# 2022 Summary Benchmarking Report

#### Background

In June 2018, City Council unanimously passed the Sustainable and Resilient Charlotte by 2050 resolution which, amongst other items, calls for the City of Charlotte to strive to fuel the city's fleet and buildings by 100% zero-carbon sources by 2030. Since, the City Council has approved the Strategic Energy Action Plan (SEAP) and Sustainable Facilities Policy (SFP) to provide a framework for achieving the Sustainable and Resilient Charlotte by 2050 resolution's ambitious goals. In particular, the SFP directs city departments to design, construct and operate city buildings in a manner aligned with the 2030 SEAP goals. A major focus of this policy is on energy usage in existing buildings and includes a requirement to benchmark and disclose building energy performance. In 2022, the city published its first building energy performance benchmarking report.

## **Energy Benchmarking Basics**

At its core, energy performance benchmarking is the process of tracking and analyzing a building's energy use and comparing the results to buildings of the same type.

This is done using an efficiency metric called energy use intensity, or EUI, which is calculated by dividing the energy use over a 12-month period (in kBtu) by the building's square footage. The smaller the EUI, the less energy a building uses per square foot, and thus the more efficiently it is operated.

Building energy performance benchmarking provides property owners with data that can be used to inform energy efficiency investments. In fact, a study by the EPA found that consistently benchmarked buildings achieved an annual average energy savings of 2.4%.

## **Updates to This Year's Report**

As programs mature, it is important that lessons learned lead to refinements that improve the overall efficacy of the program. Refinements have been made in this year's building energy performance benchmarking reporting. Moving forward, annual benchmarking reports will highlight mainly portfolio-wide and building category trends, in conjunction with a move to a data dashboard. The reporting period has also been adjusted from fiscal year (July 1 to June 30) to calendar year, with calendar year 2022 being set as the baseline year for comparisons in order to align the internal benchmarking with a new city benchmarking initiative, Power Down the Crown. Power Down the Crown is an exciting new voluntary building energy performance benchmarking initiative that invites building owners in the City of Charlotte to publicly display their building energy performance and challenges them

to contribute toward increasing the efficiency of the Power Down the Crown portfolio by 10% by 2030. Calendar year 2022 is also the first full year that all facilities have returned to full operation since the start of COVID-19, so it is an appropriate year to set as a baseline from which to measure progress. Additionally, six new facilities were added to the report this year – two Charlotte Area Transit System facilities, three police stations and a fire station.

Finally, the intent of the benchmarking program is to track building energy performance leading toward increasing energy use efficiency. This result is accomplished by benchmarking against past performance to ensure continual improvement. To measure this, the benchmarking summary report will focus on EUI as the primary performance indicator.

## Introducing the Sustainability Dashboard

In an effort to inspire the community to take similar actions and to increase access to data related to the city's benchmarking program, the city has launched a sustainability data dashboard, a link to which can be found on the <u>Sustainability website</u>. The dashboard displays the benchmarking data for the city's facilities. Specifically, the dashboard provides the ability to review EUI and greenhouse gas (GHG) emission data<sup>1</sup> for all the city's benchmarked facilities starting with calendar year 2022 data.



<sup>1</sup>The GHG emissions are calculated by adding the local grid per kWh emission factor as provided by Duke Energy and the Energy Star Portfolio Manager calculated emissions for natural gas use.

#### **2022 Benchmarking Data**

The benchmarking story this year is that of many successes. When comparing the 2021 EUI data to 2022, 54 of the facilities that were benchmarked last year, which is a majority of them, demonstrated a decrease in EUI. Seventeen of those buildings decreased their EUI by over 10%. In fact, the overall EUI of the facilities benchmarked last year decreased by 3% from 2021 to 2022.

A total of 96 properties were benchmarked this year. The following tables provide a breakdown of the number of buildings and the square footage of buildings by building type.



**CITY** of CHARLOTTE

Number of Benchmarked Properties by Type

As depicted in the chart below, nearly all building types increased how efficiently they used energy. Accounting for all newly benchmarked facilities, the entire portfolio did increase its EUI from 58.52 kBtu/ft2 to 76.69 kBtu/ft2. As anticipated in last year's benchmarking report, this is largely due to an influx of occupancy at public-facing visitor-focused facilities (e.g., arenas, etc.) as operations returned to normal for the first year since COVID-19. However, when looking at our core municipal facilities, we saw a decrease in EUI from 58.52 kBtu/ft2 to 56.12 kBtu/ft2.





#### **A Deep Dive of Fire Stations**

Of particular note was the performance of the fire stations, which had 34 of 41 stations reduce their EUI with the EUI for all of the fire stations that were benchmarked last year decreasing by 5.5%. This was accomplished through a variety of measures throughout the facilities that, in part, included control system replacements and installations, control system programming updates, HVAC and water heater replacements, and bay heating systems updates. The table below depicts the year-over-year changes at the fire stations.

![](_page_4_Figure_2.jpeg)

Fire Station #2 Fire Station #3 Fire Station #4 Fire Station #5 Fire Station #6 Fire Station #7 Fire Station #8 Fire Station #9 Fire Station #10 Fire Station #11 Fire Station #12 Fire Station #13 Fire Station #14 Fire Station #15 Fire Station #16 Fire Station #17 Fire Station #18 Fire Station #19 Fire Station #20 Fire Station #21 Fire Station #22 Fire Station #23 Fire Station #24 Fire Station #25 Fire Station #26 Fire Station #27 Fire Station #28 Fire Station #29 Fire Station #30 Fire Station #31 Fire Station #32 Fire Station #33 Fire Station #34 Fire Station #35 Fire Station #36 Fire Station #37 Fire Station #38 Fire Station #39 Fire Station #40

2021 2022

Table 4: Comparison of Fire Station EUI

![](_page_5_Picture_0.jpeg)

# Facility Highlights – Examples of Energy Efficiency Work in Action

In February 2020, the Eastway Division Station had one of CMPD's highest EUI's (148.8 kBtu/ft2). To address the inefficiencies in the facility, the city engaged an engineering consultant to design a three-phased project that consisted of replacing the building automation system (BAS) controllers (phase 1), significantly reducing outside air (phase 2), and reducing the minimum airflow of all variable air volume (VAV) zones throughout the facility (phase

3). With phases 1 and 2 of the project completed by the end of 2020 and the final phase of the project completed in early 2021, these improvements led the EUI to decrease to 89.5 kBtu/ft2, a 39.9% reduction, at the end of 2021. After additional improvements were made toward the end of 2021 to reduce the amount of time hot water was required to reheat areas of the facility, the EUI fell even further to 75.4 kBtu/ft2, a 49.3% reduction from the February 2020 EUI.

![](_page_6_Picture_0.jpeg)

In 2021, several projects were undertaken at fire headquarters to address the heating and cooling efficiency of the facility. While reviewing the building's occupancy and temperature settings, facility operations staff noted that parts of the building were scheduled as occupied outside of the normal operation of the facility and that the temperature setpoints were outside of those provided for in the city's SFP. Facility operations staff reviewed the occupancy schedules with Charlotte Fire Department staff to determine appropriate occupancy schedules for the spaces throughout the building and, to ensure the schedules reflected normal operations, an override was provided for when areas were occupied outside of the normal schedule. Temperature setpoints were then adjusted to within the ranges of the SFP. Finally, a reset of the supply air programing was done to ensure that the HVAC was not running harder than necessary to reach the setpoints. These projects led to fire headquarters increasing how efficiently energy was used in 2022, resulting in an EUI of 79.2 kBtu/ft2, a 14.8% reduction from 2021.

#### Key Takeaways

![](_page_7_Picture_1.jpeg)

The number of facilities benchmarked has increased to 96, bringing the total square footage of benchmarked facilities to 6,554,808 ft<sup>2</sup>.

![](_page_7_Picture_3.jpeg)

59% of buildings benchmarked last year improved their energy performance.

83% of fire stations performed better in 2022 compared to 2021.

![](_page_7_Picture_6.jpeg)

Strategic investments in city facilities, such as building automation controls and equipment replacements coupled with informed building operations, are resulting in buildings operating at higher efficiencies.

![](_page_7_Picture_8.jpeg)

As facility uses and needs change over time, they present opportunities for efficiency-focused adjustments and improvements to reduce associated energy usage.

![](_page_7_Picture_10.jpeg)

A deeper look at the CMPD facilities will yield projects that lead to increased efficiency.

## Conclusion

Charlotte is making progress toward its 2030 goal of striving to fuel its municipal buildings from zero-carbon sources. Because buildings represent a significant amount of the city's municipal carbon footprint, there will continue to be opportunities to make strategic investments in both energy efficiency and renewable energy for buildings to advance carbon reduction goals. The benchmarking work enabled through the Sustainable Facilities Policy and subsequent actions taken for the lower energy performing buildings will continue to support yearly progress. Specifically, benchmarking is a critical input in the roadmap for energy efficiency work and optimizing future energy efficiency and renewable energy investments.

This report and data dashboard confirm that there are important energy conservation opportunities that remain within municipal buildings, and the city's strategy toward its decarbonization goals should continue to include energy efficiency in buildings.

The city is pleased to benchmark its buildings for the second year and, at the same time, launch an opportunity for building owners in Charlotte to join in regularly benchmarking and publicly sharing results through the Power Down the Crown program. These actions will propel the community toward becoming a low-carbon city by 2050.