

Philadelphia's Building Energy Programs

2022 Report



City of
Philadelphia

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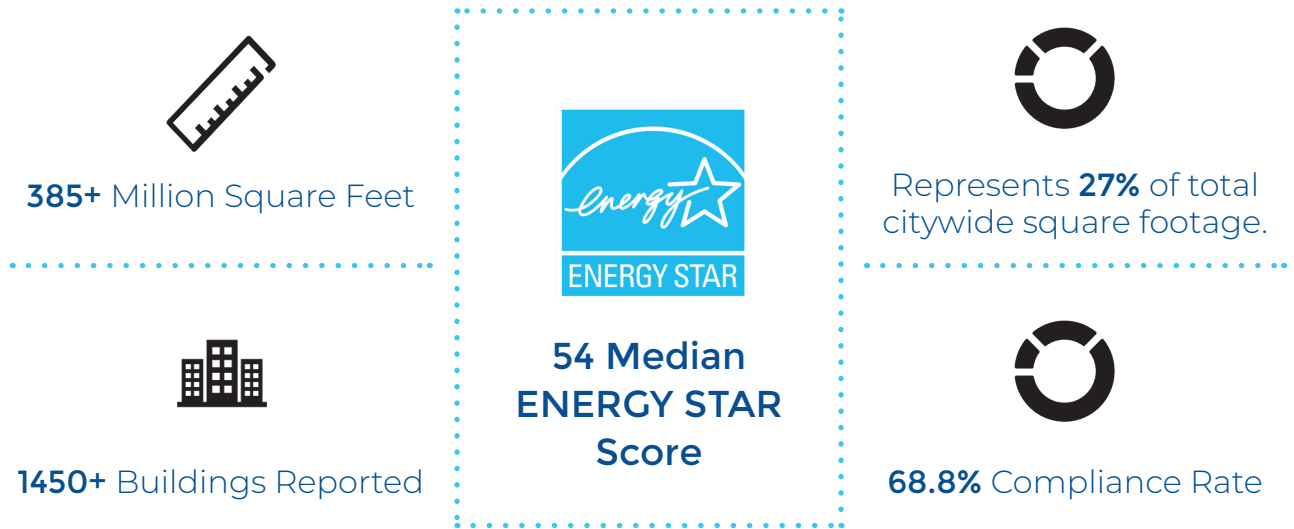
Executive Summary

In Philadelphia buildings are one the largest carbon emitters, accounting for 69 percent of all emissions in the City. Philadelphia's Building Energy Benchmarking Policy (Philadelphia Code section 9-3402) requires commercial and multifamily buildings 50,000 square feet and larger to report their energy and water usage annually to the City of Philadelphia using the free U.S. EPA's ENERGY STAR® Portfolio Manager® tool.

Benchmarking is a tool to help building owners measure, track, and disclose their energy and water use on an annual basis. The annual deadline to report the previous year's energy and water usage is June 30th. Since the start of Philadelphia's program, facilities have outperformed the national averages. Overall, buildings that have participated in the program have improved energy performance by about 18 percent since 2019. This report includes results from multifamily properties, which were first required to report in 2015. As the largest source of carbon emissions in the benchmarking data set, this building sector offers the opportunity to engage residents and property owners in energy efficiency and reduction measures.

2022 Benchmarking Highlights

Since 2012, Philadelphia's largest buildings have been reporting their energy and water use to the City of Philadelphia under Philadelphia's Building Energy Benchmarking Policy (Philadelphia Code section 9-3402). Buildings required to comply in 2022 account for more than 385 million square feet, representing 27 percent of the city's total square footage of livable building space. Since the beginning of the program, the compliance rate has dropped as the list of buildings required to report has increased with the expansion of multifamily properties and the impacts of the pandemic still lingering.

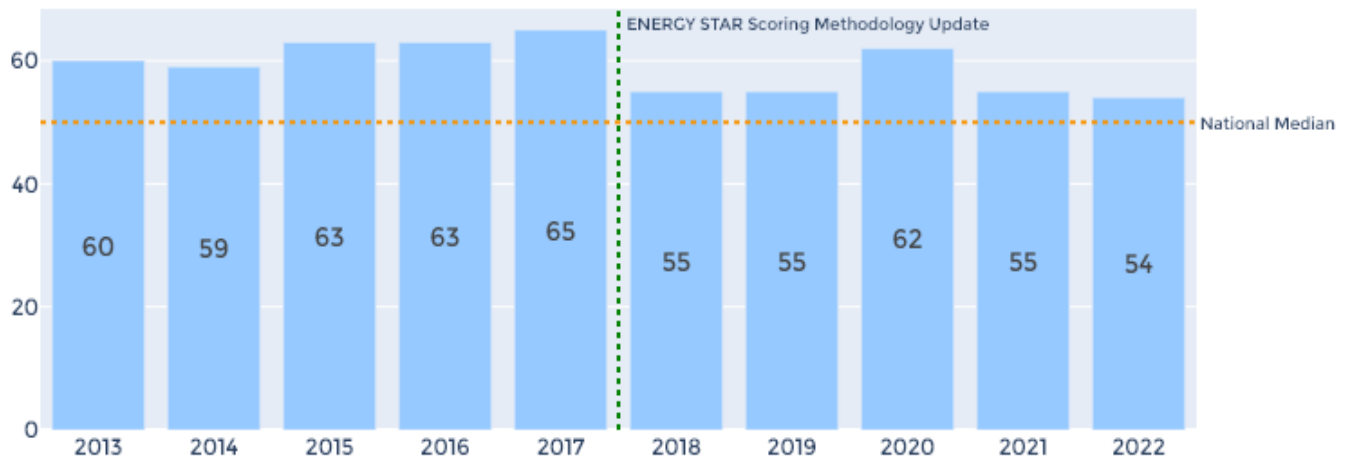


Benchmarking Over Time

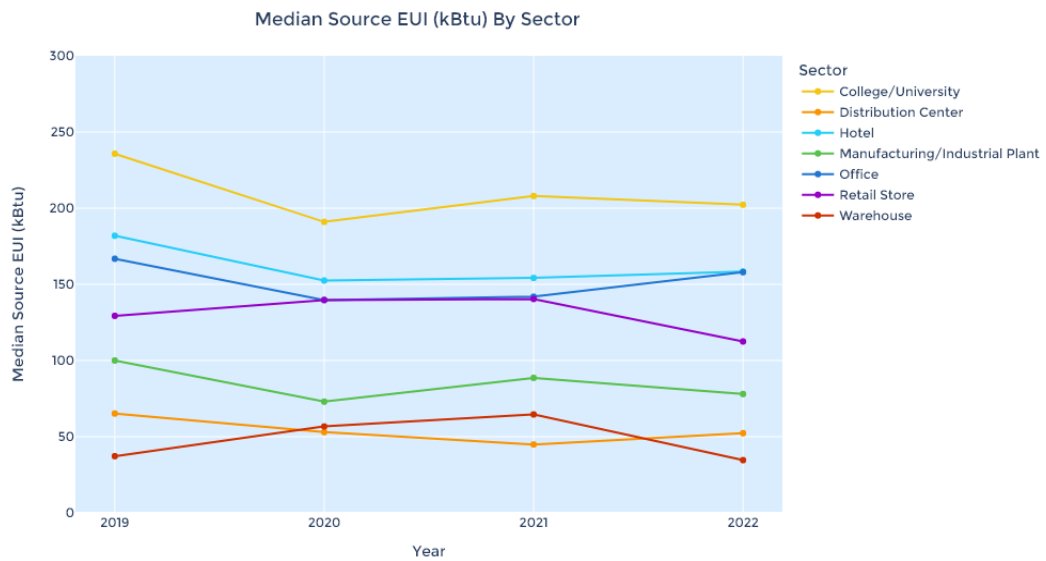
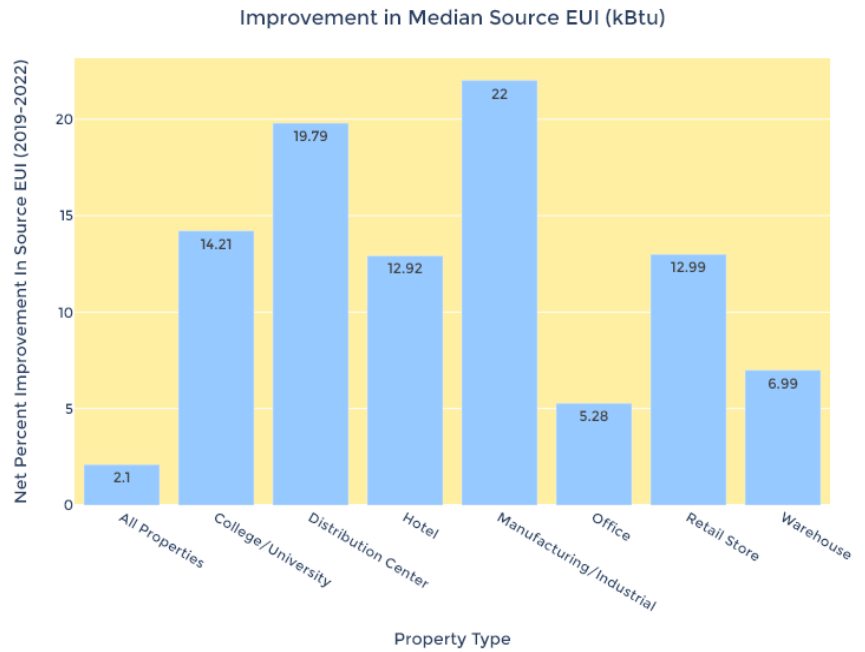
Similar to what has been observed in Philadelphia's benchmarked buildings, properties across the country are improving over time. In 2018, the EPA updated the ENERGY STAR Portfolio Manager tool to include current market survey data for calculating metrics such as the ENERGY STAR score. Due to these changes, several of Philadelphia's buildings reported a dip in their scores. Philadelphia's observed median ENERGY STAR score reported in 2017 was 65; in 2022, it dropped to 54.

While Philadelphia's benchmarked buildings are still outperforming the national average of 50, this new metric demonstrates a significant opportunity to continue improving our buildings' efficiency.

Median ENERGY STAR Score Over Time



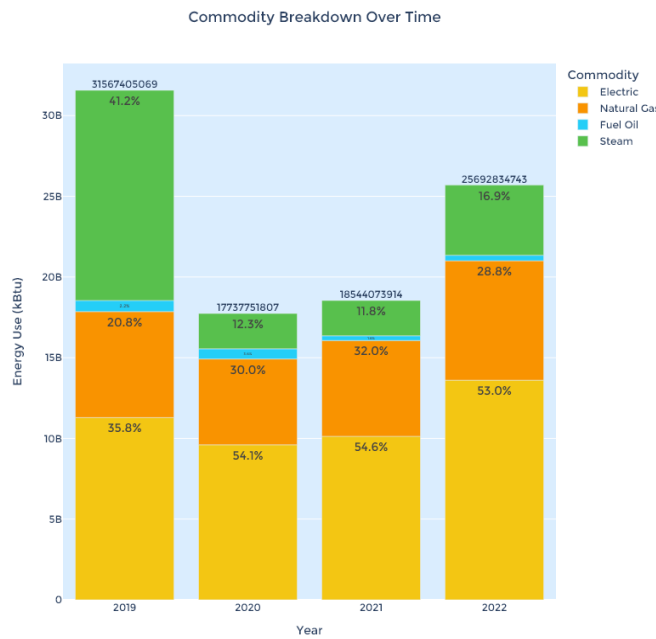
Comparative analysis on performance of building energy data submitted for 2019 and 2022, showed a source EUI performance improvement of 2.1 percent for all successfully benchmarked properties between these years. These results make it clear that the largest buildings in Philadelphia are working to become energy efficient. Most sectors saw improvement in their source EUI. Manufacturing/Industrial saw the most improvement, with a 22 percent reduction in median source EUI. Distribution Centers are trailing with a 19.79 percent reduction. For calendar year 2022, manufacturing/industrial and distribution centers make up around 2.5 percent of the total property area in the benchmarking dataset, indicating that there is still much improvement to be made in larger building sectors such as multifamily and office space.



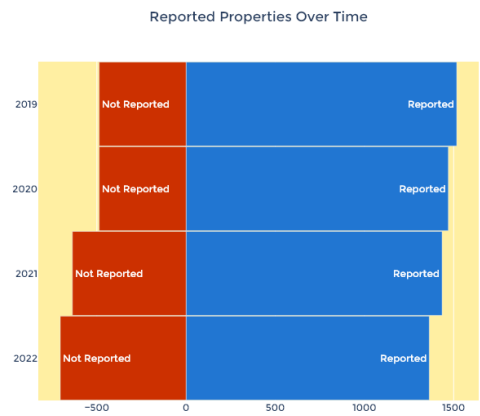
Some of the largest building sectors in the citywide portfolio have seen significant changes in source EUI over time, with many sectors seeing a steep decrease in 2020. Since 2020, most sectors have seen a steady increase in source EUI leading into the compliance year 2022. However, as shown in the graph above, manufacturing/industrial and retail sectors continue to see an overall decrease in their median source EUI.

A rigorous analysis was conducted on building energy data submitted between 2019 and 2022. This data shows an overall reduction in energy consumption of 18.6 percent between 2019 and 2022. 2020 saw a substantial decrease in energy consumption due to the impacts of the pandemic, which caused many buildings to be vacant or unused. Since then, consumption has been steadily rising.

Electricity remains the dominant commodity in the City's energy use portfolio, accounting for 53 percent of 2022's energy use. In 2022, 181 buildings reported electricity as their only energy source. Only 1.3 percent of energy was sourced from fuel oil, the most carbon-intensive energy used in buildings.



While energy use has decreased since 2019, so has the number of successfully reported buildings for each benchmarking compliance year. A significant decrease in building data submitted has been an ongoing issue since the pandemic, and more building owners have been filing for exemptions. In 2022, 705 buildings had questionable or missing data, which is a 44 percent increase since 2019. The City aims to increase the number of buildings submitting and successfully complying through combined efforts of increased resources and user outreach.

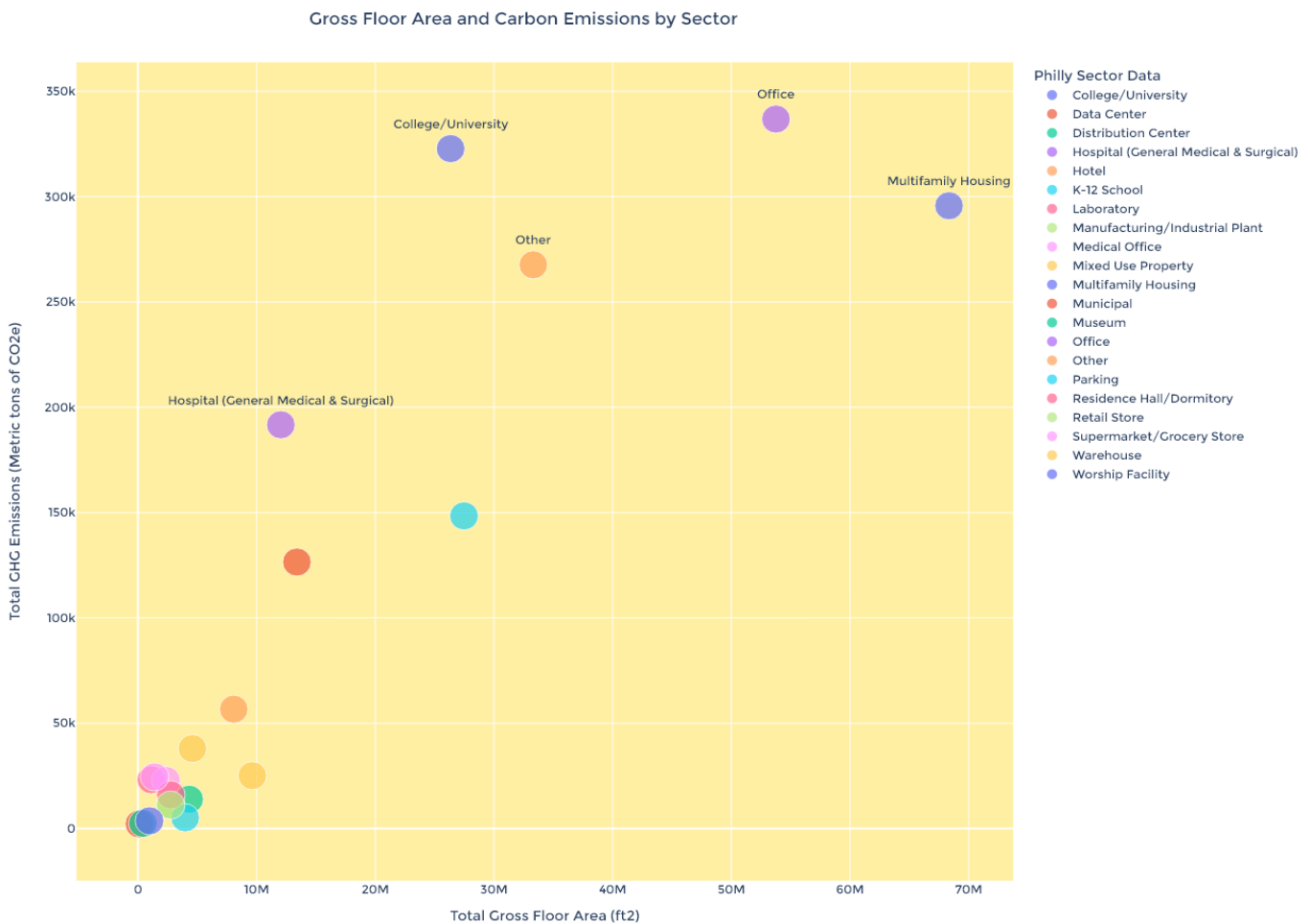


2022 Citywide Energy Performance

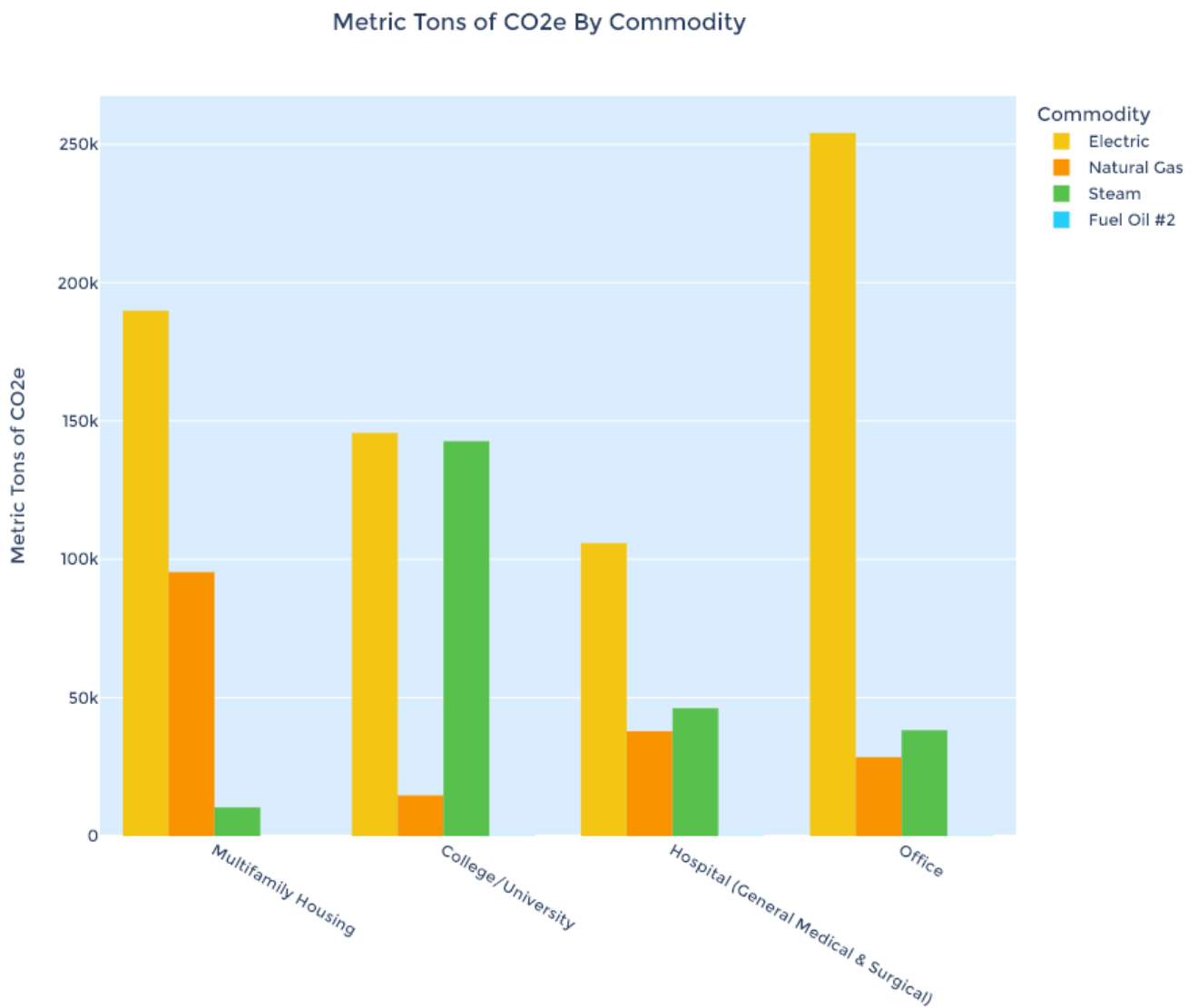
	Number of Buildings Reported	Percent of Total Property CFA	Average Site EUI (kBtu/ft ²)	Median ENERGYSTAR Score	Median Water Use (kgal)
College/University	76	9.41%	135.2	N/A	3789.8
Data Center	2	0.04%	229.9	N/A	538.7
Distribution Center	25	1.54%	39.8	70	257.5
Hospital (General Medical & Surgical)	18	4.3%	236.7	50	33903
Hotel	34	2.88%	79.6	62	6514.2
K-12 School	233	9.81%	85.2	27	971.6
Laboratory	5	0.4%	251	N/A	3258
Manufacturing/Industrial Plant	12	0.98%	97.2	N/A	1454.5
Medical Office	17	0.85%	115.4	54	3509
Mixed Use Property	19	1.64%	63.8	67	1707.6
Multifamily Housing	377	24.41%	61.5	64	4315.2
Municipal	74	4.78%	106.8	35	1223.8
Museum	4	0.15%	81.3	N/A	1400.1
Office	142	19.2%	87.9	68	2476
Other	165	11.9%	83	50	1522.5
Parking	21	1.42%	27.9	N/A	132
Residence Hall/Dormitory	22	0.99%	70.6	54	3559.3
Retail Store	22	0.98%	48.6	83	1437
Supermarket/Grocery Store	23	0.5%	246.1	51	2068
Warehouse	61	3.44%	37.5	67	104.1
Worship Facility	11	0.35%	43.3	54	297.5

The graph below clearly shows that residential buildings, as a significant contributor to our carbon emissions, also present one of our biggest opportunities for improvement. They account for 15 percent of total GHG emissions among reported properties. Understanding energy usage in these buildings can help plans for improving the efficiency of Philadelphia's multifamily properties, which reduces carbon emissions and costs for tenants. This is a critical step in order to address the energy burden faced by low-income households in Philadelphia.

In addition to residential multifamily buildings, offices, colleges and universities, and hospitals (general medical and surgical) contribute the majority of GHG emissions from benchmarked buildings at 17 percent, 16 percent, and 9 percent respectively.

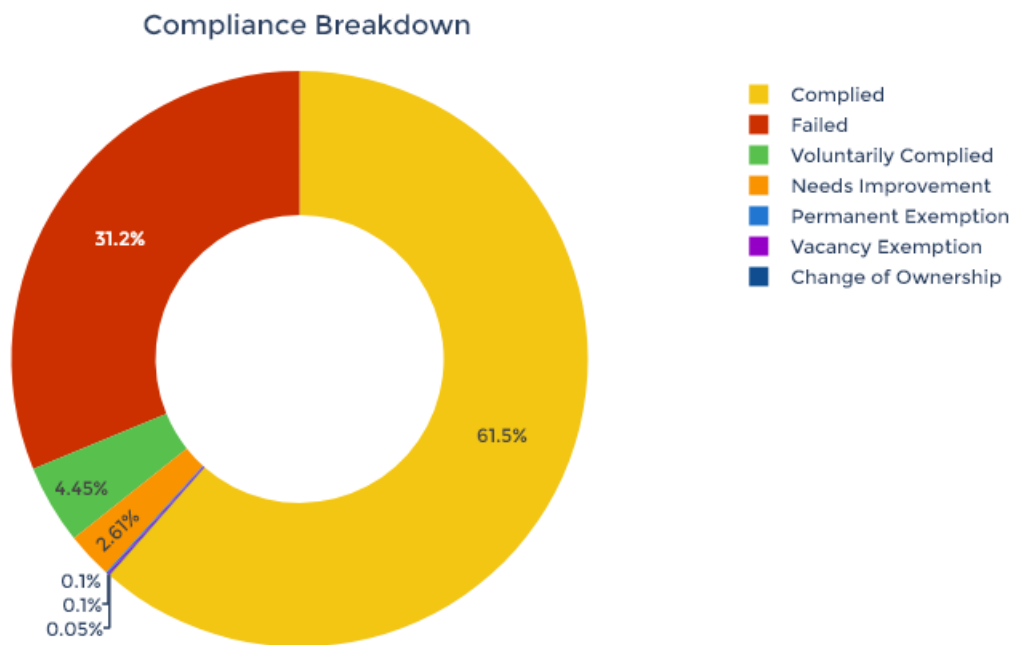


Looking closer at the top building sectors with the highest emissions, electricity and steam are the commodities with the most significant CO₂e emissions. By pursuing efforts in procuring renewable electricity such as solar and reducing steam use, sectors can aim to reduce their overall emissions.^{i,ii}



Compliance and Outreach

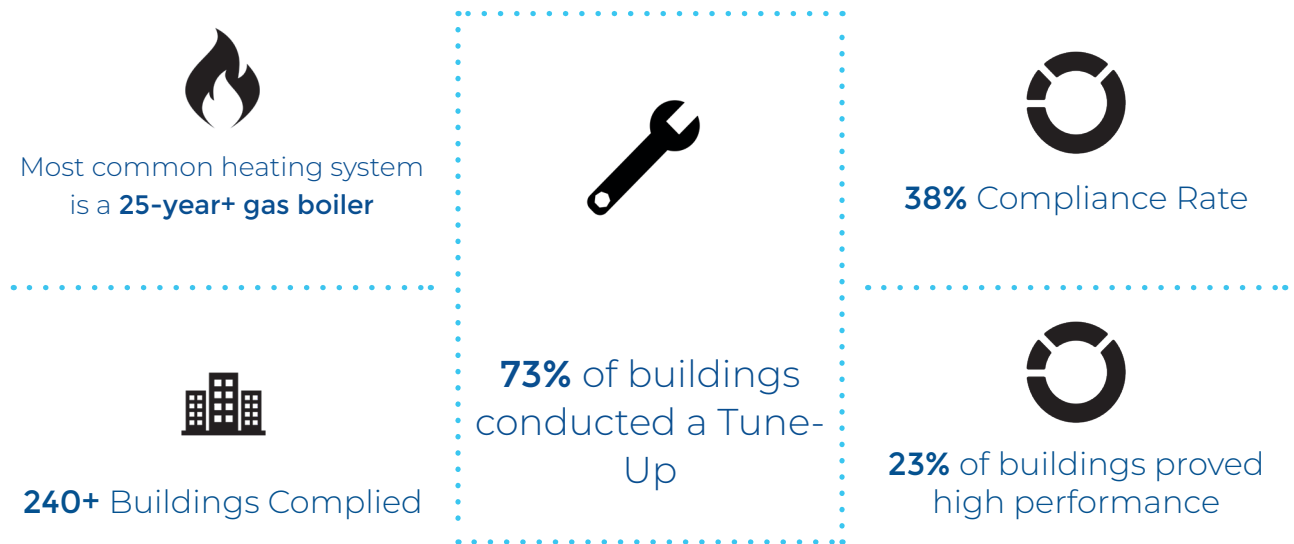
For 2022 benchmarking, there was a 68.8 percent compliance rate, which includes all buildings that submitted data, regardless of completion or accuracy. The compliance rate metric consists of buildings that complied (required or voluntary), need improvement, or successfully obtained an exemption. Voluntary buildings are properties that are not required to submit data under the Building Energy Benchmarking Policy (Philadelphia Code section 9-3402); that is, their total indoor square footage is under 50,000 ft². The failed metric consists of buildings that were required to comply but did not submit data for the compliance year.



Moving forward, building performance data submission and data analysis will be simplified through planned automation of data sharing and compliance, streamlining the process for building owners and program administration. More effective communication will provide better support and guidance to building owners in completing their benchmarking and understanding their data. Streamlining the administration and analysis of building data sets the foundation for the city to continue strengthening its building performance programs.

Building Energy Performance Program (BEPP)

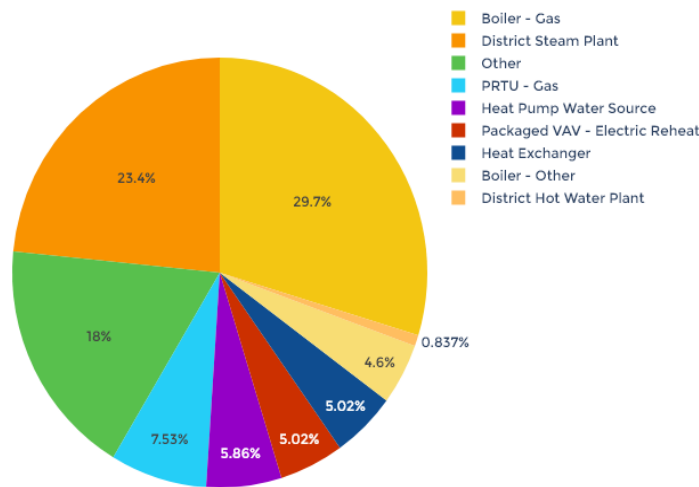
In addition to benchmarking, some building owners must comply with the Building Energy Performance Policy (BEPP) (Philadelphia Code section 9-3404). Sometimes referred to as “Building Tune-ups,” this program aims to achieve efficient energy and water use in Philadelphia’s largest nonresidential buildings. Building Tune-Ups are reviews of an existing building system, including but not limited to HVAC systems, conveying systems, and lighting systems, to ensure energy and water efficiency is maximized given existing conditions. Actions taken based on reviews can reduce building energy usage by 10-15 percent annually. BEPP requires that large buildings make corrective low/no cost actions every five years or prove that they are already operating efficiently by submitting either a Tune-Up Report or a High-Performance Certification to the Office of Sustainability. Nonresidential buildings 50,000 SQFT+ must comply with this program.



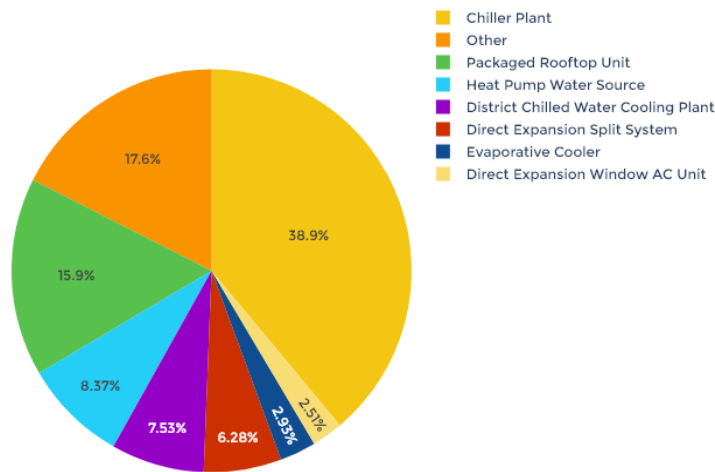
BEPP requires building owners to report on their building usage patterns along with major base building systems which can effect operational energy usage, which include: HVAC systems, plumbing and domestic hot water systems, lighting equipment and a building's envelope.

The most common heating system in buildings is gas boilers, while the most common cooling system is chiller plants. Building owners can successfully reach compliance by ensuring systems like these are up-to-date and as energy-efficient as possible.

Common Heating Systems



Common Cooling Systems



Buildings can also certify BEPP compliance by pursuing several different high-performance certifications. High-Performance certifications allow buildings that are already operating efficiently to prove so without undergoing a Tune-Up. This option makes it possible for building owners and managers to better integrate Building Performance policies such as this one into their short- and long-term work and facilities plans.

Below is a breakdown of all high-performance pathways pursued through the program. Thirty-seven building owners received ENERGY STAR Certification, making it the most pursued pathway for high-performance certification.

High Performance Pathway Breakdown



Glossary

British Thermal Unit (Btu) - A unit of energy, that can represent both thermal energy and electricity. One BTU is the amount of energy required to raise one pound of water one degree Fahrenheit.

Energy Use Intensity (EUI) - The metric used for comparing buildings in ENERGY STAR EUI expresses a building's energy use relative to its size. In this report it is expressed as kBtu/ft², and is calculated by taking the total energy consumed in a year (in kBtu) and dividing it by the floor area of the building (in ft²). All EUIs in this report are weather-normalized.

ENERGY STAR Rating - The 1-100 ENERGY STAR score was developed by the U.S. Environmental Protection Agency and provides a metric or comparison with other similar buildings across the country. The score accounts for differences in climate, occupancy and operating hours. A score of 50 represents median energy performance, while a score of 75 or better indicates a building is a top performer.

Site EUI - Site energy represents the amount of heat and electricity consumed by a building as reflected in utility bills. This is a relevant metric for facility managers, to understand how a building's energy use has changed over time. Site EUI does not, however, account for the environmental impacts of transmission and delivery of energy. Site energy sources for public buildings in this report include: electricity, natural gas, chilled water and steam.

Source EUI - Source energy represents the amount of heat and electricity consumed in the generation, transmission, and delivery of energy to the building.

Total GHG Emissions (MtCO₂e) - The metric used in this report for greenhouse gas emissions, which represents a million metric tons of carbon dioxide equivalents. Equivalent CO₂ (CO₂e) is a universal standard measurement for greenhouse gasses and their ability to trap heat in the atmosphere. These greenhouse gases include carbon dioxide, methane, nitrous oxide and chloroflouro-carbons.

Appendix

The Office of Sustainability, in collaboration with our valued stakeholders, completed the analysis of benchmarking data. Below are some of the data filtering criteria used in the 2022 benchmarking data and in the trend analysis from 2019-2022.

2019-2022 Analysis

Data used for yearly comparison in this report was pulled from Open Data Philly. The analysis was conducted on buildings that successfully reported their building energy data. This can be seen in spreadsheets with the naming convention 'Properties Reported' for their corresponding year. Comparisons over the years have undergone a rigorous data-cleaning process to normalize results. Significant outliers were dropped from original datasets in an effort to provide a more accurate depiction of energy consumption within the building profile over the years. Generally, significant outliers are due to data entry errors.

2022 Analysis

The 2022 benchmarking data was downloaded from EPA's ENERGY STAR Portfolio Manager, enabling a wider variety of data metrics and analysis. Data submitted for the most recent compliance year undergoes a series of checks to ensure realistic and accurate data. The data for the current year's analysis remains relatively unchanged, but the analysis was only run on buildings that properly submitted and passed the City's building energy benchmarking program (BEBP) data filters. Examples of data filters include:

- **Electricity Use = 0**
- **ENERGY STAR Score <1 or >99 (unless certified)**
- **District Steam Use > 1,000,000,000 kBtu**
- **Source EUI <5 or >2,000 kBtu/ft²/yr**
- **Gross Floor Area <1,000 ft²**
- **Water Use > 200,000 kgal**

Carbon emissions metrics were calculated using the Environmental Protection Agency and Portfolio Manger inventories. For more raw metrics on building data for the latest compliance years, check out the City's [visualization tool](#), which maps all submitted buildings with their corresponding submitted data.

End Notes

References:

- i. <https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf>
- ii. <https://portfoliomanager.energystar.gov/pdf/reference/Emissions.pdf>

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