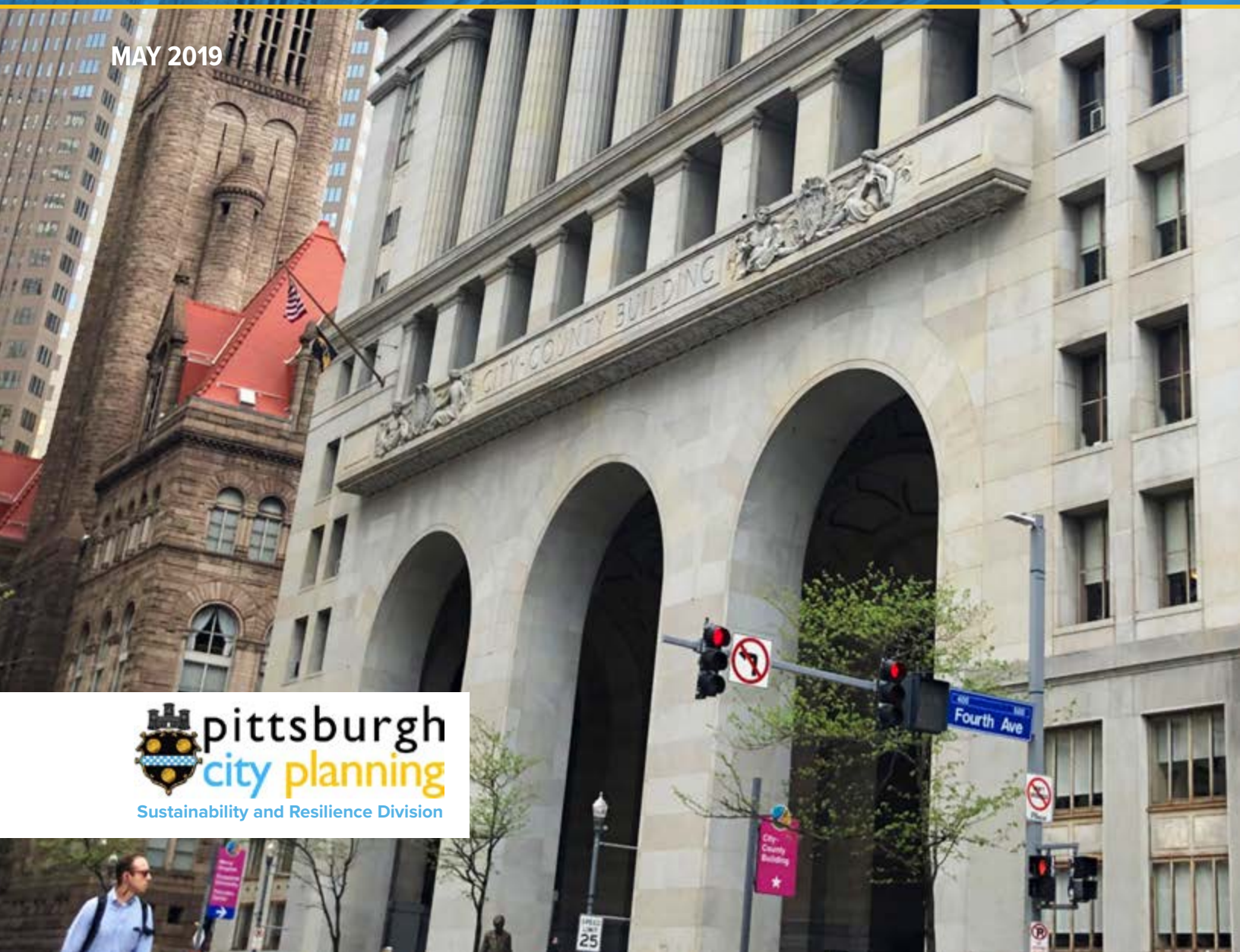
FIRST ANNUAL

PITTSBURGH MUNICIPAL BUILDING BENCHMARKING REPORT

2017 ENERGY USE

MAY 2019



pittsburgh city planning
Sustainability and Resilience Division

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PITTSBURGH MUNICIPAL BUILDING BENCHMARKING REPORT

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EXECUTIVE SUMMARY

In May 2018, Pittsburgh City Council approved the Pittsburgh Climate Action Plan 3.0, under which the City seeks to achieve dramatic greenhouse gas reductions by 2050 in an effort to address climate change and create a stronger, healthier, and more resilient Pittsburgh. Under this plan, established by Mayor William Peduto, the City aims to reduce greenhouse gas emissions by 50 percent by 2030, and 80 percent by 2050. It also seeks to reduce energy and water use by 50 percent by 2030.

THE CITY CURRENTLY TRACKS 154 FACILITIES

Tracking and addressing energy waste in public buildings saves taxpayer money, increase the quality of our buildings, and demonstrates effective solutions that can be replicated locally in many other buildings.

To reach these goals, the City must address buildings, which currently account for 80 percent of the city's carbon emissions and for a significant portion of city energy use. Pittsburgh's buildings are ripe for efficiency, innovation, and workforce development. Recognizing this, the City of Pittsburgh is leading the way by tracking energy use in municipal buildings (a process otherwise known as benchmarking) with an eye on how to better improve the City's building energy performance.

This report is the first annual building energy benchmarking report for municipal buildings owned and operated by the City of Pittsburgh.

This detailed analysis will support prioritization and planning of energy efficiency and resiliency retrofits across the City's portfolio of municipal facilities. These findings and subsequent progress reports will be utilized to track our progress towards meeting the 2030 goals set by Mayor William Peduto to reduce the energy use of Pittsburgh by 50 percent.

The City currently tracks 154 facilities in ENERGY STAR Portfolio Manager™. This free online tool is developed by the Environmental Protection Agency (EPA) to assist building owners in tracking energy use over time. In addition, Portfolio Manager calculates a building's energy use intensity (EUI), which is how much energy a building consumes relative to its area (square footage/sqft). ENERGY STAR Portfolio Manager then compares the building's EUI to the national median EUI of buildings of similar uses. The comparison of the building's EUI to a national median EUI gives owners, tenants, and operators a first indication of potential opportunity for improvement. A high EUI in comparison to the national median for example indicates that either a facility is operating energy intensive processes or has opportunities for energy improvements. In the latter case, there can often be an underlying issue such as failing equipment in need of tune-up or replacement, an insufficient building envelope, or inefficient operations that - when addressed - can improve building performance.

Addressing energy waste in public buildings saves taxpayer money, increases the quality of our buildings, and demonstrates effective solutions that can be replicated locally in many other buildings. As such, municipal buildings with high EUIs will be further investigated by the City of Pittsburgh to identify if there are opportunities for improvements that will ultimately result in cost savings, energy savings, and a more comfortable environment for the occupants.

The preliminary findings presented in this first analysis and compilation of benchmarking data include:

- **The City-County Building at 400 Grant St. stands out as the highest energy consumer** of our buildings due to its size and the age of its equipment. Actions are already scheduled to create energy savings.
- **Most of the facilities' EUIs are high or average compared to the national median** of buildings of the same use type, indicating some potentially great opportunities for energy savings.
- **The City of Pittsburgh spent $2,700,000 to operate the facilities analyzed in this report.** If we reduce energy use of these buildings by 50% now, we would save at least $1,350,000 every year.
- **Critical facilities such as 24/7 EMS facilities have a wide range of energy uses and EUIs.** The Sustainability and Resilience Division is investigating further to identify critical loads of these facilities to better understand why the energy uses vary so much between buildings of similar size and use. This analysis also will include sizing of solar panels and batteries that would allow these facilities to operate fully even during power outages due to weather events.

INTRODUCTION

Background

In October 2016, the City Council passed an energy and water benchmarking and transparency ordinance requiring all non-residential buildings over 50,000 square feet to share their energy and water consumption data with the City through ENERGY STAR Portfolio Manager by June 1st, 2018 and yearly thereafter.

By unanimously passing this ordinance, Pittsburgh became the 17th city to adopt a legislated building benchmarking approach, following similar requirements in effect in many U.S cities, including Austin, Boston, Philadelphia, New York City, San Francisco, Seattle, and Washington D.C.

For the first time, the City has access to information about the energy usage of over 660 buildings and can develop strategic actions to improve the efficiency of the local building stock. This information will increase the City's understanding of energy and water use locally and will inform energy reduction strategies that support our communities and make Pittsburgh more resilient.

Following this report, which includes 154 public buildings, the City will publish the first year of benchmarking results from building owners, including a map of compliant and non-compliant buildings.

What Is Energy Benchmarking?

Energy benchmarking is the process of regularly measuring a building's energy use and tracking its performance over time, as well as comparing its performance to that of similar buildings. Benchmarking data allows owners and occupants to understand their building's relative energy and water performance and identify opportunities to reduce or eliminate energy and water waste, potentially saving money and improving occupant health and comfort.

The Environmental Protection Agency's ENERGYSTAR Portfolio Manager is a free online tool currently used for data collection and for meeting compliance requirements of all local benchmarking laws. Portfolio Manager is designed to help building owners and managers understand how their buildings use energy and identify where opportunities for savings might exist. Buildings owners and managers also can identify investment opportunities while exploring the tool during the reporting and compliance process.

Why Are We Benchmarking?

Benchmarking public buildings offers accountability and transparency to taxpayers. Additionally, the information and data gathered through benchmarking provides a tool for the facility management team to evaluate the municipal building portfolio and assist in prioritizing investments. Utility bills accounted for $2.7 million of the 2017 Pittsburgh budget. Investing now in buildings that we will own for decades will create significant savings for the community while improving the facilities they use.

A 2015 local study[1] by National Energy Technology Laboratory showed that the commercial sector electricity usage was responsible for 37% of CO2 emissions in Pittsburgh. The benchmarking ordinance creates transparency and identifies where the energy is used. Local solutions also can be developed in partnership with the community to successfully reduce electricity usage.

Benchmarking ordinances in other U.S. cities have already shown improved energy efficiency across their building stock after a few years of implementation. In San Francisco, the City's benchmarking policy resulted in a 7.9% cumulative reduction in energy use for buildings who consistently complied with the law[2]. In New York City, the benchmarking and transparency policy resulted in cumulative energy savings of 5.7%.[3]

By complying, private owners become aware of their energy use relative to their local peers and can make smart decisions with regards to their buildings. These investments will generate savings on utility bills while improving air quality in Pittsburgh. By reducing the utility needs of the buildings of Pittsburgh, we collectively reduce pollution emitted by power plants in the region. This avoided pollution makes Pittsburgh a healthier place.

What Is In This Report?

The City of Pittsburgh started publicly sharing its facilities' energy and water use data through the Western Pennsylvania Regional Data Center (WPDRC), a regional open data platform. However, this report is the first time the City has published a comprehensive overview of its buildings' energy use.

The City of Pittsburgh currently tracks the energy use of 154 facilities in ENERGY STAR Portfolio Manager. The city is using this data to prioritize retrofit projects that will reduce our use of energy, save taxpayers money, and improve air quality.

1 http://apps.pittsburghpa.gov/redtail/images/1476_Pittsburgh_Energy_Baseline_Brochure_12.12.17.pdf

2 https://sfenvironment.org/sites/default/files/fliers/files/sfe_gb_ecb_performancereport.pdf

3 https://www.sciencedirect.com/science/article/abs/pii/S0360544217309209

This report focuses on the municipal portfolio of buildings hosting daily operations, public safety, and amenities for residents. Vacant and demolished buildings are tracked for historical records but not included in this report. Electricity expenses not linked to buildings (such as street lights, as well as park and separately metered field lights) are out of the scope of this report.

Throughout the report, we highlight success stories and projects in development, as well as specific suggestions for the future to provide concrete application of energy efficiency.

How To Read The Bar Charts In This Report

This report focuses on analyzing public buildings' energy data according to two main metrics that are presented in the bar charts throughout this report:

- Annual Site Energy Use which is the amount of energy used by a building over one year and is measured in kBtu, located on the left axis.
- Site Energy Use Intensity (Site EUI) which is the annual site energy use divided by the building's total area and is measured in kBtu/sqft, located on the right axis. This metric is often used when comparing the energy performance of facilities of similar use types.

These two metrics can be found in all the bar charts included in this report. Buildings with high annual site energy use (represented by a tall bar) and high site EUI (represented by a dot in the upper part of the chart) should be the focus of upcoming retrofit improvements as they offer the greatest opportunities for savings.

Additionally, buildings are sorted from the smallest on the left to the largest on the right of the bar charts.

OVERVIEW

In 2017, the City owned four buildings over the 50,000 sqft threshold set by the benchmarking ordinance. However, this report includes the energy use of all municipal buildings tracked in ENERGY STAR Portfolio Manager in an effort to maximize transparency.

The City of Pittsburgh sources its energy from electricity, gas, and steam to maintain comfortable conditions in its facilities, and more than half of the energy used goes toward supporting daily operations, including public works, administration, and various services to the public.

The City's public safety facilities use 26% of the portfolio's energy and includes fire stations, police, and medics facilities. Finally, amenities for residents' activities such as healthy and active living centers, recreational centers, and various park facilities account for 20% of the total energy used.

The City used gas and electricity in nearly equal proportion overall, for a total annual energy use of 143 GBtu for 2017 for 154 buildings. In 2017, $2,700,000 was spent on utilities for these buildings. If energy use was reduced by 50% starting in 2020, we would save at least $1,350,000 every year. With this in mind, Rocky Mountain Institute is working with the City on two pilot projects to develop Net-Zero Energy retrofit strategies that can be replicated to the entire portfolio.

PITTSBURGH USES STEAM?

For heating in the winter, the steam district downtown has provided heat to private and public buildings since 1915. Twenty-five of the largest buildings downtown, public and private, are benefitting from this district solution. Connection to the steam district provides more available space in the buildings and diverts the maintenance of the HVAC system onto PACT, the steam utility, instead of the building managers.

FIGURE 1

PORTFOLIO OF ENERGY USE

City of Pittsburgh Distribution of Energy Use by Type of Services

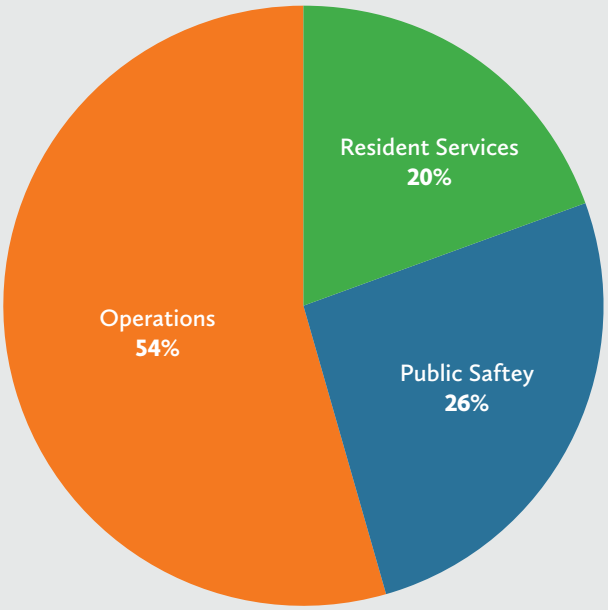


FIGURE 2

TOTAL ENERGY USE (in kBtu)

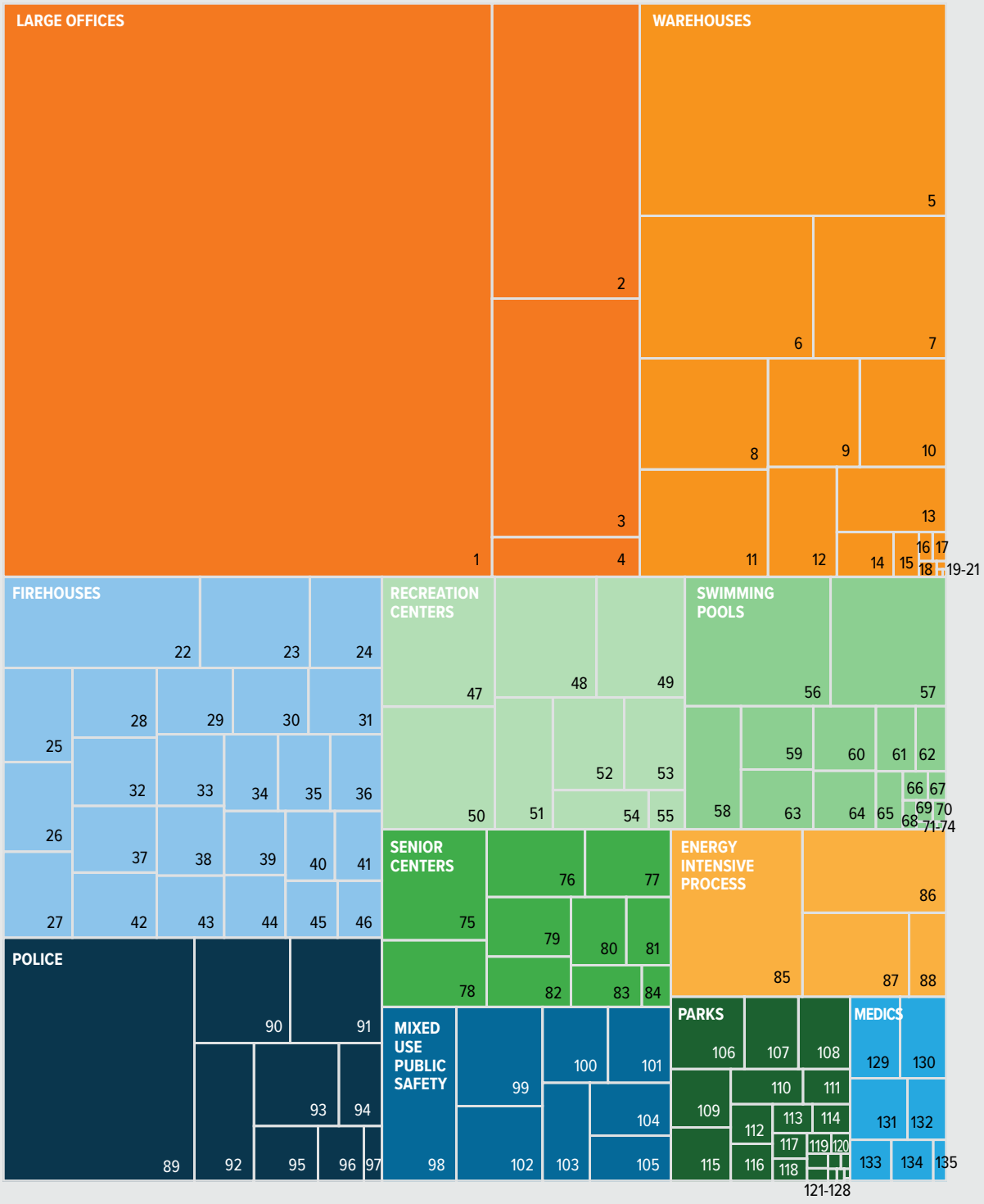
City of Pittsburgh Facilities Energy Use by Source

The following treemap, on pages 10-11, gives a more detailed overview of the portfolio and its energy consumption: the rectangles are proportional to annual energy use. This gives an understanding at a glance of where the opportunities for improvement might lie.

FIGURE 3

RELATIVE ENERGY USE OF EACH MUNICIPAL BUILDING IN ENERGY STAR PORTFOLIO MANAGER

in kBtu



LARGE OFFICES

1. City County Building-City
2. Civic Building
3. Municipal Courts Building 1
4. EMS Headquarters

WAREHOUSES

5. Eazor Warehouse
6. Finance Facility 1
7. Public Works 4th Division
8. Public Safety Training Academy
9. Public Works First Division
10. Public Works 2nd Division Bldg
11. Public Works Const.Div./ 62 St Warehouse
12. Public Works 5th Division
13. Public Works Traffic Div. Storage Building
14. McKinley Park Storage Shed
15. Public Works North Town Park Storage Bldg
16. Public Works McKinley Park Service
17. Public Works Saw Mill Run Salt Dome
18. Public Works Highland Park Service Building
19. Public Works 5th Div Salt Dome
20. Saw Mill Run Building
21. Public Works 1st Div Salt Dome

FIREHOUSES

22. Fire Station 8
23. Fire Station 4
24. Fire Station 23
25. Fire Station 22
26. Fire Station 6
27. Fire Station 38
28. Fire Station 3
29. Fire Station 37
30. Fire Station 17
31. Fire Station 13
32. Fire Station 10
33. Fire Station 7
34. Fire Station 30
35. Fire Station 29
36. Fire Station 35
37. Fire Station 15
38. Fire Station 27
39. Fire Station 28
40. Fire Station 19
41. Fire Station 34
42. Fire Station 32
43. Fire Station 26
44. Fire Truck 34
45. Fire Station 31
46. River Safety Boathouse

RECREATION CENTERS

47. Ammon Recreation Center
48. Warrington Pool And Recreation Center
49. Phillips Gym / Recreation Center
50. West Penn Recreation Center
51. Ormsby Pool And Recreation Center
52. Brookline Recreation Center
53. Paulson Recreation Center
54. Arlington Gym
55. Jefferson Recreation Center

SWIMMING POOLS

56. Oliver Bath House
57. Highland Park Pool/DPW Maintenance Building
58. Moore Pool/REC Building
59. Banksville Pool/ Shelter
60. Bloomfield Pool and Recreation Center
61. Burgwin Pool Building
62. Brighton Heights Pool Jack Stack Northgate
63. Sue Murray Filter Building
64. Ream Pool and Recreation Center
65. Homewood Pool Building
66. Westwood Pool Building
67. Riverview Pool Building
68. West Penn Pool Building
69. McBride Swimming Pool
70. Leslie Pool Building
71. Sue Murray Pool Building
72. Paulson Pool Building
73. Fairywood Pool Building
74. West Penn Pool Entrance

SENIOR CENTERS

75. Southside Market House
76. Beechview Community Center
77. Magee Recreation Center
78. McKinley Park Rec/Senior Center
79. Allegheny Reg. Library/NorthSide Seniors/ Hazlett Theater
80. Hazelwood Senior Center
81. Mt. Washington Senior Center
82. Homewood Senior Center
83. Brighton Heights Senior Center
84. Sheraden Senior Center

ENERGY INTENSIVE PROCESS

85. Schenley Skating Rink
86. Finance Compressor Building
87. Public Works Facilities Repair Shop
88. Public Works Asphalt Div Bldg

POLICE

89. Headquarters
90. Zone 5
91. Training Center
92. Zone 1
93. Zone 3
94. Zone 2
95. Accident Inves / SWAT
96. Commercial Vehicle Inspections (Old 39 Firehouse)
97. Former Police Investigations

MIXED-USE PUBLIC SAFETY

98. Fire Station 24 Former PZ3/Medic8
99. Police Zone 4 / Fire Station 18
100. EMS 9 / Rescue 1
101. Fire Station 12 / Medic 7
102. Police Zone 6 / Medic 3
103. Fire Station 14 / Oakland Sr Ctr
104. Fire Station 20 / Medic 12
105. Medic 14 / Rescue 2

PARKS

106. Morningside Fieldhouse
107. Overbrook Senior Center
108. Fire Station 32 / Springhill C Cr
109. West End Overlook Building
110. Mount Washington Shelter House
111. Robert Williams Recreation Ctr
112. Schenley Nature Musuem/VisitorC
113. Olympia Park Recreation Center
114. Herschel Concession Stand/Res.
115. Herschel Fieldhouse
116. Overbrook Community (Old 25 Firehouse)
117. Arsenal Park Building
118. Riverview Park Chapel
119. Morningside Senior Center
120. Fowler Recreation Center
121. Cowley Rec. / Pool
122. Kennard Recreation Center
123. Highland Park Farmhouse
124. Highland Park Rhododendron Shltr
125. Asphalt Plant Garage
126. Westinghouse Park Recreation Center
127. Hazelwood Community Building
128. Riverview Activities Building

MEDICS

129. EMS Training
130. Medic 4
131. Medic 10
132. Medic 2
133. Medic 1
134. Medic 6
135. Medic 8 FormerFS21

SMALL FACILITIES (not pictured)

136. Dunbar Residence & Fieldhouse
137. Frick Park Biddle Building
138. Heth Run Garage@Zoo Parking Lot
139. McKinley Park Office
140. Mellon Park Service Building
141. OMI
142. Public Works 6th Div/Heavy Equip
143. Public Works Administration Bldg
144. Public Works Forestry Building
145. Public Works Frick Park Office
146. Riverview Park Welcome Center
147. Sheraden Residence & Service Blg

12 months data not available
(demolished or newly metered facility)**:**

148. Arlington Field
149. Riverview Park Valley Refuge Picnic Shelter
150. Frick Park Nature Center
151. Wightman School Annex

TEN LARGEST ENERGY CONSUMERS

The ten buildings identified as using the most energy in the City portfolio are displayed below in relation to the rest of the buildings in the portfolio. The bubble diameter represents the annual energy use, while the horizontal axis indicates the EUI and the vertical axis indicates the size of the building. If the energy use is high (large bubble) and the site EUI is also high, there are potential opportunities for large savings.

LIGHTING RETROFIT BENEFIT

Nowadays LED lighting uses 75% less energy than commonly installed lighting. Budgeting for a lighting upgrade to LED in the City County building for 2020 would save at least $50,000/year, or half a million dollars by 2030.

In particular, the City County Building (CCB) is using significantly more energy than the rest of our buildings while having a high EUI.

If the City invested in the CCB alone to meet our 2030 district commitment to reduce energy use by 50 percent, it could result in savings of $425,000 per year in utility expenses. To achieve this level of energy reduction, elevators, windows, facades and the roof would require

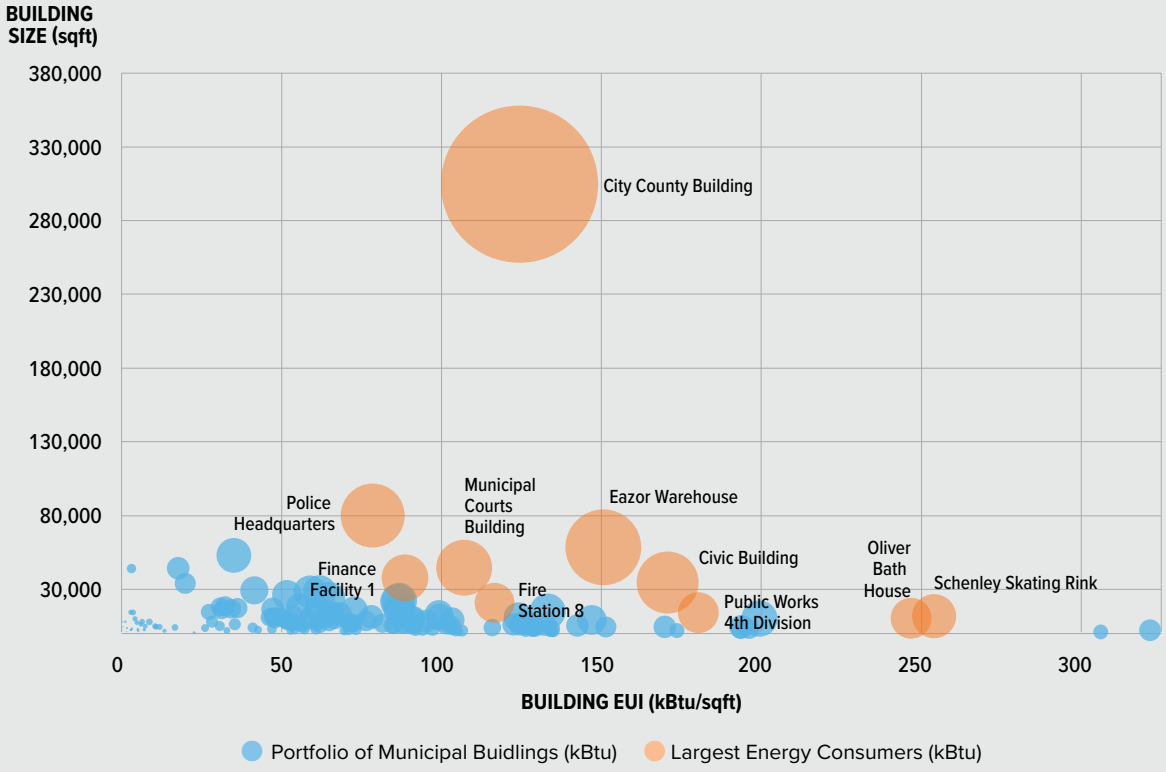
long-term investment for upgrades. However, replacing lighting as well as monitoring and controlling plug loads would also significantly reduce electricity usage while having a much shorter payback.

The CCB retrofit could rely on the Guaranteed Energy Savings Act (GESA) adopted by the State of Pennsylvania to assist local governments with large energy efficiency retrofits. This progressive contracting process enables mass upgrades of building components to be replaced through a budget neutral process by working with pre-qualified contractors.

FIGURE 4

TEN BUILDINGS USING THE BIGGEST SHARE OF ENERGY

Compared to Rest of the City of Pittsburgh's Portfolio



Note: Finance compressor building and PW traffic division storage building are not included. (EUI >700)

CITY OPERATIONS

ACROSS
790,000 SQFT

11
Office Buildings

1
Courthouse

16
Warehouses

4
Industrial Buildings

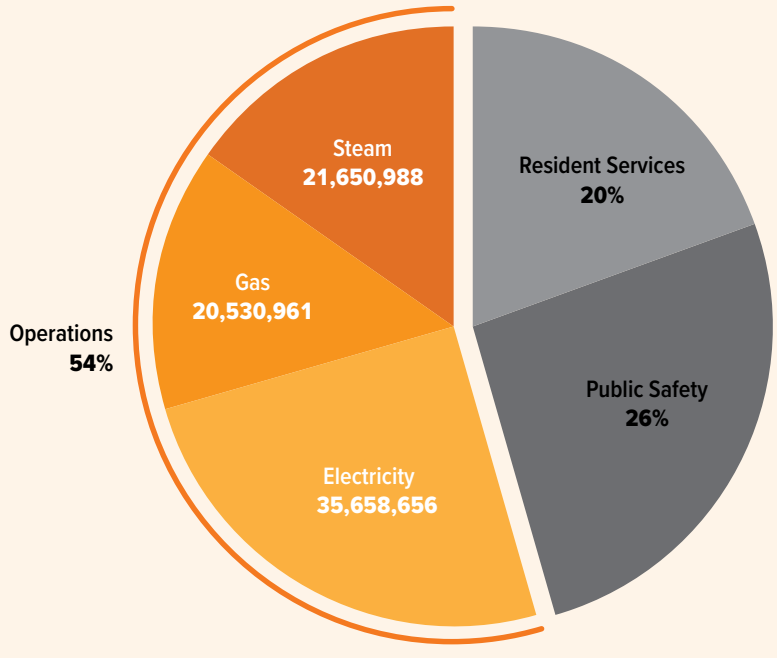
CITY OPERATIONS

The City tracks the energy use of 28 facilities that support the day-to-day operations of the City. This includes offices, warehouses, and industrial buildings detailed in the following pages.

FIGURE 5

CITY OPERATIONS ENERGY USE BY SOURCE

in kBtu



OFFICES AND COURTHOUSE

Offices account for over one third of the municipal portfolio's energy consumption.

Overall, Pittsburgh's municipal office buildings are more efficient than others across the country, with seven of our buildings using less energy than the U.S. median office building. Unfortunately, three of the City's largest buildings are not performing well: the City-County building, the Civic building, and the Municipal Court building. Each of these buildings have EUIs over 100 kBtu/sqft when the average U.S. office is 52.9 kBtu/sqft.

The Civic Building hosts many services including the Fire Bureau, the Department of City Planning, and the Department of Permit and Licensing, none of which require intense energy use. However, the Civic Building's EUI is the highest of the office buildings, which is an indication that energy is being wasted and that its systems are aging.

Addressing the inefficiencies of the largest buildings with the highest EUI will move the City closer to our 2030 energy reduction goal while also allowing the City to focus on a few targeted buildings at a time.

51,547,735 kBtu
Total Energy Use

36 % of the portfolio energy use

7 buildings out of 12 are better than the US median

MOVING TO 412 BLVD OF THE ALLIES

In 2017, the City spent $20,000 more on utility bills for the Civic building compared to a similar average building.

By moving services to 412 Blvd of the Allies and working with Rocky Mountain Institute to develop efficient design strategies, the City will save on bills, offer residents easier access to city services in a space designed to better serve the community, and show case energy efficient solutions.

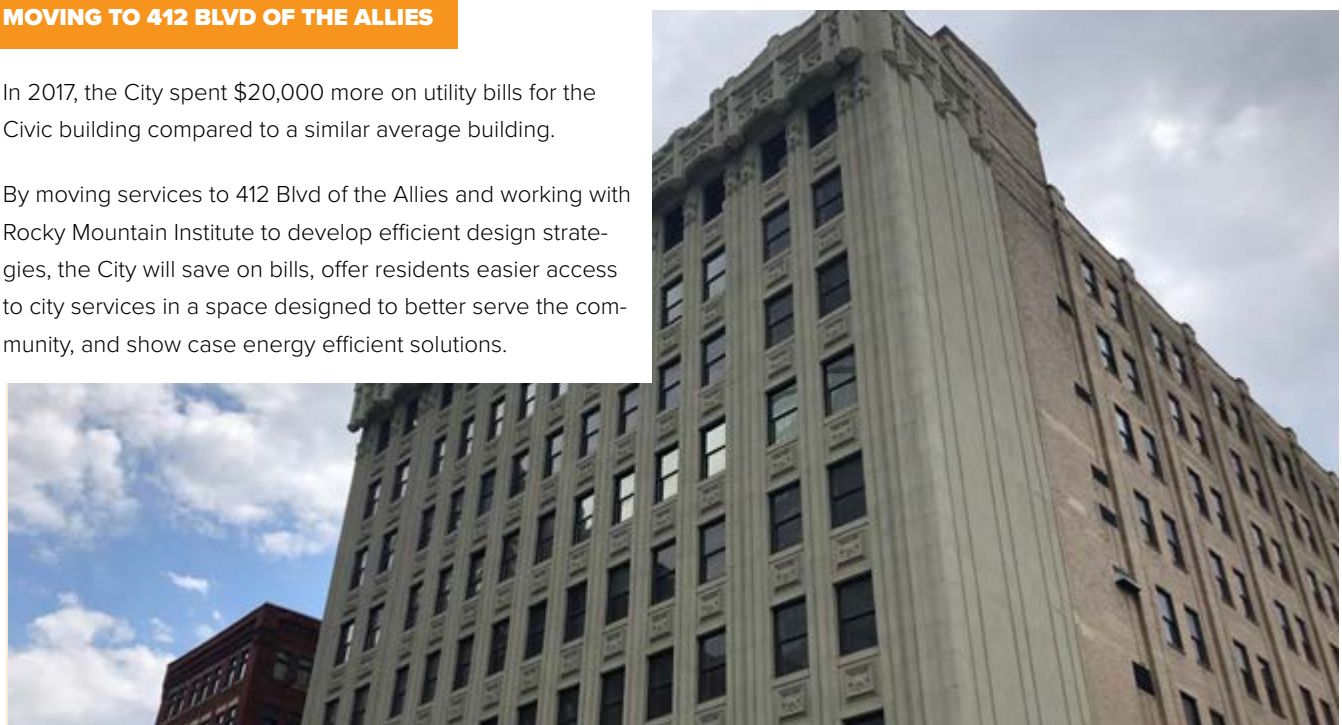


FIGURE 6

OFFICE SHARE OF THE TOTAL MUNICIPAL ENERGY USE

Energy Used by Offices Compared to Other Use Types in the City of Pittsburgh's Portfolio

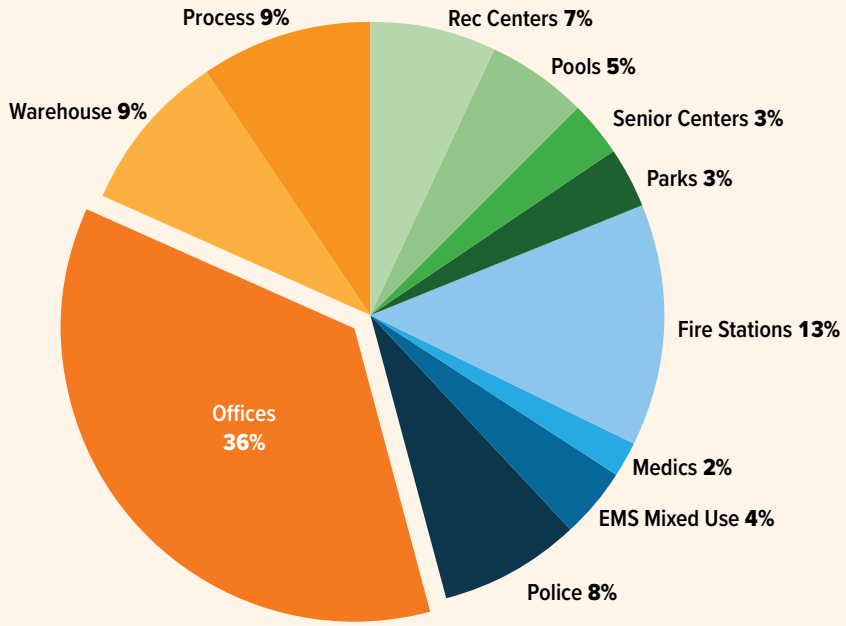
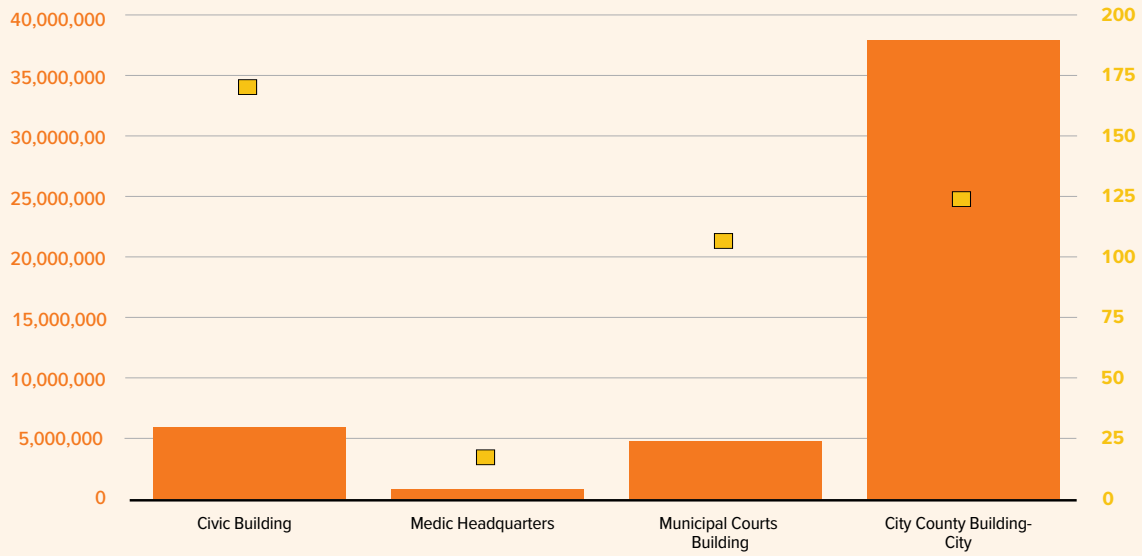


FIGURE 7

FOUR LARGEST OFFICE BUILDINGS

Site Annual Energy Use (kBtu) Site EUI (kBtu/sqft)

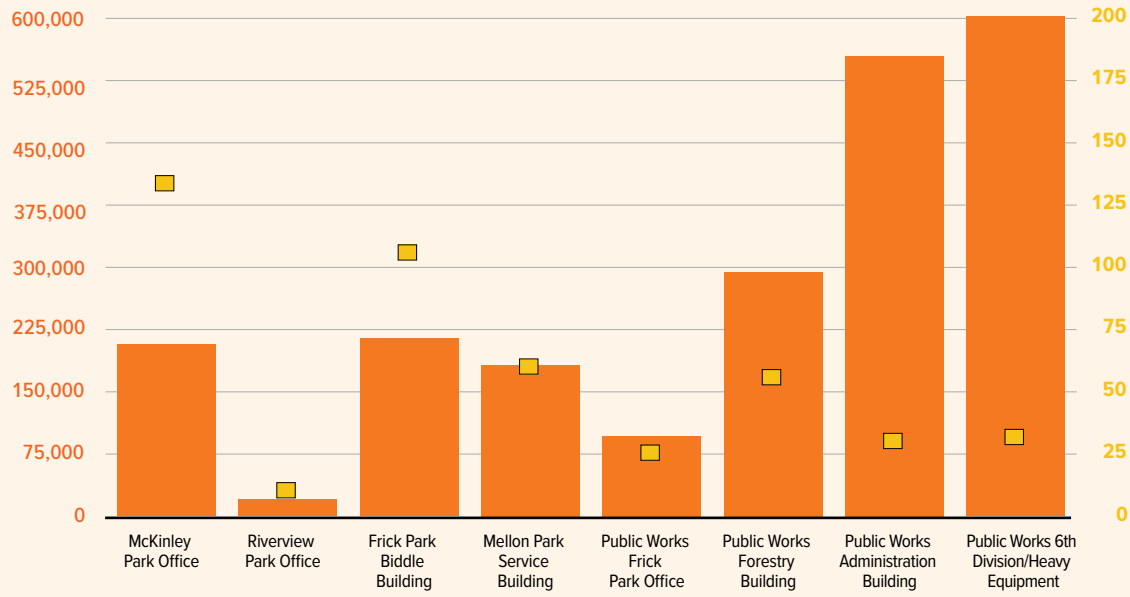


The Civic Building, Municipal Court Building, and the City County Building have an EUI worse than 53kBtu/ft2, which is the median for U.S. office buildings. When a building is performing below the median, this usually indicates that no-cost or low-cost solutions can be deployed to improve building energy performance without extensive intervention. When possible, a major capital investment for HVAC system replacement would also yield higher savings.

FIGURE 8

OFFICE BUILDINGS UNDER 20,000 SQFT

Site Annual Energy Use (kBtu) Site EUI (kBtu/sqft) **PW** Public Works



The smaller office buildings perform more efficiently than the larger facilities. The EUI of the smaller office buildings are mostly below 80 kBtu/ft2, while our large offices' EUI are above 100 kBtu/sqft. This is possibly a consequence of a higher density of computers and devices that are energy intensive in the larger buildings, or higher inefficiencies in plug loads usage.

MUNICIPAL WAREHOUSES AND MAINTENANCE FACILITIES

Public Works maintains the City's infrastructure by resurfacing streets, preserving park facilities, and rehabilitating public structures. The department also meets the environmental needs of Pittsburgh residents by collecting residential refuse and recyclables. Public Works ensures public safety by responding to emergencies such as flooding, land subsidence, snow and ice storms, and other weather-related catastrophes.

Public Works uses most of the warehouses owned by the City. Most of these facilities are using more energy than warehouses nationally.

Public Works' Traffic Warehouse has a very high EUI; it is a good candidate for further analysis of opportunity for energy savings.

Optimizing heating in warehouse facilities can yield great savings opportunities. By further analyzing the use of the space and where the heat is needed, we could upgrade the heating systems to traditional heat pumps or geothermal heat pumps to provide comfort where it is truly needed while reducing expenses.

12,804,446 kBtu
Total Energy Use

9% of the portfolio energy use

7 buildings out of 22 are better than the US median

62 STREET WAREHOUSE

The large roof of this facility was replaced in 2018. This new roof and the building orientation make it a great candidate for installing solar panels.

A preliminary analysis estimated that the facility can generate 187 MWh, or more than twice what it needs, which can be distributed to other municipal facilities surrounding the building and save $15,000 of electric bill every year.

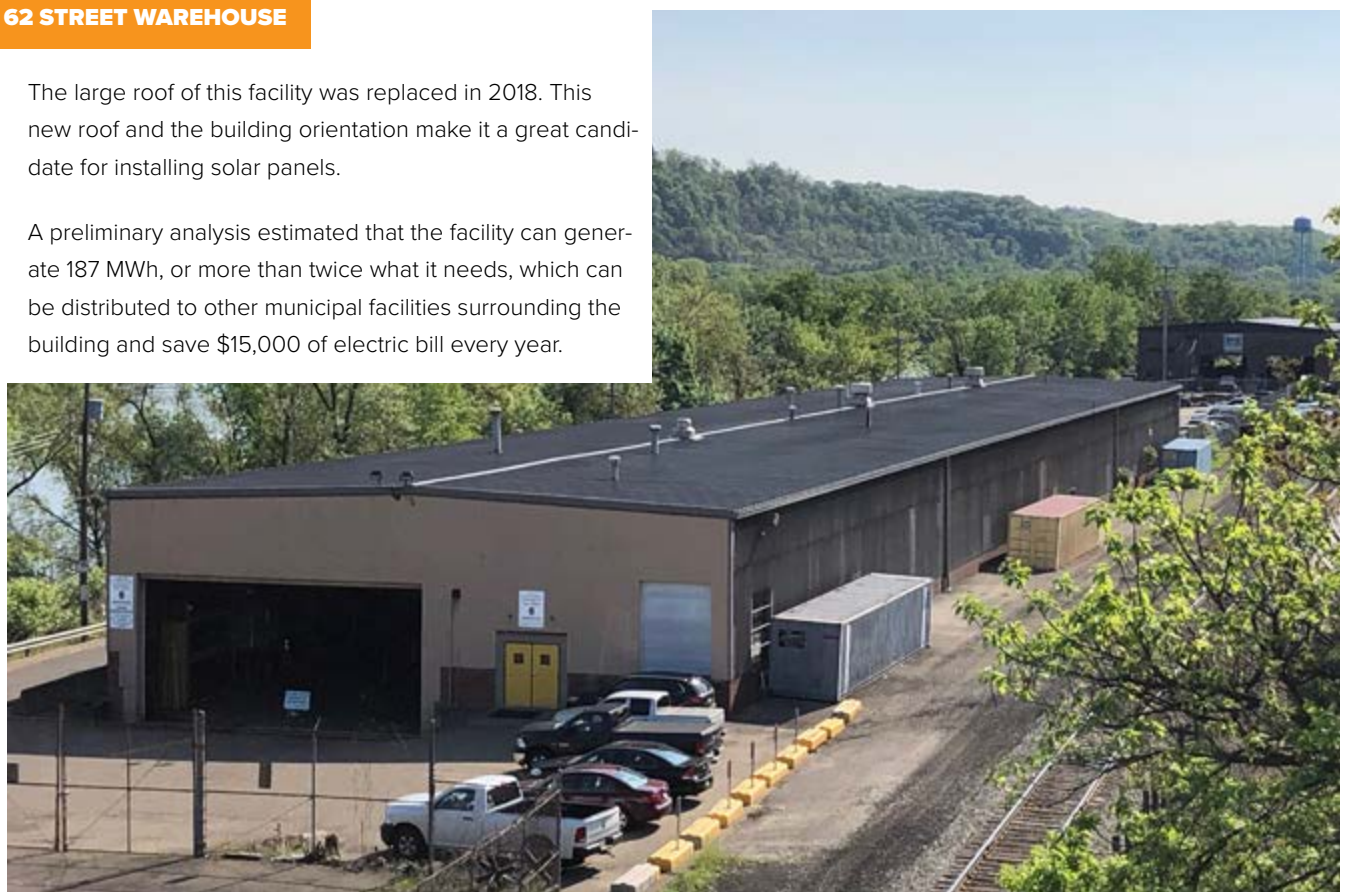


FIGURE 9

WAREHOUSES AND STORAGE FACILITIES

Site Annual Energy Use (kBtu) Site EUI (kBtu/sqft) **PW** Public Works

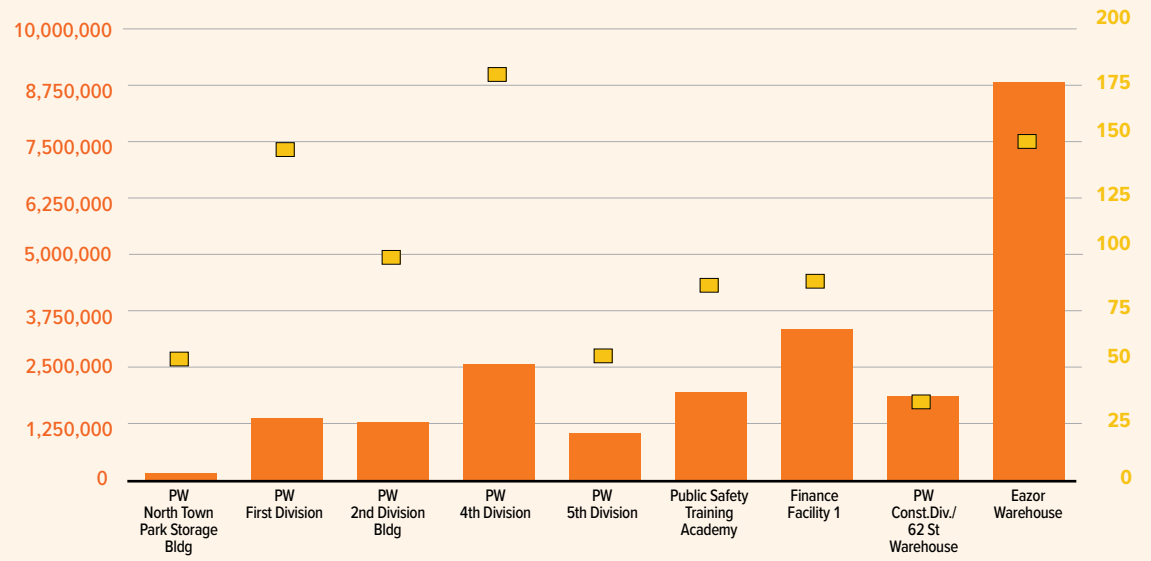
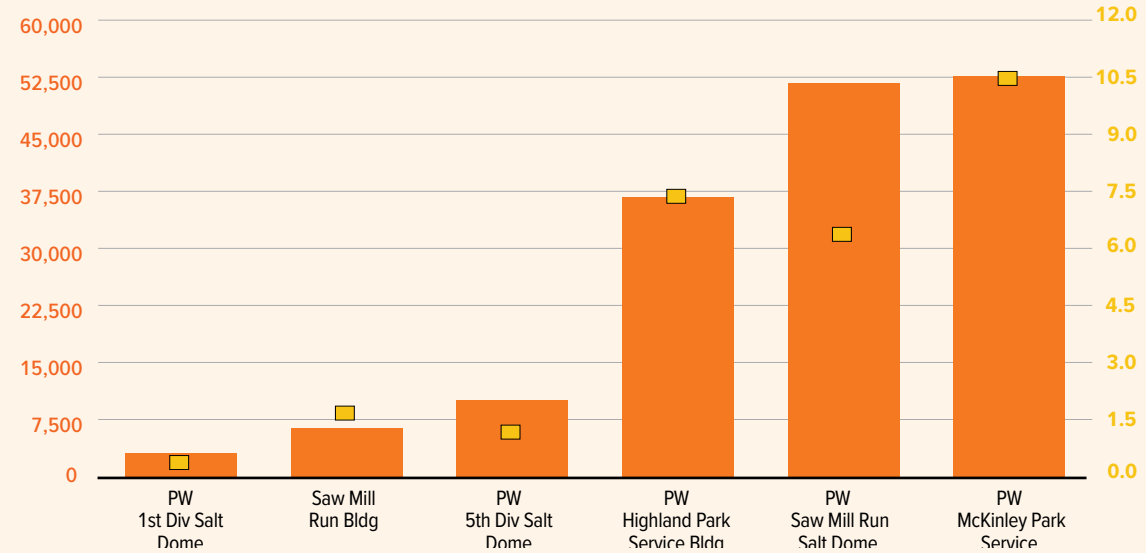


FIGURE 10

STORAGE FACILITIES WITH VERY LOW ENERGY USE

Site Annual Energy Use (kBtu) Site EUI (kBtu/sqft) **PW** Public Works

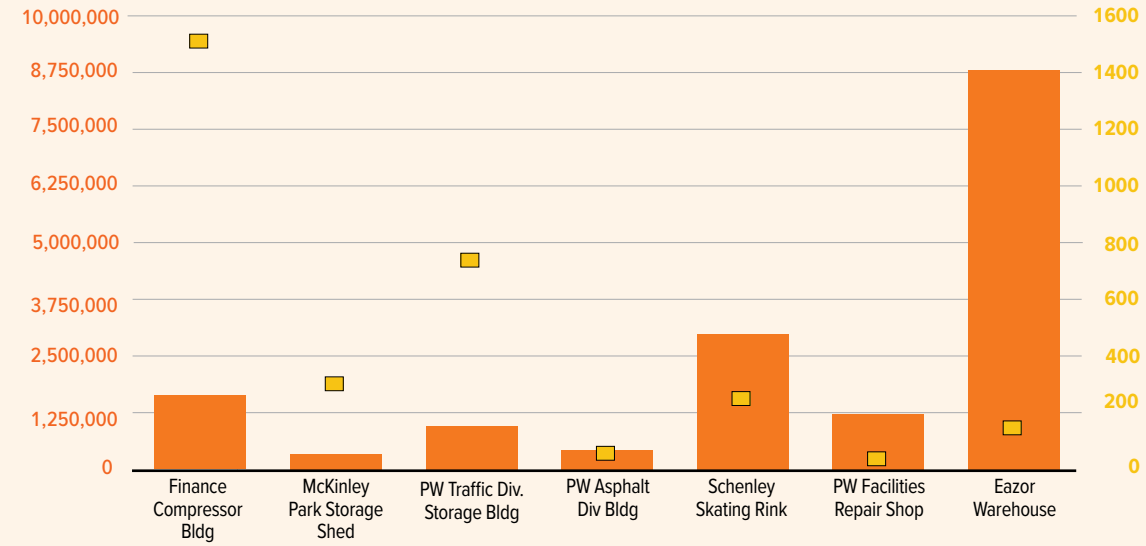


Note: This chart has a very different scale from the rest of the charts in the report; the salt domes use very little energy and would not appear on the graph otherwise.

FIGURE 11

FACILITIES WITH HIGH ENERGY USE DUE TO PROCESSES

Site Annual Energy Use (kBtu) Site EUI (kBtu/sqft) **PW** Public Works



Note: This chart has a very different scale from the rest of the charts in the report; the most energy intensive facilities would be off the chart. In this case, a high EUI is not necessarily indicative of poor performance.

PUBLIC SAFETY FACILITIES

ACROSS
550,000 SQFT

5
Police Stations

1
Police Headquarter

2
Training Centers

24
24 Fire stations

8
Medics

8
Mixed-used facilities

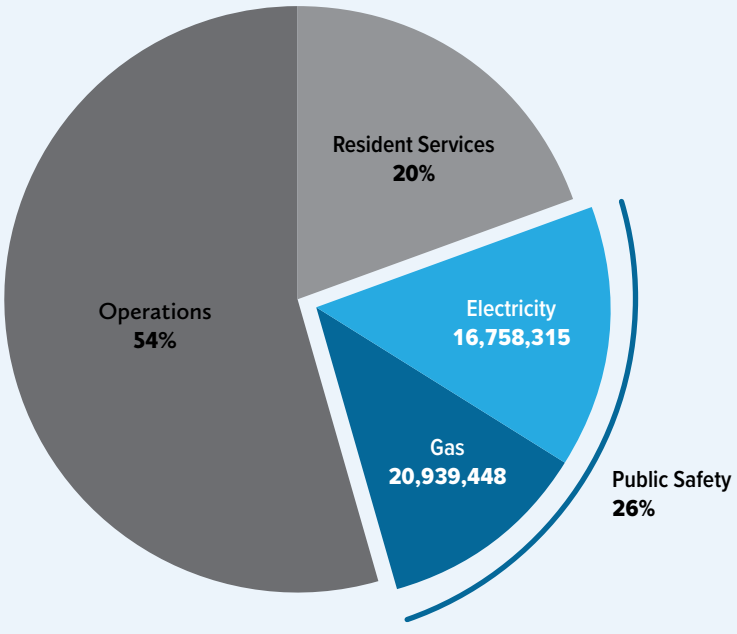
PUBLIC SAFETY FACILITIES

The Department of Public Safety includes all Municipal Bureaus and Agencies making sure Pittsburgh is a safe place to live. This portion of the benchmarking report is sub-divided in four sections: police stations, fire houses, medics, and multi-use facilities which groups several first responder services in the same location.

FIGURE 12

PUBLIC SAFETY BUILDINGS ENERGY USE BY SOURCE

in kBtu



POLICE STATIONS

The Pittsburgh Police Department is comprised of three branches including operation, investigation, and administration and are located across nine buildings.

Its most energy intensive building is the Police Headquarters, which is also the largest in total area. While its EUI is average, small energy efficiency improvements such as a lighting retrofit could significantly reduce the energy bill and provide better lighting for employees.

The Training Center has a very high EUI, which could be due to the unique needs that police training requires. Most importantly it is in an area with a high risk of flooding. Aware of these challenges, the city is currently considering relocating the center to a new and more resilient facility.

The Police Stations in Zone 1, 2, and 3 have very similar EUI. If they operate in similar ways, energy efficiency measures could be applied across the three buildings. Bundling the purchase and installation could reduce cost.

9,995,456 kBtu
Total Energy Use

7% of the portfolio energy use

1 building out of 9
are better than the US median

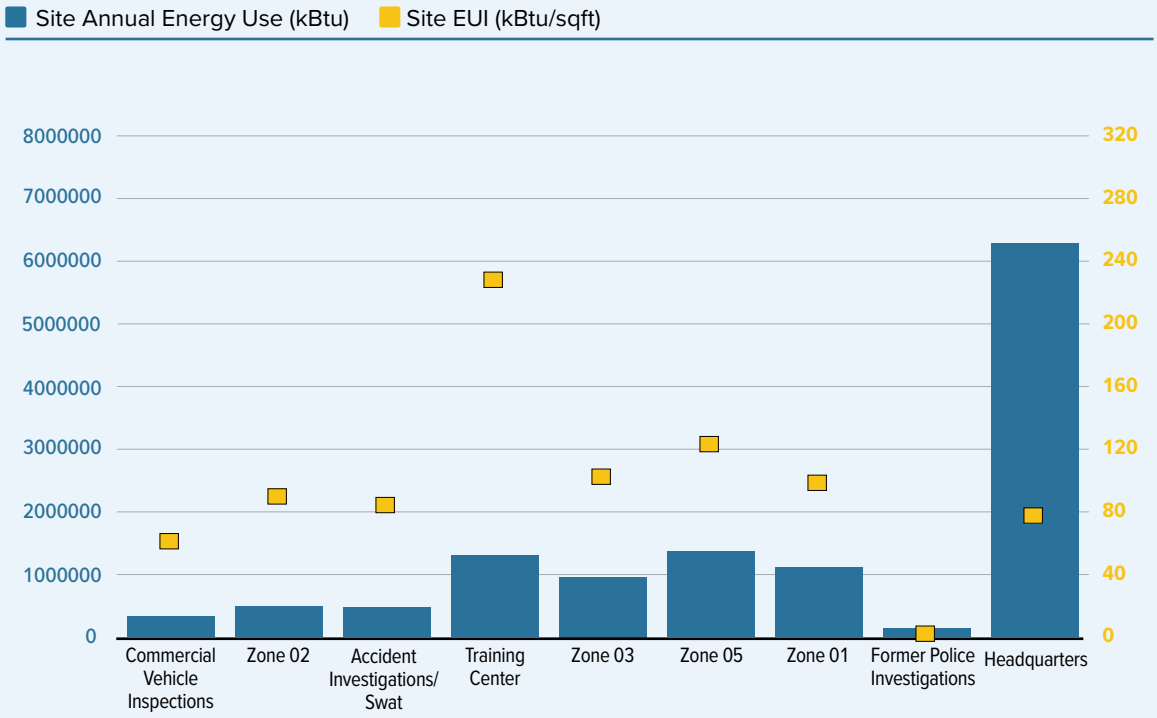
THE VETERANS AFFAIRS HOSPITAL SITE CONVERSION

The 168-acre vacant complex is being considered as a future campus for police, fire, and emergency medical services headquarters and a public safety training center.

The site could provide a state-of-the-art, net-zero facility that would be able to operate even during Power outage.

FIGURE 13

POLICE FACILITIES SITE ENERGY USE



FIRE STATIONS

The Pittsburgh Bureau of Fire protects life, property, and the environment by providing effective customer and human services related to fire suppression, fire responder medical service, hazardous materials mitigation, emergency management service, and domestic preparedness.

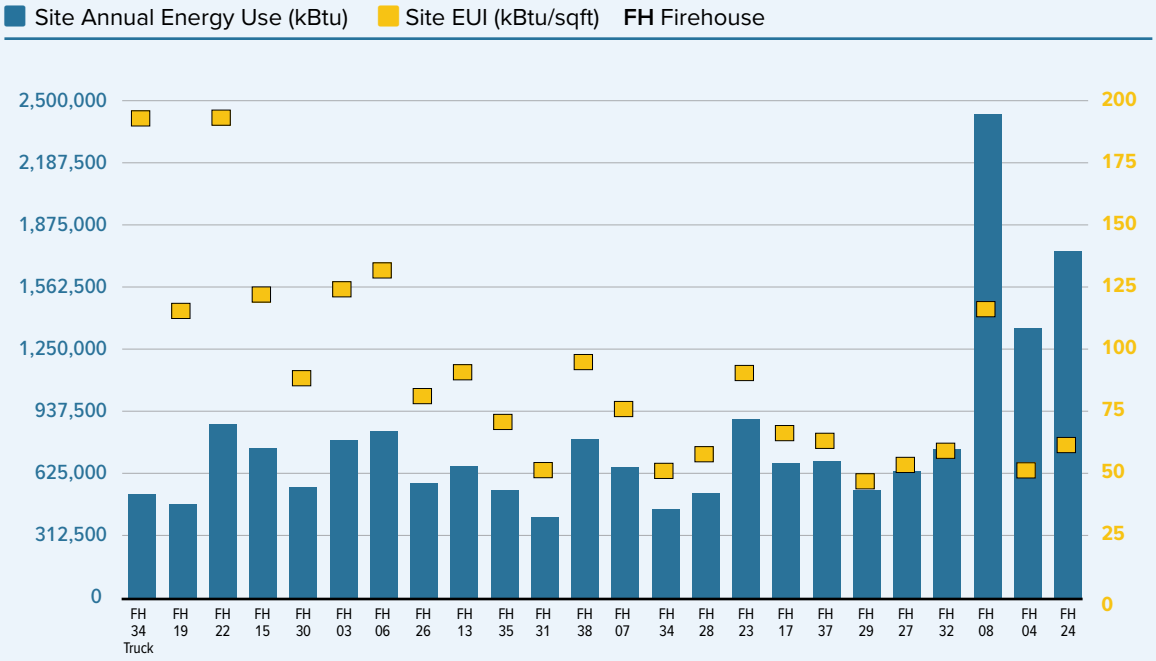
19,136,682 kBtu
Total Energy Use

13 % of the portfolio energy use

14 buildings out of 24 are better than the US median

FIGURE 14

FIREHOUSES SITE ENERGY PROFILE



Its main office is located in the Civic Building while the firehouses are strategically located across Pittsburgh.

Pittsburgh's fire stations use more energy than the median of firehouses across the country. This indicates an opportunity for Pittsburgh firehouses to learn from other cities' experiences to utilize low- or no-cost improvements to save energy.

The three firehouses with the highest site energy use are Firehouse 8, Firehouse 4, and Firehouse 24. While two firehouses have an EUI under the national median of 63 kBtu/ ft2, Firehouse 8 has a high EUI of 116 kBtu/ ft2, which is almost twice as much as the others. The energy use intensity seems independent of the size of the building, considering the variability of the EUI represented by the orange squares in Figure 14.

This information is valuable to prioritize building visits to identify where operating or system inefficiencies might be, which could be wasting energy and impacting the comfort of the occupants. We can also study the firehouses with low EUI and identify how they achieve a better score and try to replicate these features in other buildings.

High EUI are often opportunities for low-cost intervention with high financial return and improved comfort for occupants.

RESILIENCY THROUGH SOLAR PANELS + BATTERY STORAGE

As part of the resilience strategy, the replacement of the back-up generators of the fire stations by battery storage combined with the installation of solar panels is a high priority recommendation.

MEDICS

The Ambulance Division is comprised of thirteen medic units and provides prehospital emergency medical care to sick and injured residents. Eight units are located in facilities hosting a medic team while five units share their spaces with other public services, detailed in the next section. The division covers all 88 neighborhoods in the City of Pittsburgh.

The energy use and EUI varies greatly between all medic facilities. Almost all of the City's medic facilities perform better than the U.S. median.

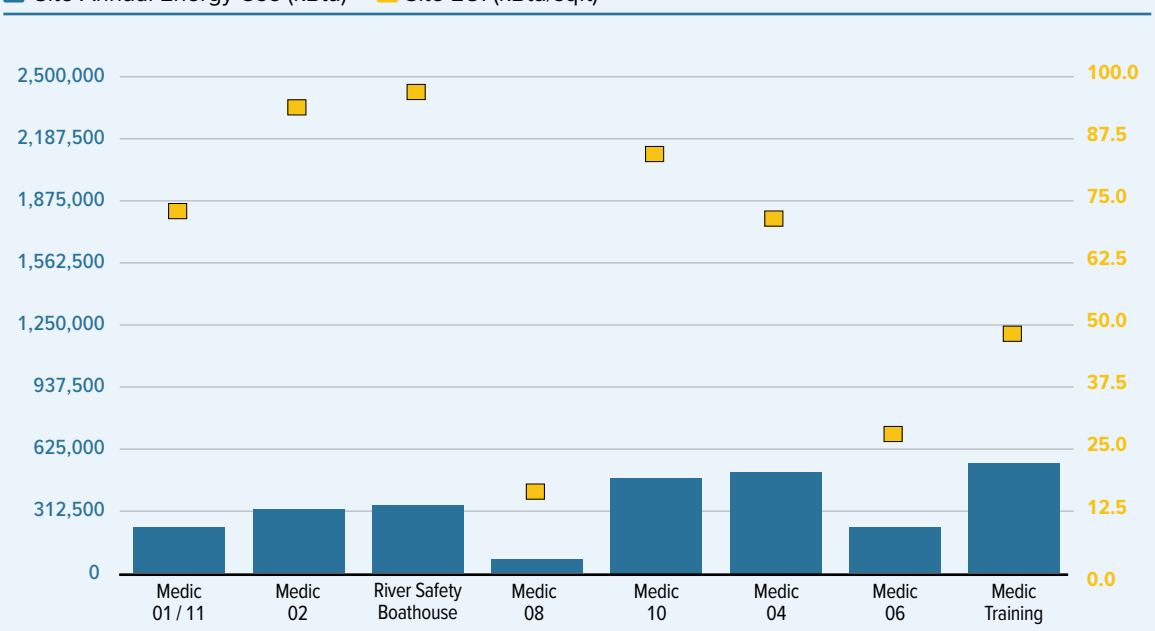
2,736,616 kBtu
Total Energy Use

2% of the portfolio energy use

7 buildings out of 8 are better than the US median

FIGURE 15

MEDICS FACILITIES SITE ENERGY USE



SMART EMS FACILITIES

Detailed analysis of the EMS energy use will be conducted by CMU through the Metro 21 initiative and provide tailored recommendations on batteries and renewable energy sources to increase the energy performance and resiliency of public safety facilities.

MULTI USE PUBLIC SAFETY FACILITIES

In eight locations, two or three public safety services are housed together.

Four medics and firehouse facilities are paired up, while the other four facilities are a unique combination of uses including, for example, a senior center house with a firehouse, which is located in the neighborhood of Oakland.

This grouping creates different energy patterns and overall usage that will warrant custom analyses and are separated in our reporting from single firehouses or police stations.

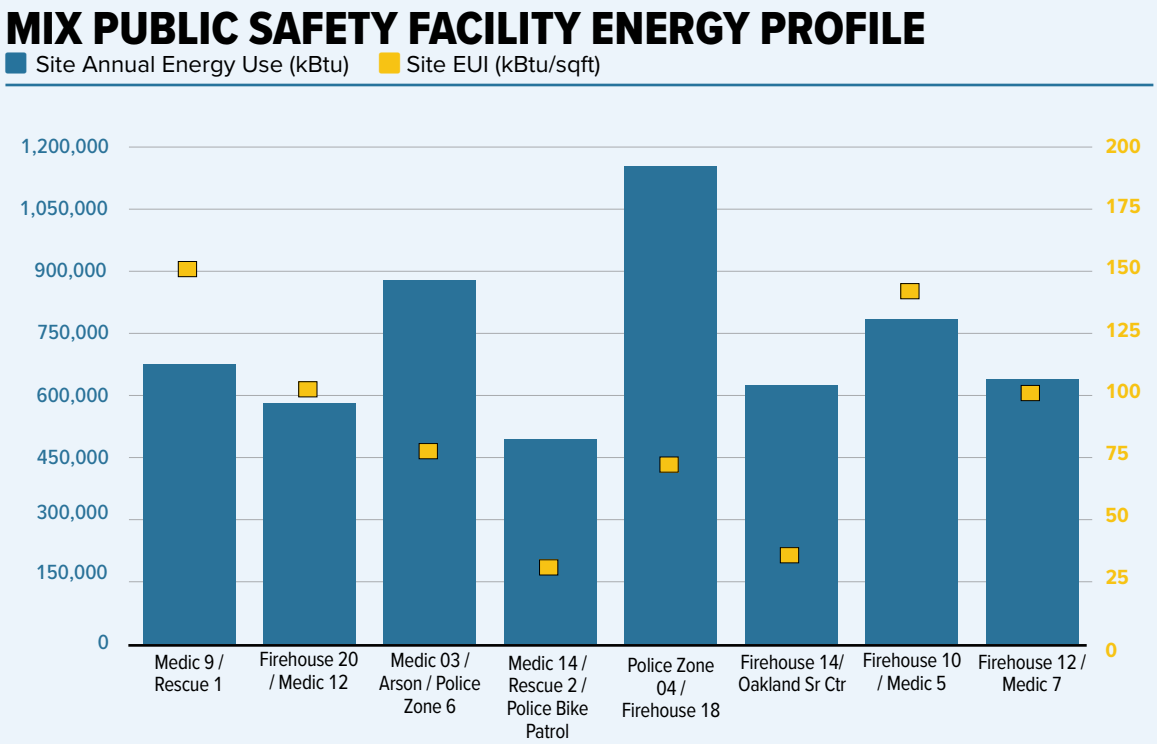
Medic 9/Rescue1 and Firehouse 10/Medic 5 have the highest EUI.

5,829,010 kBtu
Total Energy Use

4% of the portfolio energy use

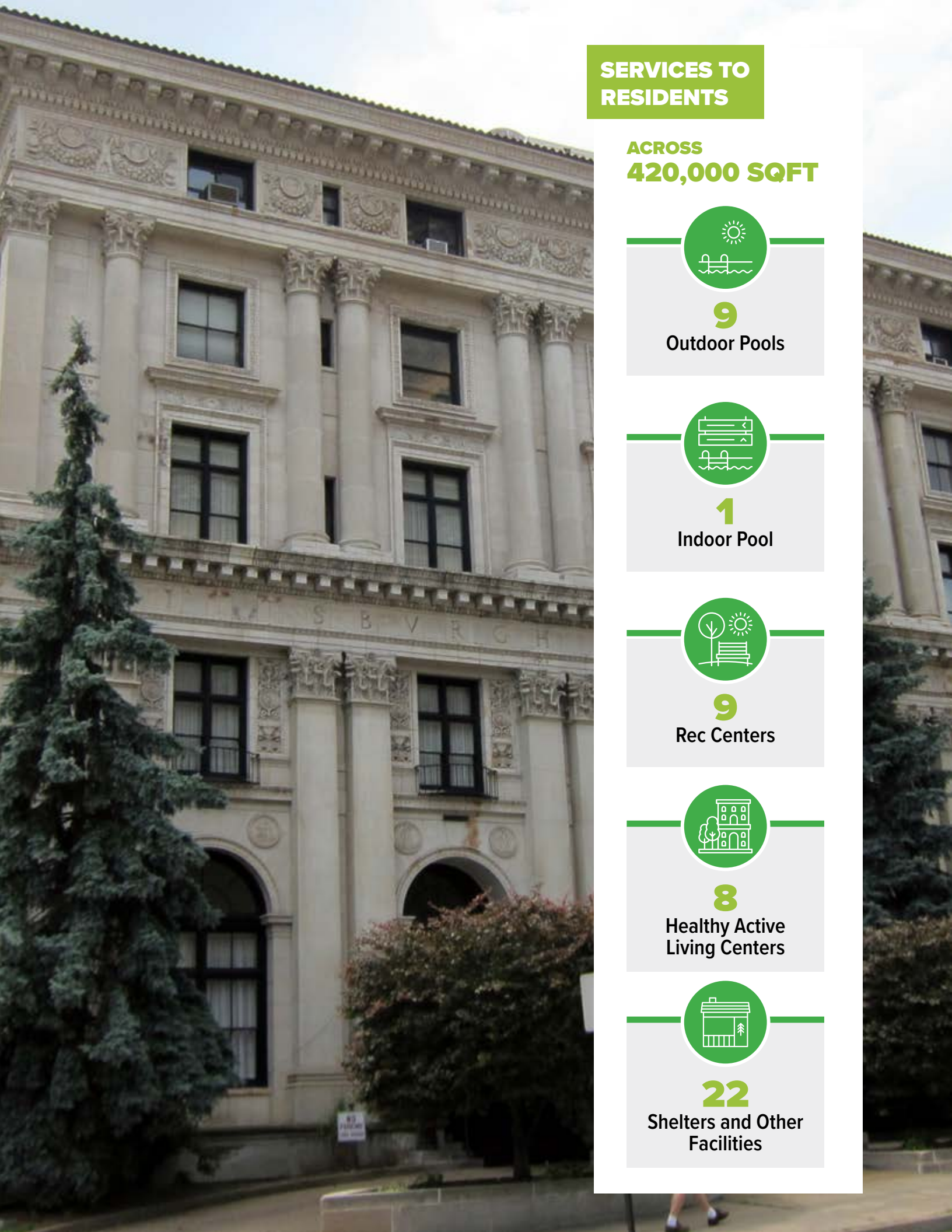
2 buildings out of 8 are better than the US median

FIGURE 16



NET-ZERO READY PUBLIC SAFETY FACILITY

Firehouse 8 is the pilote site of a 2019 charrette lead by Rocky Mountain Institute: During a one-day workshop, RMI trained staff from DPW and City Planning on existing net-zero solutions.The workshop then focused on identifying potential solutions to create a smart public safety facility that would improve safety, resilience and comfort of its occupants.



SERVICES TO RESIDENTS

ACROSS
420,000 SQFT

9
Outdoor Pools

1
Indoor Pool

9
Rec Centers

8
Healthy Active Living Centers

22
Shelters and Other Facilities

SERVICES TO RESIDENTS

Pittsburgh owns and operates many buildings such as pool and recreation centers that provide amenities to its residents to get together, stay active, and be healthy.

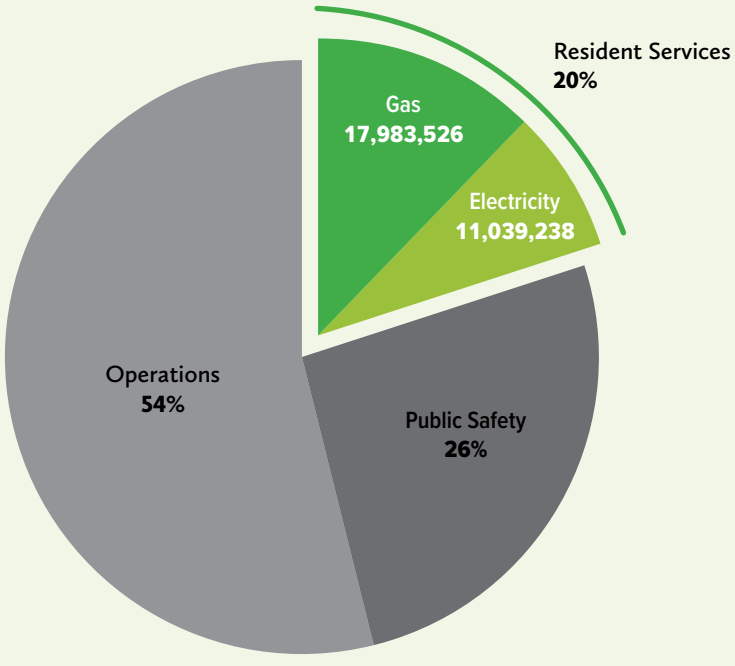
There are additional related facilities that are operated and managed by non-profits. This report only includes the facilities operated and managed by Citipark.

Facilities serving residents tend to function like residential buildings, with the bulk of energy use going toward heating, air conditioning, and lighting. Similar to many Pittsburgh residential buildings, the gas bills are much more significant than the electricity bills.

FIGURE 17

SERVICES FOR RESIDENTS ENERGY USE BY SOURCE

in kBtu



RECREATION CENTERS

Open year round, the City's Community Recreation Centers provide space for numerous indoor and outdoor sporting activities, educational programs, crafting, and leisure activities for community members. They also provide various programming for the city's youth, including afterschool programs, and Citicamps in the summer.

10,363,938 kBtu
Total Energy Use

7% of the portfolio energy use

3 buildings out of 9 are better than the US median

The most energy intensive of the recreation buildings in 2017, the Paulson Recreation Center, was previously retrofitted in 2018 with a number of energy efficiency measures.

Ammon and West Penn recreation centers are the next opportunities for energy savings among recreation centers. Both use a large amount of energy and have high EUIs. More details should be collected on their operation to identify what opportunities for energy savings are possible.

PAULSON RECREATION CENTER ENERGY EFFICIENCY RETROFIT

The recreational center recently re-opened in November 2018 after undergoing a major retrofit, including ENERGY STAR certified HVAC systems, more energy efficient windows, and a newly insulated roof.

Paulson had the highest EUI in 2017, indicating a high potential to reduce energy waste.

While not visible to the community, these energy efficiency upgrades will improve the comfort in the space and significantly reduce future energy bills.

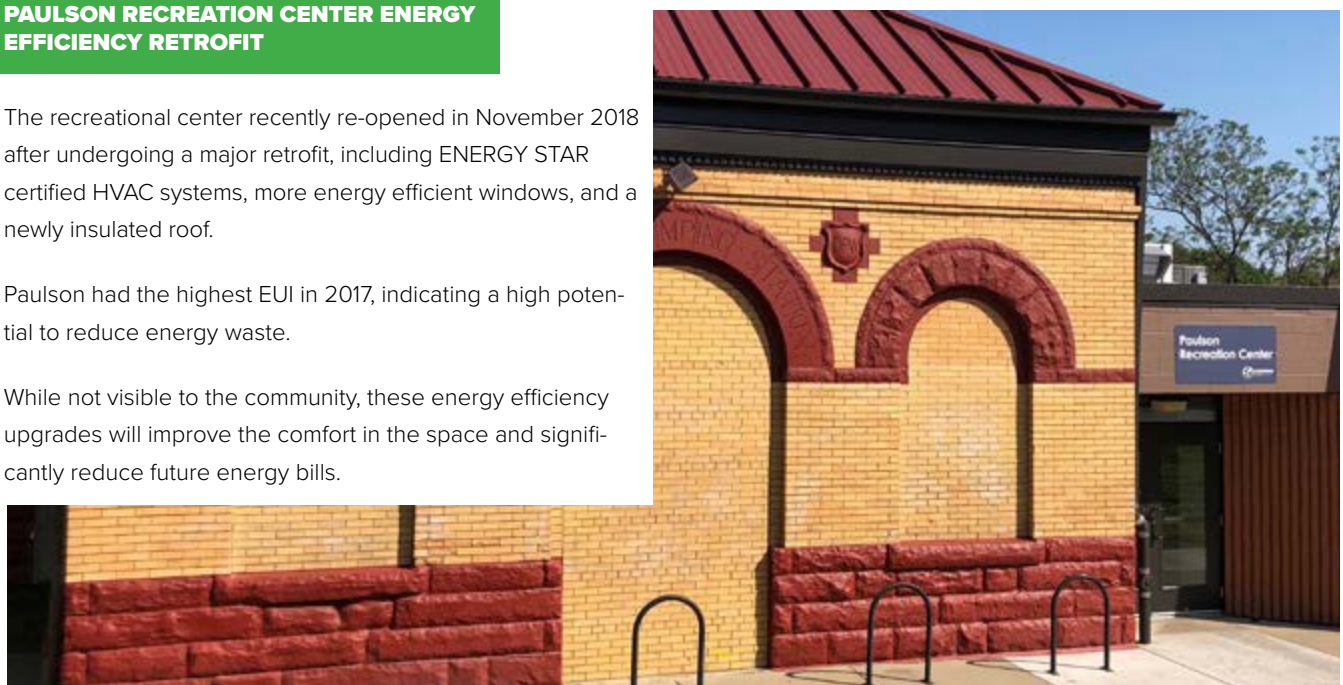
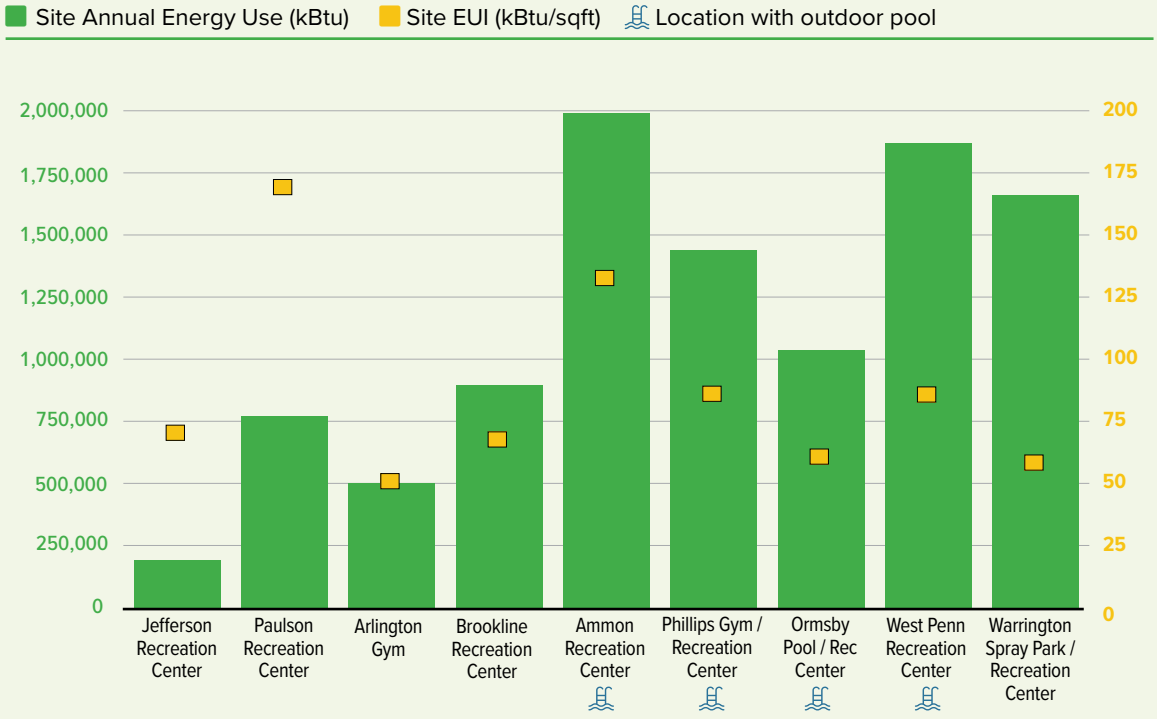


FIGURE 18

RECREATION CENTERS SITE ENERGY USE



SWIMMING POOLS

Pittsburgh currently has one indoor pool and 18 outdoor pools; four of the pools are attached to recreation centers.

7,687,416 kBtu
Total Energy Use

5% of the portfolio energy use

Swimming pools, while not buildings, require intensive energy use to operate and are an integral part of Pittsburgh's summer offering to residents. As such, they are included in this report and highlighted for future evaluation as port of a city-wide strategy to reduce overall energy use.

There is a wide range of energy use at our outdoor pools. Some of the pools are located near maintenance facilities and a portion of the energy use on-site might be used toward the maintenance activities of Citipark or the Department of Public Works. Understanding the current energy use profile at these sites can lead to an optimized energy management of the pools in the near future.

The EUI, which is the total energy use divided by the building size, is purposefully not included in this section because the pools are not located within a building, except the Oliver Bath House.

OLIVER BATH HOUSE

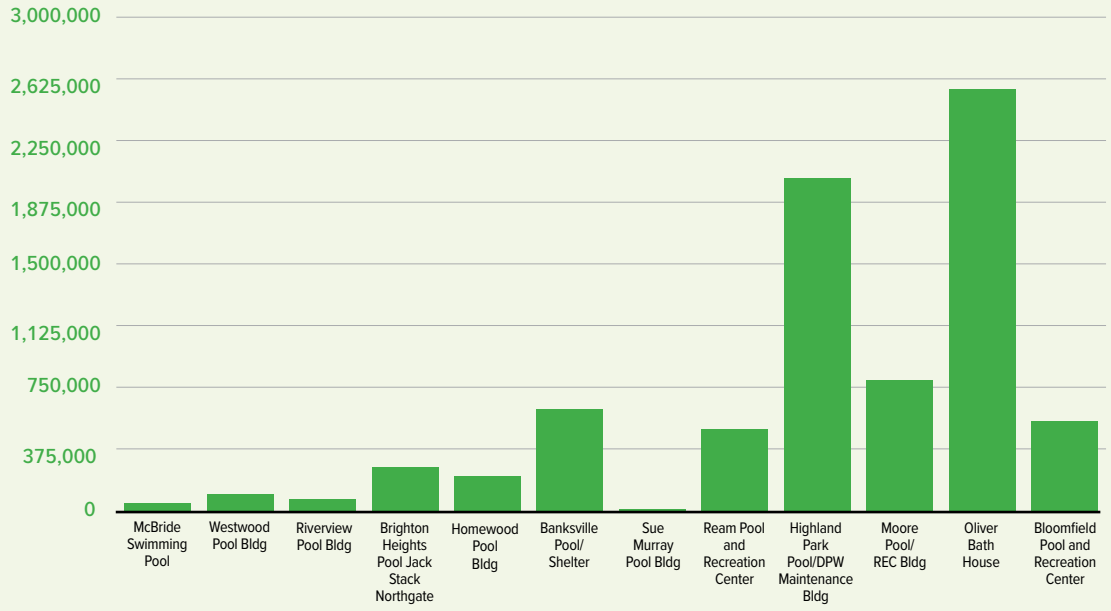
Oliver Bathhouse, a staple of the local community since 1915 currently uses 25 times the energy of the average American household- higher than any other pools or recreation center in Pittsburgh.

The City has prioritized this facility for energy improvements which will receive an architectural evaluation in 2019 to identify opportunities to improve its performance.

FIGURE 19

SWIMMING POOLS SITE ENERGY USE

Site Annual Energy Use (kBtu)



The EUI is purposefully not included in this section because the pools are not located within a building, except the Oliver Bathhouse. Additionally the size of the changing room associated with each pool varies greatly.

HEALTHY AND ACTIVE LIVING CENTERS

5,148,593 kBtu
Total Energy Use

4% of the portfolio energy use

3 buildings out of 8 are better than the US median

Citiparks Community Services operates eight Healthy Active Living Centers open year-round, Mondays through Fridays. Each center focuses on improving the lives of older Pittsburghers—physically, intellectually, socially, culturally, and financially.

Hazelwood Senior Center, Morning Side, and Southside Market House are the three centers with the highest EUI, which mean they use more energy per square foot than other centers. This can be due to having more events, aging lighting, wasteful heating systems, or other operational inefficiencies.

This benchmarking information will assist in prioritizing future investment to improve the buildings in the most need of upgrades.

GREENFIELD-MAGEE HEALTHY ACTIVE LIVING CENTER

The center was closed for the summer of 2018 for the installation of a brand-new heating and cooling/HVAC system. This upgrade will improve occupants comfort while reducing utility bills to the City.

Magee's annual energy use should be much lower following this upgrade. The annual benchmarking effort will allow us to quantify the savings realized in 2018 and beyond.

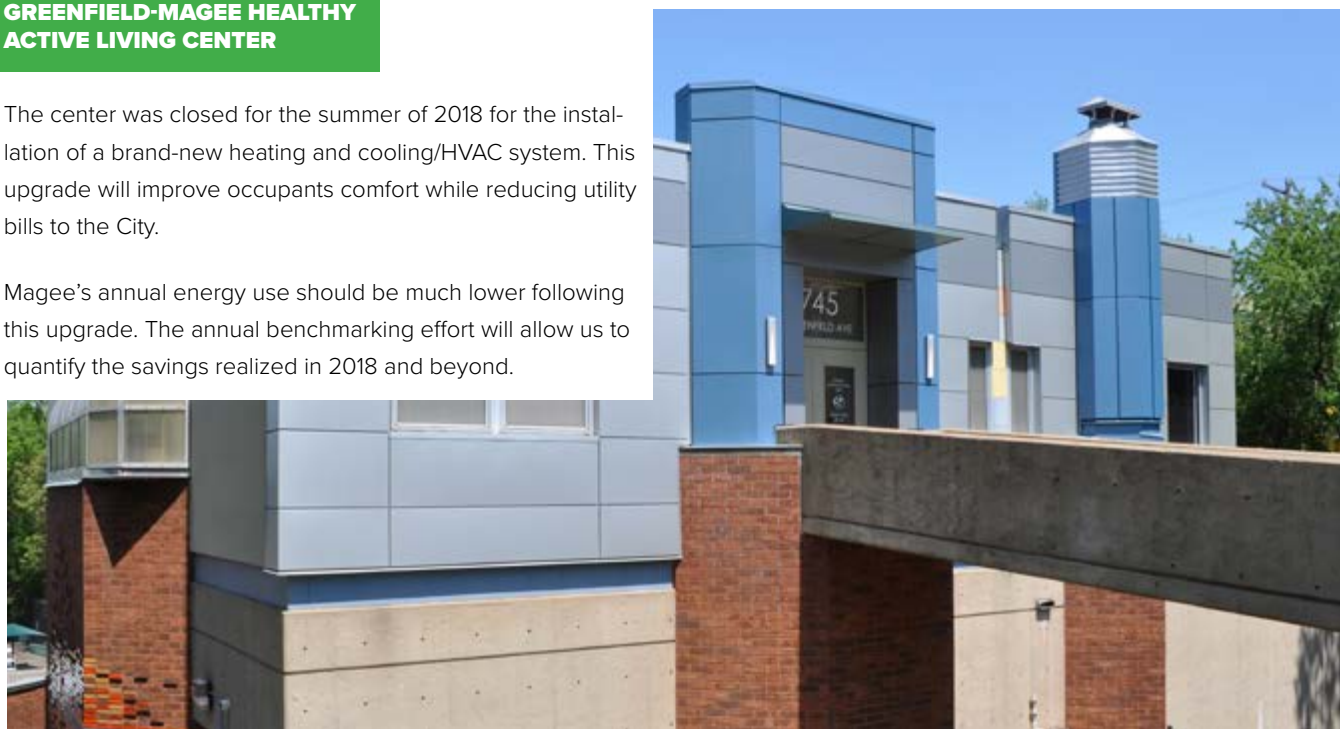
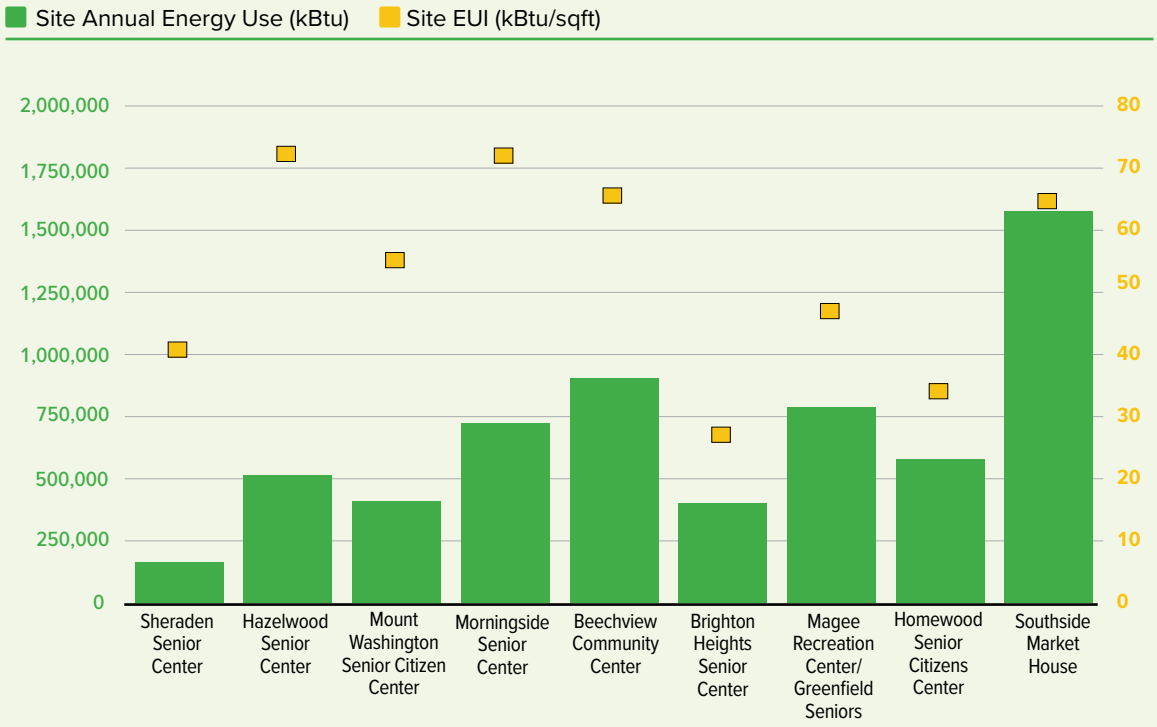


FIGURE 20

SENIOR CENTERS SITE ENERGY USE



PARK AMENITIES

In addition to the centers with regular programming, the City offers amenities such as extreme weather shelters, picnic shelters, and community centers near our parks that are used by the community for a wide variety events ranging from small birthday parties to community celebrations.

4,870,453 kBtu
Total Energy Use

3% of the portfolio energy use

14 buildings out of 22 are better than the US median

Despite this wide range of uses, park amenities only account for 3 percent of the city's energy use, making them a lower priority for the City's 2030 energy saving goals.

Once major investments have been completed elsewhere, park amenities may provide opportunities for unique energy savings and energy generation.

SOLAR PICNIC SHELTERS

Shelters can easily be transformed into net positive structure by strategically installing solar panels.

Seattle, WA installed 3 solar shelters in 2012 and Mansfield, OH is considering one in the current master plan of Sterkel Park, providing some models for Pittsburgh to follow in public parks or swimming pools.

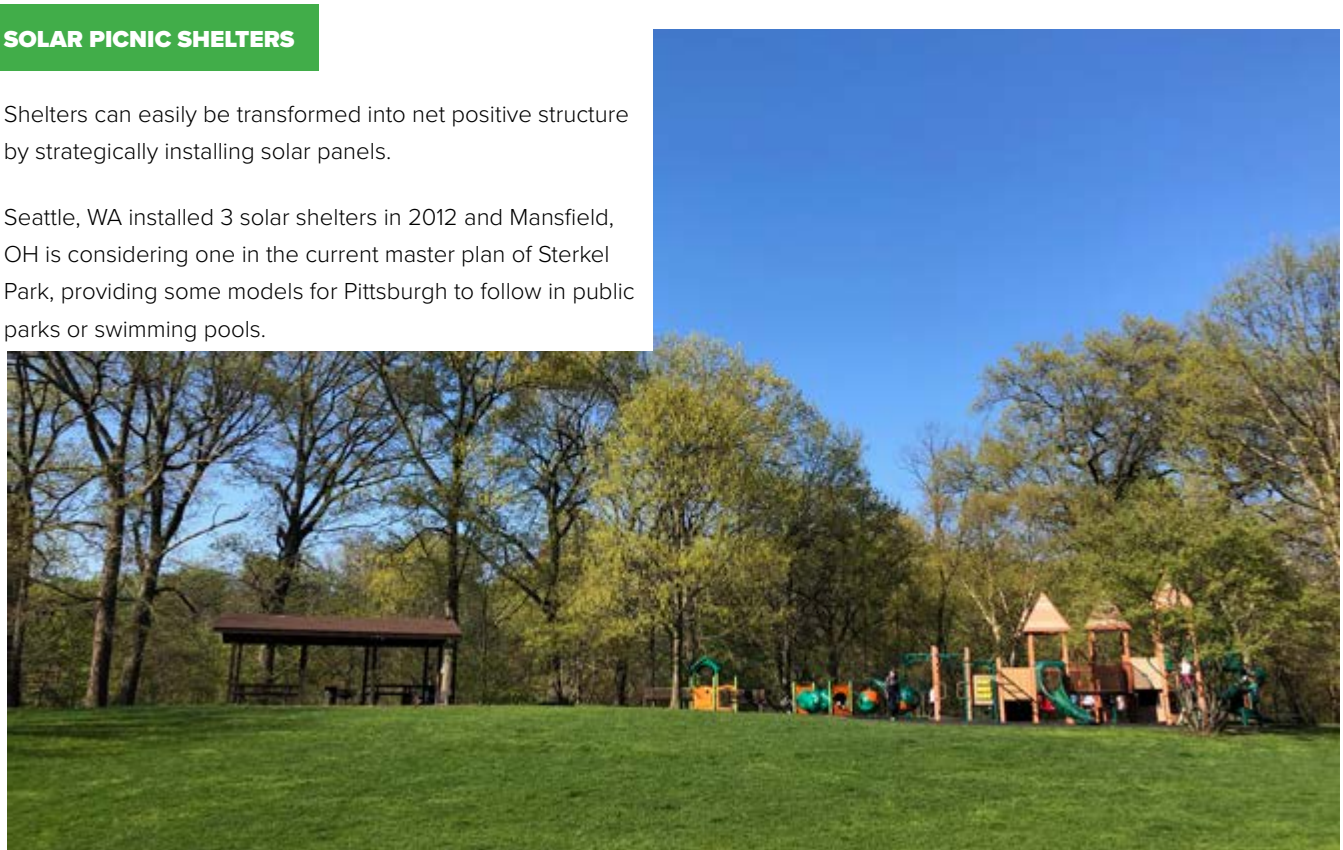
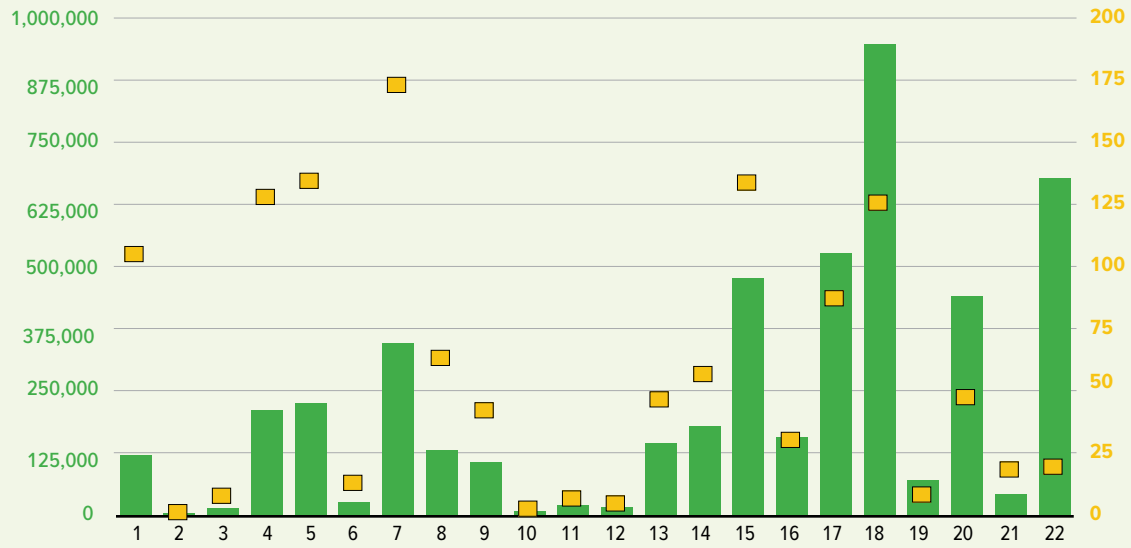


FIGURE 21

PARK AMENITIES SITE ENERGY USE

Site Annual Energy Use (kBtu) Site EUI (kBtu/sqft)



1 Herschel Concession Stand
2 Hazelwood Community Bldg. (Hazelwood Initiative)
3 Riverview Park Valley Refuge Picnic Shelter
4 Schenley cafe/ Visitors Center
5 Arsenal Park Building
6 Kennard Recreation Center
7 Mount Washington Shelter House
8 Dunbar Fieldhouse /Apartment
9 Herschel Fieldhouse
10 Westinghouse Park Recreation Center
11 Highland Park Farmhouse
12 Highland Park Rhododendron Shelter
13 Riverview Park Chapel
14 Sheraden Apartment And Service Building
15 West End Overlook Building
16 Olympia Park Recreation Center
17 Overbrook Senior Center
18 McKinley Park Rec/Senior Center
19 Riverview Park Activities Building
20 Overbrook Community/Accamando Center (Old 25 Firehouse)
21 Morningside Fieldhouse (data here is from senior Center)
22 Allegheny Reg. Library/NorthSide Seniors/Hazlett Theater

CONCLUSION

The goal of this first benchmarking report is for the City of Pittsburgh is to share its energy consumption and set an example of transparency in building energy use. This baseline data is critical to shaping future efforts to systematically retrofit all of the City's facilities.

Additionally, this report creates public awareness about the retrofits already implemented as well as accountability to address buildings with high energy efficiency needs such as the City-County Building.

Continued annual benchmarking will create an improved understanding of the public building stock. While various City Departments focus on specific aspects of buildings such as paying the utility bills, scheduling maintenance and repairs, or managing usage of the space, by going through a benchmarking process the City generates additional communication between these departments to streamline data sharing and optimize the management of these facilities.

This interdepartmental collaboration will facilitate the prioritization of improvement projects to strategically meet the City's 2030 goals.

The initial findings of this analysis reveal that the City's portfolio underperforms compared to similar facilities in the U.S. Therefore, there are many opportunities for energy efficiency retrofits across all buildings to reduce the City's building energy use and halve all of Pittsburgh's energy use by 2030.

RECOMMENDATIONS

- **Monitoring the City-County Building and deploying a strategy to reduce energy usage while improving the indoor environment will have significant impact on the utility budget.** The S&R division is working toward implementing the Energy Intelligence Network with this objective.

- **Benchmarking yearly progress to quantify savings** and continue to prioritize energy investments based on up-to-date information. Benchmarking gives the most insights when conducted regularly over several years.

- **Developing a portfolio level strategy to meet 2030 goals will lead the city to be strategic about its current investmen**t, while generating savings in future years and meeting its commitment toward the Paris Agreement. The Rocky Mountain Institute is collaborating with the S&R division to develop pilot sites to set the foundation of a zero-over-time strategy resulting in a carbon neutral portfolio.

- **Changing the procurement policy** for lighting to streamlined replacement of broken light bulbs with LED lighting will result in immediate cost savings.

- **Packaging lighting retrofits with larger HVAC investments will reduce the ROI payback** and can be financed with the Guaranteed Energy Savings Act (GESA) to minimize risks. This Commonwealth Act is a vehicle to decrease growing utility costs that is available to local governments across Pennsylvania.

- **Budgeting large HVAC maintenance expenses in the operating budget will allow for a faster response from the Department of Public Works to replace aging systems**, including large boilers and heating systems. This will result in faster delivery of safer and more comfortable environments across our municipal facilities.


UPMC
BNY MELLON


pittsburgh
city planning
Sustainability and Resilience Division