City of Philadelphia

Building Energy Benchmarking Program

2023 Report

Table of Contents

Executive Summary

In Philadelphia, buildings are the largest source of carbon emissions, accounting for 69% of all emissions citywide (Office of Sustainability, 2022). To encourage emission reductions from the largest buildings in the city, the City of Philadelphia requires buildings 50,000 square feet and larger (of which there are over three thousand in the city) to report their energy and water usage annually. Energy and water use tracking is referred to as "benchmarking." The City's Building Energy Benchmarking Policy (Philadelphia Code section 9-3402) requires large commercial and multifamily buildings to benchmark their energy and water usage data annually using the free ENERGY STAR® Portfolio Manager® tool from the United States Environmental Protection Agency (US EPA).

By reporting energy and water use annually, building owners can track their energy and water use over time. Building owners can use the data to find opportunities for cost savings, improve efficiency, and compare their building's performance to national averages. Since the start of Philadelphia's Benchmarking Program in 2012, buildings that complied with the program have improved their energy performance by about 18%. Achieving better performance and efficiency for Philadelphia's buildings advances Mayor Cherelle L. Parker's vision to make Philadelphia the safest, cleanest, greenest big city in America with economic opportunity for all. When buildings improve their energy efficiency, residents benefit from cleaner air, more comfortable spaces, and less greenhouse gas emissions.

©JARED PIPER / PHL COUNCIL

2023 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 2023 account for 489,221,337 million square feet, representing 34.7% of the city's total square footage of livable building space.

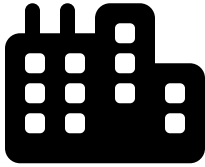**489,221,337** Million Square Feet

1,695 Buildings Reported

58

Median ENERGY STAR® Score

Large buildings represent **34.7%** of citywide floor area

69.2% Compliance Rate

2023 Citywide Energy Performance

Benchmarking Philadelphia's buildings annually is pivotal to understanding energy performance and efficiency. Property types from different sectors were observed and compared to the national median site energy use intensity (EUI) provided by ENERGY STAR® Portfolio Manager®. Energy use intensity, expressed as energy use per square foot per year, normalizes energy use to the size of the building so that large buildings are not unfairly compared to small buildings. Facility managers can utilize EUI metrics to understand their building's overall energy performance. A low EUI generally signifies good energy performance, while a high EUI indicates opportunity for improvement. The graph and table below show how Philadelphia properties compare to the national median.

Figure 1. Philadelphia median site EUI compared to the National median EUI by property type in 2023.

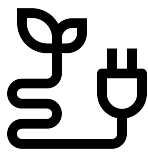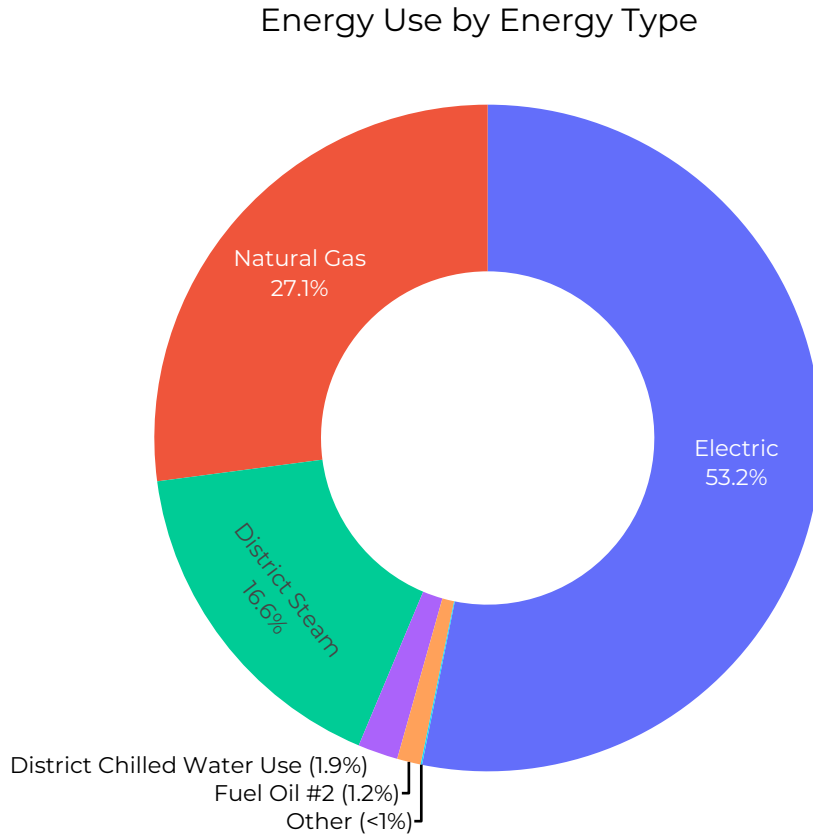Philadelphia Median EUI compared to National Median EUI in 2023
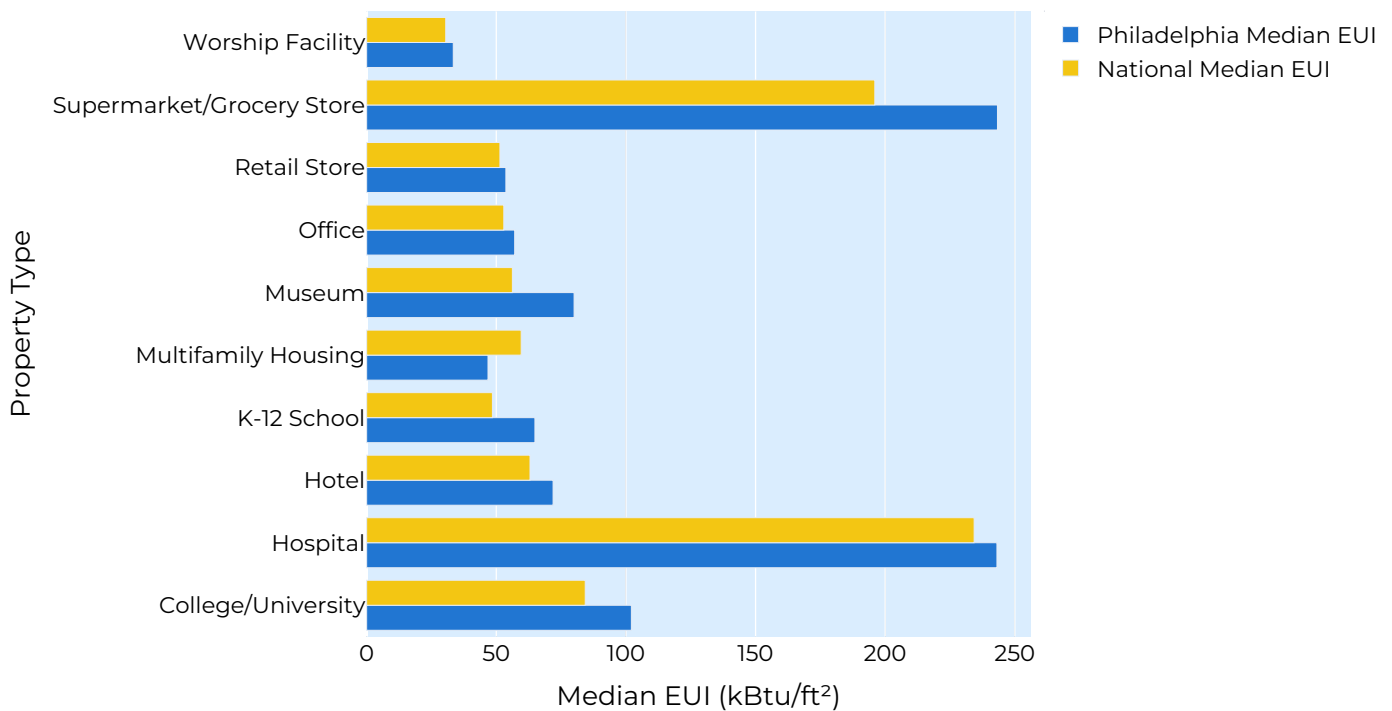
Table 1. Philadelphia's percent difference from the national median EUI by property type in 2023.

Property Type	Philadelphia Median EUI (kBtu/ft²)	National Median EUI (kBtu/ft²)	Percent Difference from National Median EUI
College/University	102	84	21%
Hospital	243	234	4%
Hotel	72	63	14%
K-12 School	65	48	34%
Multifamily Housing	47	60	-22%
Museum	80	56	42%
Office	57	53	8%
Retail Store	54	51	4%
Supermarket/Grocery Store	243	196	24%
Worship Facility	33	30	10%

In 2023, electricity accounted for 53.2% of the benchmarked buildings' total energy use, while natural gas and district steam accounted for 27.1% and 16.6%, respectively (figure 2). Since electricity, natural gas, and district steam are the largest commodities used throughout the city, it is imperative that building owners and utilities pursue low- or no-carbon alternatives. In 2023, only 0.02% of electricity was generated by renewable sources, and only 303 benchmarked buildings were 100% electrified. Electrification efforts combined with the continued pursuit of clean, reliable energy sources will greatly improve building performance, while also creating cleaner air quality for residents.

Diesel, coal and fuel oil are also used to generate energy and contribute to the carbon footprint of buildings. In 2023, benchmarked buildings reported a total use of only 0.01%, 0% and 1% for diesel, coal and fuel oil, respectively (figure 2).

Figure 2. Percentage of energy use by energy type in benchmarked buildings in 2023

Energy Use by Energy Type

Natural Gas
27.1%

Electric
53.2%

District Steam
16.6%

District Chilled Water Use (1.9%)
Fuel Oil #2 (1.2%)
Other (<1%)

0.02% of Electricity Generated from Onsite Renewable Systems

303 Fully Electric Buildings

More than **4,040 GWh** of Electricity Used

40 ENERGY STAR®-Certified Buildings

As the largest sector contributing to Philadelphia's carbon emissions, it is important that building owners understand their energy and water use. In figure 3 below, greenhouse gas (GHG) emissions were grouped by property type in relation to total combined gross floor area in square feet. This figure shows that the college/university sector emits the largest amount of GHG emissions, making up 15% of total GHG emissions among benchmarked properties. Improving the efficiency of Philadelphia's college/university buildings will reduce carbon emissions. Additionally, multifamily housing, office, hospital, and K-12 school buildings contribute 13%, 13%, 10%, and 6%, respectively.

Figure 3. Total greenhouse gas emissions by total gross floor area broken down by property type for 2023 benchmarked buildings.

Total Greenhouse Gas Emissions by Gross Floor Area by Property Type
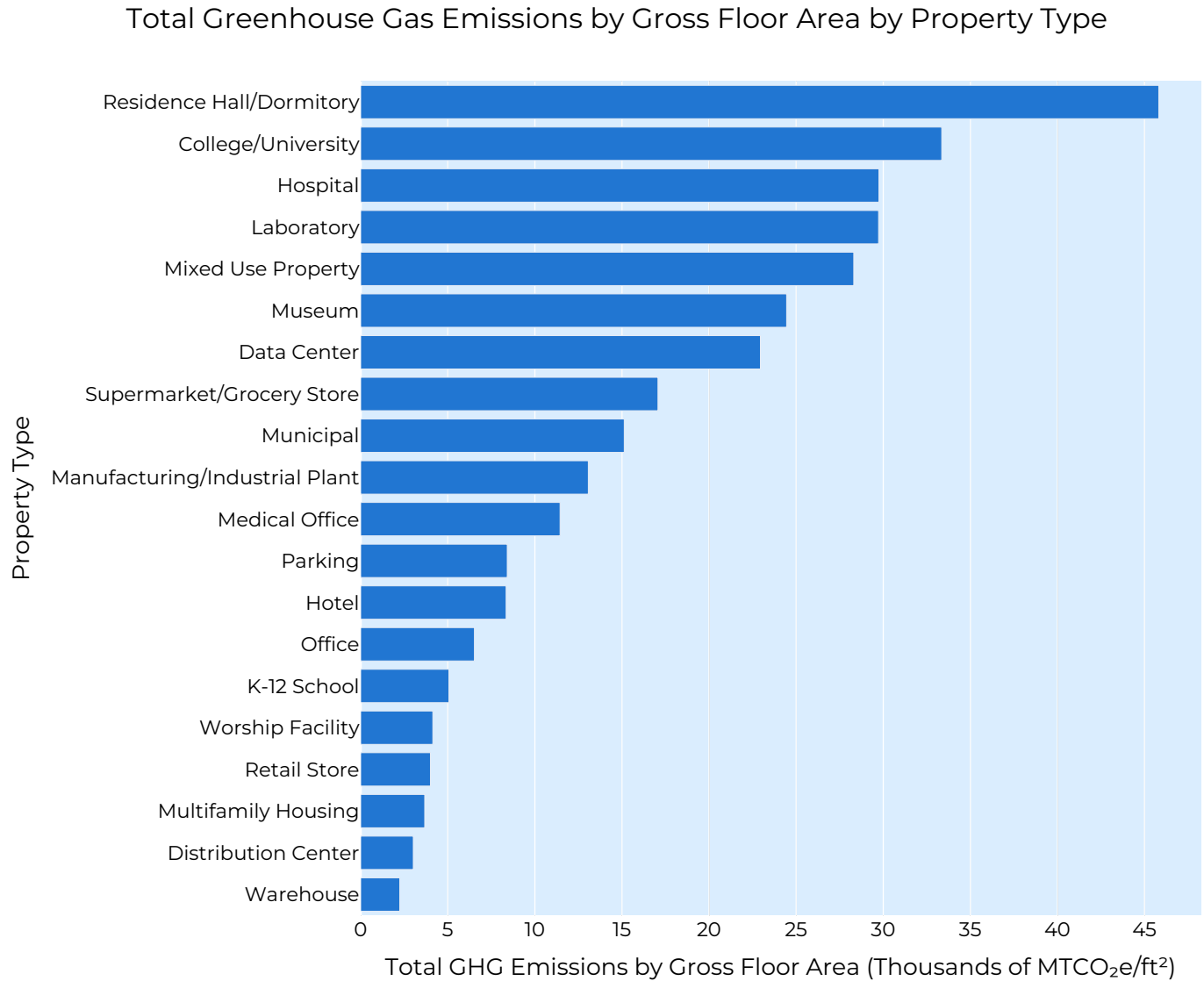
Further insights broken down by sector are displayed in the table below:

Table 2. Aggregated benchmarking metrics by property type in 2023.

Property Type	Number of Buildings Reported	Percent of Total Gross Floor Area	Average Site EUI (kBtu/ft²)	Median ENERGY STAR® Score	Median Water Use Intensity (gal/ft²)
College/University	75	3.5%	136	85	20
Data Center	17	0.9%	164	9	5
Distribution Center	29	1.7%	33	67	2
Hospital	20	2.6%	245	50	49
Hotel	42	3.1%	86	63	39
K-12 School	233	8.6%	68	33	10
Laboratory	8	0.4%	277	N/A	60
Manufacturing/Industrial Plant	17	0.8%	153	N/A	30
Medical Office	20	0.8%	113	45	28
Mixed Use Property	13	0.4%	95	N/A	10
Multifamily Housing	443	28.2%	53	66	32
Municipal	35	1.9%	160	48	13
Museum	9	0.4%	129	N/A	11
Office	130	15.2%	77	72	10
Other	429	23.2%	76	70	11
Parking	33	2.5%	88	32	6
Residence Hall/Dormitory	22	0.1%	71	42	33
Retail Store	16	0.6%	57	76	7
Supermarket/Grocery Store	27	0.5%	230	52	20
Warehouse	71	4.1%	30	66	2
Worship Facility	11	0.3%	42	32	4

2023 Compliance and Outreach

For 2023 benchmarking, there was a 69% compliance rate, which includes all buildings that submitted data, regardless of accuracy. The compliance rate metric consists of buildings that complied, failed (did not comply) or successfully obtained an exemption/extension.

Figure 4. The breakdown of compliance categories for 2023 benchmarking.

Compliance Rates in 2023

Legend:
- Complied
- Failed
- Permanent Exemption
- Annual Exemption
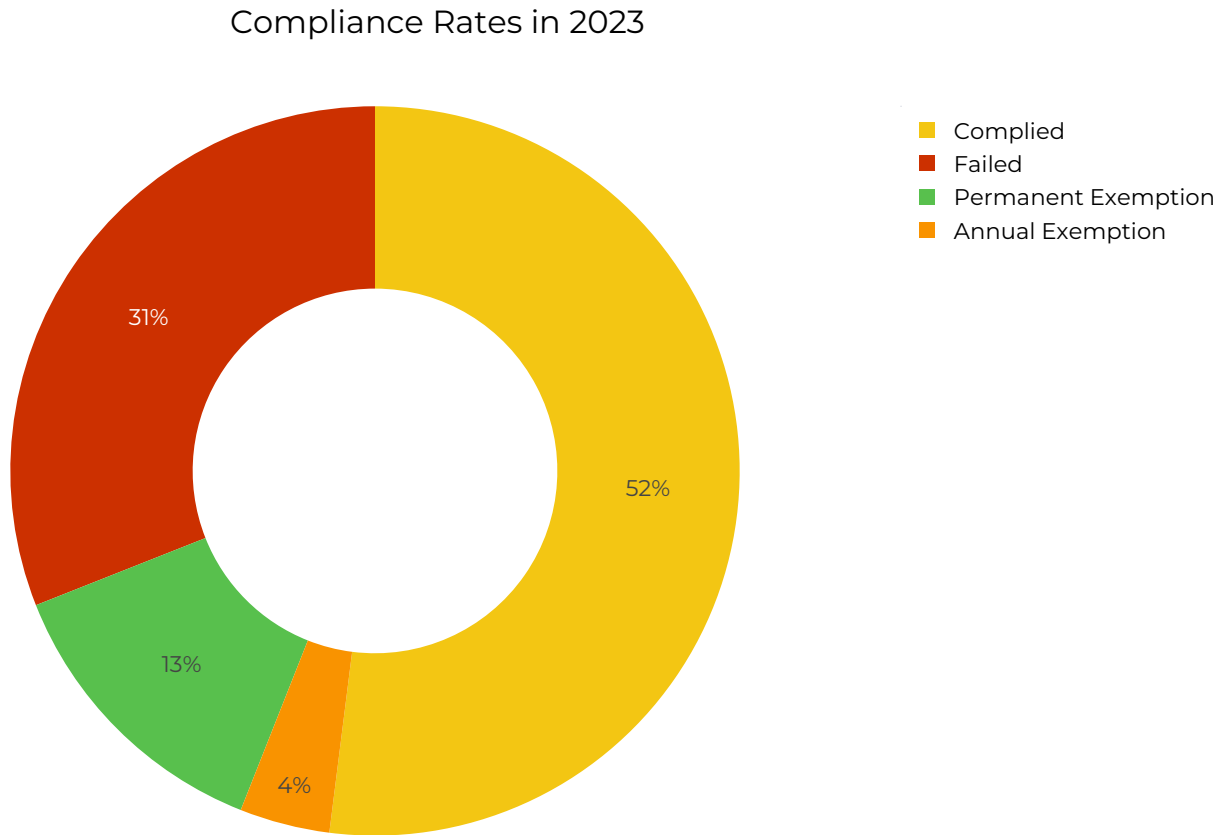
Compliance rates are calculated using the full list of buildings from the City's Office of Property Assessment that are over 50,000 square feet.

Conclusions: What's Next?

Moving forward, building energy data and analysis will be simplified through the automation of data sharing, streamlining the process for building owners and program administration. More frequent and effective communication will provide better guidance to building owners in completing the benchmarking process and understanding their data. Increasing compliance rates and collaborating with building owners sets the foundation for the City to strengthen its building energy programs and reduce greenhouse gas emissions from large buildings.

Looking ahead, the Office of Sustainability is exploring innovative building energy programs and policies to further reduce greenhouse gas emissions from large buildings, including a building performance standard. We will continue to engage residents, building owners, government leaders, and other stakeholders in the development of these policies and programs to ensure they are informed by robust feedback. In addition to being an essential part of the City's strategy to meet its climate goals, we believe building performance initiatives create an array of additional benefits in our communities, contributing to Mayor Parker's vision of making Philadelphia safer, cleaner, and greener, with economic opportunity for all.

End Notes

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 (MtCO$_2$e) - The metric used in this report for greenhouse gas emissions, which represents a million metric tons of carbon dioxide equivalents. Equivalent CO$_2$ (CO$_2$e) is a universal standard measurement for greenhouse gases 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 2023 benchmarking data.

2023 Analysis

The 2023 benchmarking data was downloaded from the 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
- Source EUI <5 or >2,000 kBtu/ft^2/yr
- Gross Floor Area <1,000 ft^2

- ENERGY STAR Score <1 or >99 (unless certified)
- Water Use >200,000 kgal
- District Steam Use >1,000,000,000 kBtu

Carbon emissions were calculated using the EPA's ENERGY STAR® Portfolio Manager® inventories. For more metrics on building data for the latest compliance years, check out the City's visualization tool, which maps all submitted buildings with their data.
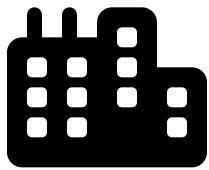
Building Energy Programs Visualization Tool:

https://experience.arcgis.com/experience/52c8a3b10e8c465eab723f04dbcb2a4d/

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

iii. Department of Energy. (2024, August 27). Biden-Harris Administration announces over $240 million for new and innovative building codes to save consumers money, reduce impacts of climate change. https://www.energy.gov/articles/biden-harris-administration-announces-over-240-million-new-and-innovative-building-codes

iv. Office of Sustainability. (2022, April 18). *2019 Philadelphia Greenhouse Gas Inventory Summary.* City of Philadelphia. from https://www.phila.gov/documents/2019-municipal-greenhouse-gas-inventory/.

Photos and Images:

i. Cover Page - Photo provided by Albert Lee Victor

ii. Page 1 - Photo by Jared Piper, PHL Council

iii. Page 2 - Ruler Icon - fontawesome.com

iv. Page 2 - Pie Chart Icon - fontawesome.com

v. Page 2/Final Page - City Icon - fontawesome.com

vi. Page 5 - Electric Meter Icon - Material Icons - https://mui.com

vii. Page 5 - Electricity Icon - Mage Icons - mageicons.com

viii. Page 5 - Renewable Energy Icon - IBM Carbon Design System - carbondesignsystem.com

ix. Page 9 - Photo by Peter Miller

x. Final Page - Map Icon - Icons8

This report was created with help from:

»» VERDANITY

Building Energy Programs
Website

Building Energy Programs
Visualization Tool

City of
Philadelphia

FACEBOOK.COM/PHILAOOS

INSTAGRAM.COM/PHILAOOS