CITY OF ST. LOUIS
BUILDING ENERGY AWARENESS ORDINANCE

St. Louis Energy Benchmarking Report 2018

AUGUST 2020

www.stlbenchmarking.com

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EXECUTIVE SUMMARY

Building energy efficiency is an essential part of creating a
healthier, more equitable, more sustainable, and more resilient St. Louis
for all who live, work, learn, and play here.

According to the City of St. Louis' most recent greenhouse gas inventory, buildings are responsible for roughly 80% of greenhouse gas emissions citywide. To avoid the worst impacts of climate change, the City adopted a goal of reducing greenhouse gas emissions 100% by 2050, a goal that cannot be achieved without substantial improvements in building energy efficiency. In February 2017, the City took an important step toward this goal by adopting the Building Energy Awareness Ordinance (Ordinance 70474), which requires buildings 50,000 square feet and larger to benchmark their energy and water use each year.

High-performance buildings help reduce emissions, lower utility bills, improve indoor and outdoor air quality, increase occupant comfort and productivity, and support local green jobs. But we can't manage what we don't measure—energy efficiency builds on a foundation of energy awareness.

To help building owners identify opportunities for improvement and to encourage the market to better value energy efficiency in buildings, the City publishes energy and water benchmarking data each year at www.stlbenchmarking.com.

2017 compliance: 45%

2018 compliance: 54%

Of the 983 buildings covered by the benchmarking ordinance, 532 submitted data for calendar year 2018, for a compliance rate of 54%. This represents a significant increase from 2017, which was the first year that reporting was required.

A small number of reporting buildings were subsequently dropped due to data quality concerns, leaving 500 buildings in the 2018 analysis. These 500 buildings represent:

- 89 million square feet of floor area
- 1.9 billion kWh of electricity used in 2018
- 47 million therms of natural gas used in 2018

Multi-family housing buildings were the largest reporting group by far, representing 24% of buildings and 18% of total square footage. The next largest reporting groups in terms of number of buildings were K-12 schools (14%) and office buildings (13%). These results are consistent with the overall makeup of large buildings in St. Louis.

In both 2017 and 2018, the most energy- and emissions-intensive property types were supermarkets, hospitals, and laboratories (see Figure ES-1). Although the increase in the number of buildings benchmarking from 2017 to 2018 makes it difficult to assess overarching trends in building performance, the data suggest a few highlights:

- 172 buildings (40%) reduced their energy use from 2017-2018, leading to an average decrease in energy use intensity (EUI) of 12%
- 94 buildings earned ENERGY STAR® scores higher than 75, the level required for ENERGY STAR certification
- One property type – residence halls – had a *median* ENERGY STAR score higher than 75, meaning that residence halls in St. Louis perform better, on average, than 75% of comparable buildings nationwide

- Seven property types - distribution centers, libraries, multi-family housing, medical offices, non-refrigerated warehouses, residence halls, and self-storage facilities - had median EUI values lower than the national median for buildings of the same property type

Nevertheless, there is always room for improvement. Compliance remains relatively low, and most buildings did not decrease EUI from 2017 to 2018.

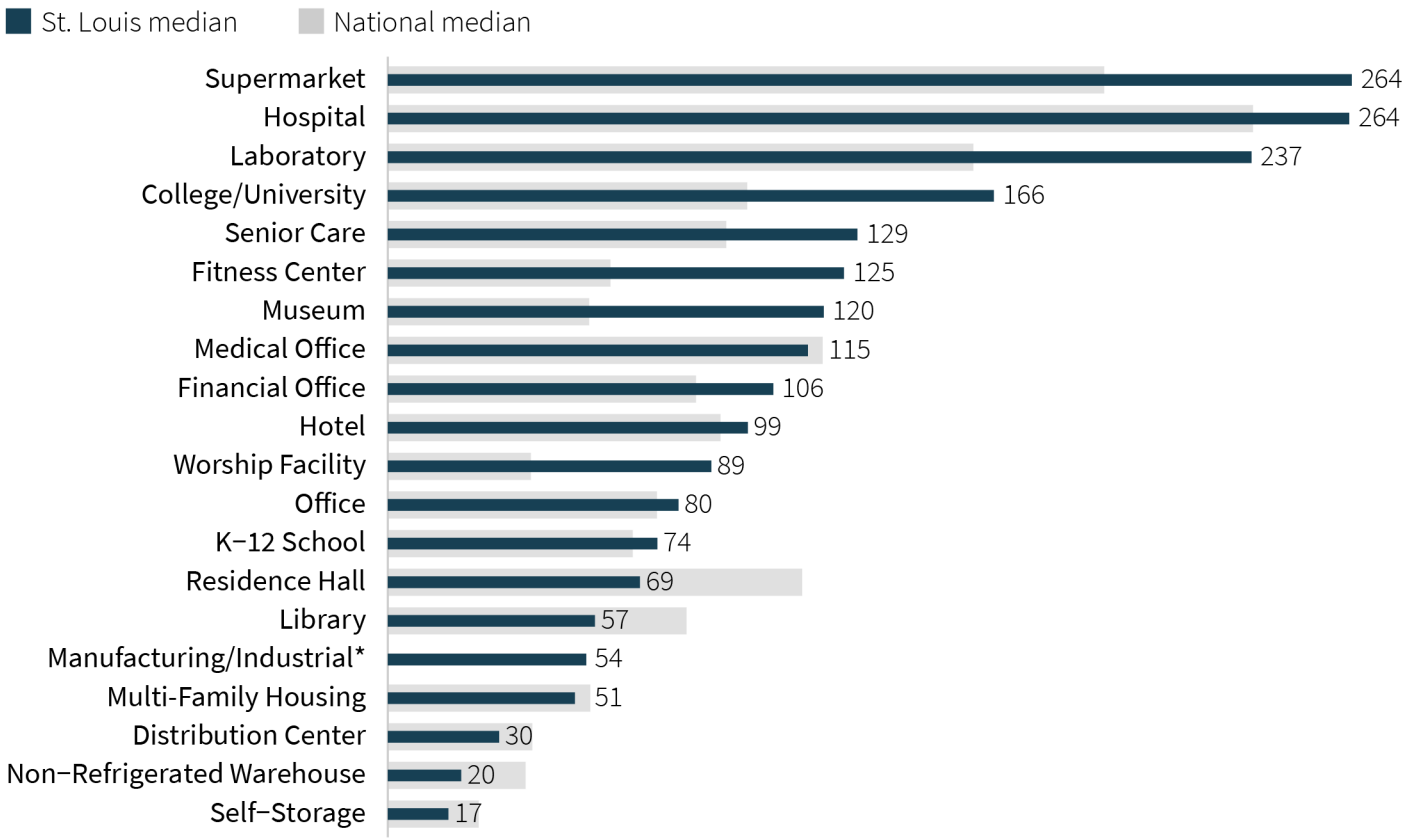
To help ensure that the benefits of energy efficiency are realized, the City adopted a Building Energy Performance Standard (BEPS) ordinance (Ordinance 71132) in May 2020, which requires that buildings already covered by the benchmarking ordinance meet specific energy performance targets by the end of a four-year compliance period. The ordinance also creates an Office of Building Performance within the Building Division to lead implementation and education efforts around benchmarking and the BEPS ordinance. With the BEPS ordinance – the fourth of its kind in the nation and the first in the Midwest – the City has reaffirmed its commitment to leading by example on climate action.

A 10% Improvement in Energy Efficiency Could Save...

If each of the 500 buildings that benchmarked in 2018 reduced its energy use by 10%, building owners and residents would collectively save, each year:

- 171,000 metric tons of CO_2
- $8.4 million on utility bills

Figure ES-1. Median Site EUI in St. Louis Compared to National Median (kBtu/ft²)



* ENERGY STAR does not calculate national median site EUI for manufacturing/industrial facilities.

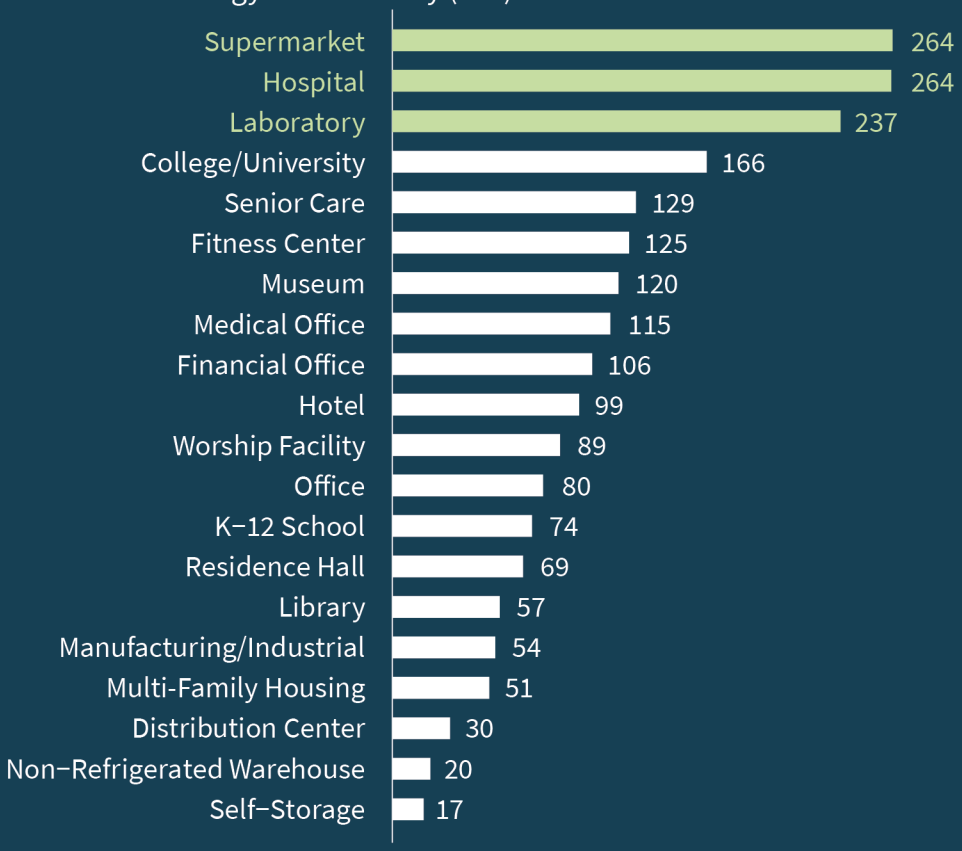
ST. LOUIS ENERGY BENCHMARKING 2018

> "Building energy efficiency is an essential part of creating a healthier, more equitable, more sustainable, and more resilient St. Louis."

In 2018, 532 of the 983 buildings covered by the benchmarking ordinance submitted performance data, up from 440 in 2017.

As in 2017, the most energy-intensive property types were supermarkets, hospitals, and laboratories.

Median Site Energy Use Intensity (EUI)



If every building reduced its energy use by 10%, we would collectively save:

$8.4 million
on electric and gas bills each year

171,000
metric tons of CO_2 each year

What's next?

May 2020	Fall	Winter/Spring 2021	May
Building Energy Performance Standard (BEPS) adopted	Building Energy Improvement Board established	Stakeholder engagement around BEPS targets	BEPS targets finalized Benchmarking 2020 deadline

For information and resources on benchmarking, BEPS, and energy efficiency in St. Louis, visit www.stlbenchmarking.com.

INTRODUCTION

In February 2017, the City of St. Louis adopted its Building Energy Awareness Ordinance (Ordinance 70474), which requires buildings 50,000 square feet and larger to report their energy and water use each year. This process – referred to as benchmarking – is overseen by the City of St. Louis Building Division.

Benchmarking is a critical first step in determining how to reduce unnecessary energy and water use in buildings. According to the City's most recent greenhouse gas inventory, commercial, residential, institutional, and industrial buildings are responsible for roughly 80% of greenhouse gas emissions in St. Louis. The U.S. Environmental Protection Agency (EPA) estimates that, on average, 30% of energy in buildings is wasted or used inefficiently. Reducing energy use in buildings can therefore have huge benefits for the environment, while also realizing cost savings from lower energy bills.

By making benchmarking data publicly available, the City wants to help owners and occupants understand how their building's performance compares to others' and identify opportunities for improvement. The City publishes this information each year to encourage the market to better value energy efficiency, similar to how miles-per-gallon ratings encourage improvements in fuel efficiency for cars. Other cities with benchmarking and transparency requirements have seen 2-3% energy savings each year from buildings subject to benchmarking ordinances.

To ensure that these savings continue over time, the City adopted a Building Energy Performance Standard, or BEPS (Ordinance 71132), in May 2020, which builds on the benchmarking ordinance by requiring buildings to meet increasingly stringent energy efficiency targets over time. The City of St. Louis' benchmarking and BEPS efforts received critical support from two national initiatives, the City Energy Project and the American Cities Climate Challenge.

How is Benchmarking Data Collected?

Each year since 2017, buildings 50,000 square feet and larger that are located in the City of St. Louis have been required to report their annual energy and water use. The reporting process happens via the free online ENERGY STAR® Portfolio Manager tool, which was developed by the EPA.

Individual building managers or their representatives upload information to Portfolio Manager detailing their building's floor area, typical operations, energy use, and water use. Based on these inputs, Portfolio Manager calculates metrics such as energy use intensity (EUI), ENERGY STAR scores, and greenhouse gas emissions. The City of St. Louis engages with building owners through trainings and one-on-one assistance to help identify and address data quality issues; however, with the exception of the data cleaning steps described later in this report, the City does not verify the accuracy of the data submitted.

City Energy Project

The City Energy Project, a joint initiative of the Natural Resources Defense Council (NRDC) and the Institute for Market Transformation (IMT) that lasted from 2014 through 2018, aimed to create healthier and more prosperous American cities by improving building energy efficiency. In particular, the initiative encouraged innovative, practical, and locally designed strategies. St. Louis joined in 2016 as one of 20 participating cities. Thanks to City Energy Project support, St. Louis was able to develop a strategy for the passage, implementation, and enforcement of its benchmarking ordinance.

American Cities Climate Challenge

Recognizing that cities account for more than 70% of global carbon emissions, Bloomberg Philanthropies launched the American Cities Climate Challenge in 2018 to support U.S. cities in reducing emissions

from buildings and transportation. St. Louis is one of 25 participating cities. With support from the initiative, St. Louis has been able to build upon its previous benchmarking and building efficiency efforts with new policies aimed at reducing energy use and emissions, including St. Louis' fourth-in-the-nation Building Energy Performance Standard ordinance and a solar-readiness ordinance.

Energy Benefits of Benchmarking

Evidence continues to accumulate showing that benchmarking leads directly to reduced energy use and consumer savings. A 2012 EPA analysis of 35,000 benchmarked buildings found average annual energy savings of 2.4%. The analysis also found that buildings that benchmarked for three consecutive years saved an average of 7% over that time.

The EPA's findings are further supported by city-level analyses. New York City, for example, found that benchmarked buildings realized energy savings of 5.7%, or $267 million, between 2010 and 2013. San Francisco found that, between 2009 and 2013, municipal buildings reduced site EUI by 7.4%. Commercial buildings that consistently complied with San Francisco's benchmarking ordinance reduced their energy use by 7.9% and greenhouse gas emissions by 17% between 2010 and 2014. In addition, a 2015 study by Resources for the Future found that office buildings in Austin, New York, San Francisco, and Seattle that were covered by benchmarking ordinances spent 3% less on utilities than buildings that did not benchmark. The study attributed this reduction to increased attentiveness to energy performance among building owners.

Non-Energy Benefits of Energy Efficiency

Energy efficiency can lead to a variety of non-energy benefits (NEBs), which accrue to utilities, individuals, or society as a whole. Although NEBs do not always represent financial cost savings, they represent real benefits to society. Table 1 lists examples of the types of NEBs that could result from building energy efficiency investments in St. Louis.[1]

Importantly, the discussion of NEBs must acknowledge that the current energy system disproportionately harms communities of color, particularly Black communities. Low-income communities and communities of color are disproportionately exposed to air pollution from power plants and other sources, and suffer long-term health complications as a result. In St. Louis, for example, Black children are more than 10 times as likely as white children to visit emergency rooms for asthma-related complications. These health concerns are further aggravated by energy-inefficient housing and workplaces that do not protect occupants from air pollution.

Why Focus on Large Buildings?

Buildings account for roughly 80% of greenhouse gas emissions in St. Louis. By focusing on the City's largest buildings - which are likely also the largest consumers of energy and water - the City hopes to maximize near-term energy and emissions reductions. The benchmarking ordinance therefore covers buildings with floor areas of at least 50,000 square feet (roughly the size of a big box store). The list of covered buildings includes much of the St. Louis skyline, from hospitals and hotels to landmarks such as Busch Stadium and the Cathedral Basilica.

This focus on near-term energy and emissions reductions is now more important than ever, as the COVID-19 pandemic underscores the importance of creating a healthier, more equitable, more sustainable, and more resilient city for all who live, work, learn, and play here. Building energy efficiency is a key part of that solution.

1 For more information on NEBs, see the Midwest Energy Efficiency Alliance's fact sheet.

In addition, energy-inefficient housing takes a disproportionate financial toll on low-income communities and communities of color. In 2011, 52% of low-income households and 46% of Black households in St. Louis experienced "energy burdens" (the percentage of household income spent on utilities) more than two times higher than the city median; among low-income multi-family households, this figure was 40%. Because of the large number of multi-family buildings covered by St. Louis' benchmarking ordinance (119 reported in 2018), energy efficiency represents an important opportunity to begin reducing economic, health, and environmental disparities.

Taking action to improve energy efficiency in buildings is especially important now, as the COVID-19 pandemic lays bare the risks and vulnerabilities faced by communities with polluted air—which are largely communities of color. Even as our understanding of COVID-19 continues to evolve, it is clear that people exposed to long-term air pollution are more likely to die of COVID-19. Indeed, in St. Louis, COVID-19 has disproportionately affected Black residents, who make up almost two-thirds of the deaths in the City despite accounting for just under half of the population. Improving building energy efficiency will not by itself address long-standing injustices, but it can be part of the solution.

Table 1. Non-Energy Benefits of Energy Efficiency Investments

BENEFITS ACCRUING TO:		
UTILITIES	**BUILDING OWNERS/OCCUPANTS**	**SOCIETY**
• Cost/labor savings from reduced shutoffs and reconnections • Insurance cost savings • Improved power quality and reliability • Operational efficiencies from reductions in peak load • Reduced transmission and distribution losses	• Increased control over energy use decisions • Reduced risk of shutoffs due to lower energy bills and increased control • Improved indoor air quality from reduced reliance on onsite combustion and building envelope improvements • Improved comfort • Improved health and productivity (fewer lost days at work or school) • Increased property value • Reduced operating and maintenance costs • Reduced tenant complaints and turnover	• Economic development benefits, including attracting new businesses and support for green jobs • Improved outdoor air quality from reduced reliance on fossil fuels • Public health improvements (e.g., reduced risk of asthma) and corresponding healthcare cost savings • Increased energy security • Preservation of affordable housing through reduced energy costs • Reduced contribution to climate change • Reduced ecological degradation (e.g., water quality impacts from coal ash)

COVERED BUILDINGS

The benchmarking ordinance covers 983 buildings in the City of St. Louis. In response to the City's request, 721 buildings submitted benchmarking data for 2018. Of these, 189 were dropped for eligibility reasons—i.e., they were located outside of the City, didn't meet the 50,000 square-foot threshold, were exempted by the City for reasons such as vacancy or lack of master-metered utility data, or represented duplicate submissions.[2] With 532 buildings remaining, the 2018 compliance rate was 54% (532/983).

In comparison, as described in the 2017 report, 440 buildings that were required to report did so, for a compliance rate of 45% (440/983).[3]

Another 32 buildings were dropped for data quality reasons, primarily missing data (or a value of zero) for electricity use. A small number were dropped for having energy use intensity (EUI) values so high as to suggest potential data errors.[4]

2017 compliance: 45%

2018 compliance: 54%

To facilitate development of a more complete data set, the City also asked buildings to submit back-data for 2017 at the time of their 2018 submission. As a result, the City's database now includes 544 buildings with 2017 data and 500 with 2018 data. Table 2 summarizes the data cleaning process.

Table 2. Data Cleaning Summary

BUILDINGS IN DATA SET	NUMBER WITH 2017 DATA	NUMBER WITH 2018 DATA	TOTAL NUMBER
Buildings that reported in 2017	553	-	553
Buildings that reported in 2018	721	721	1,442
Buildings dropped for eligibility	685	189	874
Duplicate entry	*445*	*13*	*458*
Exempted/not in City	*216*	*164*	*380*
Floor area missing or <50,000 ft²	*24*	*12*	*36*
Buildings dropped for data quality	45	32	77
Electricity missing or zero	*38*	*27*	*65*
EUI outlier	*7*	*5*	*12*
Buildings included in analysis	544	500	1,044

2 Although the City encourages voluntary reporting, voluntary reporters are not likely to be representative of buildings citywide and were dropped to avoid misrepresenting overall building performance in St. Louis.

3 This rate is calculated based on 983 buildings covered by the benchmarking ordinance. Although the 2017 report referenced 1,002 covered buildings, the City has since identified and removed from its list a number of buildings that do not meet the criteria for benchmarking.

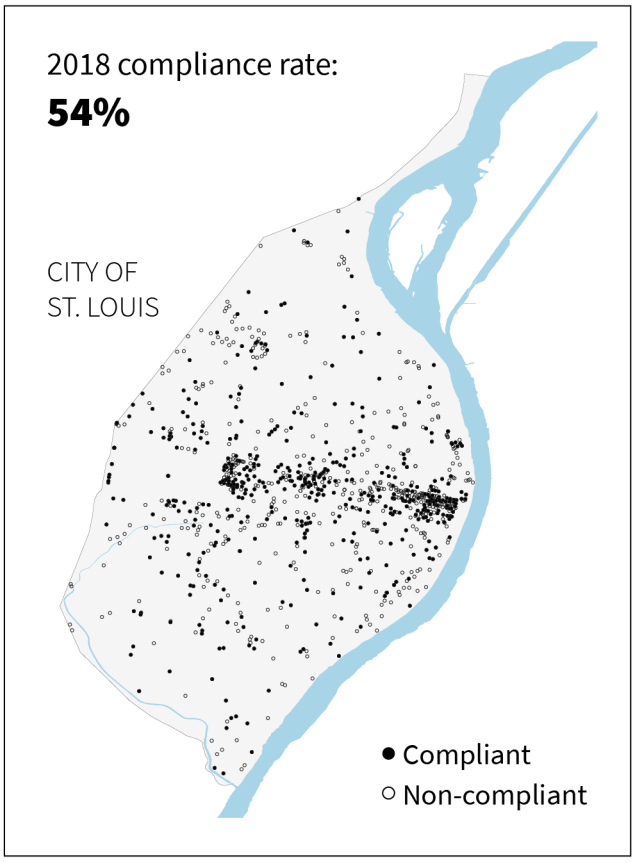
4 Specifically, the City dropped submissions where EUI was an order of magnitude higher than the next-highest EUI value for buildings of the same property type, if that difference could not be readily explained.

Another way to look at compliance is to consider the percentage of covered buildings that submitted data of high enough quality to be used in the analysis. The 2018 analysis uses data from 500 buildings, suggesting a "functional compliance rate" of 51%. These 500 buildings represent:

- 89 million square feet of floor area
- 1.9 billion kWh of electricity used in 2018
- 47 million therms of natural gas used in 2018

Between 2017 and 2018, compliance increased substantially, although there is still much room for improvement. The map in Figure 1 illustrates compliant and non-compliant buildings in 2018.

Figure 1. Benchmarking Compliance in 2018



Data: City of St. Louis. Base layer: U.S. Geological Survey (USGS) National Hydrography Dataset (NHD).

Throughout this report, buildings are analyzed in comparison to others of the same property type. Although the 500 buildings analyzed for 2018 represent more than 50 property types, many of these property types included only one or two buildings. For clarity, this report presents results only for the subset of the 20 most common property types; detailed results for all property types can be found in the Appendix.

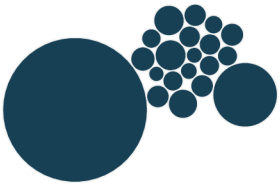
In addition, the Municipal Buildings section of this report directly compares the 15 municipal buildings in the data set to their privately-owned counterparts. With this comparison, the City is able to be more transparent and accountable to taxpayers about the operations and environmental impacts of City properties.

Figure 2 summarizes 2018 compliance and square footage by property type. As shown, multi-family housing buildings were the largest reporting group by far, representing 24% of all analyzed buildings and 18% of total square footage. The next largest reporting groups in terms of number of buildings were K-12 schools (14%) and office buildings (13%). These results are consistent with the overall makeup of large buildings in St. Louis.

Figure 2. Overview of Analyzed Buildings

Each circle represents one building.
Circles are sized according to building area, with larger circles representing larger buildings.

College/University
20; 7.2 million ft²

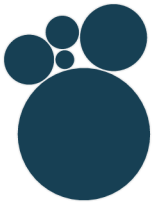


Distribution Center
20; 3.9 million ft²

Financial Office
5; 2.2 million ft²

Fitness Center
6; 527,000 ft²

Hospital
5; 5.6 million ft²



Hotel
23; 8.0 million ft²

K-12 School
72; 7.2 million ft²

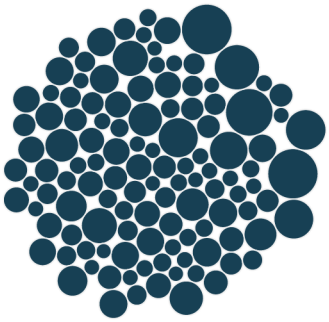
Laboratory
23; 3.3 million ft²

Library
3; 519,000 ft²

Manufacturing/ Industrial
19; 2.2 million ft²

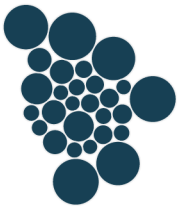
Medical Office
8; 1.2 million ft²

Multi-Family Housing
119; 16.2 million ft²

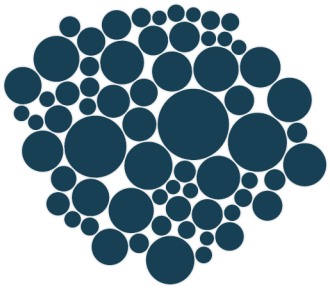


Museum
5; 1.0 million ft²

Non-Refrigerated Warehouse
28; 4.7 million ft²



Office
66; 14.3 million ft²



Residence Hall
12; 1.2 million ft²

Self-Storage
11; 1.2 million ft²

Senior Care
6; 558,000 ft²

Supermarket
5; 300,000 ft²

Worship Facility
3; 307,000 ft²

ENERGY PERFORMANCE

To track buildings' energy performance over time, the City of St. Louis uses two metrics: energy use intensity (EUI) and ENERGY STAR score. EUI is a measure of energy used per square foot of building space. A lower EUI indicates lower energy consumption—i.e., a more efficient building. ENERGY STAR scores range from 1 (inefficient) to 100 (efficient) and are assigned on a percentile basis, based on a building's energy use relative to similar buildings nationwide.[5] A score of 50 indicates performance at the national median.

Results: EUI

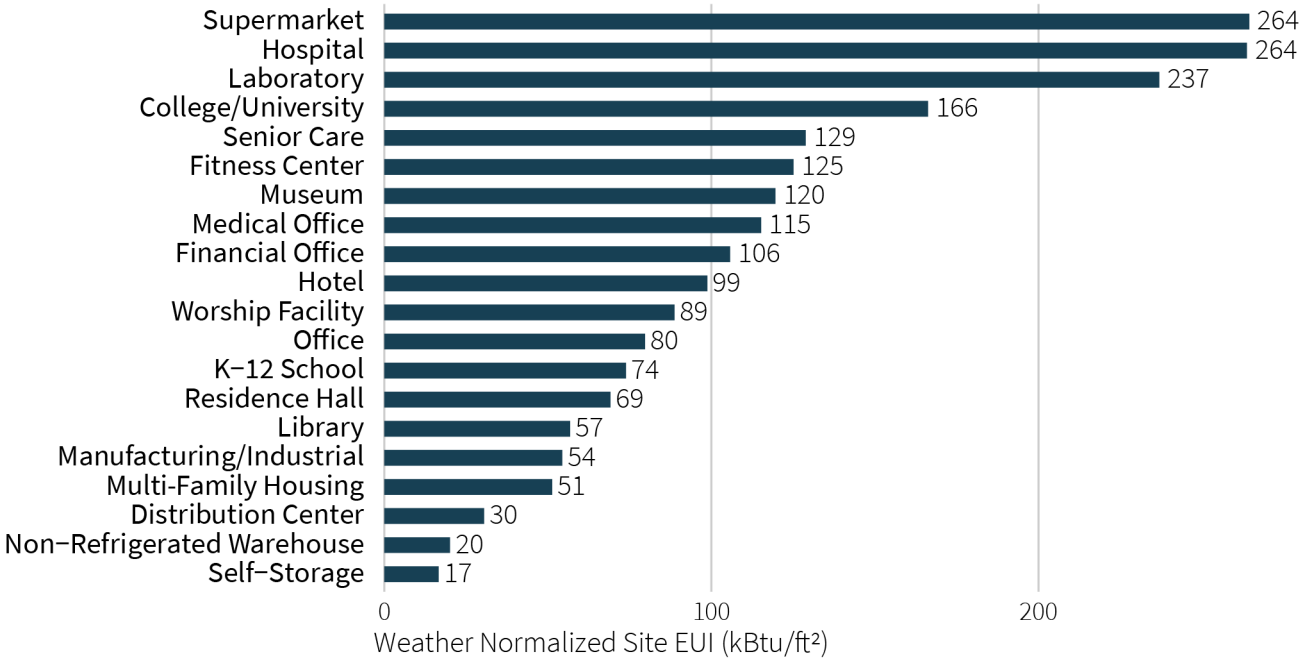
As shown in Figure 3, median site EUI varies widely by property type. This is not surprising—some properties, such as supermarkets, are extremely energy intensive, while others, such as self-storage, are not. The most energy-intensive property types in 2018 were supermarkets, hospitals, and laboratories.

What is Energy Use Intensity?

Energy Use Intensity, or EUI, is a measure of energy used per square foot of building area (kBtu/ft^2). EUI is commonly used to compare energy performance across buildings of different sizes since, in general, larger buildings use more energy. EUI can be calculated as either site EUI – which reflects only energy used onsite, as reported on utility bills – or source EUI – which also accounts for energy lost in generation, transmission, and distribution. This analysis uses site EUI for consistency with the City's recently adopted BEPS ordinance.

In this analysis, as well as the BEPS ordinance, EUI values are weather normalized. Weather normalization accounts for year-to-year variation in weather and makes it easier to identify trends in "typical" building operations.

Figure 3. Median Site EUI



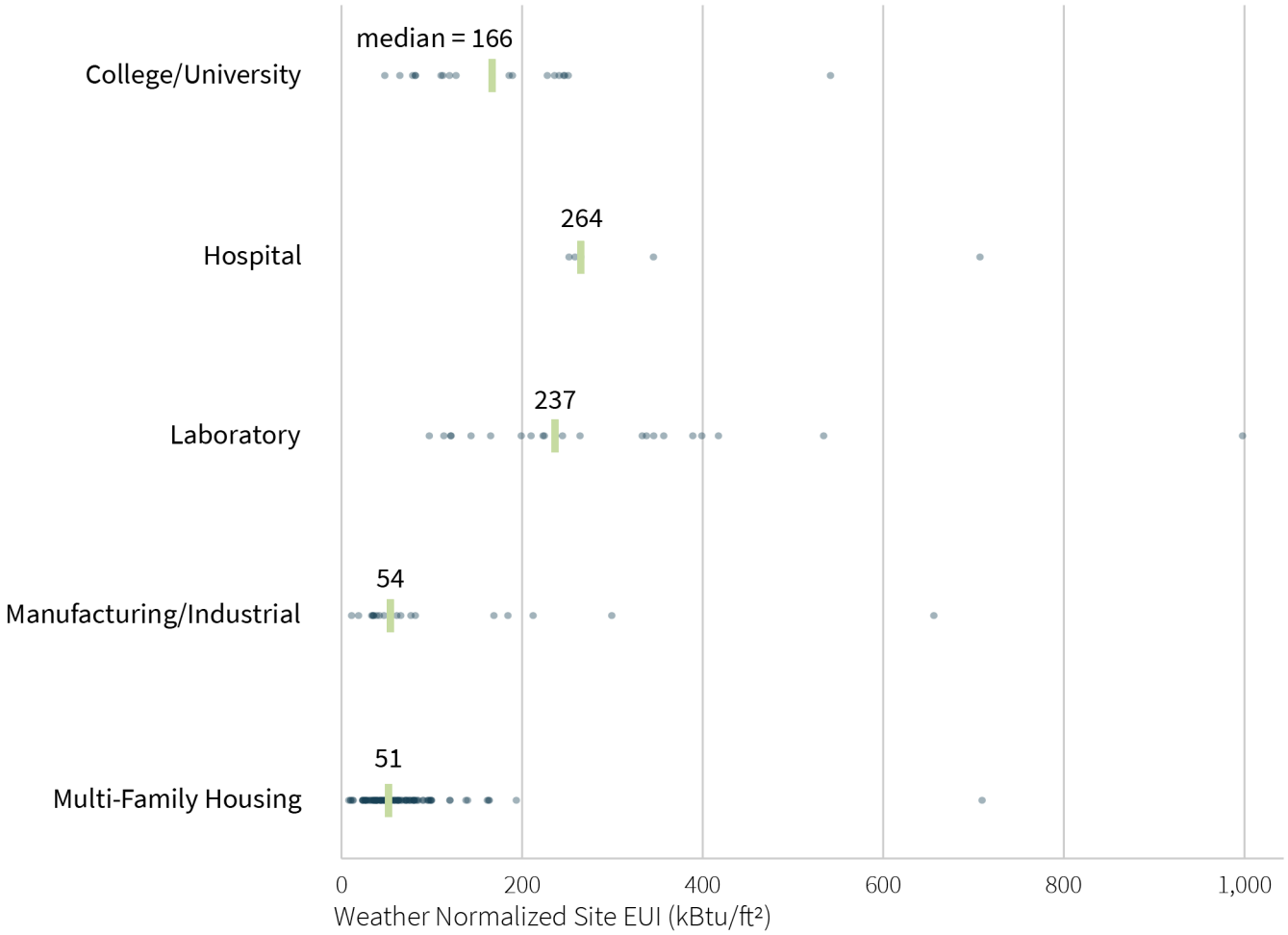
5 ENERGY STAR scores control for factors such as climate, property type, and property use (e.g., building size, number of workers, working hours). For more information, see the ENERGY STAR Score Technical Reference.

Why Do We Report Median Values?

For most of the property types presented in this report, EUI values do not vary much from building to building, so the median – the middle number when all values are arranged from low to high – is a reasonable measure of overall energy performance. The median is preferable to the average (or mean) because extreme outliers are less likely to skew the result.

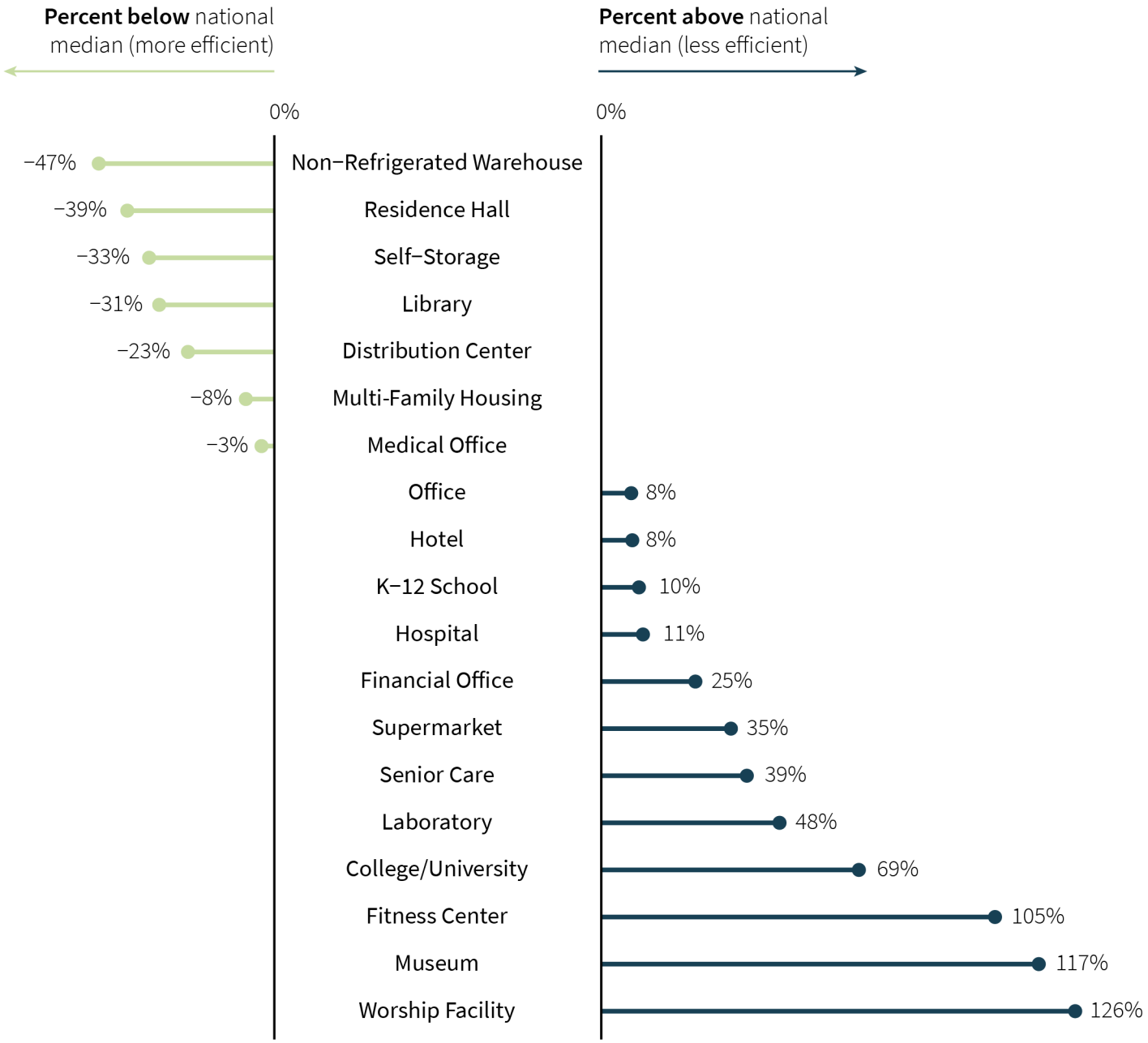
For some property types, however, EUI varies enough that it is worth looking at the distribution in more detail. Figure 4 presents the full distribution of EUI values for five property types: colleges/universities, hospitals, laboratories, manufacturing/industrial plants, and multi-family housing. As shown, each of these categories has a particularly wide range in EUI, with most values clustered around the median but a small number of outliers with extremely high EUI values. In these cases, the median provides only a limited view of the data, and the additional context provided by the range can help to understand overall energy performance.

Figure 4. Distribution of Site EUI Values Relative to Median



Another important point of comparison is how St. Louis buildings compare to similar buildings nationwide. Figure 5 shows, for each property type, the percent difference between the national median site EUI and the median in St. Louis. Positive values – shown in blue – indicate that buildings in St. Louis are, on average, more energy-intensive than their peer buildings nationwide; negative values – in green – indicate that St. Louis buildings are, on average, less energy-intensive. As shown, buildings in St. Louis generally tend to be more energy-intensive than their peers nationwide. Notable exceptions are non-refrigerated warehouses, residence halls, self-storage facilities, and libraries, which were all, on average, at least 30% less energy-intensive than the national median for properties of their same type.

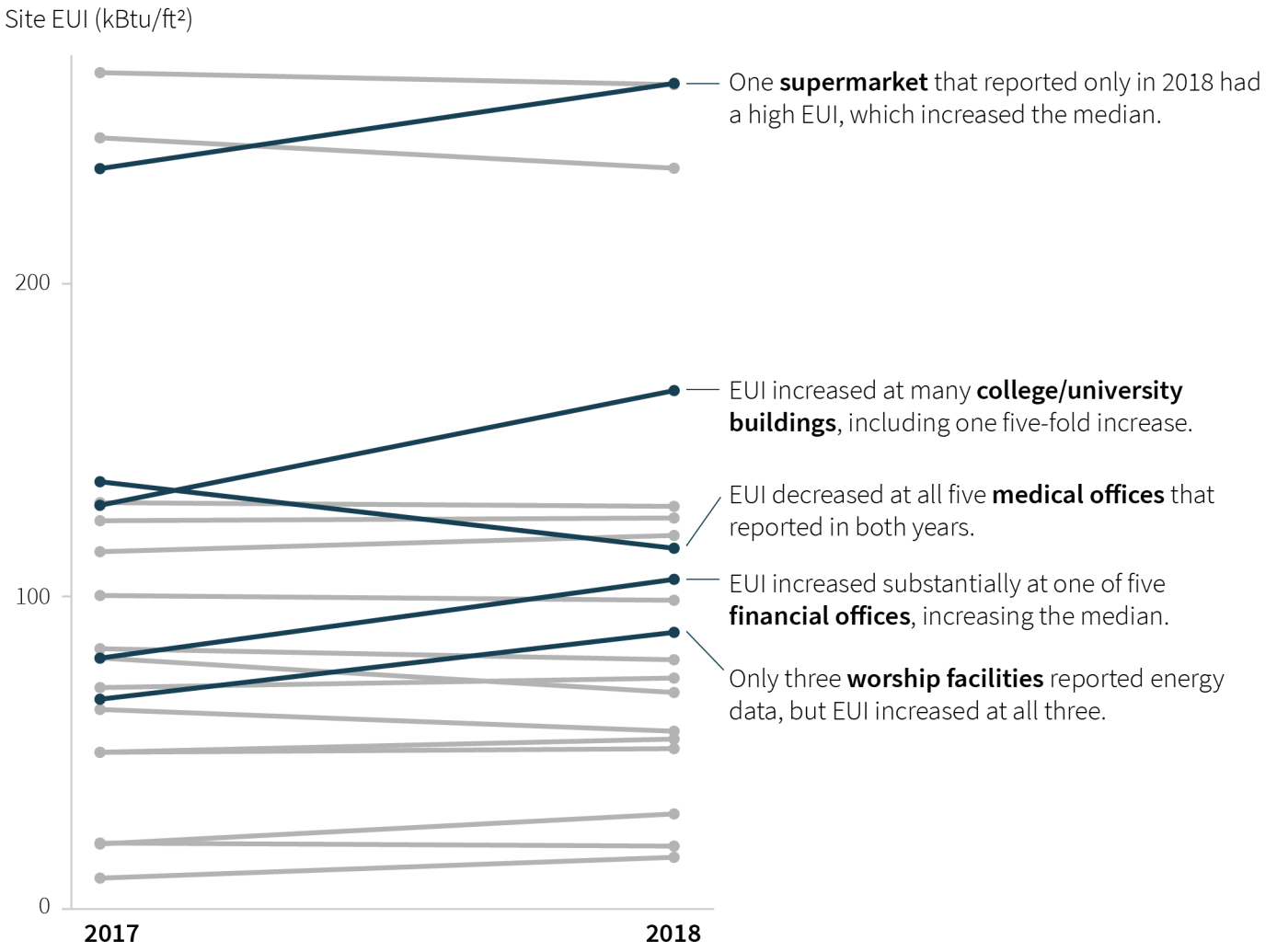
Figure 5. Median Site EUI in St. Louis Compared to National Median



Most property types showed minimal change in median EUI from 2017 to 2018, which is not surprising given that the City is only in its second year of benchmarking and still focused on increasing the compliance rate. Where median EUI values did shift, those changes were generally the result of large changes at a very small number of buildings, as highlighted in Figure 6. For example, the median EUI for supermarkets increased from 237 in 2017 to 264 in 2018, largely because one supermarket with a high EUI reported for the first time in 2018. Because most property types include only a small number of buildings (five supermarkets reported in 2018, for example), changes at one or two buildings can substantially affect the median EUI. In future years, as the compliance rate stabilizes, trends in energy performance should become more apparent.

Although median EUI did not change meaningfully for most property types, it is worth highlighting that 172 individual buildings - or nearly 40% of the 432 buildings that submitted data for both years - reduced their weather-normalized EUI from 2017 to 2018, by an average of 12%. While this is encouraging, the increase in EUI at the remaining 60% of buildings represents a significant opportunity for improvement.

Figure 6. Change in Median Site EUI 2017-2018



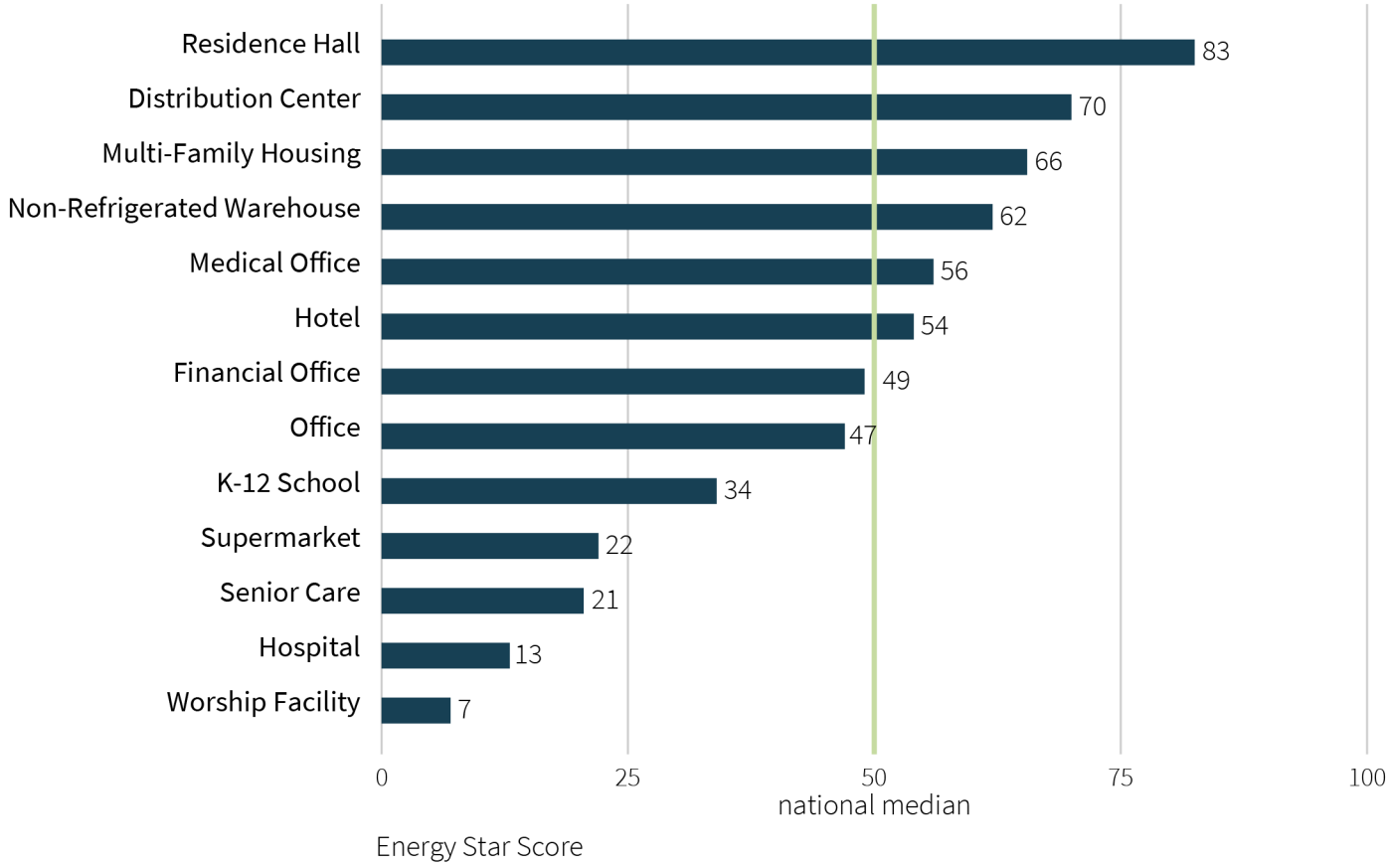
Results: ENERGY STAR Score

Not all property types are eligible for ENERGY STAR scores. Of the property types included in this report, seven are not eligible: colleges/universities, fitness centers, laboratories, libraries, manufacturing/ industrial plants, museums, and self-storage facilities. For the remaining property types, Figure 7 presents the median ENERGY STAR score for buildings of that type, relative to the national median (50 for all property types).

Similar to site EUI, median ENERGY STAR scores vary widely across property types. The highest scores (the most energy-efficient buildings) were associated with residence halls, distribution centers, and multi-family housing in 2018. The lowest scores were associated with senior care communities, hospitals, and worship facilities. The median ENERGY STAR score across all 342 St. Louis buildings that received a score in 2018 was 50.7, or approximately the national median.

To be eligible for ENERGY STAR certification, buildings must achieve an ENERGY STAR score of at least 75—that is, they must perform better than 75% of their peers. In 2018, 94 buildings earned a score higher than 75. In addition, one property type – residence halls – had a median score above 75, signaling that most residence halls in St. Louis are achieving a high level of energy efficiency.

Figure 7. Median ENERGY STAR Scores in St. Louis Compared to National Median



Energy Efficiency Success Story:

Embassy Suites St. Louis Downtown
601 Washington Ave.

The Embassy Suites St. Louis Downtown has been benchmarking its energy performance for years – even before the City of St. Louis introduced its benchmarking ordinance – through Hilton's LightStay measurement system. LightStay was introduced for all Hilton hotels in 2009 to help building managers understand how their energy performance compares to that of other hotels. Like the St. Louis benchmarking program, LightStay asks building managers to report electricity, gas, solar, and water use through ENERGY STAR Portfolio Manager.

Over the years, the Embassy Suites has completed a number of energy efficiency upgrades, including a complete transition to LED lighting, which was financed through Ameren Missouri's BizSavers Lighting Program. Before the lighting transition, maintenance staff replaced approximately 25 light bulbs each week; for four years after the transition, staff did not replace a single bulb. Ameren's program provided more than $25,000 in rebates, which offset nearly half of the project's cost.

The hotel also installed a 25-kW rooftop solar array to reduce its environmental impact. As a result of Ameren rebates, this investment achieved a payback period of 5-7 years. Thanks to all of its energy efficiency and clean energy investments, the Embassy Suites came under budget for energy costs by $19,000 in 2019.

The Embassy Suites is currently the only LEED Silver certified hotel in St. Louis. (LEED – Leadership in Energy and Environmental Design – is a green building rating system recognized worldwide. Buildings can qualify for four levels of certification: Certified, Silver, Gold, or Platinum.) Chris Meinert, Chief Engineer, noted that many hotel guests and tenants of the associated Laurel Apartments have specifically referenced the hotel's commitment to the environment as a factor in their decision to stay at this location.

EMISSIONS PERFORMANCE

Greenhouse gas emissions are created by burning fossil fuels such as coal or natural gas for electricity, heat, and transportation. Greenhouse gases – which include carbon dioxide, methane, and nitrous oxide – trap heat in the atmosphere, thus raising Earth's surface temperature and changing the overall climate. The concentration of greenhouse gases in the atmosphere has risen significantly over the past 150 years; human activities are responsible for almost all of the increase. According to the City of St. Louis' 2018 Climate Vulnerability Assessment, specific risks to the St. Louis area from climate change include increasingly extreme heat waves and cold snaps, river flooding, drought, and tornadoes.

To avoid the worst impacts of climate change, it is essential to reduce emissions quickly and substantially. The City's most recent greenhouse gas emissions inventory identified buildings as contributing roughly 80% of emissions. Since then, the City has adopted a goal of reducing its greenhouse gas emissions 100% by 2050.

In this report, the City of St. Louis analyzes both total emissions and emissions intensity (i.e., emissions per square foot of building space) as reported through the benchmarking process. Both metrics are calculated by ENERGY STAR Portfolio Manager based on the information each building submits on the amount and types of energy used.

Results: Emissions

As shown in Figure 8, median emissions vary widely across property types. Hospitals have particularly high emissions, while others, such as self-storage facilities, have particularly low emissions. As with energy performance, changes in these values since 2017 vary by property type—some property types increased median emissions, and others decreased median emissions since 2017. As the compliance rate stabilizes in future years, trends in emissions should become more apparent.

How Are Emissions Measured?

Greenhouse gas emissions are commonly measured in terms of carbon dioxide equivalent (CO_2e). This metric combines emissions from all greenhouse gases into a single measure, where emissions of each gas are adjusted based on their "global warming potential." CO_2e therefore signifies the amount of CO_2 that would lead to an equivalent amount of global warming.

Consider methane as an example. According to the U.S. EPA, methane has a global warming potential (GWP) around 28, which means that one ton of methane emissions causes roughly 28 times the impact of one ton of carbon dioxide emissions over a 100-year timeframe. (This is calculated based on how much energy each gas absorbs and the amount of time each takes to break down in the atmosphere.) If a power generator emits one ton of methane, the generator would therefore be said to have emitted 28 metric tons CO_2e ($MTCO_2e$).

Results: Emission Intensity

Although the median emissions shown in Figure 8 illustrate the relative climate impact of each property type, emissions intensity is useful for comparing buildings of different sizes. Because hospitals tend to be larger than other buildings, it is not surprising that they use more energy and have higher median emissions. As Figure 9 shows, hospitals are not, however, the most emissions-intensive property type. Instead, supermarkets and laboratories had the highest emissions per square foot in 2018. At the low end, adjusting for building area makes less of a difference. Self-storage facilities and non-refrigerated warehouses had both the lowest median emissions and the lowest median emissions per square foot.

Figure 8. Median Emissions

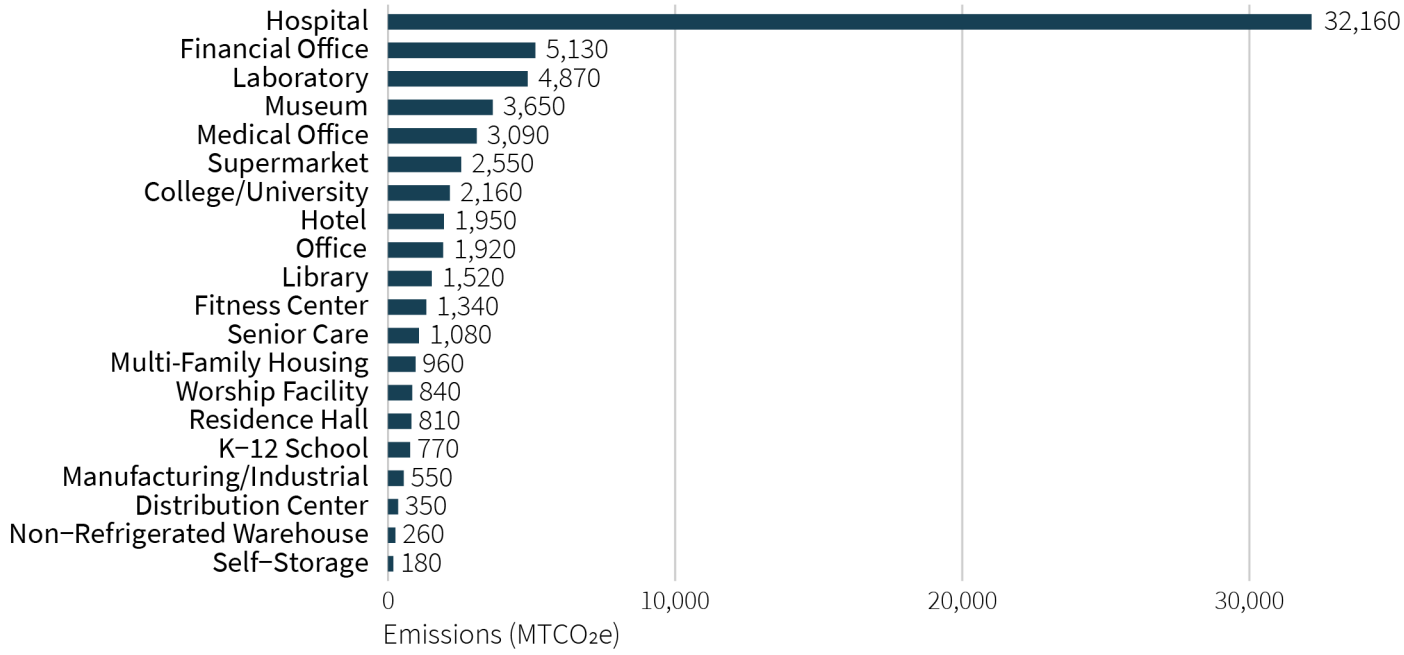
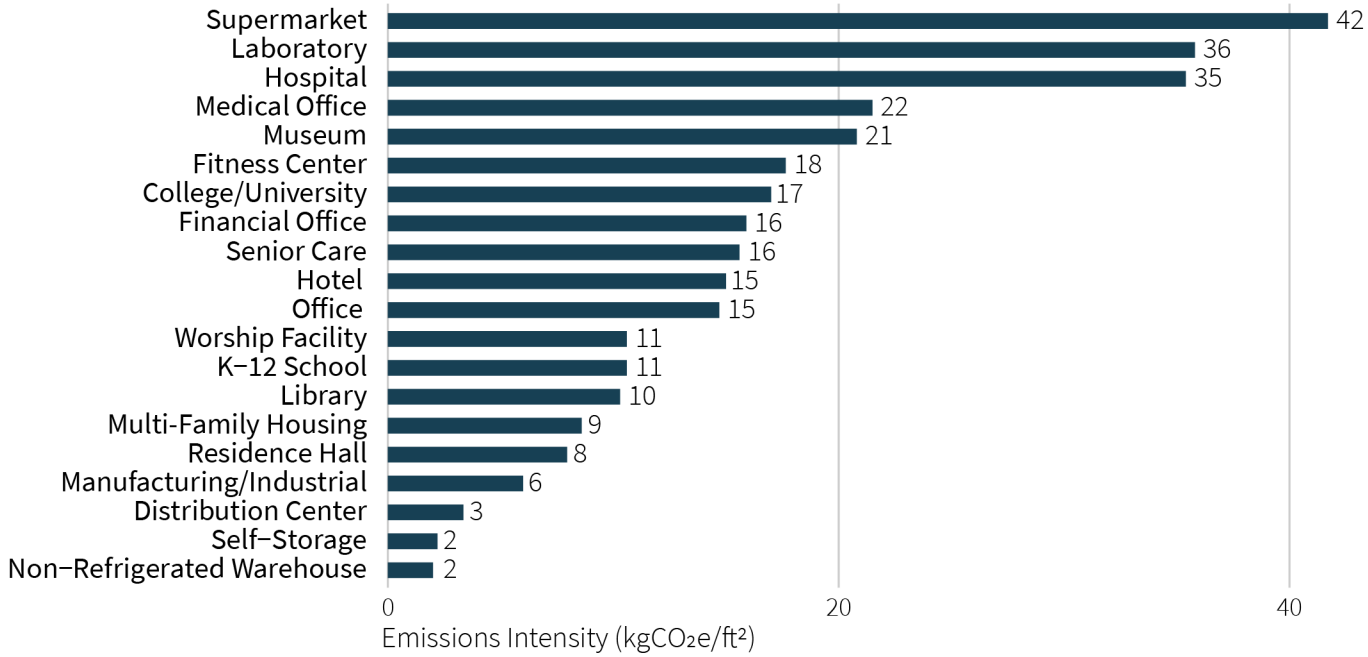


Figure 9. Median Emissions Intensity



WATER PERFORMANCE

As part of the City of St. Louis' benchmarking ordinance, buildings are required to submit data on water use in addition to energy use. The two are closely linked, since energy is used at every stage of the water management process, including for extraction, purification, heating/cooling, delivery, and wastewater disposal. The requirement to report water use is therefore intended to raise awareness about water use and encourage building owners to voluntarily adopt water efficiency measures that will simultaneously reduce operational costs, reduce energy use, and benefit the environment.

This report presents data on both total water use and water use intensity (i.e., water use per square foot of building space). These metrics include both indoor and outdoor water use. Importantly, water use information is not available for municipal buildings and is therefore presented only for privately-owned buildings.

Results: Water Use

Water use varies widely by property type, with predictable patterns. As shown in Figure 10, hospitals used the most water by far in 2018, followed by hotels and laboratories. Residential facilities such as multi-family housing buildings, residence halls, and senior care communities fell in the middle of the range. Low-occupancy facilities – including non-refrigerated warehouses, worship facilities, and self-storage facilities – used the least water. As with the other results presented in this report, the change in the number of buildings reporting between 2017 and 2018 makes it difficult to assess trends over time.

Why Don't Municipal Buildings Report Water Data?

The 15 municipally-owned buildings required to benchmark do not report water use data because they do not have individual water meters. Municipally-owned buildings are not required to pay for their own water consumption since the City owns the water utility. The City currently tracks water use for its buildings only in aggregate.

Results: Water Use Intensity

Similar to the emissions analysis, this report also presents a second metric of water performance, water use intensity, to compare across buildings of different sizes. Adjusting for building area changes the resulting pattern. As shown in Figure 11, the most water-intensive property type in St. Louis is residence halls, followed closely by fitness centers. At the low end, adjusting for building area has less of an impact.

Figure 10. Median Water Use

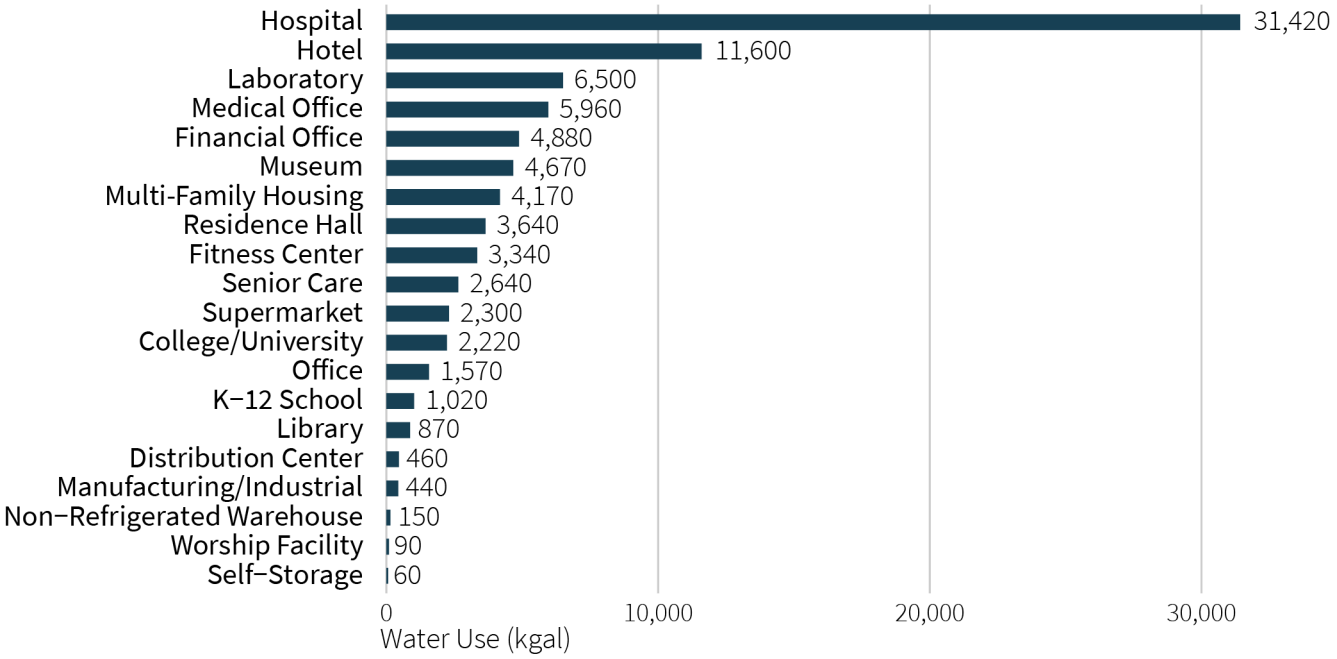
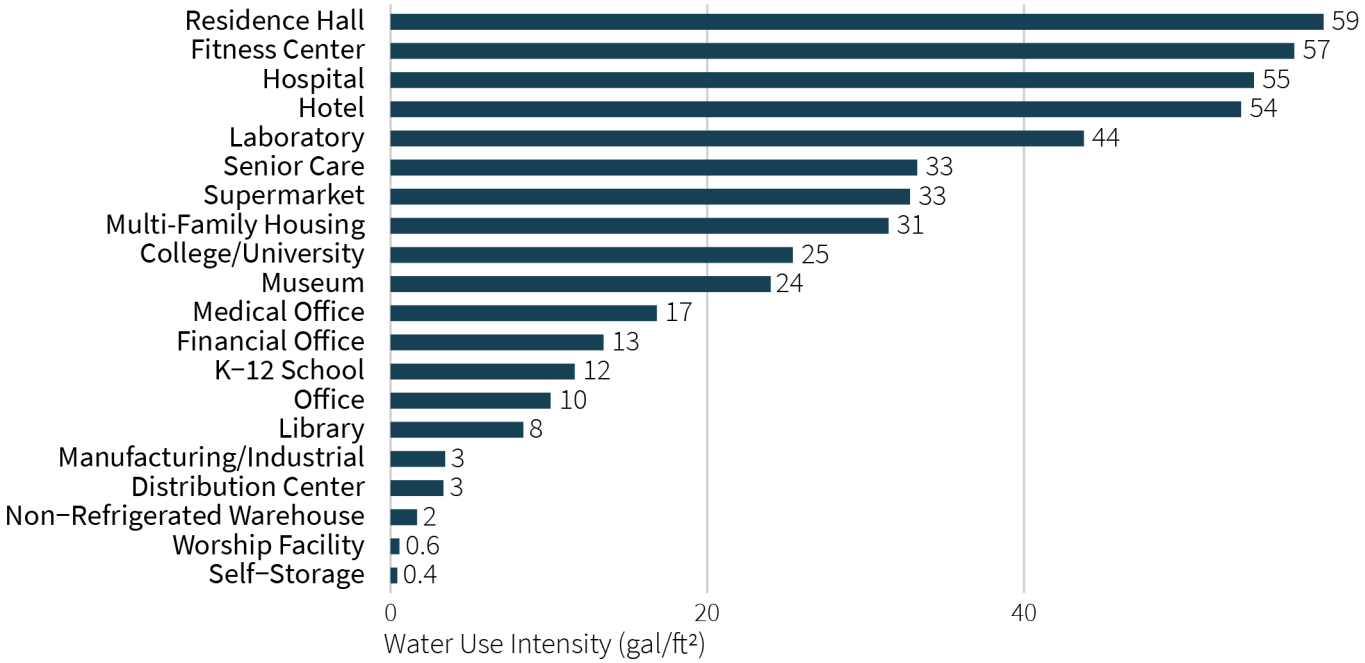


Figure 11. Median Water Use Intensity



MUNICIPAL BUILDINGS

In an effort to track progress toward the City's climate and energy goals, increase transparency around municipal building operations and environmental impacts, and lead by example on sustainability, the City believes it is important to report municipal buildings' performance separately from their privately-owned counterparts. Measuring and monitoring energy consumption by municipal buildings - and then finding ways to improve their performance - is critical for achieving the City's goal to reduce greenhouse gas emissions 100% by 2050.

Publicly reporting this data also provides an opportunity to highlight the City's leadership in energy efficiency. As one example, in the fall of 2018, the City's Facilities Management Division was approved for a $1.3 million loan from the Missouri Division of Energy. The loan is being used for retro-commissioning projects at the City Justice Center, new St. Louis Metropolitan Police Department Headquarters, Juvenile Courts Center, and Carnahan Courthouse. These investments are projected to save the City over $500,000 annually, with an estimated payback period of less than three years.

This section first compares municipal buildings to their privately-owned counterparts in terms of site EUI, emissions, and emissions intensity; it then provides building-level data for all 15 municipal buildings. These 15 buildings represent 2.9 million square feet and nine property types, as shown in Table 3.

Importantly, because this section relies on data from a very small number of buildings, it is difficult to draw overarching conclusions about the performance of specific property types. As the City of St. Louis adds additional years of benchmarking data over time, it will become easier to identify patterns among these buildings.

In addition, this section does not cover ENERGY STAR scores in detail because only two municipal property types – courthouses and office buildings – are eligible to receive ENERGY STAR scores. Instead, this section highlights the energy efficiency investments made by one top-scoring municipal building. Finally, this section does not discuss water use because the City does not track water use by building.

Table 3. Overview of Municipal Buildings

PROPERTY TYPE	NUMBER OF BUILDINGS	TOTAL BUILDING AREA (FT²)
Prison	3	554,100
Courthouse	2	836,900
Office	2	768,500
Police Station	2	294,200
Repair Services	2	172,000
Fitness Center	1	83,600
Manufacturing/Industrial	1	58,200
Self-Storage	1	57,500
Social/Meeting Hall	1	79,500
Total	**15**	**2,904,400**

Results: EUI

Figure 12 shows how median site EUI varies across property types and in comparison to privately-owned buildings of the same type. (Note that some property types, such as prisons and police stations, do not include any privately-owned buildings.) Among municipal buildings, prisons and manufacturing/industrial plants had the highest median site EUI in 2018. Self-storage facilities and office buildings had the lowest median site EUI.

Figure 12 also shows that, in several cases, municipal buildings performed better than their private counterparts. Of the five property types with both municipal and private buildings, three (fitness centers, social/meeting halls, and offices) show a lower median site EUI for municipal buildings than for private buildings, meaning that the municipal buildings were more energy efficient. In contrast, two property types (manufacturing/industrial plants and self-storage facilities) show a higher median site EUI for municipal buildings.

Between 2017 and 2018, median site EUI increased for six of the municipal property types and decreased for three, as shown in Figure 13. Most of these fluctuations were relatively small, however they do suggest room for improvement.

Figure 12. Median Site EUI in Municipal and Private Buildings

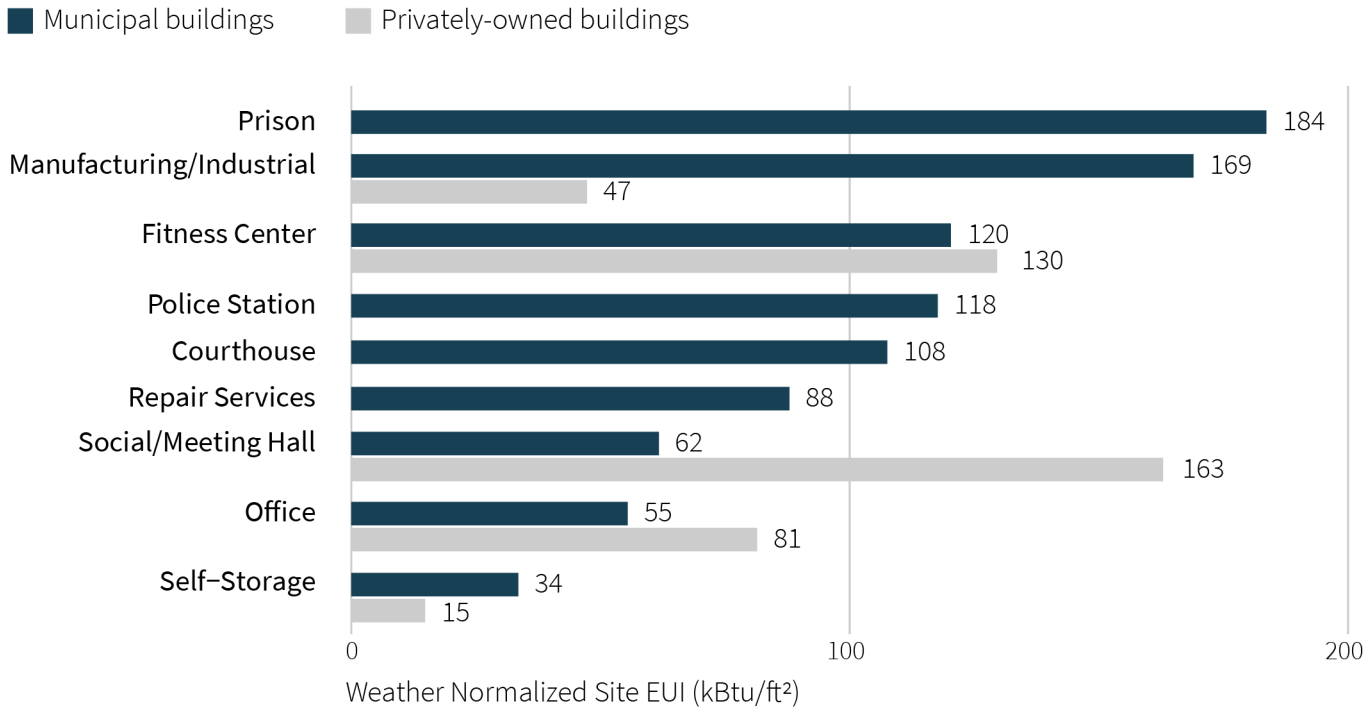
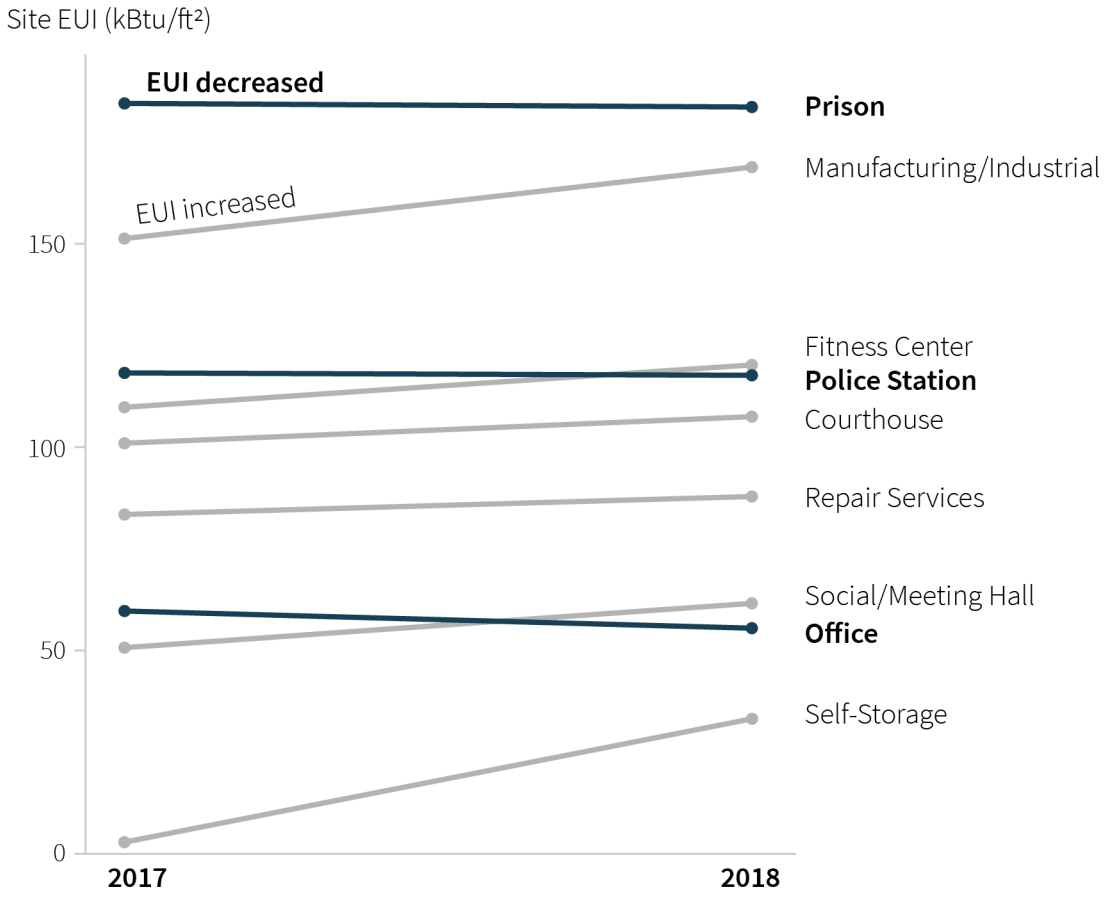


Figure 13. Change in Median Site EUI Among Municipal Buildings 2017-2018



Results: Emissions and Emissions Intensity

As shown in Figure 14, median emissions vary widely across property types. Among municipal buildings, courthouses have the highest emissions, and self-storage facilities have the lowest.

Two property types (social/meeting halls and fitness centers) show municipal buildings that are performing slightly better, on average, than their private counterparts. In contrast, three (office buildings, manufacturing/industrial plants, and self-storage facilities) show municipal buildings that are lagging slightly behind.

To more effectively compare across buildings of different sizes, Figure 15 presents results in terms of emissions intensity (i.e., emissions per square foot of building area). This figure shows that, among municipal buildings, prisons had the highest emissions per square foot in 2018. Self-storage facilities had extremely low median emissions per square foot.

Adjusting for building area slightly changes the comparison between municipal and private buildings. In terms of both overall emissions and emissions intensity, municipally-owned social/meeting halls and fitness centers perform better than their private counterparts, and municipally-owned manufacturing/industrial plants and self-storage facilities lag slightly behind their private counterparts. Municipally-owned office buildings have higher overall emissions but lower emissions per square foot, compared to their private counterparts.

Figure 14. Median Emissions in Municipal and Private Buildings

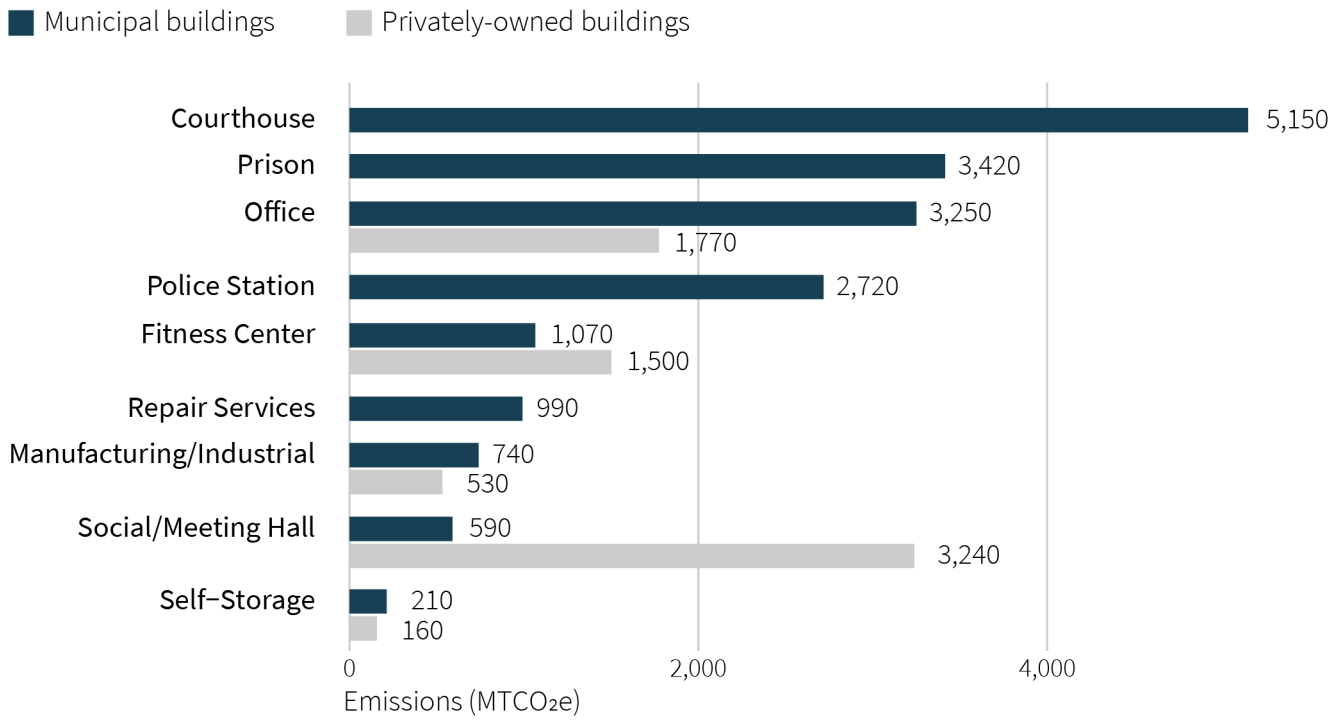
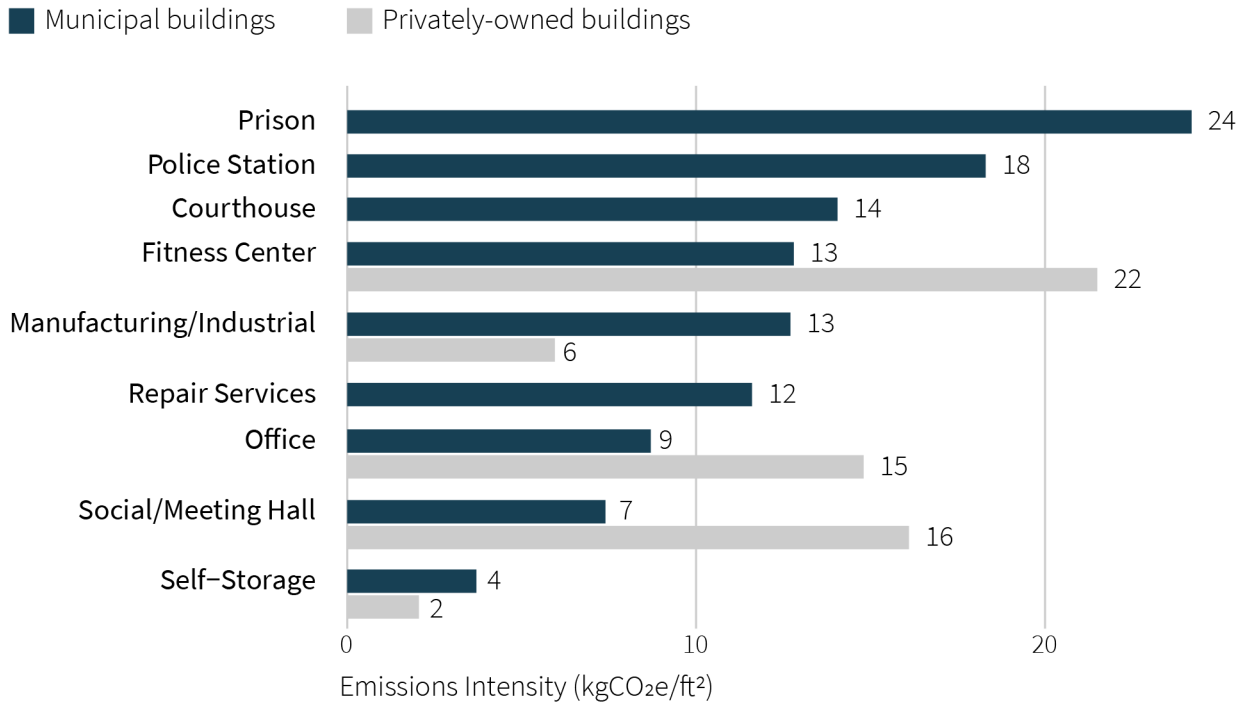


Figure 15. Median Emissions Intensity in Municipal and Private Buildings



Energy Efficiency Success Story:

1520 Market St.

ENERGY STAR score: 85
ENERGY STAR certification: 2017

In 2018, four municipal buildings received ENERGY STAR scores: two courthouses, with a median score of 41, which is substantially below the national median of 50, and two office buildings, with a median score of 79. One of the municipal office buildings stands out in particular. The 1520 Market Building earned an ENERGY STAR score of 85, which means that it performs better than 85% of similar buildings nationwide.

The 1520 Market Building provides office space for a number of city agencies, including the St. Louis Development Corporation, Affordable Housing Commission, Animal Control, Health Department, and many others. It is a large space - roughly 450,000 square feet - and has more than 17,000 light fixtures that are slowly being replaced with LEDs. As an example of the scale of this transition, the second floor of the building previously required 800 T8 fluorescent bulbs; following the retrofit, it uses only 30 LEDs. Other energy efficiency upgrades have focused on optimizing the building's HVAC (heating, ventilation, and air conditioning) system. Following the upgrades:

- Air handlers use frequency drives to slow motor speed and reduce energy consumption
- Chillers require only two pumps instead of four because they run on a common loop
- Economizers bring in cool outside air to reduce the load on the chillers, which are shut off completely between October and April

As a result of these investments, 1520 Market has realized significant cost savings on equipment (e.g., chiller pumps) and energy. The building received ENERGY STAR certification in 2017.

Results: Building-Level Data

Although it is difficult to draw conclusions about the performance of municipal buildings compared to their privately-owned counterparts at this time, the City is committed to improving energy performance at its buildings. To increase transparency and accountability, Table 4 summarizes performance at each of the 15 municipal buildings required to benchmark. This information is also available at www.stlbenchmarking.com.

Table 4. Municipal Building Performance

BUILDING ADDRESS	BUILDING NAME	PROPERTY TYPE	FLOOR AREA (ft^2)	SITE EUI (kBtu/ft^2)	ENERGY STAR SCORE	EMISSIONS ($MTCO_2e$)	EMISSIONS INTENSITY ($kgCO_2e/ft^2$)
10 N. Tucker Blvd.	Civil Courts	Courthouse	290,761	156.3	14	5,685.2	19.6
1100 Market St.	Carnahan Courthouse	Courthouse	546,106	58.8	68	4,618.5	8.5
1200 Central Industrial Dr.	Central Industrial Drive	Repair Services	83,981	88.8	NA	1,055.0	12.6
1200 Clark St.	SLMPD (old)	Police Station	141,000	110.9	NA	1,928.9	13.7
1200 Market St.	City Hall	Office	314,884	65.2	72	3,227.4	10.2
1500 Market St.	1520 Market	Office	453,644	45.7	85	3,272.9	7.2
1515 N. Kingshighway Blvd.	Wohl Rec. Center	Fitness Center	83,556	120.3	NA	1,065.5	12.8
1901 Olive St.	SLMPD (new)	Police Station	153,214	124.4	NA	3,507.9	22.9
200 S. Tucker Blvd.	Justice Center	Prison	259,539	183.6	NA	6,701.5	25.8
2150 S. 59th St.	SLMPD Property Custody	Self-Storage	57,536	33.5	NA	212.8	3.7
3919 Laclede Ave.	ESD/SLMPD Fleet Services	Repair Services	88,000	87.0	NA	929.4	10.6
4190 S. 1st St.	South Refuse Garage	Manufacturing/ Industrial	58,215	169.0	NA	740.0	12.7
5250 Enright Ave.	West-End Rec. Center (Demetrious Johnson)	Social/Meeting Hall	79,462	61.7	NA	591.0	7.4
7600 N. Hall St.	Medium Security Institution (Workhouse)	Prison	141,204	191.2	NA	3,414.7	24.2
910 N. Vandeventer Ave.	Family Courts Juvenile Justice	Prison	153,309	95.7	NA	1,869.2	12.2

WHAT'S NEXT

Increasing the compliance rate from 45% to 54% in the second year of reporting involved the cooperation and efforts of the U.S. Green Building Council-Missouri Gateway Chapter and many other local partners. Thank you for continuing to support City-led efforts and helping to maintain and improve the resiliency of St. Louis' building stock!

In the years to come, as buildings continue to report their energy and water performance and pursue greater energy efficiency, the City of St. Louis will work with its partners to:

- Push for a benchmarking compliance rate of 100% for each reporting year
- Establish a Regional Energy Resource Hub to help building owners comply with the City's BEPS ordinance and invest in energy efficiency and renewable energy
- Establish the Office of Building Performance within the Building Division to lead implementation and education efforts around benchmarking and the BEPS ordinance
- Increase the number of building owners taking advantage of utility incentives, rebates, and other local resources for energy efficiency investments, such as Property Assessed Clean Energy (PACE) financing

Policy Development

Since the benchmarking ordinance was adopted in 2017, the City has adopted three other policies aimed at reducing building energy consumption, as shown in Figure 16. The first of these was a suite of building codes from the International Codes Council, which the City adopted in August 2018. These include the 2018 International Energy Conservation Code (IECC), a model code that sets a minimum threshold for energy performance in new buildings. Second, the City adopted a solar-ready ordinance (Ordinance 71063) in December 2019. This ordinance requires that new residential, multi-family, and commercial buildings be built in a way that will reduce costs associated with any future solar panel installations. Finally, in May 2020, the City adopted a new Building Energy Performance Standard (Ordinance 71132), which requires that buildings already covered by the benchmarking ordinance meet specific energy performance targets by the end of a four-year compliance period. These policies should, together, substantially reduce energy consumption and emissions in the City.

Understanding the BEPS Ordinance

On May 5, 2020, Mayor Lyda Krewson signed into law the Midwest's first (and the fourth in the nation) Building Energy Performance Standard (BEPS). This ordinance represents the most significant step the City has taken to date toward its commitment to reduce citywide greenhouse gas emissions 100% by 2050.

The BEPS ordinance affects the same buildings that are currently required to benchmark—that is, municipal, commercial, institutional and residential buildings 50,000 square feet and larger. The Building Division and its local partners will be engaging closely with these building owners over the coming year to be sure that the BEPS requirements are clear.

The specific energy efficiency standards that buildings will need to meet will be set by May 4, 2021, by a nine-member Building Energy Improvement Board representing the local building industry, utilities, building owners, and other stakeholders. The Board will set one energy efficiency standard for each property type, based on local benchmarking data and the recommendations of the City. The standards will be set such that at least 65% of buildings of each property type will need to improve their performance. Building owners will have the flexibility to decide what combination of physical or operational improvements can best help them meet the standards and will have four years - until May 4, 2025 - to comply.[6] The City will send building owners a customized building energy scorecard each year to help building owners gauge their progress toward compliance. To ensure that energy efficiency continues to improve over time, the City will update the standards after every compliance period.

A 10% Improvement in Energy Efficiency Could Save...

If each of the 500 buildings that benchmarked in 2018 reduced its energy use by 10%, building owners and residents would collectively save, each year:

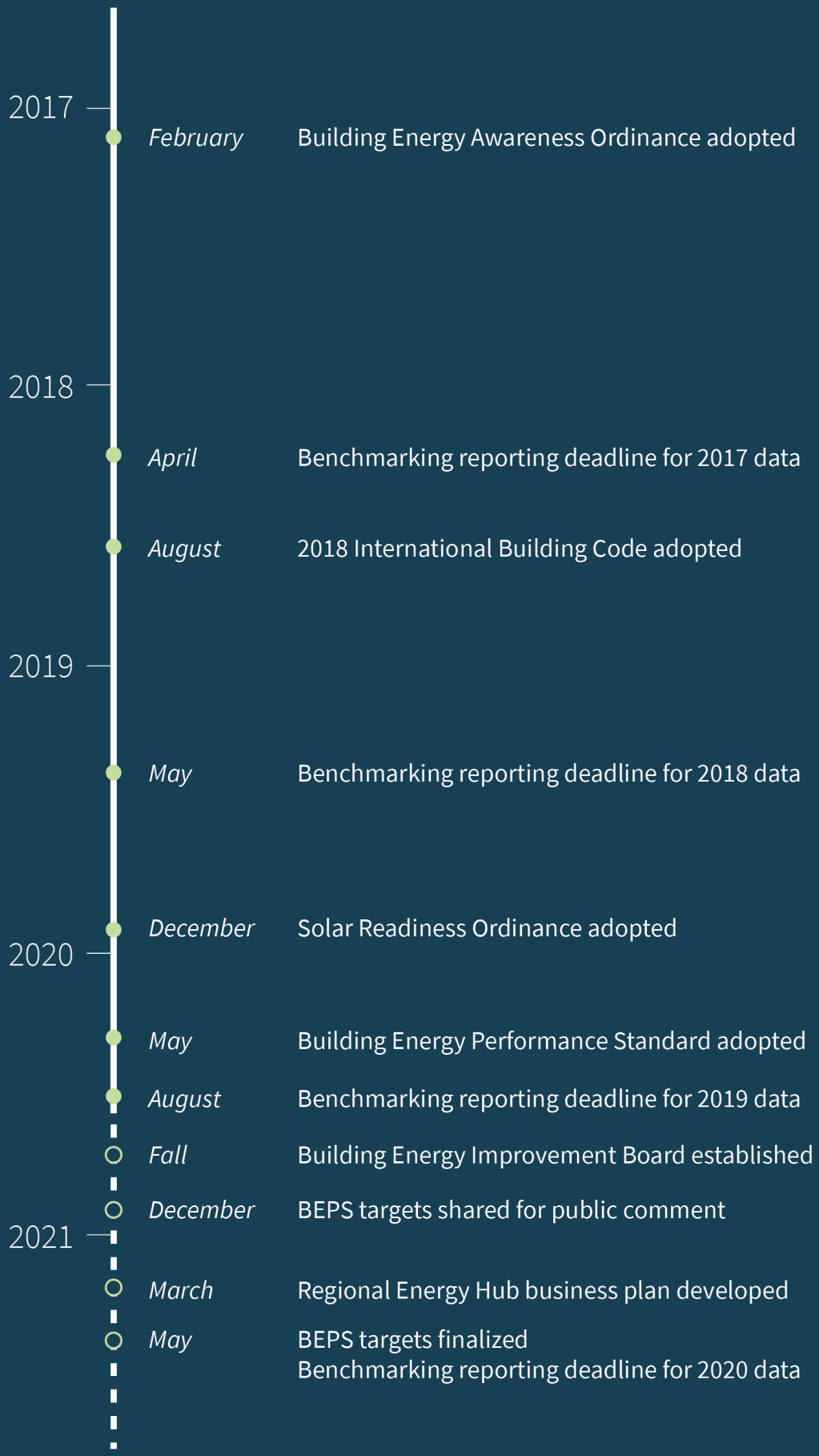
- 171,000 metric tons of CO_2
- $8.4 million on utility bills

A greener St. Louis is possible!
See www.stlbenchmarking.com for energy saving tips and resources.

Estimated savings reflect changes in electricity and natural gas use only. Cost calculations assume $0.04 per kWh electricity and $0.13 per therm natural gas (based on large general service rates from Ameren and Spire). Carbon calculations use emission factors from the EPA's eGRID model (SRMW subregion) for electricity and the U.S. Energy Information Administration for natural gas.

6 Qualified affordable housing buildings and houses of worship will have an additional two years to comply (by May 4, 2027). The additional time offered to these properties should allow building owners to incorporate energy efficiency upgrades into larger capital improvement projects at the time of mortgage refinancing.

Figure 16. Timeline of Building Energy Efficiency Policy



GLOSSARY

Benchmarking: The process of measuring and comparing a building's energy and water use to that of similar buildings or an established baseline

Building Energy Awareness Ordinance: Also referred to as the "benchmarking ordinance," a policy adopted by the City of St. Louis in January 2017 (Ordinance 70474) that requires buildings 50,000 square feet and larger to report their energy and water use annually using ENERGY STAR Portfolio Manager. https://www.stlouis-mo.gov/government/city-laws/ordinances/ordinance.cfm?ord=70474

Building Energy Performance Standard (BEPS): A policy that sets energy efficiency targets for all new and existing buildings. The City of St. Louis passed a BEPS policy in April 2020 (Ordinance #71132) that will require all buildings 50,000 square feet and larger to meet targets specific to their property type by 2025 and every four years thereafter. https://www.stlouis-mo.gov/government/city-laws/ordinances/ordinance.cfm?ord=71132

Carbon dioxide equivalent (CO_2e): A measure of greenhouse gas emissions that incorporates emissions from all greenhouse gases (e.g., carbon dioxide, methane, nitrous oxide). Emissions of each gas are adjusted based on their global warming potential to indicate the amount of CO_2 that would lead to an equivalent amount of global warming. Common units are $MTCO_2e$ (metric tons CO_2e) and $kgCO_2e$ (kilograms CO_2e).

Energy burden: The percentage of household income spent on utilities

Energy use intensity (EUI): A building's energy use per square foot of building area, typically expressed as kBTU/square foot. All EUI values used in this analysis were calculated by ENERGY STAR Portfolio Manager.

- **Site EUI:** A variation of EUI that reflects the amount of energy used onsite, as reported on utility bills.
- **Source EUI:** A variation of EUI that reflects the total amount of raw fuel required to provide the energy consumed onsite. In addition to energy used onsite, this metric also includes energy lost in generation, transmission, and distribution.
- **Weather Normalized Site EUI:** A variation of site EUI that adjusts for year-to-year changes in weather, typically by assuming 30-year average weather conditions. Weather normalized site EUI is used in this report.

ENERGY STAR® Portfolio Manager: A free, online tool developed by the U.S. EPA that is used nationwide to measure and track energy use, water use, and greenhouse gas emissions. www.energystar.gov/benchmark

ENERGY STAR® Score: A commonly used benchmark for assessing and comparing the performance of commercial buildings. The ENERGY STAR score is expressed as a number on a 1-100 scale and indicates a building's energy performance on a percentile basis, compared to buildings with similar characteristics. Buildings earning a score of 50 represent the national median in energy performance. Buildings earning a score of 75 perform better than 75% of their peers. For more information: www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager/understand-metrics/how-1-100

- **ENERGY STAR® Certification:** For buildings, a certification that identifies highly energy-efficient buildings. To be eligible, buildings must achieve an ENERGY STAR score of at least 75. For more information: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification

EPA: U.S. Environmental Protection Agency. https://www.epa.gov/

Global Warming Potential (GWP): The amount of warming caused by a greenhouse gas, expressed as a multiple of the amount of warming caused by the same mass of carbon dioxide. Global warming potential varies according to how much energy a gas absorbs and the amount of time it takes to break down in the atmosphere.

IECC: International Energy Conservation Code

kBtu: Kilo-British thermal unit (Btu), or 1,000 Btu. A measure of energy use, defined as the amount of heat needed to raise the temperature of 1,000 pounds of water by one degree Fahrenheit.

kgal: Kilogallon, or 1,000 gallons

Leadership in Energy and Environmental Design (LEED): A green building rating system developed by the U.S. Green Building Council that is recognized worldwide. Buildings can qualify for four levels of certification: Certified, Silver, Gold, or Platinum. https://www.usgbc.org/leed

Non-Energy Benefits (NEBs): Benefits beyond direct energy savings that are realized by the adoption of energy efficiency measures. These include, for example, public health benefits, environmental benefits, economic development, reductions in utility labor costs, and improvements in occupant comfort and productivity.

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APPENDIX

Methodology

Using property assessment data, the City of St. Louis has identified 983 buildings covered by the benchmarking ordinance. This number differs from the number referenced in the 2017 benchmarking report (1,002 covered buildings) because the City has since identified and removed from its list a number of buildings that do not meet the criteria for benchmarking.

For calendar year 2018, 721 buildings submitted benchmarking data through ENERGY STAR Portfolio Manager. Of these, 189 were dropped by the City for eligibility reasons—i.e., they were located outside of the City, didn't meet the 50,000 square foot threshold, were exempted by the City for reasons such as vacancy or lack of master-metered utility data, or represented duplicate submissions. Although the City encourages voluntary reporting, voluntary reporters are not likely to be representative of buildings citywide and were dropped to avoid misrepresenting overall building performance in St. Louis.

An additional 32 buildings were dropped due to data quality issues, primarily missing data (or a value of zero) for annual electricity use. A small number were dropped for having energy use intensity (EUI) values so high as to suggest potential data entry errors. Specifically, the City dropped submissions where EUI was an order of magnitude higher than the next-highest EUI value for buildings of the same property type, if that difference could not be readily explained.

To facilitate development of a more complete data set, the City of St. Louis also asked buildings to submit back-data for 2017 at the time of their 2018 submission. As a result, after data cleaning, the City's database includes 544 buildings with 2017 data and 500 with 2018 data, as shown in Table A-1.

All analyses were conducted using the sample of 1,044 buildings (544 with 2017 data and 500 with 2018 data). In cases where buildings did not provide complete data, ENERGY STAR Portfolio Manager flagged the missing data points as Not Available (NA), and the City dropped those buildings from the

Table A-1. Data Cleaning Summary

BUILDINGS IN DATA SET	NUMBER WITH 2017 DATA	NUMBER WITH 2018 DATA	TOTAL NUMBER
Buildings that reported in 2017	553	-	553
Buildings that reported in 2018	721	721	1,442
Buildings dropped for eligibility	685	189	874
Duplicate entry	*445*	*13*	*458*
Exempted/not in City	*216*	*164*	*380*
Floor area missing or <50,000 ft²	*24*	*12*	*36*
Buildings dropped for data quality	45	32	77
Electricity missing or zero	*38*	*27*	*65*
EUI outlier	*7*	*5*	*12*
Buildings included in analysis	544	500	1,044

corresponding analysis. The number of buildings included in each analysis is shown in Table A-2.

As part of the data cleaning process, the City also re-categorized 26 buildings whose primary property type was identified by ENERGY STAR Portfolio Manager as Other, Mixed Use, or Not Available. These re-categorizations were based on descriptive information provided by the building owners through Portfolio Manager as well as staff knowledge of the properties.

Detailed Results

For clarity, the report presented results only for the subset of the 20 most common property types. Table A-3 presents results of all analyses for all property types. Importantly, the 2017 results presented in this table differ from the results presented in the 2017 report because of additional data received since then, as well as changes the City made to the data cleaning process. All 2017 data were re-analyzed for this report to ensure that the results could be compared between years.

Building-level data is available at www.stlbenchmarking.com.

Table A-2. Number of Buildings Included in Each Analysis

ANALYSIS	YEAR	NUMBER INCLUDED	NUMBER DROPPED DUE TO NA
Energy Use Intensity (EUI)	2017	501	43
	2018	477	23
ENERGY STAR Score	2017	357	187
	2018	342	158
Emissions	2017	544	0
	2018	499	1
Emissions Intensity	2017	543	1
	2018	499	1
Water Use	2017	491	53
	2018	436	64
Water Use Intensity	2017	490	54
	2018	436	64

Table A-3. Median Results by Property Type, 2017 and 2018

PROPERTY TYPE	YEAR	NUMBER OF BUILDINGS	WEATHER NORMALIZED SITE EUI (kBtu/ft²)	NATIONAL SITE EUI (kBtu/ft²)	ENERGY STAR SCORE	EMISSIONS ($MTCO_2e$)	EMISSIONS INTENSITY ($kgCO_2e/ft^2$)	WATER USE (kgal)	WATER USE INTENSITY (gal/ft²)
Adult Education	2017	1	50.8	63.3	NA	672.1	5.1	547.1	4.1
	2018	1	55.1	71.9	NA	769.9	5.8	547.6	4.2
Automobile Dealership	2017	1	137.9	56.1	NA	1,092.9	20.2	1,651.2	30.6
	2018	0	NA	NA	NA	NA	NA	NA	NA
Bar/Nightclub	2017	1	365.8	259.8	NA	5,866.9	58.7	10,595.4	106.0
	2018	0	NA	NA	NA	NA	NA	NA	NA
College/ University	2017	21	128.8	95.8	NA	1,890.7	17.5	2,429.9	16.7
	2018	20	166.2	98.6	NA	2,157.2	17.0	2,223.9	25.4
Courthouse	2017	2	100.9	80.1	44.0	4,738.1	12.7	NA	NA
	2018	2	107.6	86.5	41.0	5,151.9	14.1	NA	NA
Data Center	2017	1	514.0	NA	NA	14,117.4	111.4	4,351.6	34.4
	2018	1	516.5	NA	NA	14,159.4	111.8	6,283.7	49.6
Distribution Center	2017	28	20.7	27.8	77.5	334.7	2.3	101.3	0.7
	2018	20	30.5	39.6	70.0	354.5	3.4	459.7	3.3
Financial Office	2017	5	80.0	83.2	58.0	2,362.1	14.1	2,348.0	16.3
	2018	5	105.7	84.5	49.0	5,133.7	15.9	4,878.8	13.5
Fitness Center	2017	5	124.2	65.6	NA	1,119.7	13.4	2,855.7	48.0
	2018	6	125.1	61.1	NA	1,335.3	17.7	3,341.4	57.1
Food Service	2017	1	113.8	209.9	NA	2,174.8	20.2	430.9	4.0
	2018	1	118.3	214.7	NA	2,385.7	22.1	160.3	1.5
Hospital	2017	6	267.6	225.5	14.0	26,711.9	34.1	31,001.7	42.9
	2018	5	263.7	237.3	13.0	32,162.1	35.4	31,422.1	54.5

PROPERTY TYPE	YEAR	NUMBER OF BUILDINGS	WEATHER NORMALIZED SITE EUI (kBtu/ft²)	NATIONAL SITE EUI (kBtu/ft²)	ENERGY STAR SCORE	EMISSIONS ($MTCO_2e$)	EMISSIONS INTENSITY ($kgCO_2e/ft^2$)	WATER USE (kgal)	WATER USE INTENSITY (gal/ft²)
Hotel	2017	26	100.3	90.4	49.0	1,885.1	14.3	7,696.3	50.1
	2018	23	98.8	91.2	54.0	1,950.2	15.0	11,598.4	53.7
Indoor Arena	2017	1	80.4	47.0	NA	5,335.1	14.4	6,879.4	18.6
	2018	1	77.5	49.9	NA	4,780.9	12.9	7,278.4	19.7
K-12 School	2017	72	70.8	56.6	31.0	699.0	9.7	728.9	9.8
	2018	72	73.9	67.2	34.0	774.0	10.6	1,019.3	11.6
Laboratory	2017	23	246.8	153.4	NA	4,774.2	33.3	4,313.2	33.5
	2018	23	236.9	160.6	NA	4,867.7	35.8	6,501.5	43.8
Library	2017	3	63.9	71.3	NA	1,926.4	10.5	1,670.4	16.1
	2018	3	56.8	81.9	NA	1,523.7	10.3	871.1	8.4
Manufacturing/ Industrial	2017	22	50.1	NA	NA	625.5	5.5	622.6	3.6
	2018	19	54.4	NA	NA	550.9	6.0	435.8	3.4
Medical Office	2017	8	136.9	106.1	36.0	2,583.8	22.4	1,454.0	14.5
	2018	8	115.2	119.3	56.0	3,091.9	21.5	5,959.6	16.8
Multi-Family Housing	2017	131	50.1	47.1	67.5	869.4	7.6	3,688.3	32.1
	2018	119	51.3	55.5	65.5	959.2	8.6	4,174.5	31.4
Museum	2017	6	114.3	53.0	NA	2,580.5	18.5	9,613.4	16.7
	2018	5	119.6	55.2	NA	3,650.6	20.8	4,666.9	24.0
Non-Refrigerated Warehouse	2017	29	21.1	35.0	70.0	193.0	1.8	87.9	1.3
	2018	28	20.1	37.8	62.0	258.1	2.0	146.5	1.7
Office	2017	70	83.3	72.3	49.5	1,905.8	14.4	1,414.9	11.2
	2018	66	79.7	73.8	47.0	1,919.3	14.7	1,567.3	10.1

PROPERTY TYPE	YEAR	NUMBER OF BUILDINGS	WEATHER NORMALIZED SITE EUI (kBtu/ft²)	NATIONAL SITE EUI (kBtu/ft²)	ENERGY STAR SCORE	EMISSIONS ($MTCO_2e$)	EMISSIONS INTENSITY ($kgCO_2e/ft^2$)	WATER USE (kgal)	WATER USE INTENSITY (gal/ft²)
Performing Arts	2017	2	162.3	62.8	NA	1,876.7	19.4	1,934.5	5.4
	2018	2	161.6	64.1	NA	1,871.2	20.6	1,775.6	5.0
Personal Services	2017	1	76.5	43.4	NA	1,584.4	11.3	3,098.6	22.1
	2018	1	72.9	46.5	NA	1,639.9	11.7	2,017.6	14.4
Police Station	2017	2	118.3	59.1	NA	2,604.5	17.5	NA	NA
	2018	2	117.7	61.2	NA	2,718.4	18.3	NA	NA
Prison	2017	3	184.5	81.9	NA	3,114.8	22.1	NA	NA
	2018	3	183.6	85.9	NA	3,414.7	24.2	NA	NA
Refrigerated Warehouse	2017	1	42.3	61.4	74.0	611.3	8.4	135.2	1.9
	2018	1	60.5	64.9	54.0	886.9	12.1	185.7	2.5
Repair Services	2017	3	82.1	52.3	NA	825.8	9.4	444.0	8.2
	2018	2	87.9	53.4	NA	992.2	11.6	NA	NA
Residence Hall	2017	12	80.4	93.9	68.0	1,060.6	8.9	3,944.1	48.5
	2018	12	69.2	113.7	82.5	813.8	8.0	3,644.0	58.9
Residential Care	2017	1	229.3	45.1	NA	1,691.7	30.5	2.6	0.1
	2018	0	NA	NA	NA	NA	NA	NA	NA
Restaurant	2017	1	145.6	43.0	NA	1,223.7	21.6	5,850.1	103.1
	2018	1	147.7	42.4	NA	1,294.0	22.8	5,665.0	99.9
Retail Store	2017	6	56.2	53.1	47.0	1,681.2	12.3	1,028.7	9.0
	2018	3	81.4	84.9	50.0	1,671.1	14.4	1,328.0	9.6
Self-Storage	2017	12	9.8	21.6	NA	125.2	1.2	55.9	0.5
	2018	11	16.6	24.9	NA	184.3	2.2	63.5	0.4
Senior Care	2017	8	130.0	88.9	28.5	1,068.3	14.5	2,027.8	23.8
	2018	6	128.8	92.8	20.5	1,076.4	15.6	2,644.4	33.3

PROPERTY TYPE	YEAR	NUMBER OF BUILDINGS	WEATHER NORMALIZED SITE EUI (kBtu/ft²)	NATIONAL SITE EUI (kBtu/ft²)	ENERGY STAR SCORE	EMISSIONS ($MTCO_2e$)	EMISSIONS INTENSITY ($kgCO_2e/ft^2$)	WATER USE (kgal)	WATER USE INTENSITY (gal/ft²)
Social/Meeting Hall	2017	6	154.7	70.1	NA	2,363.3	15.0	740.6	9.6
	2018	6	113.8	62.9	NA	2,360.0	12.0	345.0	4.7
Stadium	2017	1	69.8	50.0	NA	14,624.8	11.2	237.1	0.2
	2018	1	71.3	50.4	NA	15,594.2	12.0	207.7	0.2
Strip Mall	2017	5	110.5	100.0	NA	2,754.5	25.3	2,627.7	25.9
	2018	4	144.3	104.6	NA	2,083.1	24.2	3,093.7	34.8
Supermarket	2017	5	236.6	197.7	34.0	2,365.8	39.5	1,290.1	24.9
	2018	5	264.4	196.5	22.0	2,549.7	41.7	2,300.5	32.8
Urgent Care/ Clinic	2017	2	185.0	71.5	NA	5,014.8	26.9	5,820.6	18.1
	2018	2	133.7	71.4	NA	4,463.6	19.3	7,416.9	23.1
Veterinary Office	2017	1	149.0	80.5	NA	2,275.3	18.2	5.7	0.1
	2018	1	129.5	81.1	NA	1,974.1	15.8	5.5	0.0
Vocational School	2017	4	83.0	50.8	NA	1,079.9	13.5	466.8	4.5
	2018	4	97.4	55.0	NA	1,162.8	14.4	443.3	5.0
Wastewater Treatment	2017	1	7,709.7	51,142.9	NA	278,241.7	1,177.8	42,240.9	178.8
	2018	1	7,388.8	51,490.2	NA	270,136.2	1,143.5	112,166.7	474.8
Wholesale Club	2017	1	50.9	67.8	83.0	2,896.4	7.6	869.9	2.3
	2018	1	52.2	73.9	75.0	3,233.7	8.5	769.2	2.0
Worship Facility	2017	3	66.9	25.3	2.0	990.4	14.8	79.6	0.5
	2018	3	88.7	39.2	7.0	843.9	10.6	93.0	0.6

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