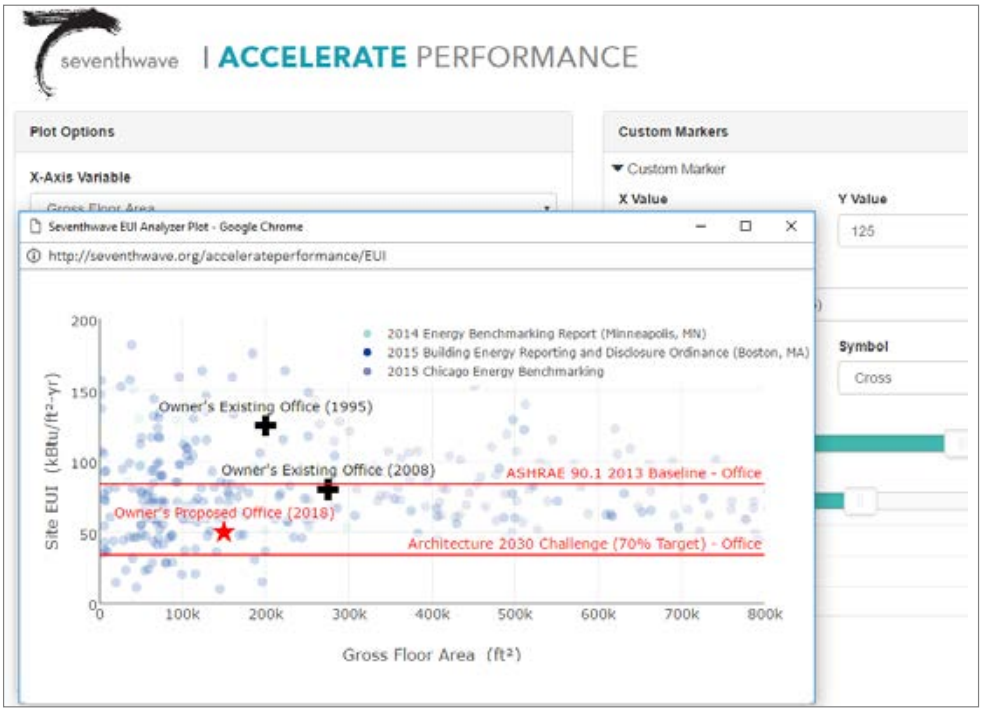
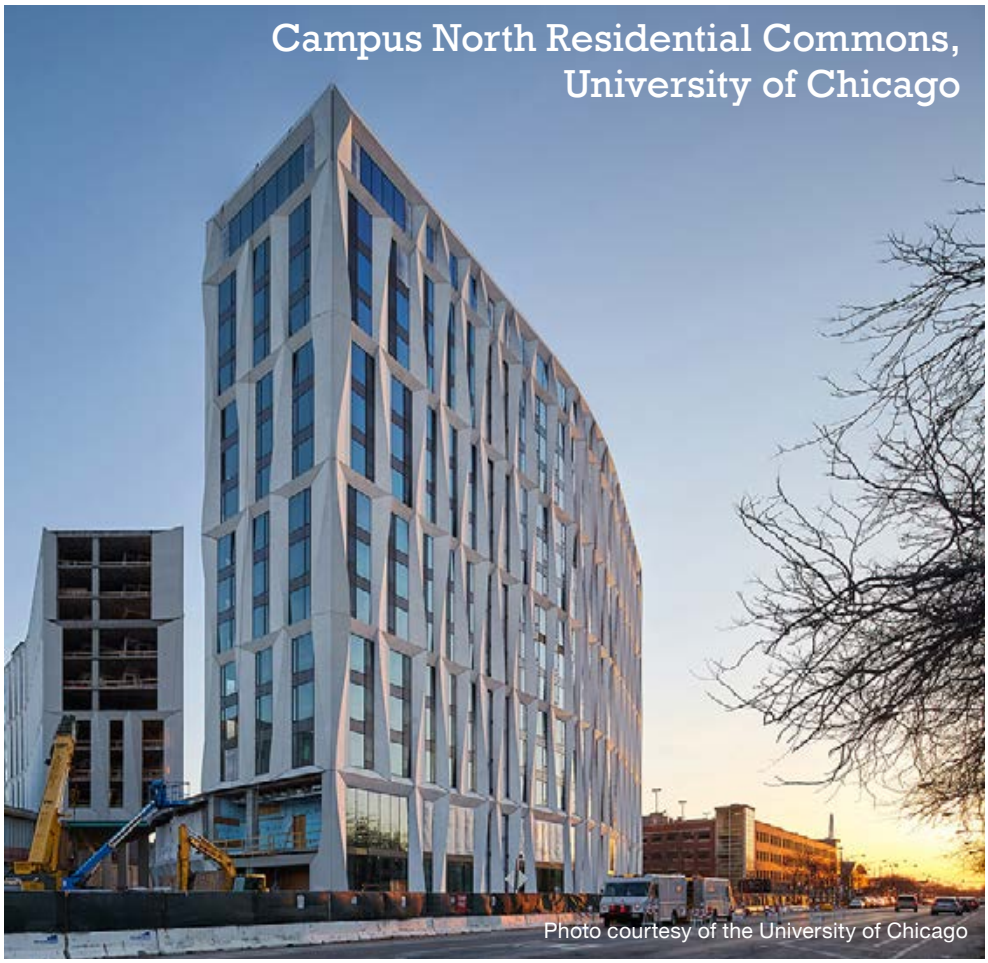


Photo courtesy of Seventhwave



ACKNOWLEDGEMENTS

The City of Chicago would like to thank the multiple partners and supporters who have collaborated in implementing the Chicago Energy Benchmarking Ordinance. The City and its partners have worked closely together to ensure energy benchmarking and reporting is as easy as possible for the 3,500 properties now covered by the ordinance requirements.

The Chicago Energy Benchmarking Working Group has been involved in this effort for over 3 years, starting with advising on the development of the benchmarking ordinance in 2013 and continuing through to current involvement in outreach, support, and technical assistance for completing benchmarking and implementing energy efficiency improvements.

A special thanks to Elevate Energy, the local partner that operates the Chicago Energy Benchmarking Help Center, which has responded to over 10,000 phone calls or emails since 2014. We also greatly appreciate the efforts of the U.S. Green Building Council – Illinois chapter, another key partner who has provided over 40 free trainings, and that has provided pro-bono assistance to over 100 organizations with financial need. Most of this support has been extended through its impressive volunteer network. Thank you also to the many volunteers who have donated their time to deliver trainings, provide free help, and conduct additional research.

We are extremely grateful for the ongoing partnership of Commonwealth Edison and Peoples Gas, whose work is critical to the success of Chicago Energy Benchmarking. Energy service providers have also played an important role in the process of implementing the Chicago Energy Benchmarking Ordinance, and we are appreciative of the 80+ firms working in Chicago to support outreach and assist in energy benchmarking and data verification, the latter of which helps ensure a high level of data quality.

A final thank-you to the City's internal implementation team, including the Chicago Housing Authority, a key outreach partner; the Department of Innovation and Technology (DoIT), who has partnered to publish energy transparency information; the Department of Business Affairs and Consumer Protection; and the Department of Buildings.

CHICAGO ENERGY BENCHMARKING WORKING GROUP

ASHRAE – Illinois
American Institute of Architects – Chicago Chapter
C40 Cities Climate Leadership Group
City Energy Project
Elevate Energy
Institute for Market Transformation
Midwest Energy Efficiency Alliance
Natural Resources Defense Council
Seventhwave
U.S. Green Building Council – Illinois Chapter.

The 2016 Chicago Energy Benchmarking Report and the initiatives / programs described herein were created with input, analysis, and other support from the following organizations and individuals:

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Appendix

Useful Benchmarking Metrics and How to Use Them

- **ENERGY STAR Score:** A 1-100 ENERGY STAR score shows the property's overall energy performance relative to similar buildings. A score of 50 indicates energy performance at the national median, while a score of 100 represents extremely high energy performance. Scores below 50 indicate significant opportunities for improvement.[29]
  - The 1-100 ENERGY STAR rating allows comparisons across property types, and across different geographies because it normalizes for differences in energy use (such as climate or annual weather patterns, building space uses, operating characteristics, and other variables).
  - A score of 75 or above represents a top performer, and properties with scores of 75 or above may be eligible for the national ENERGY STAR recognition. Learn more at: www.EnergyStar.gov/Buildings
- **EUI:** Energy Use Intensity (EUI) is the energy use per square foot of gross floor area in the property. There are two types of EUI metrics:
  - Site EUI refers to the total energy per square foot that is actually consumed in the building, including all electricity, natural gas, and other fuels in all building spaces (including common areas and tenant spaces).
  - Source EUI includes the energy per square foot that is actually consumed in the building (i.e. site EUI), plus additional energy that is generated and consumed 'upstream' of the building at power plants, or energy lost through transmission and distribution.

The ENERGY STAR Portfolio Manager tool can also be used to track energy costs, as well as water consumption and water costs, solid waste generation, and many other metrics.

Multi-Year Building Comparisons

If you have two or more years of benchmarking results, determine the property's performance over time by using the ENERGY STAR score and/or weather normalized metrics. Weather-normalized metrics account for changes in weather from year to year (such as an extremely hot summer or a very cold winter) and allow comparisons of the same building to itself across different years.[30]

Additional Terms

- **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).
- **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 ft^2. 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.

[29]For more details about how to interpret your property's ENERGY STAR score, please visit: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager/interpret-your-results/what

[30]Two key weather normalized metrics include weather normalized site energy use and weather normalized source energy use, both expressed in kBTU. These include the 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. 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 Verification

Under the Chicago Energy Benchmarking Ordinance, all covered properties are required to complete data verification once every three years, starting with the first year that the property is required to comply with the ordinance (see Table 1 for the thee-year compliance schedule.) Data verification is required to ensure that reported information is being tracked and reported correctly.

Data verification may be completed by in-house staff, and the use of a third party is not required. However, data verification must be completed by an individual holding a City-recognized license or training credential.[31] 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.

Data verification takes the form of a signed Data Verification Checklist, a standard report generated automatically by the ENERGY STAR Portfolio Manager tool.[32] 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. From 2014 - 2016, more than 100 properties totaling 12 million ft^2 (including faith-based groups, affordable housing, nonprofit organizations, and other buildings in-need) received pro-bono data verification support from volunteer energy professionals and service providers. See page 31 for more details on pro-bono Chicago Energy Benchmarking building support.

Data Quality

Building upon standard practices established in 2014 and 2015, Chicago Energy Benchmarking implementation continues to work with building owners and managers to ensure high levels of reported data quality. For example, the City works with partners to complete automated reviews of every single benchmarking submission to look for missing information or possible data issues, and the Chicago Energy Benchmarking Help

Table 3: Percentage of Analyzed Properties Using Estimated, Default, or Temporary Values

Type of Values	2015	2016
Estimated Values – Energy	9%	9%
Default Values	40%	31%
Temporary Values	5%	4%

[31]As of 2016, the City of Chicago recognized seven eligible data verifier licenses and training credentials, including:
1. Building Operator Certification (BOC) - Midwest Energy Efficiency Alliance
2. Building Energy Technology Certificate (BET) - City Colleges of Chicago
3. Building Energy Assessment Professional Certification (BEAP) – ASHRAE
4. Certified Energy Manager Certification (CEM) - Association of Energy Engineers;
5. Facilities Engineering Technology Energy Conservation Course (FET 220) - Offered jointly by IUOE Local 399 and Triton College
6. Professional Engineer (PE) - State of Illinois;
7. Licensed Architect - State of Illinois;

See http://www.CityofChicago.org/EnergyBenchmarking for additional information

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

Center then sends a customized email to property representatives that summarizes any possible data issues with their report(s). Property representatives with missing information or possible issues are also provided instructions on how to review and update their submissions. If the submission is complete and no data quality issues are found, the Help Center sends a final confirmation email to the benchmarking representatives.

Similar to results from 2014 and 2015, the 2016 reports continue to indicate high levels of data quality. In addition, data quality may be improving over time, as indicated by a reduction in the use of default and temporary values (See Table 3).

Analysis Methodologies

Data Analysis Methodology

Most data analysis methodologies were unchanged from what was used in the 2015 data analysis.

Data Cleansing and Summary of Analyzed Properties

In general, data cleansing ensured that properties with possible data quality issues were excluded from the analysis in this report. First, properties with duplicate submissions were removed, which can occur when multiple facility managers or owners submit reports for the same property. Once duplicates were removed, the dataset included 2,546 reporting properties (as of the analysis cutoff date, which was July 6, 2016.)

Of these 2,546 reporting properties, 94 properties reported voluntarily (i.e. were not required to comply). To avoid any reporting bias, voluntarily-reported data were not included in energy performance analysis, leaving 2,452 reports for 'covered' properties (i.e. those that were required to comply in 2016). From these 2,452 properties, 193 reports (7.9%) were removed from the data analysis due to being outliers or due to missing information. The records identified as outliers included 164 properties that reported the following extreme values for key energy metrics:

- 21 properties: Site EUI less than 3 kBTU/square foot or a Site EUI more the three standard deviations above or below the median site EUI for the property's building sector (see page 66-67 for more details on the eight building sectors included in this analysis)
- 143 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 2015 or 2016. All properties with scores of 1 or 2 were removed

An additional 22 properties missing electricity use, and seven properties missing Site EUI metrics were removed. This data cleansing process resulted in 2,559 covered building data submissions that provide the basis for the analysis presented in this report.

Building Sectors

Table 4 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 or property type grouping.

Table 4: Detailed Building Sector Description and Energy Performance Metrics by Sector for Analyzed Properties

Building Sector	Size of Covered Properties	Primary ENERGY STAR Portfolio Manager Property Type(s)	Number of Properties Included in Analysis	Total Floor Area (Gross ft2) – Buildings and Parking	Median Site EUI (kBTU/ square foot)	Median Source EUI (kBTU/ square foot)	Median ENERGY STAR Score (1-100 rating)
Office	50,000 ft² and greater	Bank Branch and Financial Office	4	4,586,235	79	211	82
		Office, 50,000 ft2 – 99,999 ft²	64	4,649,131	81	188	67
		Office, 100,000 ft² – 249,999 ft²	87	14,177,266	81	189	74
		Office, ≥ 250,000 ft²	157	145,606,128	74	184	82
	Subtotal:	**All Offices**	**312**	**169,018,760**	**78**	**187**	**79**
Multifamily Housing	50,000 ft² and greater	Multifamily Housing, 50,000 ft2 – 99,999 ft²	317	22,374,370	80	122	66
		Multifamily Housing, 100,000 ft2 - 249,999 ft²	346	55,264,251	81	136	55
		Multifamily Housing, ≥ 250,000 ft²	356	187,109,861	83	142	43
	Subtotal	**All Multifamily Housing**	**1,019**	**264,748,482**	**81**	**134**	**55**
K-12 Schools	50,000 ft² and greater	K-12 School, 50,000 ft² – 99,999 ft²	199	14,857,201	73	133	59
		K-12 School, 100,000 ft² - 249,999 ft²	154	21,921,325	67	125	60
		K-12 School, ≥ 250,000 ft²	28	9,825,738	68	124	72
	Subtotal:	**All K-12 Schools**	**381**	**46,604,264**	**71**	**129**	**59**
Healthcare	50,000 ft² and greater	Ambulatory Surgical Center; Outpatient Rehabilitation/Physical Therapy; and Urgent Care/ Clinic/Other Outpatient	4	816,209	168	379	NA
		Hospital (General Medical & Surgical)	24	24,403,929	232	445	44
		Medical Office	13	2,952,444	111	271	33
		Other - Specialty Hospital	5	838,911	160	332	NA
	Subtotal:	**All Healthcare**	**46**	**29,011,493**	**188**	**386**	**41**
Higher Education	50,000 ft² and greater	College/University, 50,000 ft2 – 99,999 ft²	35	2,495,508	89	210	NA
		College/University, 100,000 ft2 - 249,999 ft²	41	6,522,087	88	199	NA
		College/University, ≥ 250,000 ft²	23	17,607,202	84	184	NA
	Subtotal:	**All College/University**	**99**	**26,624,798**	**88**	**199**	**NA**

	Size of Covered Properties	Primary ENERGY STAR Portfolio Manager Property Type(s)	Number of Properties Included in Analysis	Total Floor Area (Gross ft2) – Buildings and Parking	Median Site EUI (kBTU/ square foot)	Median Source EUI (kBTU/ square foot)	Median ENERGY STAR Score (1-100 rating)
Lodging	50,000 ft² and greater	Hotel	60	26,303,873	122	241	36
		Other - Lodging/ Residential and Residence Hall/Dormitory	20	3,815,429	96	190	57
		Residential Care Facility	5	464,840	174	270	NA
		Senior Care Community	42	3,320,625	103	177	31
	Subtotal:	**All Lodging**	**127**	**33,904,767**	**114**	**219**	**36**
Retail	50,000 ft² and greater	Automobile Dealership	3	702,650	68	134	NA
		Enclosed Mall and Other - Mall	13	2,586,497	94	262	NA
		Retail Store	58	12,870,257	86	205	67
		Strip Mall	18	4,451,005	101	246	NA
		Supermarket/Grocery Store	34	2,994,807	245	593	59
		Wholesale Club/ Supercenter; Other – Services; and Repair Services (Vehicle, Shoe, Locksmith, etc.)	10	1,682,873	141	324	36
	Subtotal:	**All Retail**	**136**	**25,288,089**	**104**	**253**	**59**
Other	50,000 ft² and greater	Adult Education; Other – Education; and Preschool/ Daycare	5	1,011,875	74	147	NA
		Convention Center and Other-Entertainment/ Public Assembly	8	11,358,691	96	208	NA
		Courthouse; Other - Public Services; and Prison/Incarceration	6	7,388,418	101	187	78
		Fitness Center/Health Club/Gym	6	893,432	211	382	NA
		Indoor Arena and Other - Recreation	17	3,759,215	108	154	NA
		Laboratory	25	3,912,158	320	696	NA
		Library	7	1,942,274	94	239	NA
		Mixed Use	26	25,911,193	98	218	72
		Movie Theater; Performing Arts; and Social/Meeting Hall	11	1,451,514	150	273	NA
		Museum	7	3,285,830	150	304	NA
		Other	12	7,174,421	104	243	87
		Worship Facility	9	941,342	76	158	25
	Subtotal:	**All Other Properties**	**139**	**69,030,363**	**110**	**223**	**67**
Grand Total:			**2,259**	**664,231,016**	**83**	**152**	**59**

Savings Opportunity Methodology

The savings opportunity methodology is unchanged from the 2015 analysis. Total potential energy savings is the sum of the individual building energy use reductions that would result from each property 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 grouped together in Table 4.

As with all analysis in this report, properties removed through the data cleansing process were excluded from the analysis of potential savings (see page 65 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 $0.076/kWh of electricity and $7.501 per 1,000 cubic feet of natural gas. For the multifamily housing properties, the analysis used estimated residential energy rates of $0.126/kWh of electricity and $10.333 per 1,000 cubic feet of natural gas. Estimated energy rates are based on the average January – December 2015 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.[33] To reflect local Chicago energy market conditions (including some properties' ability to negotiate lower energy rates), the 2015 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. The GHG reductions are expressed in metric tons of carbon dioxide equivalent (CO_2e). 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 CO_2e per year, taken from the EPA calculator found at: http://www.epa.gov/cleanenergy/energy-resources/refs.html

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.

[33]U.S. Department of Energy Information Administration average 2015 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_sIL_m.html

Trend Analysis Methodology

The trend analysis for properties reporting for three consecutive years presented on page 50-52 applies to individual properties that reported in 2014, 2015, and 2016, and were included in the data analysis for all three of those years. The trend analysis for properties reporting for two consecutive years applies to properties that reported in 2015 and 2016 (most of which were not required to report in 2014), and were included in the data analysis for both of those years. Weather-normalized site energy use was used for the trend analysis to control for weather variations between the calendar years of the comparison.[34]

Trend Analysis for Properties Reporting in the Past Three Consecutive Years

Last year in 2015, 212 properties were included in the multi-year analysis for properties that had reported in both 2014 and 2015. Of these 212 properties, 12 were removed for the analysis this year in 2016. A total of six properties were not analyzed in 2016 (due to being identified as an outlier or having missing information); three received a temporary exemption in 2016 and were not required to report; one did not submit a report in 2016; and two reports showed a 50% or greater increase or decrease in weather normalized site EUI. Removing these 12 properties left 200 property reports in the trend analysis for buildings that reported three years in a row.

Trend Analysis for Properties Reporting in the Past 2 Consecutive Years

For the trend analysis covering two consecutive years, a total of 1,083 properties reported for the first time in 2015 and reported again in 2016. Of these 1,083 properties, 76 were removed from the trend analysis. A total of 31 properties did not have weather normalized metrics in 2015, and eight properties did not have weather normalized metrics in 2016. An additional 37 properties showed a 50% or greater increase or decrease in weather normalized site EUI. Removing these 76 properties left 1,007 properties in the trend analysis.

Calculation Methodologies

The total weather normalized site energy use (in kBtu) for the sample properties was summed for the years included in each analysis. The total for 2016 was then subtracted from the total in the earliest year available. These calculations indicate a decrease in total weather-normalized site energy use for both groups of properties analyzed.

Table 5 shows the total weather-normalized site energy use (in KBtu) for each calendar year included in the analysis for these two groups of buildings, and the total percentage reductions achieved in weather normalized site energy use.

Table 5: Year-Over-Year, Same Building Trend Analysis

	Metric Used: Weather-normalized site energy use (kBTU)				
Group	**2014 Reported Data (from CY 2013)**	**2015 Reported Data (from CY 2014)**	**2016 Reported Data (from CY 2015)**	**Change between First Year and 2016 Reported Data**	**Percentage Change**
Properties reporting for 3 consecutive years (2014, 2015, and 2016) (n=200)	19,191,512,665 kBTU	18,965,535,602 kBTU	18,414,644,531 kBTU	(776,868,134) kBTU	-4.0%
Properties reporting for 2 consecutive years (2015 and 2016) (n=1,007)	Not available	23,551,656,395 kBTU	23,092,420,881 kBTU	(459,235,513) kBTU	-1.9%

[34]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

The estimated energy cost savings included in the trend analysis results were derived using the same methodology as the Energy Cost Savings calculations in the Savings Opportunity Methodology (described above). GHG emission reductions were calculated directly from ENERGY STAR Portfolio Manager results.

Cross City Comparison Methodology

As discussed in the Cross City Comparison (page 44), the Chicago median ENERGY STAR score for each building sector was compared to median sector scores from Boston, Minneapolis, New York City, Philadelphia, and Washington, DC. Each of these cities also has a benchmarking and transparency policy,[35] and the availability of publicly-released data under these policies allowed the comparison.[36]

In order to develop a 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 4.

The median ENERGY STAR scores calculated for each building sector in each of the six cities are shown in Table 6. At the time this analysis was completed, data from the five other cities were available for calendar year 2014; the data from Chicago represents calendar year 2015.

The higher education building sector is not eligible to receive ENERGY STAR scores, and was excluded from the cross-city analysis. The multifamily building sector was included for the first time this year, because several cities recently released multifamily data for the first time. City / sector sample sizes of less than 15 were also excluded from the analysis; these are marked with an asterisk in Table 6.

[35]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 Minneapolis Commercial Building Benchmarking and Transparency: http://www.ci.minneapolis.mn.us/environment/energy/
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

[36]Data Sources:
City of Boston CY 2014 Benchmarking Dataset: https://d3n8a8pro7vhmx.cloudfront.net/greenovateboston/pages/460/attachments/original/1443708687/Energy_Reporting_Data_1Oct2015.xlsx?1443708687
City of New York CY 2014 Benchmarking Dataset: http://www.nyc.gov/html/gbee/html/plan/ll84_scores.shtml
City of Minneapolis CY 2014 Dataset: http://www.minneapolismn.gov/environment/energy/benchmarking
City Philadelphia CY 2014 Dataset: https://data.phila.gov/api/views/rxi8-wx2m/rows.csv?accessType=DOWNLOAD
Washington, DC CY 2014 Dataset: http://doee.dc.gov/node/1150817

Table 6: Median ENERGY STAR scores for Boston, Chicago, Minneapolis, New York City, Philadelphia, and Washington, DC by Building Sector

Sector	Size of Buildings	Median Score (if N>15 Properties)	Min	Max	Chicago (CY 2015 Data)	Boston (CY 2014 Data)	Minneapolis (CY 2014 Data)	New York City (CY 2014 Data)	Philadelphia (CY 2014 Data)	Washington DC (CY 2014 Data)
K-12	>50,000ft2	63	41	83	59 (n=375)	83 (n=70)	66 (n=51)	66 (n=1,338)	45 (n=243)	41 (n=100)
Multifamily	>50,000ft2	60	55	73	55 (n=952)	73 (n=242)	NA	56 (n=6,553)	NA	65 (n=460)
Office	>50,000ft2	78	73	87	79 (n=292)	79 (n=175)	87 (n=68)	75 (n=1,062)	73 (n=165)	77 (n=431)
Retail	>50,000ft2	64	59	67	59 (n=87)	61 (n=15)	NA	67 (n=90)	66 (n=51)	NA
Lodging	>50,000ft2	44	36	58	36 (n=109)	58 (n=61)	64* (n=14)	44 (n=337)	38 (n=59)	48 (n=100)
Healthcare	>50,000ft2	46	29	50	41 (n=34)	29 (n=19)	NA	50 (n=67)	50 (n=33)	51* (n=12)
Other	>50,000ft2	68	54	93	68 (n=18)	NA	81* (n=14)	54 (n=55)	93 (n=16)	40* (n=12)

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