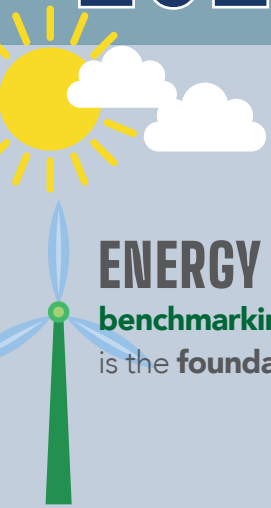




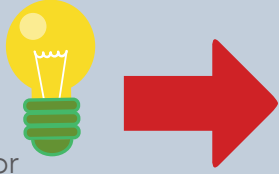
2021
CHICAGO ENERGY
BENCHMARKING

★ ★ REPORT ★ ★

2021 Chicago Energy Benchmarking Report ★ ★ ★ ★

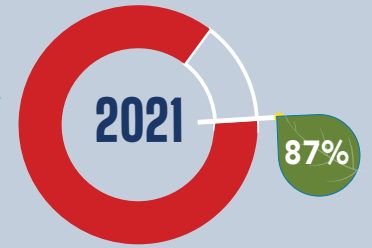


ENERGY
benchmarking
is the foundation for



- Reducing energy,
- Saving on utility costs, &
- Supporting clean energy jobs.

REACH
Under **Chicago Energy Benchmarking**,
87% of large buildings reported their energy use in 2021,
up from 85% in 2020.



IMPACT AND OPPORTUNITY

The median carbon emissions per square foot (GHG intensity) from reporting properties are down by **37%** since **2016**. Energy use per sq. ft. (also known as Energy Use Intensity) for buildings reporting in the last three consecutive years (2019-2021) has dropped by **7%**.



BUILDING ON SUCCESS

The **Chicago Energy Rating System** was implemented in **2019** to increase **awareness** of energy use. Building owners are required to display a placard illustrating their building's energy performance on an annual basis to the general public. Approximately **39%** of buildings received a four out of four-star rating in **2021**. Chicago is proud to have been the **first city in the nation** to require this kind of **transparency**.



To learn more, go to: www.CityofChicago.org/EnergyBenchmarking
www.ChicagoEnergyRating.org



DEAR FELLOW CHICAGOANS,

Reducing energy use, saving building operators, businesses, and residents money on utility bills, and boosting our local economy creates and supports clean energy jobs throughout the City of Chicago. These co-benefits directly align with two components of Mayor Johnson's commitment to eliminating poverty in Chicago: reducing expenses for Chicagoans and expanding quality jobs. Another issue facing our city is the climate crisis, which broadly impacts the world. It disproportionately affects low-income communities and communities of color—hence its sometimes-used moniker, “the climate gap”. Increasing temperatures and precipitation, exasperated by extreme flooding and heat waves, result in unexpected risks for vulnerable communities, including increased health risks.

While we are all affected by climate change, navigating these challenges is far more complex in underserved communities that may lack the necessary resources to react effectively. As much as climate is an environmental issue, it is also a social and economic justice issue. Chicago will continue to lead in this fight against climate change. Reducing energy consumption is a significant step towards the City's continued commitment to the goals of the Paris Climate Agreement, including a 26-28% reduction in greenhouse gas emissions by 2025. The city is 59% of the way to meeting that goal. Energy use in buildings represents approximately 70% of the City's current greenhouse gas emissions, and the city must improve building energy efficiency to meet our ambitious climate goals. Relatedly, the city also strives towards reaching 100% renewable energy by 2035; assuring that buildings use energy as efficiently as possible is the first step in that endeavor. Streamlining energy performance in buildings remains a critical part of Chicago's climate strategy.

In 2021, we continued to see improvements in energy performance for the largest buildings across the city. These reporting properties represent 2,936 of the city's largest buildings, amounting to 768 million square feet of property. Between 2018 and 2021, buildings saw their per square foot energy use drop by 7%. Furthermore, the carbon emissions per square foot continued to decline rapidly and has decreased by 37% from 2016 to 2021. In 2019, Chicago became the first U.S. city to assign buildings an energy performance rating and require properties to post their rating. The new Chicago Energy Rating System makes energy use information for large buildings easily accessible to residents while encouraging energy savings. The city also began to share information on water use in buildings under the updates. The strides made towards these goals to date would only be possible with the partnership of many dedicated groups, from building owners to property managers to operating engineers. We appreciate your persistent attention and work to ensuring that Chicago continues to serve as a global leader in tackling energy waste and supporting sustainable action at both the community and building-level.

Sincerely,

Angela Tovar
Chief Sustainability Officer
Commissioner
Department of Environment
City of Chicago







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I. EXECUTIVE SUMMARY

Measuring and tracking a building’s energy use is the first step in identifying opportunities to reduce that usage and save on utility bills. In 2013, the City of Chicago adopted its benchmarking ordinance requiring buildings over 50,000 square feet (sq. ft.) to report their energy use once per year and perform data verification every three years. The City used a tiered approach for phasing in compliance requirements by building sector and size that started with the largest buildings. The impetus for the benchmarking ordinance is to raise awareness of energy performance through information and transparency, with the goal of unlocking energy and cost savings opportunities for businesses and residents. To this end, the City began implementing the Chicago Energy Rating System in 2019, which makes energy use information for large buildings easily accessible to residents and encourages energy savings. The Chicago Energy Rating System uses a zero-to-four-star scale that is based on existing publicly available energy data and requires buildings covered under the ordinance to post their rating in a prominent location on the property. Complying buildings are also required to share this information at the time of sale or lease listing. Chicago was the first U.S. city to assign buildings an energy performance rating and require properties to disclose their rating.

Building owners are not currently required to gather and report their water usage data, as the City collects this data from its Department of Water Management and Department of Finance. The City plans to begin sharing information on water usage in buildings in the future. Like energy data, water consumption information will provide valuable insight to assist building owners in finding opportunities for efficiency and savings.

Energy benchmarking has continued to prove effective in fostering energy and cost savings since its implementation. From 2016 to 2021, the median carbon emissions per sq. ft. (also known as GHG Intensity) for reporting buildings has fallen by 37% while median energy use per sq. ft. (also known as Energy Use Intensity) has fallen by 17% (after adjusting for weather differences from year to year). These improvements have been driven by property owners as the City encourages, but does not require, owners to make improvements through this ordinance. The City supplements regular compliance-related notifications to building owners with additional resources on how to reduce their energy use.

■ KEY TAKEAWAYS:

Energy benchmarking continues to provide the foundation for increasing energy aptitude, saving energy, reducing utility costs, and supporting clean energy jobs throughout the City.

1 REACH

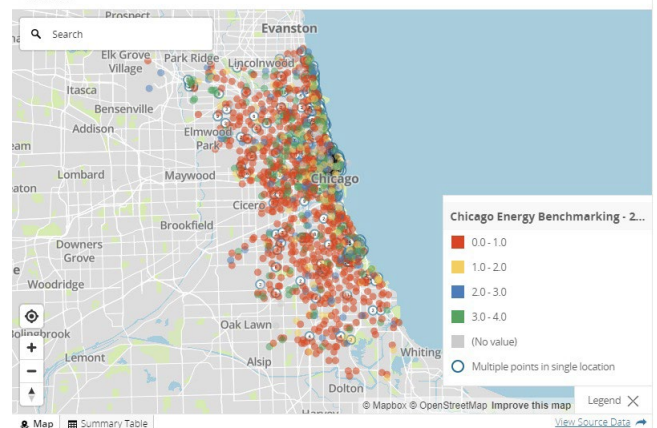
Compliance with the Chicago Energy Benchmarking Ordinance has continued to remain high. In 2021, 2,936 properties spanning over 768 million sq. ft. reported energy use. The 2021 reporting rate by number of properties was 87% (92% by total sq. ft.), which is 2% higher than the 2020 reporting rate of 85%.

2 IMPACT

A majority of Chicago properties required to benchmark continue to perform above national averages, based on a median ENERGY STAR score of 63 out of 100. Energy use per sq. ft. (also known as Energy Use Intensity) for buildings reporting in the last three consecutive years (2019-2021) has dropped by 7%.

2020 Annual Report

GSF v. ERS





I. EXECUTIVE SUMMARY

3 OPPORTUNITY

There are several incentive programs available from ComEd and Peoples Gas to support building owners and managers in making energy efficiency improvements to their facilities. ComEd and Peoples Gas programs also offer technical support such as energy assessments to a variety of building types including small businesses, industrial, nonprofit organizations, and affordable housing providers.

Federal investment in climate and energy has also ramped up through the Inflation Reduction Act (IRA). This could lead to new federally funded incentives and tax credits available at the local level for commercial and residential properties. Some local funding mechanisms and opportunities already exist, such as Chicago PACE, and more recently the City of Chicago's Climate Infrastructure Fund. The latter will provide grants intended to support neighborhood projects that mitigate the effects of climate change and accelerate the city's equitable transition to the green economy.



4 BUILDING ON SUCCESS



Implemented in 2019, the Chicago Energy Rating System was the first of its kind in the U.S. and vastly expanded awareness and transparency of energy use in large buildings across the City. Property owners or their representatives are required to post their rating placard and share it at time of listing the property for sale or for lease. Property owners will continue to receive updated rating placards on an annual basis and be required to post and share.

Approximately 39% of buildings received a four out of four-star rating in 2021, up from 30% in 2020. A breakdown for all buildings which received a one-to-four star rating is shown in Table 1 below.

Table 1. 2020 Energy Rating Scores Breakdown

Number of Stars Received	Number of Buildings	Percentage
1 or 1.5	540	21%
2 or 2.5	461	18%
3 or 3.5	566	22%
4	981	39%
TOTAL:	2,548	100%



II. REACH: CHICAGO ENERGY BENCHMARKING BACKGROUND AND COMPLIANCE

OVERVIEW

The goal of the Chicago Energy Benchmarking Ordinance (2014) and Energy Rating System updates (2019) are to increase awareness of energy performance through measurement, tracking, visibility, and transparency of energy use information. Approximately 3,600 buildings that are 50,000 sq. ft. or greater are required to measure and report energy use annually, post updated placard ratings, and complete additional data verification every three years.

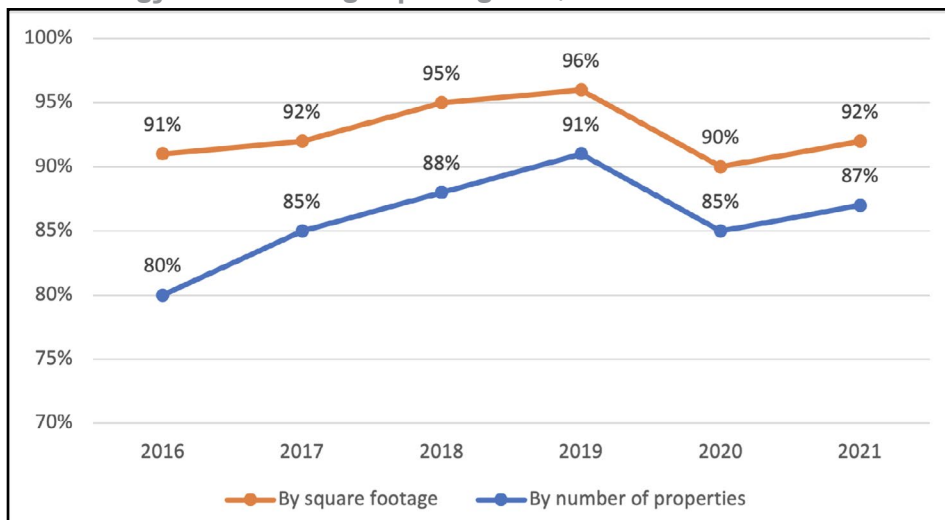
COMPLIANCE SUMMARY

Compliance with the Chicago Energy Benchmarking Ordinance continues to be relatively high every year.¹ The 2021 reporting rate by number of properties was 87%, which is 2% higher than the 2020 reporting rate of 85%.

2021 Reporting, by the Numbers:

- **2,936** total reporting properties
- **87%** reporting rate, when measured by number of properties
 - **92%** reporting rate, when measured by total sq. ft.

Figure 1: Energy Benchmarking Reporting Rate, 2016 to 2021



In 2021, 2,936 properties submitted reports to the City of Chicago. Additionally, 75 properties submitted on a voluntary basis, and 111 properties received temporary exemptions, leading to 3,085 “covered properties” (required by ordinance to report) reporting or exempt out of 3,553 total, resulting in an 87% reporting rate (92% of all covered buildings by total sq. ft.). The City of Chicago and its partners are committed to supporting building teams through outreach and assistance in order to continue to reach similar or higher compliance levels into the future.



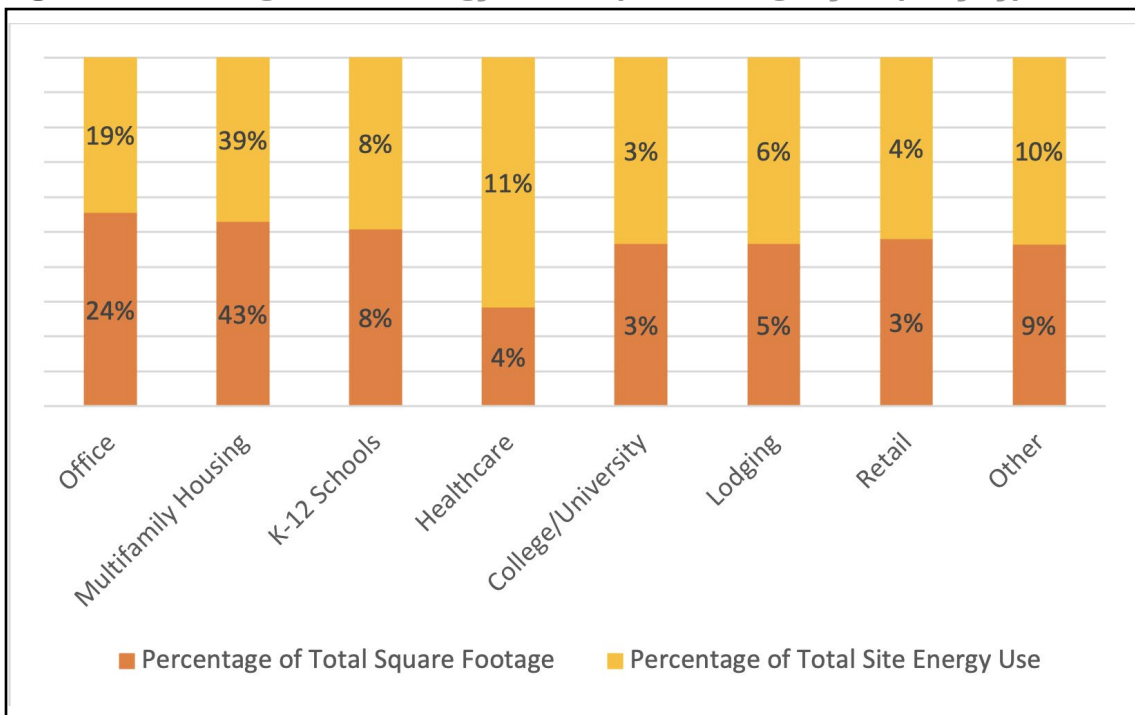
III. IMPACT: 2021 BENCHMARKING RESULTS

■ PROPERTIES ANALYZED IN 2021

Energy benchmarking reports from 2,769 properties are included in this analysis, and these buildings are referred to as “analyzed properties.” (For more details on the analysis methodology please see the Appendix, pages 21.) Each property is assigned to one of eight property groups.

The total square footage of all analyzed properties is over 740 million sq. ft. (including both buildings and parking). A breakdown of the sq. ft. versus breakdown of energy use by type of building is shown in Figure 2. Multifamily housing continues to be the largest by both sq. ft. and percentage of energy use, representing 43% of the total sq. ft., and 39% of total site energy use of all analyzed properties, followed by offices and then K-12 schools for sq. ft. and healthcare for percentage of energy use. (For more details on property types please see the Appendix, Table 3.)

Figure 2: Percentage of Site Energy Use V. Square Footage by Property Type



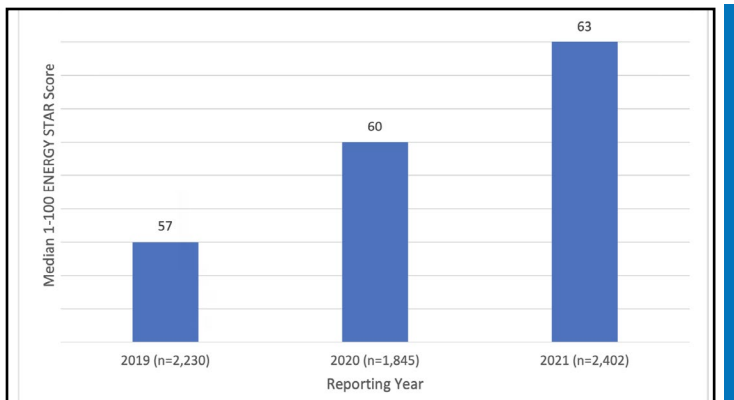


OVERALL ENERGY PERFORMANCE

The 1-100 ENERGY STAR score represents a property's overall energy performance relative to similar building types across the nation, while normalizing for different climates. 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. (For more details on ENERGY STAR score calculations, please see the Appendix.)

In 2021, the median ENERGY STAR score for all analyzed properties in Chicago was 63 out of 100, an increase of three points from the median of 60 in 2020. Figure 3 shows the median reported ENERGY STAR score from Chicago Energy Benchmarking reports over the past three years.

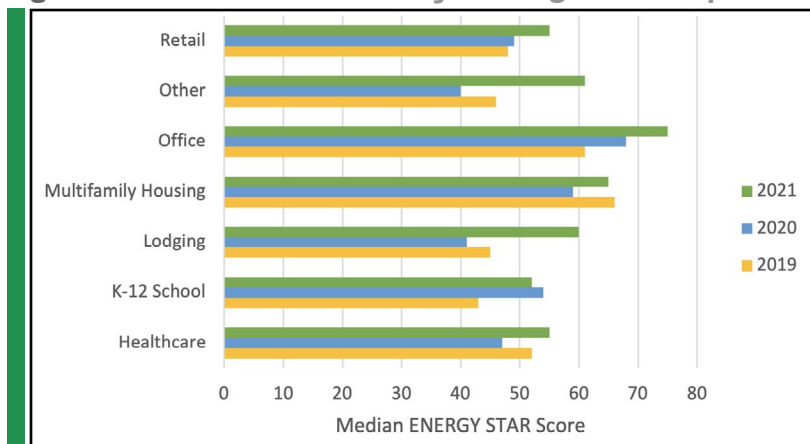
Figure 3: Median ENERGY STAR Scores, 2019 to 2021



*Median reported ENERGY STAR scores from 2016-2018 not included due to updates implemented to the ENERGY STAR Portfolio Manager system in 2018.²

Since 2019 the median ENERGY STAR score has increased in all property sectors, except Multifamily Housing. (See Figure 4). A median score of 63 is well above the national median of 50, indicating the Chicago properties over 50,000 square feet are performing slightly better than the majority of comparable buildings in the U.S.

Figure 4: ENERGY STAR Scores by Building Sector Reported from 2019-2021



² In August 2018, EPA updated performance metrics for some U.S. buildings in ENERGY STAR Portfolio Manager® based on the most recent market data available. This update is part of EPA's standard process to keep ENERGY STAR metrics as current as possible, and reflective of current market performance. At this time, the 1-100 ENERGY STAR scores and other source energy metrics were updated for certain U.S. building types benchmarking in Portfolio Manager across all time periods to reflect the latest performance metrics.

This update was followed by a score review period for U.S. K-12 schools, worship facilities, warehouse properties, hotels, offices, retail stores, and supermarkets, during which EPA engaged industry to get feedback, conduct additional analysis, and ensure the score models deliver metrics that support organizations' energy efficiency goals. See additional information on this update here: <https://www.energystar.gov/buildings/facility-owners-managers/existing-buildings/use-portfolio-manager/update-energy-star-scores-cbecs>



TREND ANALYSIS

As building owners benchmark their buildings year after year, it is the goal of the City that insight gained will help pinpoint opportunities for improvements at the individual scale. *At a broader scale*, analyzing trends can help City officials identify sectors which may be lagging, work to better understand technical assistance needs, and look to leverage opportunities to buildings owners that need it the most. Understanding how buildings are performing over time is an important metric.

Approximately 2,300 properties that benchmarked and reported in 2019 and again benchmarked and reported in 2021 (three consecutive reporting years) saw a decrease in total net energy costs of approximately \$118.7 million. This is large in part due to substantial electricity cost savings seen for both commercial and residential properties included in the analysis, totaling approximately \$99.4 million. These properties saw a reduction in energy use per sq. ft. by 6.5%, based on the median weathernormalized source energy use per sq. ft. from 2019 compared to 2021 (which takes into account changes in weather from year to year, as well as changes in the property size). *These results suggest that the majority of properties continue to improve energy efficiency and achieve savings even after multiple years of required energy benchmarking, which went into effect for all properties over 50,000 sq. ft. in 2016.*

Overall, the carbon emissions per sq. ft. of space have continued to decline steadily, in total by 37% since 2016. All building sectors have seen decreases in the GHG intensity as shown in Figure 5. When comparing total GHG emissions from nearly 2,300 properties that reported in 2019 and again reported in 2021, total GHG emissions are down 22%, which equates to over 1,000,000 metric tons of carbon dioxide equivalents (CO₂e). This reduction is equivalent to removing nearly 220,000 passenger cars from the road each year.³

Figure 5: Median GHG Intensity from 2016–2021

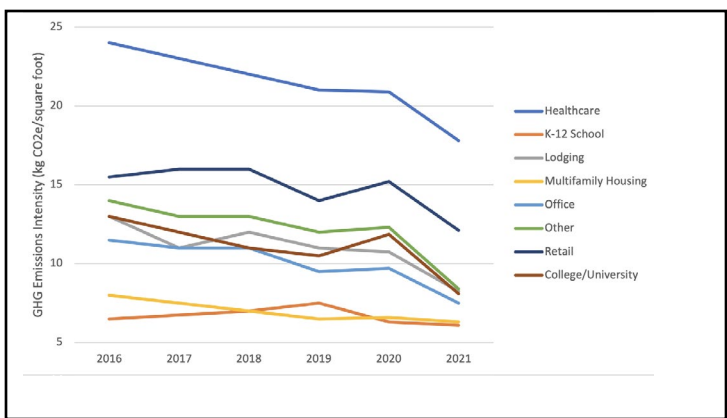
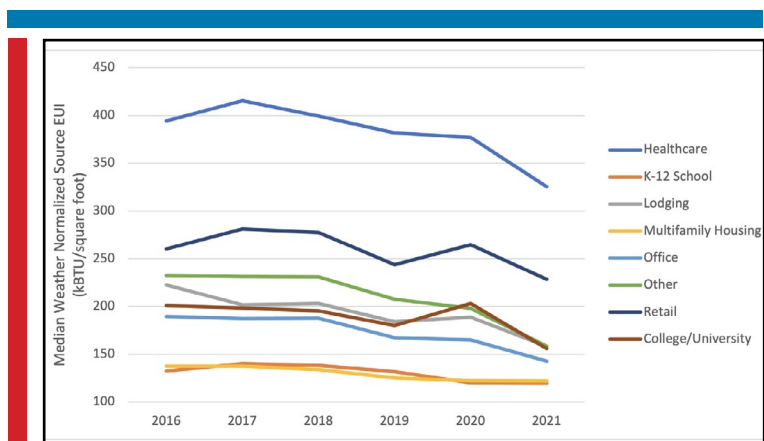


Figure 6: Median Source EUI 2016–2021

Finally, comparison over the past six years of benchmarking information shows that the median weather-normalized source energy use per sq. ft. for all reporting buildings has dropped by 17% from the 2016 to 2021 reporting years. All sectors saw decreases since the 2016 reporting year. The largest drops have been seen in the Lodging (41%), Office (33%), and College/University (29%) sectors.

³<https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>





ENERGY STAR Certification

Properties that receive a score of 75 or higher and meet other criteria may be able to earn the ENERGY STAR label. In Chicago, the number of ENERGY STAR certifications continues to rise year after year (Figure 7).

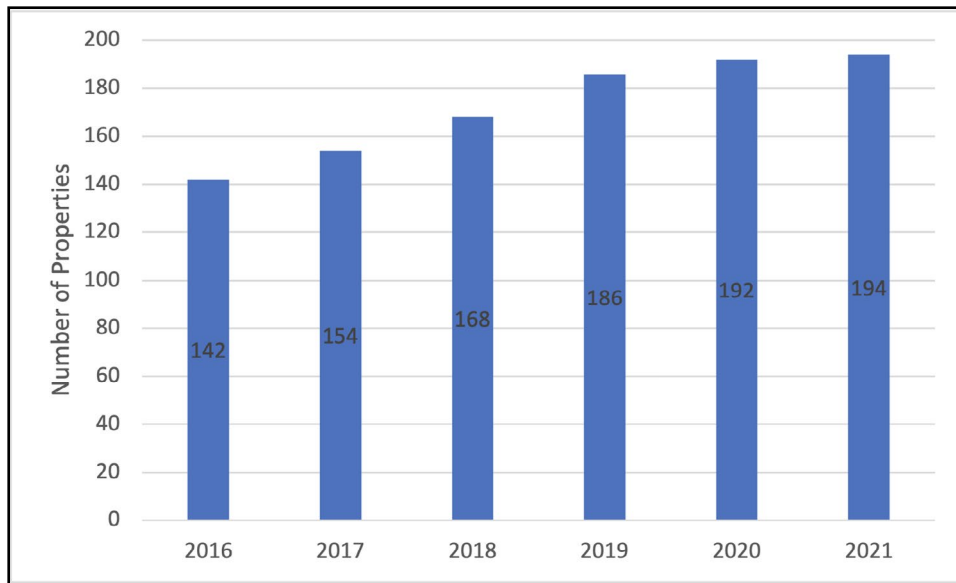
As of the 2021 Reporting Year, a total of 194 properties subject to the energy benchmarking ordinance have been certified, up from 142 certified properties in 2016.

ENERGY STAR certification is a nationally recognized standard for energy performance. ENERGY STAR-certified buildings meet strict energy performance standards set by the U.S. EPA. Therefore they use less energy, are less expensive to operate, and cause fewer GHG emissions than comparable structures.

If your property has a score of 75 or higher, consider getting it certified and receiving the ENERGY STAR label in order to publicly communicate that the building is high-performing.



Figure 7: ENERGY STAR Certified Properties from 2016–2021





IV. OPPORTUNITY: Ways to Save Energy

■ UTILITY INCENTIVE AND REBATE PROGRAMS

Many incentive and rebate programs are available from ComEd and Peoples Gas that support building owners and managers in making energy improvements for their facilities. Incentives opportunities can change each year, so building owners are advised to contact the utilities directly to understand the current offerings.

A free energy assessment is a great first step, which provides an analysis of energy-consuming equipment and operations to help you gain a better understanding of possible improvements. It is advisable to get an energy assessment every two to three years, and most properties are eligible. This process will help you identify low-cost and no-cost opportunities specific to your property, and other potential projects to reduce consumption. To find out more, contact the utilities today:

- **ComEd:**
Phone: 855.433.2700
Website: <https://www.comed.com/WaysToSave/ForYourBusiness/Pages/FacilityAssessments.aspx>
- **Peoples Gas:**
Phone: 855.849.8928
Website: <http://www.peoplesgasdelivery.com/business/rebates.aspx>

If you have already conducted an assessment or audit, or you have already identified specific projects to retrofit your property, be sure to consider using one of the utility rebate and incentive programs to help finance your project.

Commercial, Institutional, and Public Buildings:

- ComEd's Energy Efficiency program can help reduce building energy use. Incentives and support programs help businesses drive energy savings and an improved bottom line. For more information, please visit: <https://www.comed.com/WaysToSave/ForYourBusiness/Pages/Default.aspx>
- Peoples Gas Natural Gas Savings Program offers incentives to encourage business customers make energy-efficient improvements to reduce energy use and enhance workplace comfort. For more information, please visit: <https://accel.peoplesgasdelivery.com/business/rebates.aspx>

Multifamily Residential Buildings:

- ComEd and Peoples Gas offer building managers and owners energy efficiency upgrades and incentives through the Multi-Family Comprehensive Energy Efficiency Program: https://accel.peoplesgasdelivery.com/home/rebates_multifamily.aspx
- ComEd's Marketplace Website: Current listings of product offerings and discounts: <https://www.comedmarketplace.com/>



■ Other Funding Opportunities

Building owners and managers should continue to stay informed through local media outlets and green building networks as federal investment in climate and energy has ramped up through the Inflation Reduction Act (IRA). New federal funding sources such as incentives and tax credits will be available at the local level for commercial and residential properties to make improvements that lower their carbon footprints.

In addition, other local funding opportunities are currently available such as the City of Chicago's Climate Infrastructure Fund which is accepting grant applications now through August 18, 2023. These grants are intended to support neighborhood projects that mitigate the effects of climate change and accelerate the city's equitable transition to the green economy. Individual grants from approximately \$50,000 to \$250,000 are available through the fund to support capital investments in energy efficiency projects, electric vehicles, and green infrastructure. Applicants may be Chicago non-profit organizations and small businesses, with priority given to projects located in environmental justice communities. See more at <https://www.chicago.gov/city/en/sites/dpd-recovery-plan/home/climate-infrastructure-fund.html>

Another funding mechanism is Chicago PACE, a voluntary financing program that makes it possible for owners and developers of commercial and multifamily properties to obtain low-cost, long-term financing for energy efficiency, sustainability, and renewable energy infrastructure in new or existing buildings. PACE is available to the following types of properties:

- Commercial and industrial properties
- Multifamily residential apartment buildings or cooperative housing properties with five or more units
- Nonprofit properties

In February 2021, Cook County launched a similar program that is accessible to qualified building owners in Chicago.

For more information on the City of Chicago PACE program, please visit: www.ChicagoPACE.org

For more information on the Cook County PACE program, please visit: <https://iecapace.org/cook-county-c-pace-program>



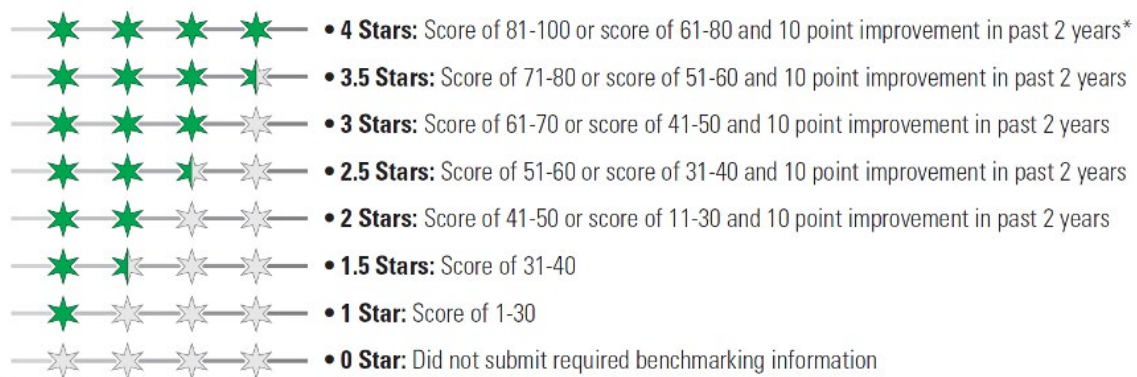


V. BUILDING ON SUCCESS: Energy Rating System Implementation

The original Chicago Energy Benchmarking ordinance (2013) allows the City to share buildings' ENERGY STAR scores and other metrics publicly, via their online data portal. However, many tenants, condominium owners, building operating engineers, and even some property managers may not be aware of the portal or how to access and utilize the information for their benefit. Therefore, the primary intent of the ordinance updates that introduce the Energy Rating System is to help improve the visibility and transparency of information that is already publicly available. There are no new reporting requirements or costs associated with these updates.

Disclosing a building's rating at the time of listing for sale or lease enables prospective buyers and tenants to make more-informed decisions about operating costs related to energy use. The rating system also offers every property that has one, two, or three stars with the opportunity to earn an extra star by making one 10-point improvement, thus incentivizing properties to improve their ENERGY STAR scores.

CHICAGO ENERGY RATING SYSTEM (WITH HALF-STARS)



*Note: Any building with ENERGY STAR certification also receives four stars.

It has been proven that additional visibility and transparency of ratings can improve a building's energy use performance. For example, restaurants in New York City are required to publicly post grades of A, B, or C, based on their health inspections. After the City enacted this requirement, the number of restaurants receiving an A grade on initial inspection increased by 14% in the first 18 months.

In 2017, the City of Chicago committed to the goals of the Paris Climate Agreement, including a 26-28% reduction in greenhouse gas emissions by 2025. Energy use in buildings represents over 70% of the City's current greenhouse gas emissions. Therefore, it is crucial that the City increases energy efficiency in buildings in order to meet its long-term climate goals. Improving energy performance in buildings is thus a key climate strategy in Chicago⁴.

⁴ City of Chicago Greenhouse Gas Inventory Report https://www.chicago.gov/content/dam/city/progs/env/GHG_Inventory/Chicago-2017-GHG-Report_Final.pdf



■ WATER DATA / ANALYSIS OPPORTUNITIES

The City also plans to begin sharing information on water use in buildings under the latest ordinance updates. Building owners are able to opt-out of having their water usage data shared publicly. Building owners are not required to gather and report the water usage data, but instead the City will collect the data from its Department of Water Management and Department of Finance. Similar to benchmarking energy usage, benchmarking water usage is the first step to identifying opportunities to reduce water use and save on utility bills.

Some building owners also use ENERGY STAR Portfolio Manager to track their water use. While this is not required, it is encouraged by the City for building owners in order to begin addressing their building's water use and look for efficiency opportunities.





VI. ACKNOWLEDGEMENTS

The City of Chicago is grateful for the assistance and input of several partnering organizations that have supported the implementation of the Chicago Energy Benchmarking Ordinance and the Chicago Energy Rating System.

The 2021 Chicago Energy Benchmarking Report and the initiatives / programs described herein were created with input, analysis, and other support from the following organizations and individuals:

OFFICE OF THE MAYOR, CITY OF CHICAGO

Angela Tovar, Chief Sustainability Officer
Gavin Taves, Climate and Energy Program Manager

ELEVATE AND THE HELP CENTER TEAM

Gus Sandoval, Project Manager
Dara Reiff, Associate Director

And a special thanks to ComEd and Peoples Gas for ongoing support in providing energy use data for the benchmarking requirements, as well as information regarding appropriate energy saving opportunities.

Document design by:
City of Chicago

CHICAGO ENERGY BENCHMARKING / CHICAGO ENERGY RATING SYSTEM PARTNERS

- ABOMA
- ASHRAE – Illinois
- American Cities Climate Challenge
- American Institute of Architects – Chicago Chapter
- BOMA - Chicago
- C40 Cities Climate Leadership Group
- Chicagoland Apartment Association
- Chicago Association of REALTORS
- ComEd
- Elevate
- Enterprise Community Partners
- Illinois Environmental Council
- Illinois Green Alliance
- Institute for Market Transformation
- Midwest Energy Efficiency Alliance
- Natural Resources Defense Council
- Peoples Gas
- Seventhwave (now Slipstream)
- Sierra Club
- U.S. Environmental Protection Agency



VII. 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.⁵

- 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

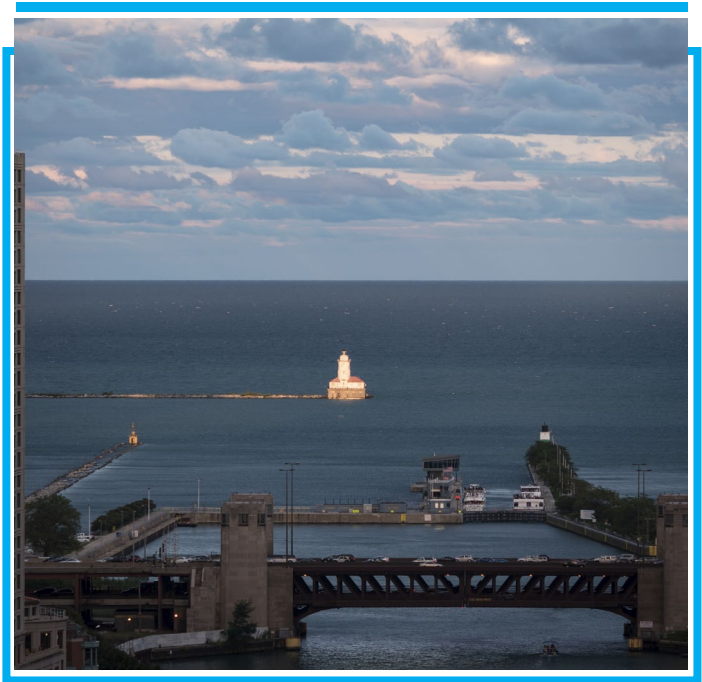
• **Energy Use Intensity:** Energy Use Intensity (EUI) is the energy use per square foot of gross floor area in the property. There are two types of EUI metrics:

- 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 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.⁶



⁵ 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>

⁶ 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>



VII. APPENDIX

■ 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).
- **Greenhouse Gas (GHG) Emissions:** Carbon dioxide (CO₂) and other gases released as a result of energy generation, transmission, and consumption. GHG emissions contribute to climate change and are expressed in metric tons of carbon dioxide equivalent (CO₂e). GHG emissions are also released due to other activities in buildings, such as refrigeration and cooling, but those emissions are not calculated from energy benchmarking.
- **Gross Floor Area (Building Size):** Total interior floor space between the outside surfaces of a building's enclosing walls, expressed in square feet. This includes tenant space, common areas, stairwells, basements, storage, and interior parking.
- **Site Energy Use:** Energy consumed on-site at a building, as measured by utility bills, and expressed in thousands of British Thermal Units (kBtu).
- **Source Energy Use:** Energy required to operate a property, including on-site consumption, as well as energy used for energy generation, transmission, and distribution; expressed in kBtu.

■ DATA VERIFICATION

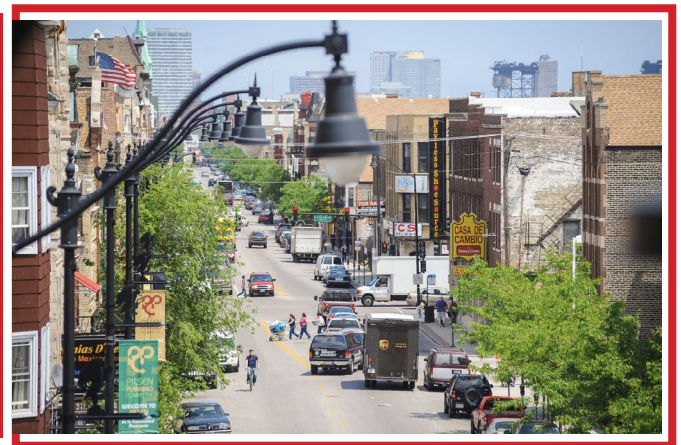
Under the Chicago Energy Benchmarking Ordinance, all covered properties are required to complete data verification once every three years, starting with the first year that the property is required to comply with the ordinance. Data verification is required to ensure that reported information is being 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.⁷ 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. It is important to note that verifiers are not required to complete the Indoor Environmental Standards section of the Data Verification Checklist, but are required to complete all other sections. 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.

In 2021, any building team that had verified data in 2018, as well as any building team that had not ever verified data in the past, was required to conduct official verification. The City has followed up with all teams that were required to complete verification and did not do so, and will also continue to conduct outreach to building teams about the data verification requirement.



⁷ See www.CityofChicago.org/EnergyBenchmarking for additional information



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■ DATA QUALITY

Energy benchmarking continues to rely on a self-reporting process (although data verification is required once every three years). Certain indicators continue to point to a high level of data quality for the information reported in Chicago.

As in previous years, the City and its partners complete automated reviews of all benchmarking submissions to identify missing information, errors, or possible data issues. If any issues are found, the Chicago Energy Benchmarking Help Center then sends a customized email to property representatives containing a list of issues, and links to documentation on how to address each issue. Property teams typically review their data, update any information that was entered in error, and then resubmit their report to the City. Once a submission is found to be complete and free of any potential data quality issues, the property representatives receive a final confirmation email.

Some of the indicators used to track data quality include the number of properties that use default, estimated, and temporary values. While using these values is allowed under the energy benchmarking ordinance, these values indicate a slightly lower level of data quality and accuracy. The use of each of these indicators has continued to remain low, indicating strong data quality (See Table 2).

Table 2: Percentage of Analyzed Properties Using Estimated, Default, or Temporary Values

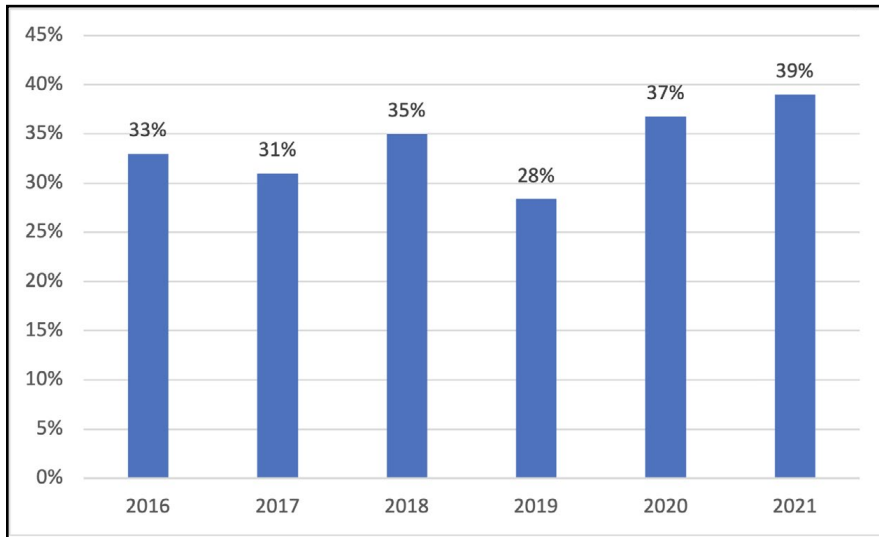
Type of Values	2016	2017	2018	2019	2020	2021
Temporary Values	4%	3%	2%	1%	1%	1%
Estimated Values – Energy	9%	5%	5%	5%	6%	5%
Default Values	31%	24%	22%	19%	8%	22%

In addition, more properties are using the Data Quality Checker, a feature provided within the ENERGY STAR Portfolio Manager benchmarking tool. Chicago Energy Benchmarking participants are strongly encouraged to use the Data Quality Checker to review their submissions before reporting to the City of Chicago each year. (See Figure 8).



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Figure 8: Percentage of Analyzed Properties Using the Data Quality Checker in ENERGY STAR Portfolio Manager, by Year



■ ANALYSIS METHODOLOGIES

Data Analysis Methodology

Most data analysis methodologies were unchanged from what was used in the 2016, 2017, 2018, and 2019 data analyses.

Data Cleansing and Summary of Analyzed Properties

Data cleansing was completed using the same process as previous years. 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 3,011 reporting properties (as of the analysis cutoff date, which was September 1, 2021).

Of these 3,011 reporting properties, 75 properties reported voluntarily (i.e. were not required to comply) and were removed from the dataset that was used for analysis, leaving 2,936 reports for “covered properties” (required to comply). From these 2,936 properties, 167 reports (6%) were removed from the data analysis due to being outliers or due to missing information.

The 167 records removed from the analysis either reported extreme values for key energy metrics or had other data issues as follows:

- 29 properties: Site EUI less than three kBTU/sq. ft. or a Site EUI more the three standard deviations above or below the median site EUI for the property’s building sector (see Table 3 for a breakdown of the eight building sectors included in this analysis).
- 103 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 2018 or 2019. All properties with scores of 1 or 2 were removed.
 - 29 properties: Missing electricity use.
 - 6 properties: Missing Site EUI metrics.

This data cleansing process resulted in 2,769 covered building data submissions that provide the basis for the analysis presented in this report, a decrease of 21% from the analyzed properties in 2020, which included 2,187 analyzed properties.



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■ BUILDING SECTORS

Table 3 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.

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.

Table 3: Detailed Building Sector Description and Energy Performance Metrics by Sector for Analyzed Properties

Building Sector	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	Bank Branch and Financial Office	6	5,455,312	71.8	176.17	61.5
	Office, 50,000 ft2 – 99,999 ft2	82	6004,651	66.2	161	59
	Office, 100,000 ft2 - 249,999 ft2	91	14,639,372	76.9	152.4	61
	Office, ≥ 250,000 ft2	161	152,170,677	62.1	141.2	73
	All Offices	340	178,270,012	65.7	142.8	68
Multifamily Housing	Multifamily Housing, 50,000 ft2 – 99,999 ft2	472	33,483,614	79.0	117.0	66
	Multifamily Housing, 100,000 ft2 - 249,999 ft2	373	60,671,563	75	121	62
	Multifamily Housing, ≥ 250,000 ft2	422	213,778,318	76.5	125.5	52
	All Multifamily Housing	1,349	320,279,571	77.3	121.7	59
K-12 Schools	K-12 School, 50,000 ft2 – 99,999 ft2	240	18,039,121	81.6	124.4	42
	K-12 School, 100,000 ft2 - 249,999 ft2	195	27,866,120	70.9	114.5	67
	K-12 School, ≥ 250,000 ft2	41	14,190,57	71.8	105.3	62
	All K-12 Schools	476	60,095, 298	77.2	119.7	54
Healthcare	Ambulatory Surgical Center; Outpatient Rehabilitation/Physical Therapy; and Urgent Care/Clinic/Other Outpatient	3	254,689	106.9	190.0	--
	Hospital (General Medical & Surgical)	20	28,145,570	231.8	389.4	47
	Medical Office	15	3,120,965	108.6	247.3	45
	Other - Specialty Hospital	5	636,230	226.8	361.4	--
	All Healthcare	43	32,157,454	108.8	325.2	47
College/ University	College/University, 50,000 ft2 – 99,999 ft2	37	2,684,283	99.6	162.7	--
	College/University, 100,000 ft2 - 249,999 ft2	44	6,672,774	73.6	139.7	--
	College/University, ≥ 250,000 ft2	21	11,689,405	82.8	154.9	--
	All College/University	102	21,046,462	83.2	155.8	--
Lodging	Hotel	73	26,445,014	89.6	155.1	41
	Other - Lodging/Residential and Residence Hall/Dormitory	28	4,459,079	80.0	134.9	70
	Residential Care Facility	12	1,413,505	125.4	187.2	--
	Senior Care Community	65	7,737,227	111.0	172.0	32
	All Lodging	178	40,054,825	94.0	158.1	41



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(Continued from previous page.)

Building Sector	Primary ENERGY STAR Portfolio Manager Property Type(s)	Number of Properties Included in Analysis	Total Floor Area (Gross ft ²) – Buildings and Parking	Median Site EUI (kBtu/ square foot)	Median Source EUI (kBtu/ square foot)	Median ENERGY STAR Score (1-100 rating)
Retail	Automobile Dealership	5	884,032	93.1	237.8	--
	Enclosed Mall and Other - Mall	16	4,953,881	86.3	214.3	--
	Lifestyle Center and Strip Mall	19	3,806,901	83.3	170.7	--
	Retail Store	44	10,215,464	80.4	170.0	51
	Supermarket/Grocery Store	47	3,973,068	235.7	509.9	51
	Wholesale Club/Supercenter; Other – Services; and Repair Services (Vehicle, Shoe, Locksmith, etc.)	6	129,198	114.5	237.0	22.5
	All Retail	137	23,962,544	107.9	228.5	49
Other	Adult Education; Other – Education; and Preschool/Daycare	5	634,005	100.6	192.2	--
	Convention Center and Other-Entertainment/Public Assembly	4	9,633,990	81.1	153.6	--
	Courthouse; Other - Public Services; and Prison/Incarceration	5	7,261,128	78.3	152.1	68.5
	Fitness Center/Health Club/Gym	10	1,508,915	138.5	270.7	--
	Indoor Arena and Other - Recreation	14	1,251,590	98.3	118.2	--
	Laboratory	15	2,854,001	280.4	489.0	--
	Library	7	1,866,559	101.2	185.2	--
	Mixed Use	27	25,197,056	74.5	166.9	59
	Movie Theater; Performing Arts; and Social/Meeting Hall	13	1,562,208	90.2	181.0	--
	Museum	5	2,814,258	68.6	138.4	--
	Other	29	4,916,106	69.9	113.8	--
	Worship Facility	7	706,007	57.8	89.0	23.5
	All Other Properties	141	60,206,023	81.8	156.2	--
Grand Total		2766	736,072,188			

NOTE: Does not include data center properties for confidentiality reasons.



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■ TREND ANALYSIS METHODOLOGY

The trend analysis presented in this report applies to individual properties that reported in 2019 and reported again in 2021. The properties included in the trend analysis were only those that were analyzed properties in 2021. Weather-normalized source energy use per sq. ft. was used for the trend analysis to control for weather variations between the calendar years of the comparison, as well as any changes in the properties' square footage.⁸

A total of 2,023 analyzed properties from 2021 also reported data in 2019 and had a value for the weather-normalized source energy use intensity metric in both 2021 and 2019. This cohort of 2,023 properties was included in the trend analysis for energy use.

A total of 2,289 analyzed properties from 2021 also reported data in 2019 and had a value for the total GHG emissions metric in both 2021 and 2019. This cohort of 2,289 properties was included in the trend analysis for GHG emissions.

⁸ 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>



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■ CALCULATION METHODOLOGIES

The median weather normalized source energy use intensity (in kBTU/sq. ft.) for the sample properties was calculated for 2017 and 2020. The median for 2020 was then subtracted from the median in 2018. These calculations indicate a decrease in total weather-normalized source energy use for the group of properties analyzed.

The total GHG emissions (in CO₂e/year) for the sample properties was calculated for 2018 and 2020. The total for 2020 was then subtracted from the total in 2018. These calculations show a decrease in total GHG emissions for the group of properties analyzed. Table 4 shows the median weather-normalized source energy use intensity (in kBTU) and the total GHG emission values for 2018 and 2020 for this group of buildings, and the total percentage reductions achieved.

Table 4: Three-Year, Same Building Trend Analysis

Year	Median Weather-Normalized Source Energy Use Intensity (kBTU/sq. ft./year) (n=1,824)	Total Greenhouse Gas Emissions (CO₂e/year) (n=845)
2018	139.1	5,656,754
2020	130.6	4,642,341
Change	-8.5	-1,014,413
Percentage Change	-7%	-22%







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