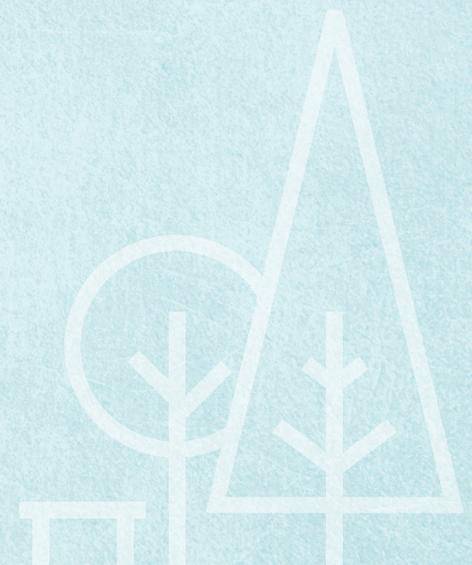


BOULDER BUILDING PERFORMANCE PROGRAM

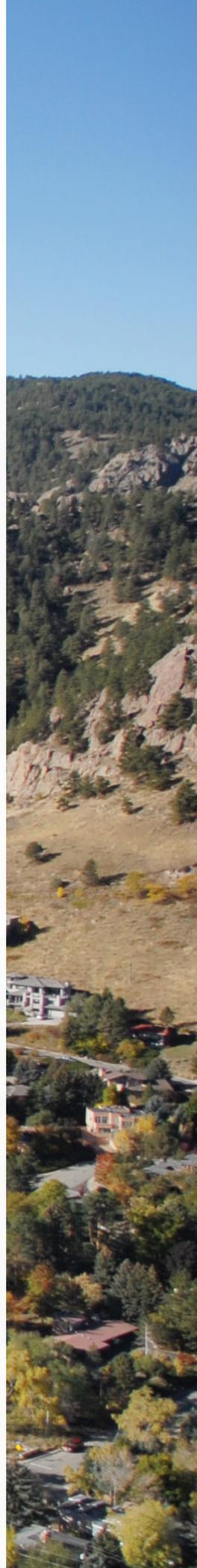
2017/2018 Report Update





CONTENTS

I.	Executive Summary	2
II.	Introduction	3
III.	Building Performance Ordinance	4
	What's New in 2018	5
IV.	2018 Rating & Reporting Results	7
	Building Characteristics	8
	Energy Performance	9
	Emissions Performance	12
	How Boulder Compare?.....	14
V.	Next Steps	18



I. EXECUTIVE SUMMARY

2018 RATING & REPORTING HIGHLIGHTS

Compliance



representing nearly 29 million square feet (sf) were subject to the Building Performance Ordinance in 2018.



These buildings represent 62 percent of all commercial and industrial sf in the City of Boulder.



The program achieved 99 percent compliance in 2018.

Energy & Emissions

295 building energy reports

After exemptions and data cleaning, as well as the removal of large industrial campuses,¹ analysis was conducted on 295 building energy reports, representing 19 million sf.



78 Median Site EUI (kBTU/sf)

71 Median ENERGY STAR® score

The median energy use intensity (EUI) of 78 kBTU/sf-year and the median ENERGY STAR® score of 71 indicate Boulder's C&I sector has improved its energy use since 2016.



36% of Commercial and Industrial (C&I) Emissions

The total emissions reported by the 295 buildings represent 36 percent of the C&I emissions footprint based on the 2017 community greenhouse gas inventory.



3% reduction in energy use

Consistently reporting buildings have reduced overall site energy use by 1 percent over 3 years of rating and reporting and 3 percent over the past year.



¹ Large industrial campuses were not included in data analysis due to their custom rating and reporting requirements.

II. INTRODUCTION

Boulder has long understood the importance of local climate action. Boulder's residents and businesses were among the first in the country to implement programs like the [Climate Action Plan Tax](#) (CAP Tax) and a host of other [energy efficiency and conservation programs](#). In support of these community energy and climate priorities, the Boulder City Council adopted the [Boulder Building Performance Ordinance](#) (BPO) in October 2015.² These commercial and industrial (C&I) building rating and reporting and energy efficiency requirements move beyond the current voluntary programs to require actions that reduce energy use and improve the quality of Boulder's building stock.

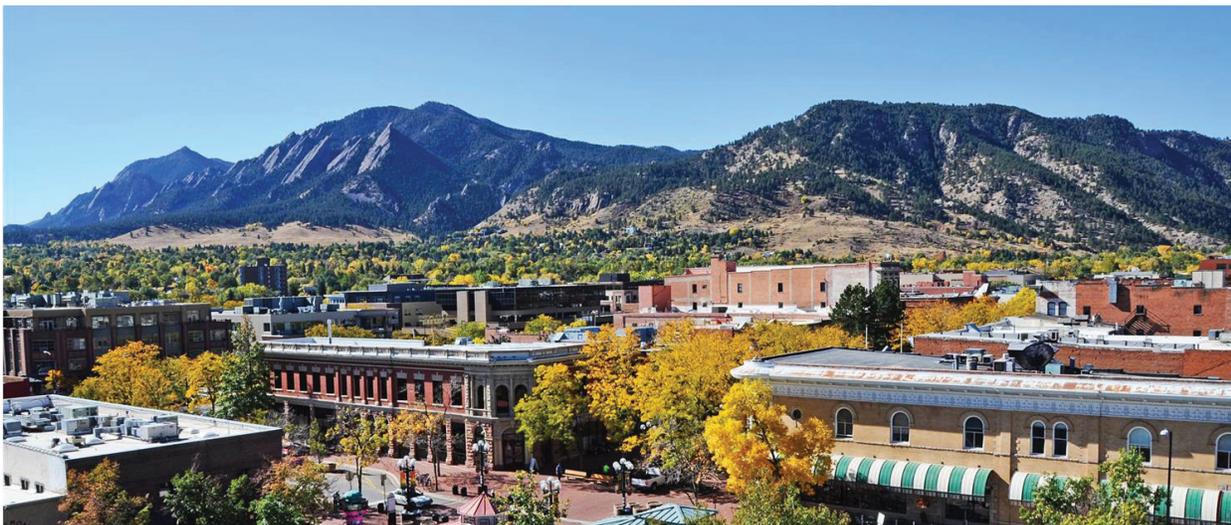
Energy consumption from the C&I sector accounts for over 50 percent of the City of Boulder's [greenhouse gas \(GHG\) emissions footprint](#). The ordinance was adopted with the objectives of increasing awareness of building energy performance, realizing cost effective energy savings, informing design of future programs and driving market transformation. Further, the ordinance is a key initiative toward achieving the City of Boulder's [Climate Commitment](#) goal of an 80 percent reduction in community GHG emissions by 2050, which was adopted by City Council in Dec. 2016.

C&I BUILDING
ENERGY USE
ACCOUNTED FOR

55%

OF BOULDER'S
TOTAL GREENHOUSE
GAS EMISSIONS
IN 2018.

Learn more about the city's climate commitment goals: BoulderClimate.com
Track progress on key city goals: bouldercolorado.gov/boulder-measures



² Prior to the adoption of the Building Performance Ordinance, city staff conducted substantial outreach efforts including stakeholder engagement and working groups within the community. Please see bouldercolorado.gov/lead/boulder-building-performance-background for more information.

III. BUILDING PERFORMANCE ORDINANCE

The Boulder Building Performance Ordinance affects privately-owned C&I buildings 20,000 square feet (sf) and larger, newly constructed³ C&I buildings 10,000 sf and larger and city-owned buildings 5,000 sf and larger.

The ordinance requires affected building owners to carry out the following actions:

1. Annually rate and report (R&R) whole-building energy use, which will be publicly disclosed after a grace period;
2. Perform energy assessments (EA) every 10 years;
3. Perform retrocommissioning (RCx) every 10 years and implement cost effective RCx measures within two years of the study; and
4. Perform one-time lighting upgrades.

Large industrial or manufacturing campuses where multiple buildings are served by a central plant or single utility meter are also subject to the Building Performance Ordinance. However, due to their unique nature, these campuses are subject to custom requirements.⁴

Boulder is one of 25 cities in the country to adopt such a policy.⁵ Though many of the elements of Boulder's policy are similar to those implemented by other cities, Boulder's policy is one of a select few that moves beyond building energy performance awareness and requires efficiency actions to achieve building performance improvement.

Ordinance Objectives

- Saving money on utility bills through cost-effective efficiency measures;
- Helping building owners understand and manage their building's energy use;
- Educating tenants and real estate professionals about building energy performance;
- Informing future energy programs and services for the C&I sector;
- Reducing GHG emissions; and
- Improving the quality of Boulder's C&I building stock.

³Any commercial or industrial building for which an initial building permit was issued on or after Jan. 31, 2014.

⁴For more information on these custom requirements see bouldercolorado.gov/sustainability/boulder-building-performance-large-industrial-campus

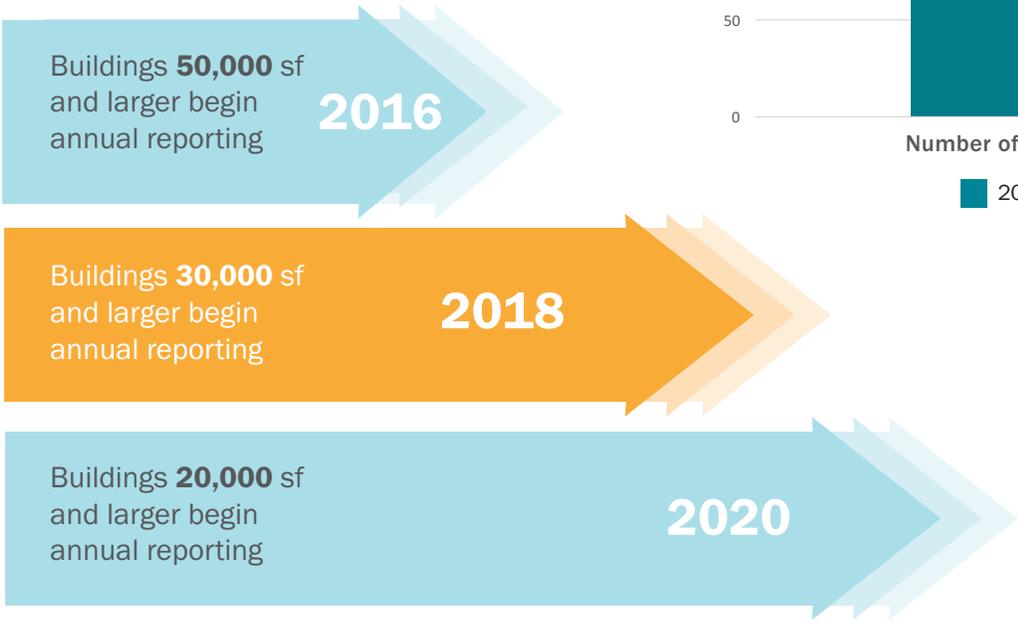
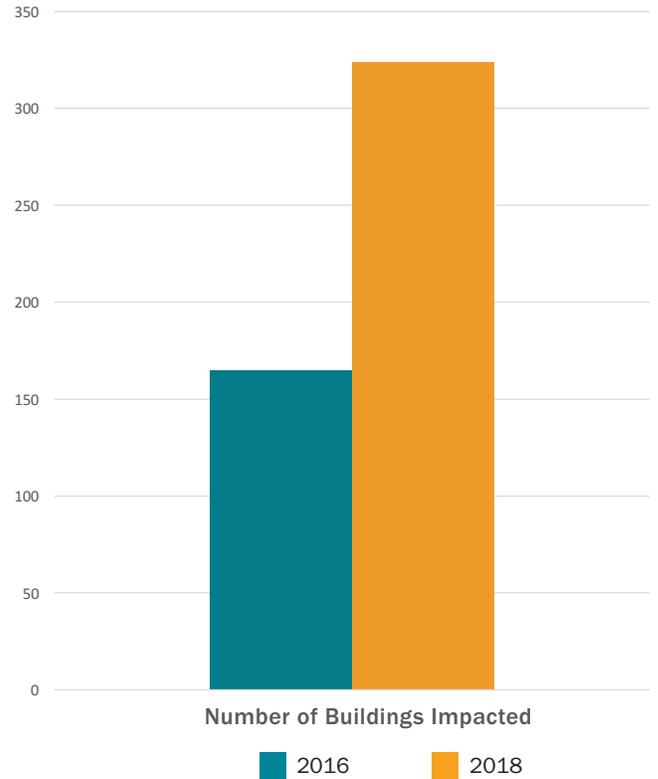
⁵As of Nov. 2018; reported by www.buildingrating.org

For more information on the background of the Building Performance Ordinance or the program resources, requirements and timelines, please see www.BoulderBuildingPerformance.com.

What's New in 2018

Additional Buildings Triggered

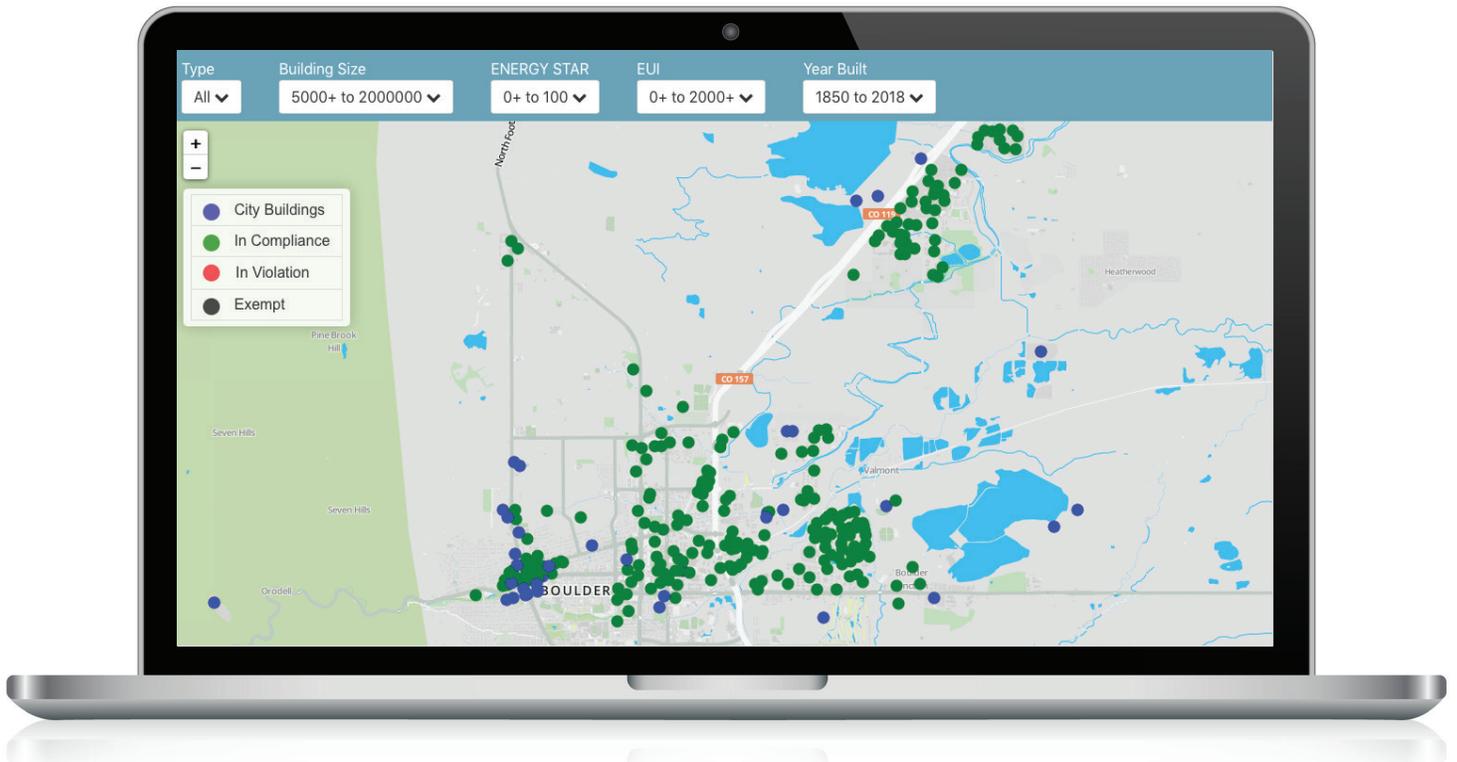
The 2018 reporting year was the second phase for annual rating and reporting. While the previous two years required the largest buildings to report energy use, in 2018, buildings 30,000 sf and larger were required to begin annual rating and reporting. This next phase resulted in an additional 159 buildings reporting annual energy use to the city, representing over 12 million sf.



Helpdesk Launched

A full-time helpdesk was launched in 2018 to assist building owners with using Portfolio Manager, connecting with the utility's automatic data upload and applying for exemptions or deadline extensions. Nearly 500 individual correspondences were tracked in this new system in 2018.

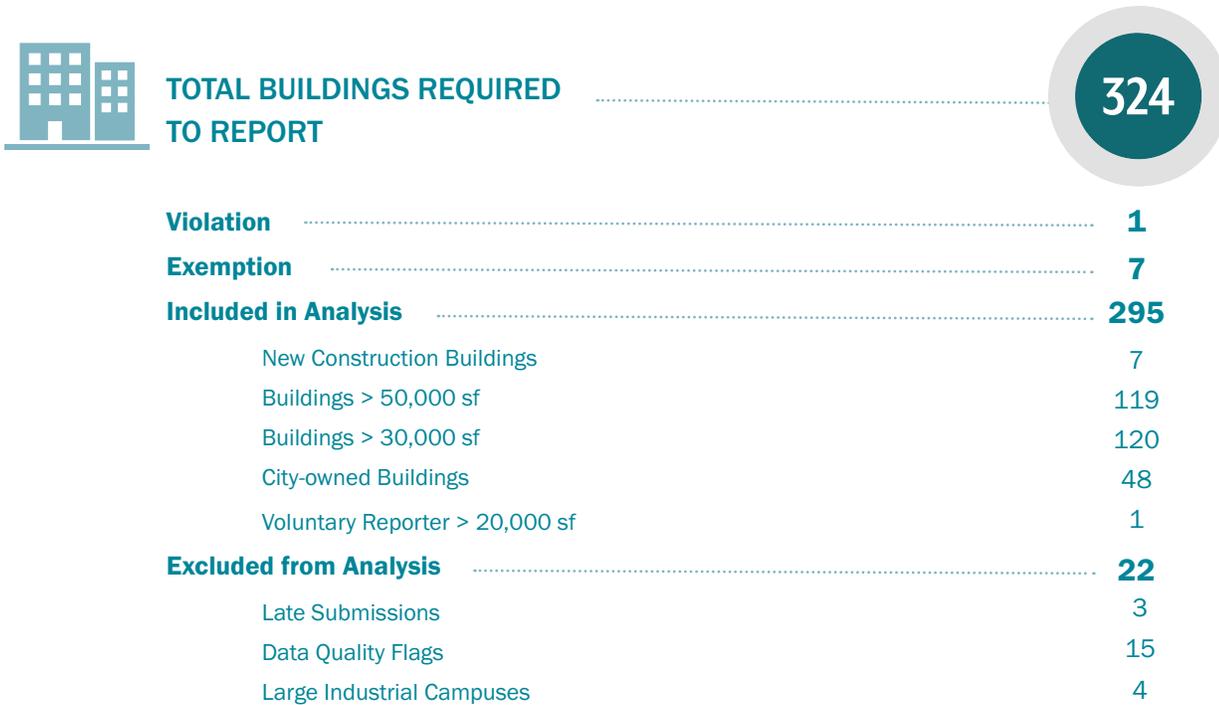
Along with launching the helpdesk, the city implemented a new data management system in 2018. This system better tracks ownership and compliance, as well as conducts quality control on submitted energy use and issues a report card to individual building owners. This system also feeds the [Building Performance Map](#), where energy data will be publicly disclosed beginning 2019.



IV. 2018 RATING AND REPORTING RESULTS

By June 1, 2018, 324 buildings were required to rate and report energy use to the city, representing 62 percent of all C&I sf in the City of Boulder. Nine percent of these 324 buildings required to report were excluded from analysis for various reasons, including exemptions, data quality issues and late submissions. The following analysis represents energy reports from 295 buildings, including one voluntary submission, or about 19 million sf. See Figure 1 for more information on the compliance breakout of buildings reporting in 2018.

FIGURE 1. 2018 COMPLIANCE BREAKOUT



Building Characteristics

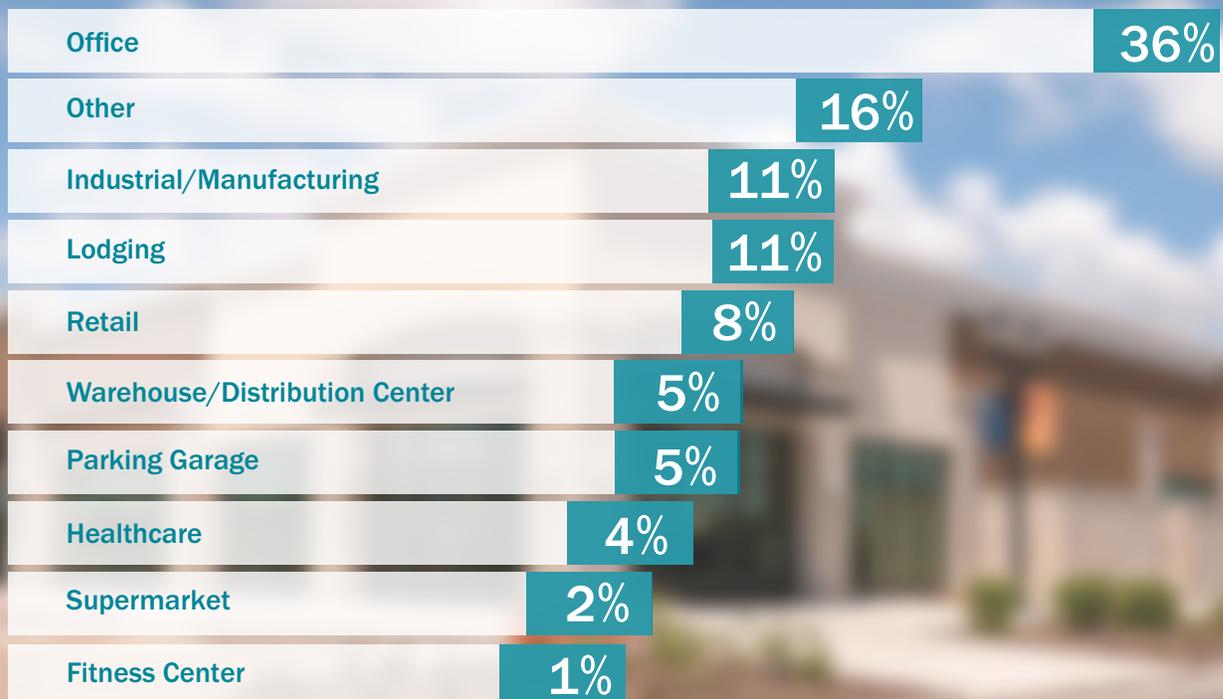
NUMBER OF BUILDINGS IN ANALYSIS INCREASED:



While additional buildings were added to the program in the 2018 reporting year, most sectors remained steady in the number of buildings reporting energy use. Office saw the largest increase in the number of buildings, from 39 buildings in 2016 to 123 in 2018.

As shown in Figure 2, buildings with a primary space use of office remained the largest reporting sector in 2018 at 36 percent. The Other category includes libraries, fire stations, automobile dealerships, and other space types with fewer buildings.

FIGURE 2. SQUARE FOOTAGE BREAKOUT OF BUILDINGS IN ANALYSIS





WHAT IS AN EUI?

Energy use intensity (EUI) is the annual energy used in a building as a function of square footage. This metric is expressed in thousand British therman units (kBtu) per square foot of gross floor area.

Energy Performance

BOULDER'S MEDIAN EUI⁶ DECREASED:

2016: 83 kBtu/sf-yr

2018: 78 kBtu/sf-yr

OVERALL, THE CITY OF BOULDER SAW A 6% DECREASE IN THE MEDIAN EUI FROM 2016 TO 2018.

A low EUI generally signifies good energy performance in a building. However, certain property types, such as manufacturing or data centers, are energy intensive in their processes and will always have higher EUIs. Therefore, it is important when comparing EUIs to do so after normalizing by building type and by climate. Fortunately, the standard reporting tool, Portfolio Manager⁷, normalizes this data automatically to provide a more accurate comparison.

Table 1 shows the 2018 reporting results by building phase. The subset of buildings that began reporting in 2018 (buildings 30,000 sf and larger) saw similar, yet slightly less efficient, metrics to the larger buildings that have been reporting since 2016. While city-owned buildings have a lower average EUI than privately-owned C&I buildings, they are also performing less efficiently when looking at the average ENERGY STAR[®] score. New construction buildings are far surpassing all other reporting buildings in both average EUI and average ENERGY STAR[®] score. This high performance is to be expected given the stringency of [Boulder's Energy Conservation Code](#).

Table 1. 2018 Reporting Results by Building Phase

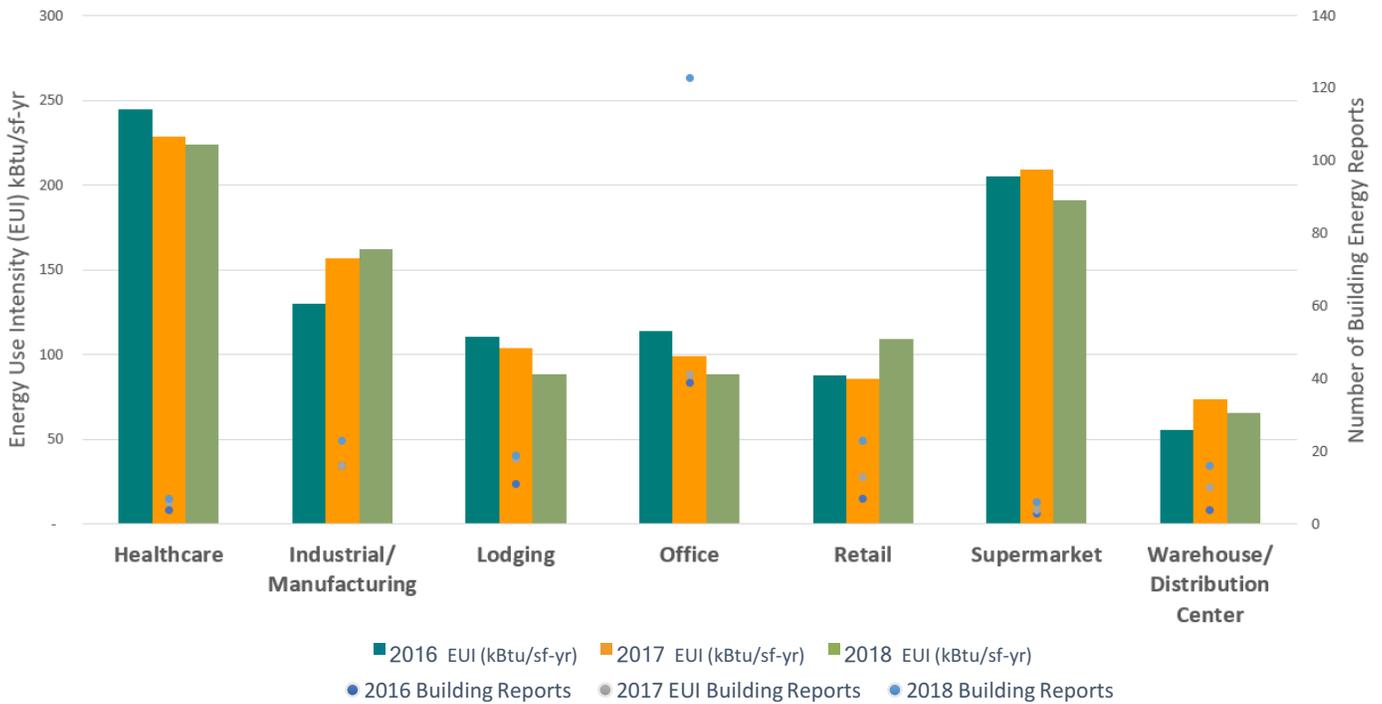
Building Phase	Average EUI (kBTU/sf-yr)	Average ENERGY STAR [®] Score	Number of Buildings
City-owned buildings	99	56	48
Buildings 50,000 sf and larger	107	67	119
Buildings 30,000 sf and larger	108	62	120
New Construction 10,000 sf and larger	49	86	8

Figure 3 on the next page shows the year over year trends in both average EUI and number of buildings reporting by sector.

⁶Site EUI was used for analysis purposes, which represents the annual amount of all energy the property consumes onsite, as reported on utility bills.

⁷A free online software developed by the U.S. EPA to help buildings benchmark, verify and report energy use and property information (www.EnergyStar.gov/PortfolioManager).

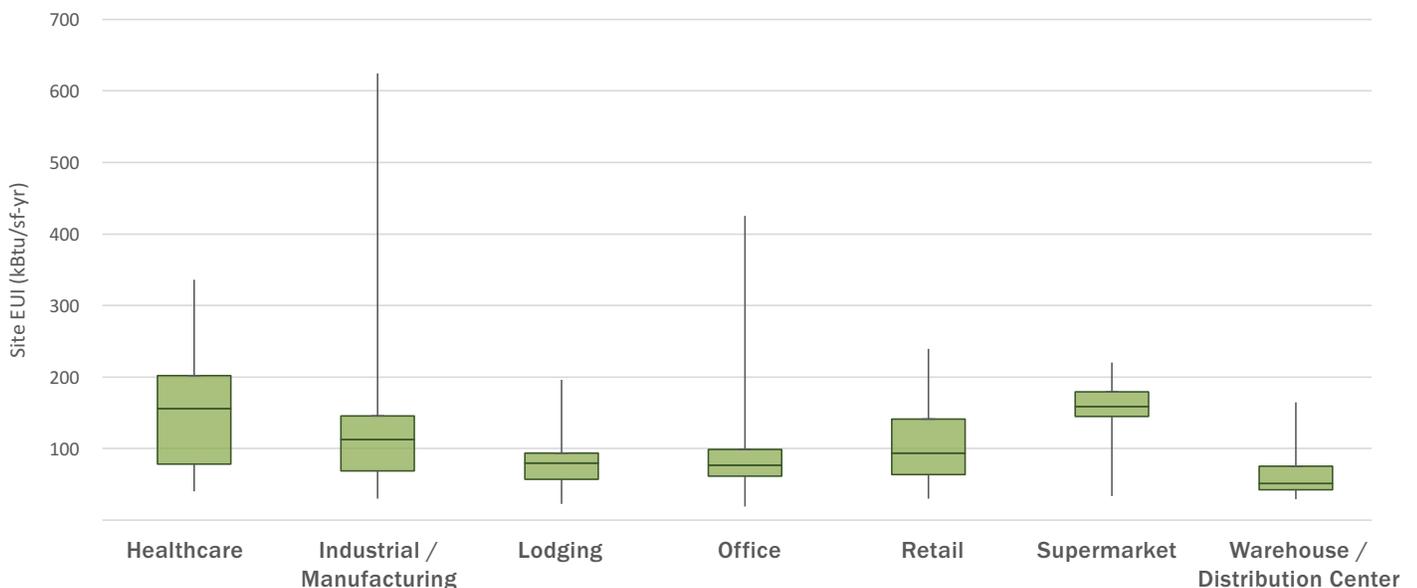
FIGURE 3. AVERAGE WEIGHTED EUI AND NUMBER OF BUILDINGS REPORTING BY SECTOR OVER TIME



Interestingly, despite the substantial increase in the number of buildings reporting, the Office sector average EUI decreased 23 percent from 2016 to 2018 reporting. The Healthcare and Lodging sectors also saw decreases in average EUI. This trend is likely due to both the addition of less energy intensive new construction buildings as well as improved energy performance among the largest buildings as described further in Buildings Consistently Reporting below.

There was a wide range of EUIs reported in each sector in 2018, demonstrating the diversity of energy intensive activities even within building sectors. Figure 4 shows the EUI ranges by sector.

FIGURE 4. SITE EUI RANGES BY SECTOR REPORTED IN 2018



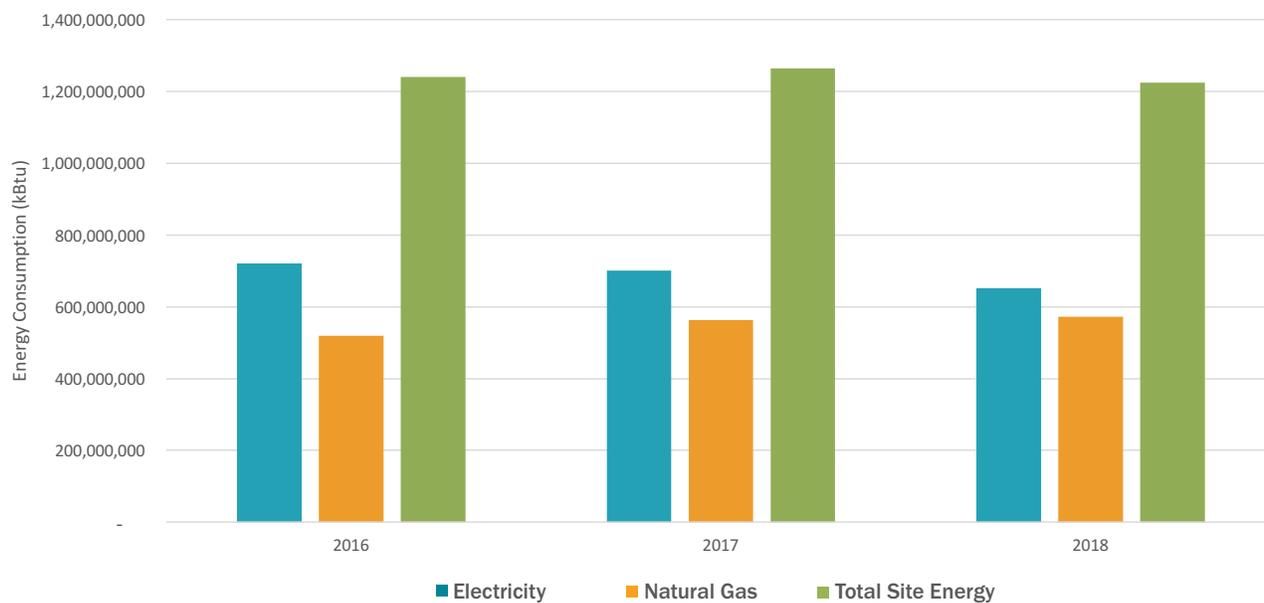
While the industrial and manufacturing sector EUI range makes sense given the activities represented, the range in the office sector is a bit more surprising and may have more to do with secondary space uses such as data centers and restaurants located within office buildings.

Buildings that reported an EUI below the building type median or an ENERGY STAR® score lower than the national median of 50 are likely to have the greatest opportunities to improve energy performance. Similarly, often the largest savings potential is found in buildings with EUIs in the two highest quartiles shown below.

Buildings Consistently Reporting

Since reporting began in 2016, 139 buildings have reported each year. These buildings have reduced electricity use by 11 percent over three years of rating and reporting. However, the building set also increased natural gas consumption by nine percent over that same time period, netting a one percent decrease in overall site energy use over three years of reporting.⁸ In the past year, this same building set achieved a three percent decrease in total site energy use. This greater energy reduction in the recent year may be due to these largest buildings starting to complete energy efficiency upgrades or may be due to proactive efforts to complete the upcoming required energy assessments, due by June 2019. Figure 5 shows the energy use trends over time for these buildings consistently reporting.

FIGURE 5. ENERGY CONSUMPTION BY FUEL TYPE AND YEAR FOR BUILDINGS REPORTING EACH YEAR



⁸It is important to note, due to the unanticipated frequency of third-party natural gas in Boulder in the first year of the program, it is likely natural gas consumption is underrepresented in 2016 energy reports, and a less drastic increase in consumption has actually occurred over the three year period. The C&I sector as a whole only saw a four percent increase in natural gas consumption in that time period, as calculated in the community-wide GHG inventory.

CITY BUILDING PERFORMANCE

City buildings 5,000 sf and larger have been required to report energy use each year beginning 2016. A total of 48 city-owned buildings reported energy use in 2018. These buildings represent a variety of space uses including offices, recreation centers, water and wastewater treatment facilities, libraries, fire stations and maintenance facilities. Overall city building energy consumption has remained relatively flat, increasing less than one percent from 2016. However, the average EUI decreased just over one percent over that same three-year period as additional square footage was added. To address energy use in the city building portfolio, the city is making the following efforts:

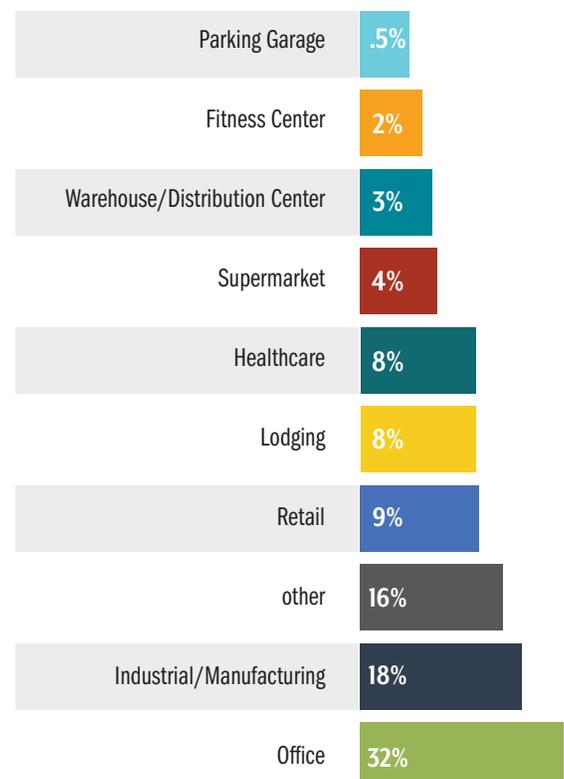
- The city has a goal of reducing city operational emissions 80 percent by 2030 from a 2008 baseline and is exploring the value of setting individual building EUI targets.
- Given the age of the city-owned building stock and with most cost-effective efforts implemented from energy performance contracting efforts, the city is currently completing a building stock analysis to determine a long-term strategy for improving the city portfolio.
- In 2018, the city completed an extensive deep energy retrofit on the Brenton building, which has resulted in a near net zero facility.
- Iris Center received ENERGY STAR® certification in 2018.
- 18 city facilities have onsite solar and the city is exploring additional onsite solar opportunities, including bulk purchasing.

City energy consumption is available on the [building performance map](#). More information on energy efficiency at city facilities is available at: bouldercolorado.gov/public-works/energy-efficiency-upgrades-at-city-facilities-energy-performance-contract

Emissions Performance

The total GHG emissions generated by the 295 reporting buildings was 308,291 metric tons of carbon dioxide-equivalent (MT CO₂e), as reported in 2018 energy reports. This is approximately 36 percent of the C&I sectors GHG emissions footprint based on the City of Boulder’s 2017 community GHG inventory. Not surprisingly, office buildings represent the largest share of emissions (Figure 6), as that sector also represents the largest percentage of total square footage. However, the proportion of emissions and square footage do not always align. For example, supermarkets represent only one percent of square footage, but four percent of emissions. Parking garages represent four percent of square footage but less than one percent of emissions.

FIGURE 6. GHG EMISSIONS GENERATED BY SECTOR



OFFICE SECTOR BREAKOUT

Office buildings represent 36 percent of total square footage reporting in 2018. Overall the sector seems to be performing consistently, if not slightly better, in 2018 despite a significant increase in the number of buildings reporting. Here is a snapshot of the largest reporting sector as compared to the first year of reporting in 2016:

Number of Office buildings reporting increased

215%,

from 39 to 123.

Office building square footage increased significantly, from 2 million sf to just under

7 million sf.

The average ENERGY STAR® score for Office buildings improved three points, from

65 to 68.

The weighted average EUI for office buildings decreased

23%,

from 114 kBtu/sf-yr to 88 kBtu/sf-yr.

There is a very wide range of EUIs reported by office buildings, likely due to the frequency of secondary, higher energy intensive space uses in office buildings, such as restaurants and data centers. The majority (53%) of office buildings report an EUI of 85 kBtu/sf-yr or less, which is the average EUI for Boulder's climate zone.

GHG emissions from office buildings represent **12%** of the C&I sector GHG emissions reporting in the 2017 community GHG emissions inventory.



Large Industrial Campus Reporting

Large Industrial Campuses (LICs) are subject to custom rating and reporting requirements given the energy-intensive activities occurring at these locations, including the publishing of an annual narrative that describes the energy efficiency activities, goals and achievements each year. The three reporting LICs are:



The annual public narratives for these LICs can be accessed at:

boulder.colorado.gov/sustainability/boulder-building-performance-large-industrial-campus

How Boulder Compares

While the overall EUI trends shows a decrease in the amount of energy consumed in various sectors across the City of Boulder, such as healthcare, office and retail, this decrease does not necessarily mean that City of Boulder buildings are performing comparably to similar buildings across the state, region or country. To better understand how a building is operating compared to a larger dataset of similar buildings, many cities use the 1-100 ENERGY STAR® score generated from Portfolio Manager.

ENERGY STAR® Portfolio Manager assigns a score from 1 to 100 for those building types where a large enough national dataset is available to set scores (a higher score represents a high performing, energy efficient building).⁹ This score compares a building's performance to similar

buildings nationwide, normalizing for type and climate. A score of 50 means your building is performing better than 50 percent of like buildings. Buildings that receive a score of 75 or higher (i.e. perform better than 75 percent of like buildings) may be eligible for ENERGY STAR® certification.¹⁰

**Boulder's Median
ENERGY STAR®
Score Increased:**



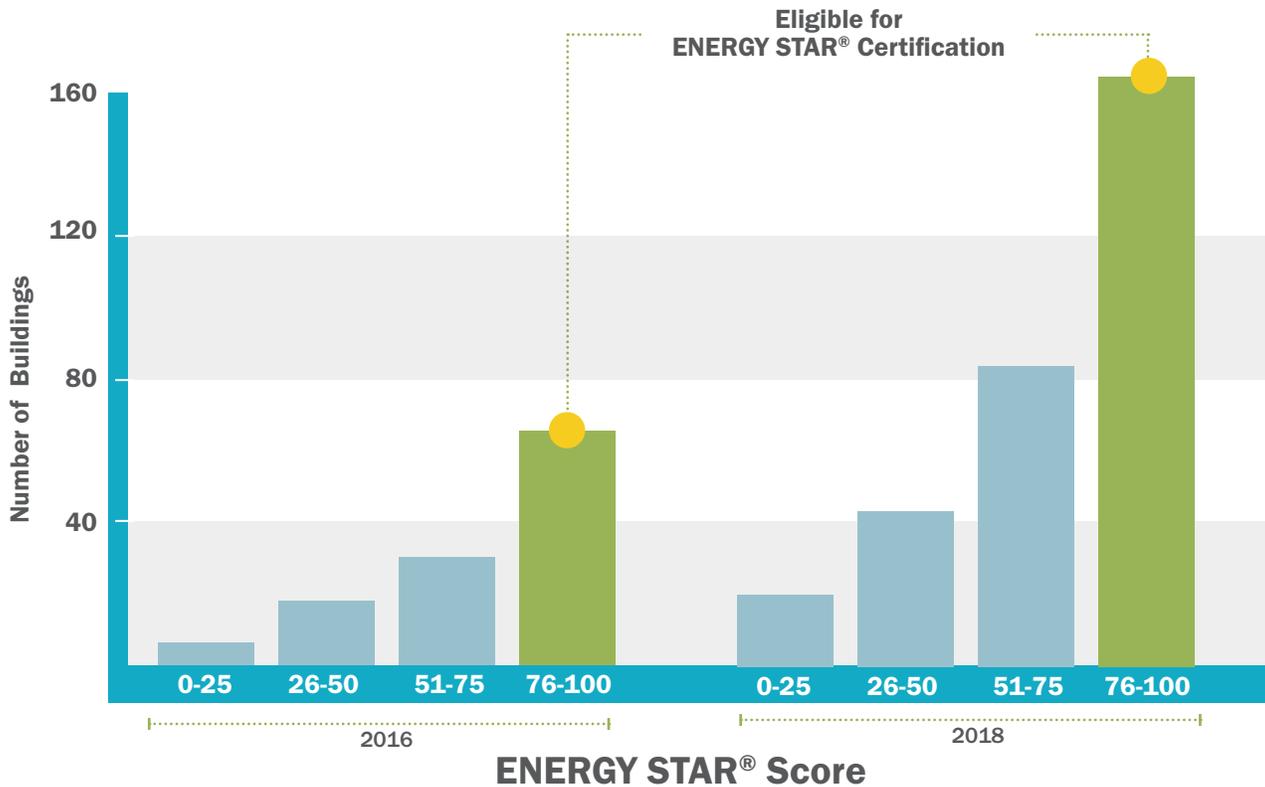
**Overall the City
of Boulder saw a 1
percent increase
in the median
ENERGY STAR®
score from 70 to 71.**

Shown in Figure 7, an additional 104 buildings received ENERGY STAR® scores in the 2018 reporting year, from 59 in 2016 to 163 in 2018. Of those buildings that submitted energy reports in 2016, 30 had scores eligible for ENERGY STAR® Certification. In 2018, this increased to 78 buildings. Of those 78 buildings with a score of 75 or above, 18 received ENERGY STAR® Certification in order to exempt the building from the ordinance efficiency requirements.

⁹For the list of building types eligible for ENERGY STAR® score, see: energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager/identify-your-property-type-0

¹⁰Receiving certification would also exempt the building from the Building Performance Ordinance efficiency requirements. More information on scores and certification are available at: energystar.gov/buildings/about-us/energy-star-certification

FIGURE 7. NUMBER OF BUILDINGS RECEIVING ENERGY STAR® SCORES



Looking within Boulder’s city limits, the number of ENERGY STAR® Certifications has increased since the initiation of the Building Performance Ordinance. This increase in certifications is most likely due to ordinance-affected buildings demonstrating high enough performance to receive an exemption from ordinance efficiency requirements. However, not all of these certifications represent buildings subject to the ordinance in 2018, which may demonstrate building owners and tenants see an increasing value in certifying their high performing spaces regardless of whether the building is subject to the ordinance.

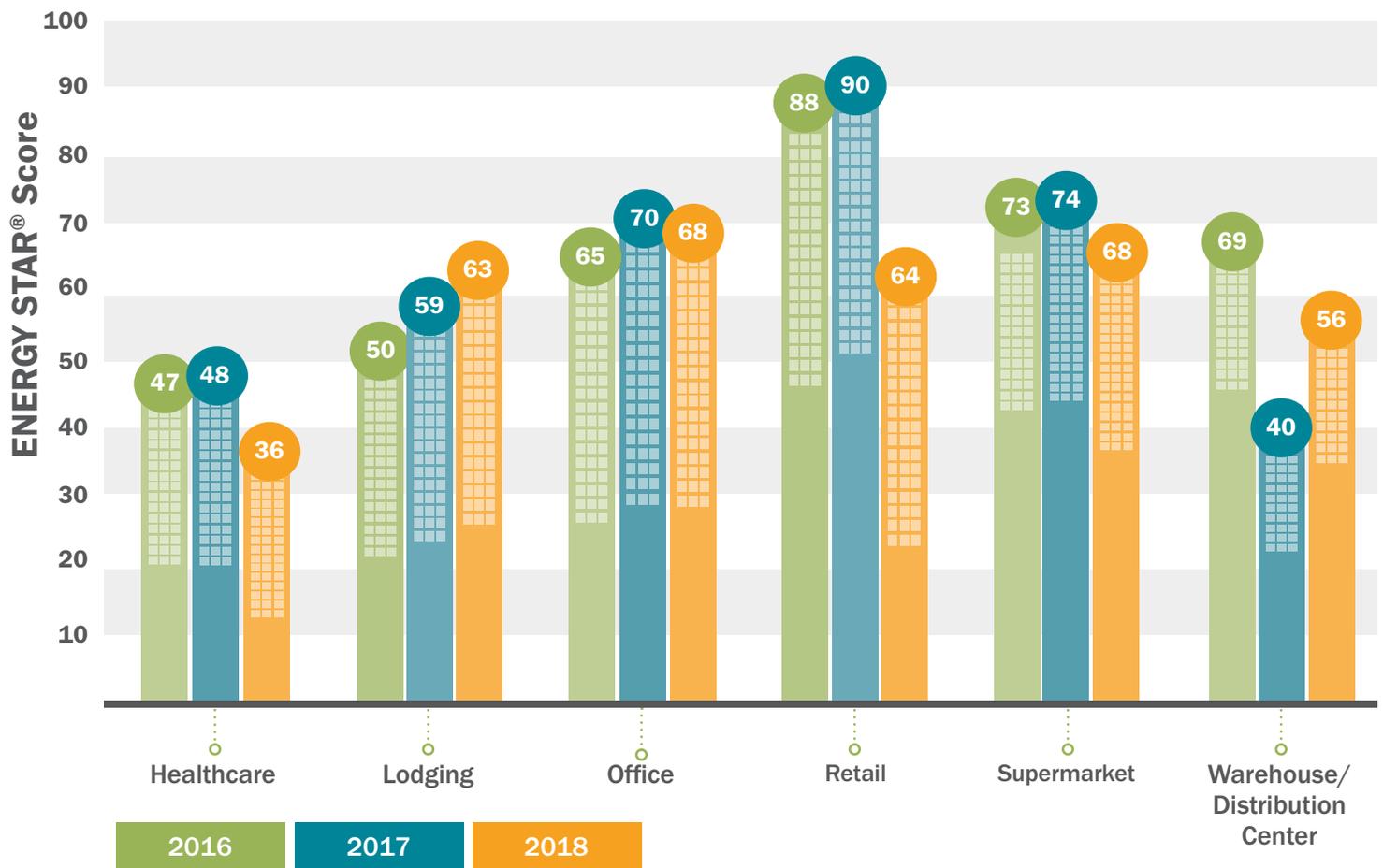
FIGURE 8. TREND OF CITY-WIDE ENERGY STAR® CERTIFICATIONS ISSUED

City of Boulder ENERGY STAR® Certification Trend (Number of Certifications)



With more buildings receiving scores in 2018, most building sectors saw a decrease in the average score of the sector (see Figure 9). The retail sector and healthcare sector saw significant decreases in average sector scores with the addition of new buildings, whereas lodging saw an increase. This means that while buildings may be improving performance in the City of Boulder overall based on EUI trends, some sectors are still operating less efficiently than similar buildings nationwide.

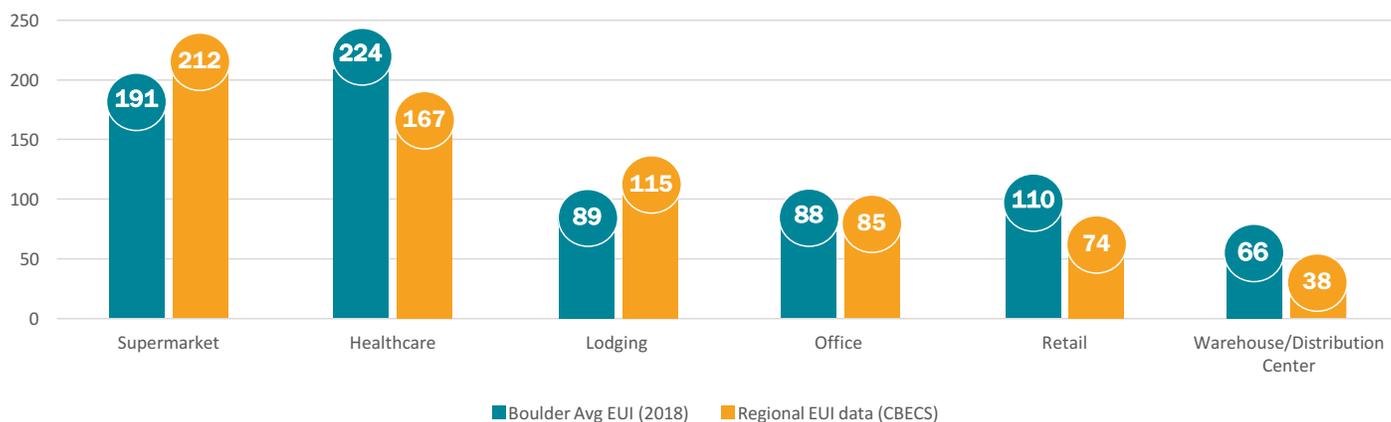
FIGURE 9. AVERAGE ENERGY STAR® SCORE BY SECTOR



To better understand how Boulder buildings are performing, the overall EUI by building type¹¹ was compared to the most recently calculated average EUI by building type for the Boulder climate region. These EUIs were calculated by the Commercial Buildings Energy Consumption Survey (CBECS)¹², which is a national sample survey that collects information on the U.S. commercial building stock.

As shown in Figure 10, while most of Boulder’s building sectors are performing comparably or more efficiently than the average, the retail sector again stands out as less efficient than the average, which means there is likely performance improvement opportunities in this sector.

FIGURE 10. BOULDER AND REGIONAL EUI COMPARISON BY BUILDING TYPE



When evaluating data currently available from other cities implementing similar policies to Boulder’s Building Performance Ordinance, Boulder’s building stock is performing comparably to these other cities despite differences in the number of buildings impacted, as shown in Table 2.

¹¹EUI by building type was calculated by summing all energy consumed by each building type and dividing by the summed square footage of that building type.

¹²Table C10. “Consumption and gross energy intensity by climate region for sum of major fuels, 2012.” Released May 2016. Column: “Energy intensity for sum of major fuels (thousand Btu/square foot).” Region: “Very cold/cold.” <https://www.eia.gov/consumption/commercial/reports/2012/energyusage/>

Table 2. City-Reported Benchmarking Results

	Compliance Rate	Median ENERGY STAR® Score (1-100)	Median Site EUI (kBtu/sf-year)	Buildings Subject to Reporting
Boulder (2018)	99%	71	78	324
Minneapolis (2016)¹³	Not Available	75	80	434
Chicago (2017)¹⁴	85%	64	80	2780
Seattle (2016)¹⁵	99%	75	40.5	3,352
Denver (2018)¹⁶	90%	73	67	1,161
Cambridge (2016)¹⁷	91%	65 (Avg)	82.4	1,117
Kansas City, MO (2017)¹⁸	64.5%	74	Not Available	503

NEXT STEPS

The program timeline brings several deadlines in 2019.

Ordinance Requirement	City Buildings ≥ 5,000 sf	Existing Buildings ≥ 50,000 sf New Buildings ≥ 10,000 sf	Existing Buildings ≥ 30,000 sf	Existing Buildings ≥ 20,000 sf	Large Industrial Campuses
Rating & Reporting	2016	2016	2018	2020	2016
Public Disclosure	2019	2019	2021	2023	2016
Energy Assessments	2019	2019	2021	2023	2019
Lighting Upgrades	2021	2021	2023	2025	2025
Retro-commissioning	2021	2021	2023	2025	N/A
Implement Cost Effective Measures	2023	2023	2025	2027	2021

¹³Accessed online at: minneapolismn.gov/www/groups/public/@health/documents/webcontent/wcmssp-208686.pdf

¹⁴Accessed online at: cityofchicago.org/content/dam/city/progs/env/EnergyBenchmark/2017_Chicago_Energy_Benchmarking_Report.pdf

¹⁵Accessed online at: seattle.gov/Documents/Departments/OSE/Seattle%20Energy%20Benchmarking%20Analysis%202016%20for%20web.pdf

¹⁶Accessed online at: denvergov.org/content/dam/denvergov/Portals/771/documents/EQ/Energize%20Denver/Denver%202018%20Benchmarking%20Report%20Final.pdf

¹⁷Accessed online at: cambridgema.gov/CDD/zoninganddevelopment/sustainablebldgs/~/_/media/73C667F5FE0644BE9963329DD2DF0B74.ashx

¹⁸Accessed online at: drive.google.com/file/d/1eCpmY8ZxPlafahc1IHUW7DvR9oyjBTeY/view

Data Publication Beginning 2019

The City of Boulder elected to publicly disclose building-specific energy metrics following a two-year grace period. This means in summer 2019, following the reporting deadline for 2018 calendar year data, the energy metrics for existing buildings 50,000 sf and larger and new construction buildings 10,000 sf and larger will be publicly disclosed on the building performance map now available at www.BoulderBuildingPerformance.com

2019 Energy Assessment Deadline

2019 also brings the deadline for all larger buildings to complete an energy assessment. All buildings subject to the Building Performance Ordinance must not only annually rate and report whole-building energy use, but must also undertake efficiency actions on the deadlines below:

Rating & Reporting

↓ 3 yrs

Energy Assessments

↓ 2 yrs

Lighting and RCx

↓ 2 yrs

Implement Cost Effective
RCx Measures

For more information on the Boulder Building Performance Ordinance please see www.BoulderBuildingPerformance.com





www.BoulderBuildingPerformance.com

