Attachment A

City of Boulder

Commercial Building Energy Rating & Reporting Pilot Program Report

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For The Life Of Your Building

CITY OF BOULDER

BOULDER, COLORADO
26 FEBRUARY 2013

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1. Executive Summary

As a leader in sustainability and as part of its Climate Commitment, the city of Boulder (city) is currently implementing a commercial energy efficiency strategy to address the large impact its commercial buildings have on energy use and greenhouse gas (GHG) emissions. The purpose of this document is to report on findings and recommendations from the commercial building energy rating and reporting pilot program so that the city can continue to focus effectively on this strategy moving forward. The city has several programs in place that address energy efficiency which provides a great foundation for future programs.

Stated Objectives and Outcomes

The commercial building energy rating and reporting pilot program included a cross sampling of Boulder's private sector commercial buildings[1]. This pilot program will inform participating building owners, tenants, and the city about how existing commercial buildings' use energy. It will also allow building owners and tenants to understand their buildings' energy performance, and, through the city and county *EnergySmart* advisor service or private sector energy consultants, help identify areas where energy efficiency improvements could save significant energy and money. Objectives of the pilot program include, encouraging and understanding the process of rating and reporting of energy use and helping to inform the development of a potential rating and reporting ordinance. In addition, to further lead by example, the city's most energy intensive facilities were rated as part of Phase 3 of its Energy Performance Contracting program with McKinstry.

Aggregated Pilot Building Summary

A total of 43 private commercial buildings participated in the city's pilot program, yet at the time of this report, only 40 buildings had completed the process. To protect the privacy of the pilot participants, results of the program were aggregated. Of the 40 buildings included in this analysis, the median site Energy Use Intensity (EUI) was 87. The EUI of a building is a calculation of how much energy is consumed per square foot. The lower the EUI, the less energy the building consumes per square foot. A national sampling of similar buildings (created using Energy IQ – a building indexing tool created by the Lawrence Berkeley National Laboratory) showed a median EUI of 86 – very close to the pilot median of participating buildings. ***When compared nationally to similar building types, the pilot program buildings proved to be average in terms of energy efficiency.***

In addition, the city's eligible pilot commercial buildings had a median ENERGY STAR rating of 81. ENERGY STAR is a joint program of the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE) that was developed to save money and protect the environment through energy efficient products and practices. Portfolio Manager is the online tool administered by the ENERGY STAR program to track and manage energy use. An ENERGY STAR rating is a rating from 1 -100 that addresses how efficiently buildings use energy, relative to similar buildings nationwide. A rating of 50 indicates average energy performance, while a rating of 75 or better indicates top performance. Of the 40 participating buildings, 19 were able to receive an Energy Star rating with a median rating of 81; it can be said that these buildings are top performers on a national scale.

It should be noted that while all of the 40 buildings had enough data to calculate a building EUI, only 19 buildings were able to receive an ENERGY STAR rating. This can be due to a number of factors including:

1) The data entered into Portfolio Manager did not cover a consecutive year of energy consumption;

2) The building's space type did not match an existing EPA building designation (e.g. office, hotel, retail, data center, etc.); or

3) The building did not meet the EPA's

[1] The majority of public schools are located in residential zoning; only buildings located in commercial, industrial, mixed-use and public zoning districts were included in this analysis.

minimum operating characteristics (e.g. at least 5,000 square feet, operating at least 30 hours per week, contains at least one full-time worker, etc.).

It also should be noted, as particularly relevant to this set of buildings, that while mixed-use properties are eligible for an ENERGY STAR rating, if the building has more than half of its square footage dedicated to retail space, it is not eligible for a whole building[2] ENERGY STAR rating.

The median, (rather than the mean) was used to represent the buildings' performance to account for statistical outliers in the collected data. Since, in this case, the buildings' performance data was not symmetrically distributed (i.e. skewed), using a median to represent the buildings' collective performance displays a more accurate representation of collective performance.

While the aggregated results of the participating commercial buildings show average performance, a larger number of participants would be necessary to give statistical validity to this conclusion. The 40 buildings that participated in the pilot program only represent about five percent of the total square footage of private commercial buildings within the city. Aggregating and analyzing a larger number of buildings compared to the total number of commercial buildings would yield a more informative set of data, and provide valuable opportunities to analyze the data for a greater number of correlations and comparisons on a local and national level. In addition, because this pilot was voluntary, it's possible that energy conscious building owners were more likely to participate, further skewing the results.

Key Findings, Trends, and Issues

Results

The most common building type in the pilot program was office buildings. Of the 40 participating buildings, 20 were office buildings; this is not surprising as office buildings are the most common type of commercial building across the United States. The combined gross square footage of the participating pilot commercial buildings was just under two million square feet, with a median gross square footage per building of just over 15,000 square feet. Considering about two-thirds of all the private commercial buildings throughout the city are under 20,000 square feet, this sampling is an accurate representation of the majority of commercial buildings in the city in terms of total building size.

However, it is important to note here that while two-thirds of private commercial buildings are under 20,000 square feet, these buildings only represent one-fifth of the total gross square footage of commercial buildings. This pilot has accurately reflected energy consumption of buildings by size, ***but targeting larger buildings (above 20,000 square feet) has more potential for capturing the bulk of the energy consumption of commercial buildings, since energy consumption is commensurate with square footage, not number of buildings.***

Commercial buildings in the pilot program were built between 1891 and 2011 with the (hypothetical) average building being built in 1971. Upon closer analysis, the majority (over 50 percent) of participating buildings were built between 1960 and 1990.

It would be fair to say that the data collected during this pilot is most representative of a building profile of 15,000 square foot office buildings built between 1960 and 1990. It should be noted that the mean (average) building size that participated in the pilot was 46,000 square feet. Again, due to the asymmetrical results of the data collected, the median (15,000 square feet) is a better representation of the size of the buildings in the pilot.

To address energy consumption in the majority of square footage across Boulder's commercial building portfolio, it is critical to target buildings above 50,000 square feet for reporting and rating. Typically, buildings above 50,000 square feet also have a better return on investment for energy efficiency upgrades due to higher initial total energy costs.

[2] Whole building energy use takes into account all energy sources

Process

In terms of overall design, implementation and process, the pilot program proved successful. The surveys taken by the pilot's participating building owners, tenants and energy coaches resulted in the following qualitative information:

- The building owners and tenants reported that the contracted energy coaches did a skillful job and played a crucial role in the program and in the energy rating and reporting process;
- The energy coaches reported to have had a good experience with the pilot program and felt that the program was effective;
- The process took about the time the energy coaches and building owners expected (seven hours on average, per building);
- The energy coaches found data collection manageable, and Portfolio Manager relatively easy to navigate when following the predetermined protocol;

In addition, most energy coaches and building owners provided feedback that this program helped the owners understand their energy use. Many indicated that they would continue to track their energy use and potentially implement upgrades to their facilities. Noted challenges included excess paperwork, data collection and energy use consent waiver/approval issues (especially for multi-tenant buildings), nuances and comprehension of Portfolio Manager, and sensitivity around disclosure.

Recommendations

Based on the pilot program results, it is recommended that the city continue with a voluntary energy rating program similar to the pilot program; the key process findings stated above demonstrate the success of the pilot program process. Recommendations to improve the energy rating and reporting process as part of a city-wide program or ordinance include the following:

- Provide more educational and engagement opportunities (and possibly incentives) for building owners and tenants – this would help with the process and address disclosure concerns;
- Enhance energy coach training to include lessons learned from the pilot and address data collection and entry and Portfolio Manager nuances (multiple meters, campus ratings, rating eligibility, etc.);
- Provide energy coaches with energy savings estimates for a variety of potential improvement measures as a next step;
- Cut down on paperwork, or include a flowchart of the process and paperwork required;
- Investigate better ways to access whole building energy use data (i.e. potentially include utility data release in tenant lease, collaborate with the Xcel Energy to set up an automatic electronic data transfer or online account, etc.);
- Investigate installing sub-meters and potentially offsetting some of the cost of purchase and installation;
- Continue to work with both building owners and tenants (e.g. *EnergySmart, 10 For Change*) to gather energy data and develop new incentive or regulatory programs – both the tenant and owner need to work together to create higher performing properties;
- Since 49 percent of the commercial buildings located in the city have square footage over 50,000 square feet, it is important to especially target larger building types for rating and reporting;
- Consider implementing prescriptive energy standards for buildings over 50,000 square feet utilizing best-in-class efficiency programs; such as, recommissioning, auditing, and utility spending analysis; and
- Study capabilities of the 2013 Portfolio Manager release prior to proceeding with a formal commercial energy rating and reporting program.
- Based on limitations of data collected in Portfolio Manager an additional recommendation is included in **Appendix 1**.

2. Background and Context

Commercial buildings represent just under one-fifth of U.S. energy consumption, with office space, retail space, and educational facilities representing about half of commercial sector energy consumption. The top three end uses in the commercial sector are space heating and cooling, and lighting, which represent close to half of commercial site energy consumption[3]. From this information, it is easy to pinpoint where the opportunities are to decrease energy use from commercial buildings, yet many cities are still figuring out the right course of action. There are many players in the commercial building sector, from building owners and representatives to property managers and tenants; as a result, it can be difficult to create energy efficiency programs and policies that address these intricate relationships and the various stakes each entity has in each commercial building.

The city of Boulder is a leader in sustainability and is currently implementing a commercial energy efficiency strategy. The purpose of this document is to report on findings and recommendations from the commercial energy rating and reporting pilot program so that the city can continue to implement an effective commercial energy efficiency strategy moving forward.

Energy Rating Benefits and Successes

As a first step, cities are beginning to rate energy use in the commercial building sector and are finding that knowledge is power. Aside from voluntary programs such as the city's *10 For Change* and *EnergySmart*, a number of cities including Austin, Texas, Washington, DC, Seattle, Washington, and most recently Minneapolis, Minnesota are mandating energy rating and reporting. A few cities such as Berkeley and San Francisco, California, and New York City are going a step further by mandating prescriptive measures and/or performance standards in addition to energy rating and reporting.

In New York City, the city found that it could reduce greenhouse GHG emissions by up to 20 percent if inefficient buildings were brought up simply to the median Energy Use Intensity (EUI)[4] in its building category. The city also found that the older building stock was more energy efficient than the newer building stock.

These energy rating and reporting policies vary by:

- Building type and size;
- Information being disclosed;
- Timeline for compliance; and
- Additional measures that go beyond ratings and reporting.

Even though there are variations, the adopted policies all share common goals. These are:

- Understanding the existing energy performance of their city or state's existing commercial building stock;
- Building a national database of building performance information and tools; and
- Sharing that information as appropriate to encourage energy efficiency improvements.

This type of information is critical in developing effective energy efficiency policies for the commercial building sector.

All other cities that have adopted energy rating and reporting ordinances use ENERGY STAR Portfolio Manager. Supported by the United States Environmental Protection Agency (EPA) and Department of Energy (DOE), the free online tool generates a Statement of Energy Performance using entered energy data, which includes a performance rating (1-100) and/or EUI and comparisons to similar building uses throughout the country. These building ratings are normalized through analysis of a variety of factors, including: geographic location (and,

[3] Source: U.S. Department of Energy Buildings Energy Data Book.

[4] A building's EUI is calculated by taking the total energy consumed in one year (measured in kBtu) and dividing it by the total floorspace of the building (measured in square feet). Generally, a low EUI signifies good energy performance. (Source: ENERGY STAR)

therefore, weather), building size, use, occupancy and so forth. ***More than 28 billion square feet – about 40 percent of the country's inventory – now use Portfolio Manager to monitor and report energy performance.***

City of Boulder Energy Efficiency Programs

In 2006, the city of Boulder's Climate Action Plan (CAP) identified that energy use makes up 76 percent of the community's GHG emissions. The electricity consumption of the industrial and commercial sectors accounts for nearly 83 percent of those emissions. In response to this information, the city established several programs for businesses and commercial building owners to begin addressing this issue. Throughout the past five years, the city's commercial energy efficiency programs and services have evolved to increase their effectiveness. See **Appendix 2** for more background on the city's commercial energy efficiency and CAP programs.

3. Commercial Building Stock in the City of Boulder

Commercial buildings' energy use varies due to several factors, including building size, geographic location, occupancy and use. Therefore, accurate commercial building information is essential to an efficient and successful energy rating and reporting program. This type of data is also critical for identifying the buildings that would be subject to future requirements and for contacting those buildings' owners. Once the owners begin rating and reporting, this database serves as a tool for tracking energy use and compliance after the ordinance is adopted and reporting begins. The city has access to a variety of business and commercial property information but found that Boulder County's property tax database provided the best available information. See below for Boulder's commercial building stock and its breakdown by sector.

Private Sector Commercial Building Breakdown

Includes buildings classified as the following types from the property tax database as: church, hospital, hotel, retail, private-owned commercial, and commercial condominiums. Number of buildings and square footages estimated based on zoning & city limits.

Size Category	Total SQFT	Number of Bldgs	% Total SQFT	% Total Number of Buildings	Proportion of total private sector buildings, square feet
< 1,000	35,344	69	0.10%	4.26%	
1,000 - 4,999	1,273,455	437	3.60%	27.01%	
5,000 - 9,999	2,449,221	340	6.93%	21.01%	96% of sq. ft. 69% of bldgs.
10,000 - 19,999	4,212,723	300	11.91%	18.54%	89% of sq. ft. 48% of bldgs
20,000 - 29,999	4,198,069	173	11.87%	10.69%	77% of sq. ft. 29% of bldgs.
30,000 - 39,999	3,257,714	92	9.21%	5.69%	66% of sq. ft. 18% of bldgs.
40,000 - 49,999	2,540,362	57	7.18%	3.52%	56% of sq. ft. 13% of bldgs.
50,000 and above	17,390,654	150	49.19%	9.27%	49% of sq. ft. 9% of bldgs.
TOTAL	**35,357,542**	**1,618**			

City of Boulder Owned Facilities*

Size Category	Total SQFT	Number of Bldgs
<1,000	3,713	7
1,000 - 4,999	56,165	19
10,000 - 19,999	251,900	20
20,000 - 29,999	174,066	7
30,000 - 39,999	103,876	3
5,000 - 9,999	87,108	14
50,000 and larger	732,436	6
TOTAL	**1,409,264**	**76**

**Based on zoning and city limits*

Other Public Sector Commercial Buildings*

Type	Total SQFT	Number of Bldgs
Federal	319,735	5
State	37,917	7
County	770,925	16
RTD	77,449	2
UCAR	569,309	10
University - Private	74,336	2
University - State	8,367,921	75
TOTAL	**10,217,592**	**117**

**The majority of the public schools are located in residential zoning*

Total Commercial Buildings*

Type	Total SQFT	Number of Bldgs
Private Sector	35,357,542	1,618
City of Boulder	1,409,264	76
Other Public Sector	10,217,592	117
Total	**46,984,398**	**1,811**

**Based on zoning and city limits*

4. Pilot Program Background and Building Characteristics

Pilot Program Background

The commercial building energy rating and reporting pilot program included a cross sampling of Boulder's private sector commercial buildings. This pilot program will inform participating building owners, tenants, and the city about how existing commercial buildings use energy. It will also allow building owners and tenants to understand their building's energy performance, and, through the city and county *EnergySmart* advisor service or private sector energy consultants, help identify areas where energy efficiency improvements could save money. In addition, to further lead by example, the city of Boulders' most energy intensive facilities were rated as part of Phase 3 of its Energy Performance Contracting program with McKinstry (see Section 8 for results). Objectives of the pilot program include encouraging and understanding the process of rating and reporting of energy use and helping to inform the development of a potential rating and reporting ordinance. See **Appendix 3** for more information and background on the commercial building energy rating and reporting pilot program.

Pilot Program Buildings' Characteristics

The private sector pilot program had ***43 buildings participating, representing 17 building owners; at the time of this analysis only 40 buildings had completed the process and were included.*** Below is a breakdown of the 40 buildings' characteristics in terms of number of buildings in each size category. Also noted is eligible rating in Portfolio Manager, and diversity of space type.

Participating buildings include the following space types that receive an energy performance rating (ENERGY STAR rating, on scale of 1-100, 100 being the most efficient) in Portfolio Manager:

- Data Center
- House of Worship
- Warehouse
- Retail
- Office
- Senior Care Facility
- Hospital (specialized nursing facility)
- Schools

Participating buildings include the following uses that receive an Energy Use Intensity (EUI) score in Portfolio Manager:

- Fitness Facility
- Manufacturing
- Restaurant

Pilot building participants had diverse characteristics, such as:

- Large industrial buildings
- Residential use converted to commercial use
- Multi-tenant buildings
- Various energy use meter configurations
- Various ages
- A campus of buildings

	Building Size (sq. ft.)						
	1,000-4,999	5,000 - 9,999	10,000 - 19,999	20,000 - 29,999	30,000 - 39,000	40,000 - 49,999	> 50,000
Number of Commercial Buildings in Pilot Program (40)	4	5	13	2	1	2	13

5. Aggregated Results of the Pilot Program

On the following pages are the aggregated data results of the pilot program displayed as site EUI, source EUI, and ENERGY STAR rating. While all 40 of the buildings that were included in the pilot program were able to generate a site and source EUI, only 19 buildings out of 40, qualified for an ENERGY STAR rating. As revealed in the results, many buildings did not qualify for an ENERGY STAR rating for a variety of reasons.

The pilot buildings have been displayed for both site EUI and source EUI charts so as to provide a better understanding of each building's on-site efficiency as well as its total energy demand. Since an ENERGY STAR rating is calculated based on a building's source energy consumption, and many of the buildings did not qualify for an actual ENERGY STAR rating, the information displays all three measures of energy consumption separately.

Definitions For Reference[6] :

Site Energy: The total energy consumed at the building location regardless of fuel type, measured in kBtu / square foot / year.

Source Energy: All of the energy used in delivering energy to a site, including power generation and transmission and distribution losses, to perform a specific function, such as space conditioning, lighting, or water heating, measured in kBtu / square foot / year.

ENERGY STAR Rating: A rating of energy performance on a scale of 1–100 relative to similar buildings nationwide, calculated using source energy.

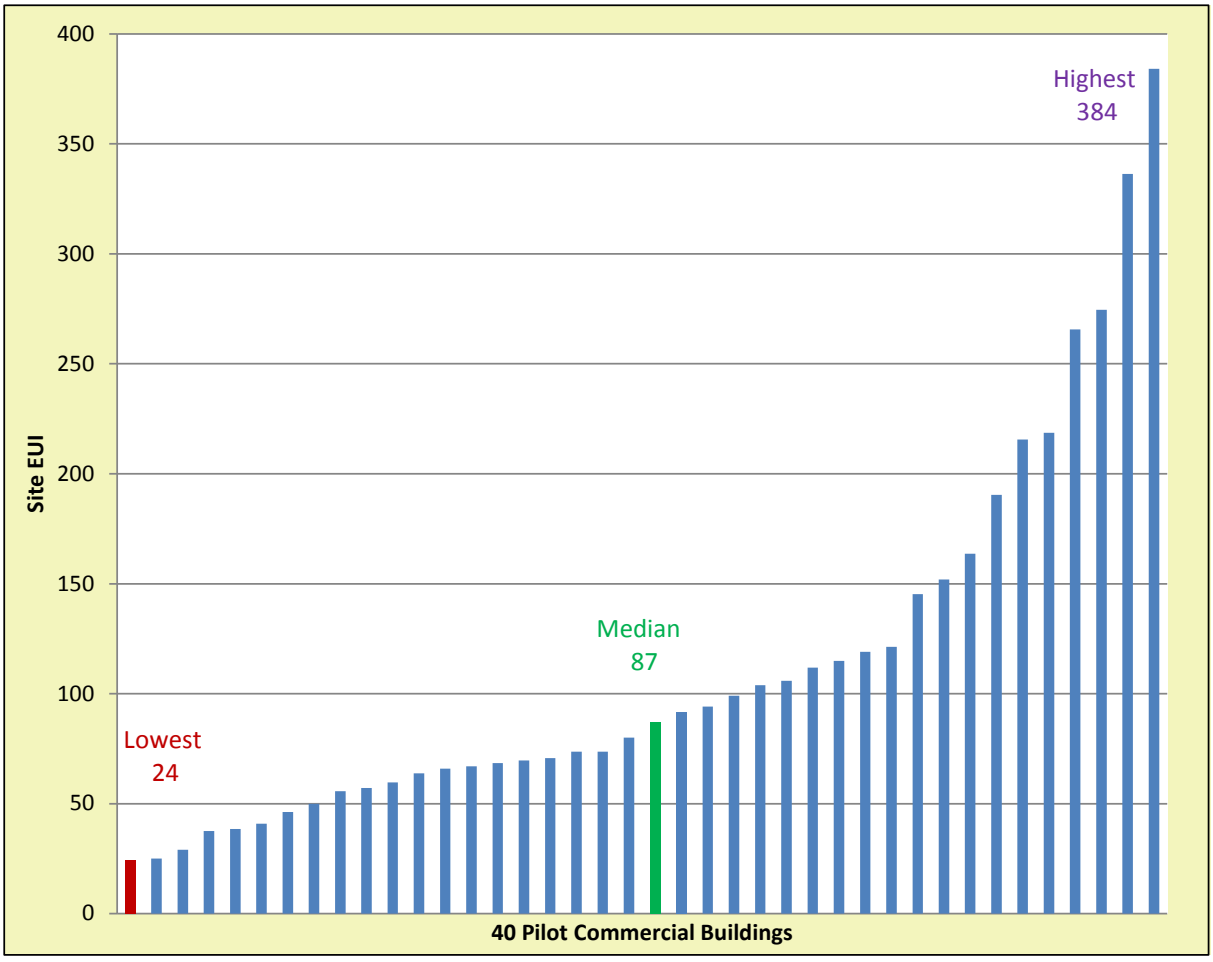
Aggregate Site Energy Use Index

Among the 40 private commercial buildings that participated in the pilot program, the range of site EUIs went from 24 to 384 with a median site EUI of 87. Compared to a national average site EUI of 86 (see Section 6), this demonstrates that the pilot buildings are about average in terms of energy efficiency.

This wide range of EUIs indicates that there is a large amount of energy efficiency potential within this portfolio, and is likely indicative of a larger portfolio of commercial buildings inside the city. Since a site EUI measures energy consumption per square foot, the chart on page 12 highlights that there are a number of buildings that have an opportunity to improve their energy efficiency relative to their peers. Nineteen buildings represented in the chart are above the median range, indicating that these would likely have the most potential for cost-effective efficiency improvements.

[6] For a further explanation of the differences between site and source energy visit the EPA's Portfolio Manager description page at www.energystar.gov

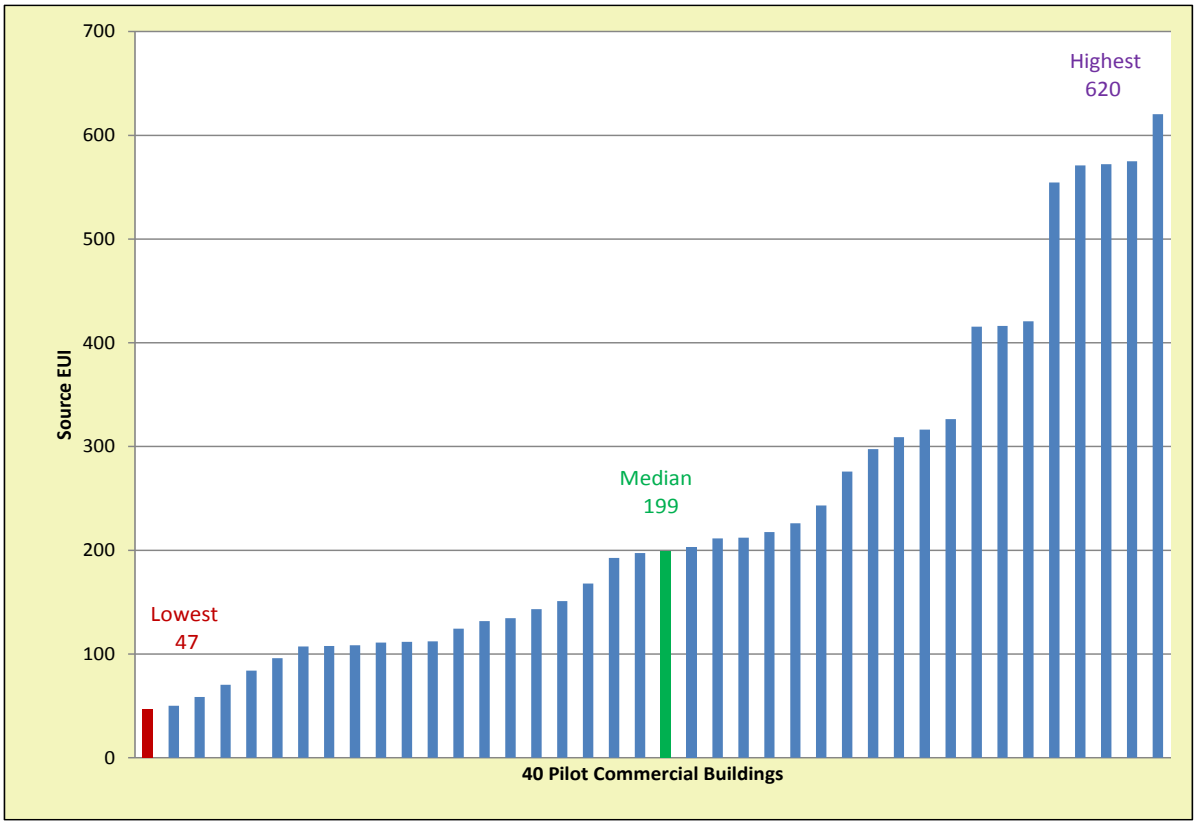
40 Pilot Commercial Buildings Aggregate Site Energy Use Index



Aggregate Source Energy Use Index

Among the 40 private commercial buildings in the pilot program, the range of source EUI scores is 47 to 620 with a median source EUI of 199. Since source EUI accounts for total energy demanded from the raw fuel source for a creating a watt of electricity and on average, three watts are needed to deliver one watt of usable electricity – the numbers reflected below are much higher than site EUIs. While on-site efficiency (as reflected by site EUI) is extremely important, source energy takes into account a building's total energy footprint. Preferred fuel choice (electricity or natural gas typically) has a large impact on a building's source EUI. As seen from the very wide range of EUIs below, there is a large opportunity for improving source EUI (which will, in-turn, improve a building's ENERGY STAR rating since the score is calculated based on source EUI). Nineteen buildings represented in the chart below are above the median range indicating that these would likely have the most potential for total energy demand improvements.

40 Pilot Commercial Buildings Aggregate Source Energy Use Index



Aggregate Energy Star Rating

Again, among the 40 buildings in the pilot program, the range of ENERGY STAR ratings is from 13 to 97 with a median ENERGY STAR rating of 81. This median suggests exceptional performance, clearly demonstrating that the buildings participating in the pilot program are top performing buildings on a national scale. However, it appears from the small number of buildings that qualified for an ENERGY STAR rating, that this sampling is skewed toward higher performing buildings. More so, it's also possible that since participation in the pilot was voluntary, energy conscious building owners were more likely to participate.

This may also be due to those buildings being eligible for ENERGY STAR Leader Certification (earning a 75 rating or above) – requiring a Professional Engineer to review and correct any incorrect data entered into Portfolio Manager that would disqualify the building for an ENERGY STAR rating. As is stated below in the results, fewer buildings were eligible for an ENERGY STAR rating for a number of possible reasons. Building ineligibility can be due to the following:

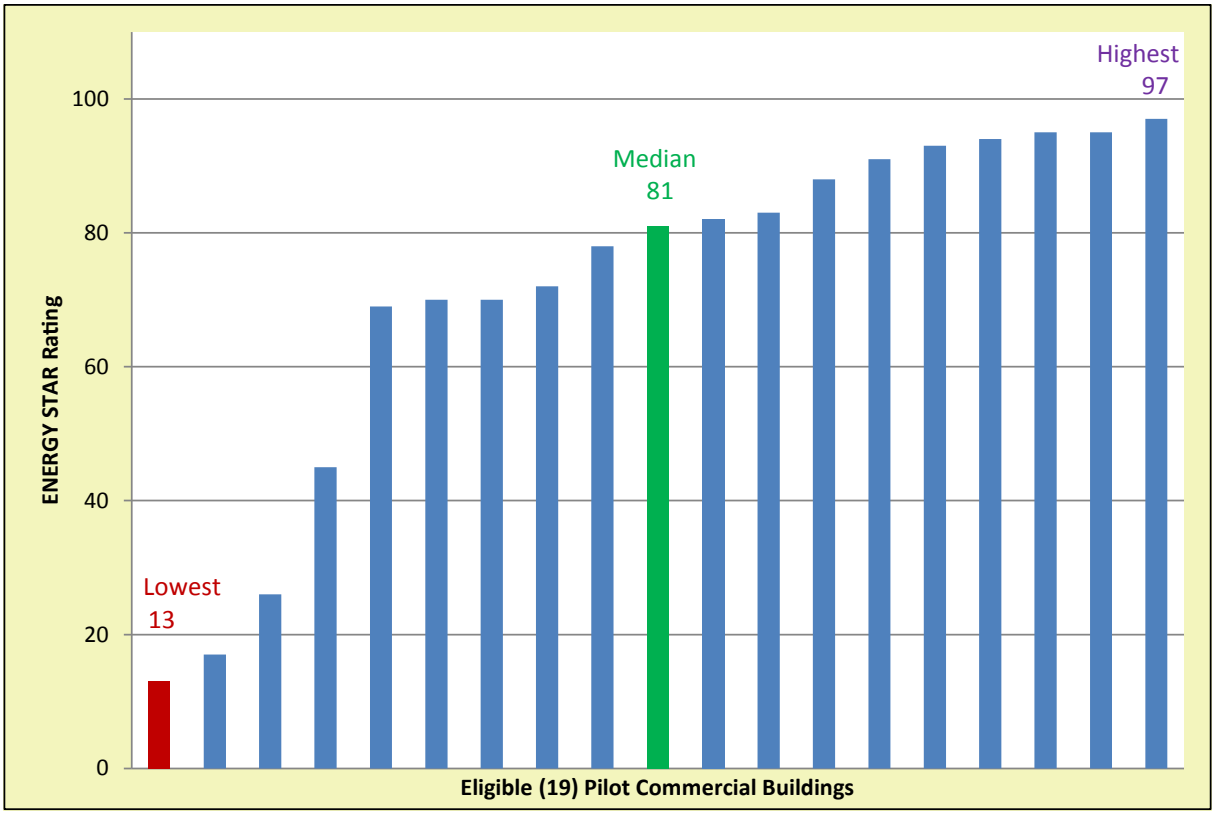
1) The data entered into Portfolio Manager did not cover a consecutive year of energy consumption;

2) The building's space type did not match an existing EPA building designation (e.g. office, hotel, retail, data center, etc.); or

3) The building did not meet the EPA's minimum operating characteristics (e.g. at least 5,000 square feet, operating at least 30 hours per week, contains at least one full-time worker, etc.).

It also should be noted, as particularly relevant to this set of buildings, that while mixed-use properties are eligible for an ENERGY STAR rating, if the building has more than half of its square footage dedicated to retail space, it is not eligible for a whole building ENERGY STAR rating.

40 Pilot Commercial Buildings Aggregate Source Energy Star Rating



*Note: ending dates of generated ENERGY STAR ratings differ

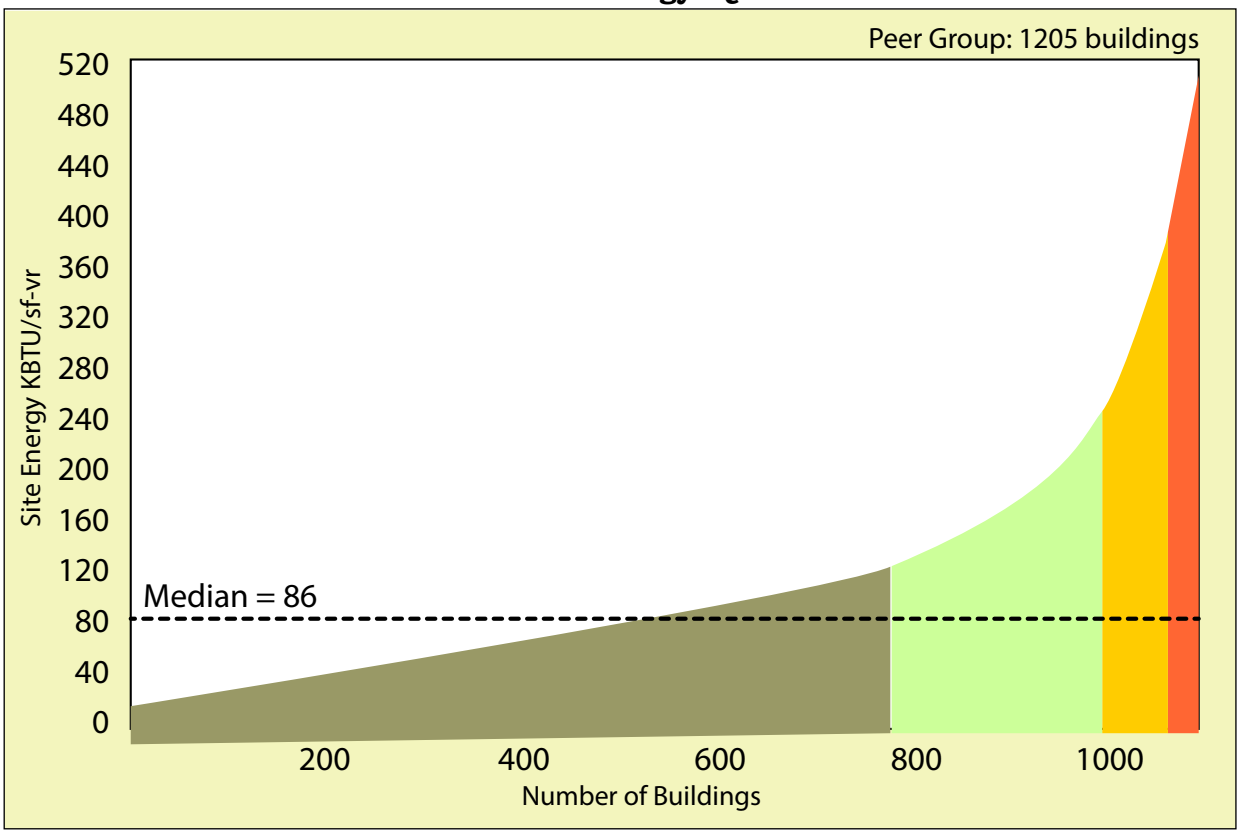
6. Factors that Contribute to Energy Consumption in Commercial Buildings

There are many factors that contribute to energy consumption in commercial buildings. A building's efficiency is determined in part by the building's vintage, use type, geographical location, fuel type, size, operational procedures, and energy-related equipment.

Across the United States, a building's efficiency can be determined by its EUI as compared with buildings of similar characteristics. The most comprehensive survey of commercial buildings' efficiency was completed by the Energy Information Administration (EIA) in 2003. This was called the Commercial Building Energy Consumption Survey (CBECS).

In comparing the participating pilot buildings within the city of Boulder with those in the United States, the pilot buildings consume about the same energy per square foot as similar use (office, retail, schools, etc.) buildings on a national level. The median site EUI (as seen in the aggregate results) was 87; a comparison of similar buildings nationally had a median site EUI of 86 – very close to the pilot program median. Below is a national sampling of similar buildings (created using Energy IQ – a building indexing tool created by the Lawrence Berkeley National Laboratory (LBNL)).

LBNL Energy IQ



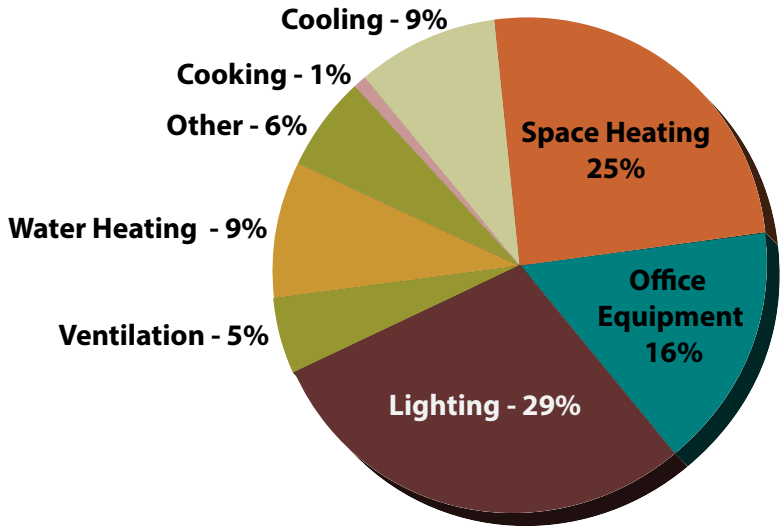
Source: Lawrence Berkeley National Laboratory

The majority of buildings that participated in the pilot program were office buildings. The pie chart below illustrates how these types of buildings primarily use energy. Commercial office buildings are the most common building type within the United States (consuming 17 percent of all the energy in the commercial building sector). These buildings all use energy for relatively the same thing, and have similar end-use breakdowns as shown below. By understanding how and where these buildings use energy, the city can promote specific programs targeting, for example, lighting or space heating. Much of this targeting is already being done with the commercial *EnergySmart* program.

Building Size

The two most common building sizes in the pilot program were buildings between 10,000 – 19,999 square feet (13), and over 50,000 (13). However, the median building size was 15,000 square feet, and 70 percent of the buildings in the pilot program were under 50,000 square feet. While two-thirds of all private commercial buildings within the city are less than 20,000 square feet, these buildings only represent one-fifth of the total gross square footage of private commercial buildings. This pilot has accurately reflected energy consumption of buildings by size, but targeting larger buildings (above 20,000 square feet) has more potential for capturing the bulk of the energy consumption of commercial buildings, since energy consumption is commensurate with square footage not number of buildings. Typically, buildings above 50,000 square feet also have a better return on investment for energy efficiency upgrades due to higher initial total energy costs.

Average Energy End-Use In Office Buildings Across The United States



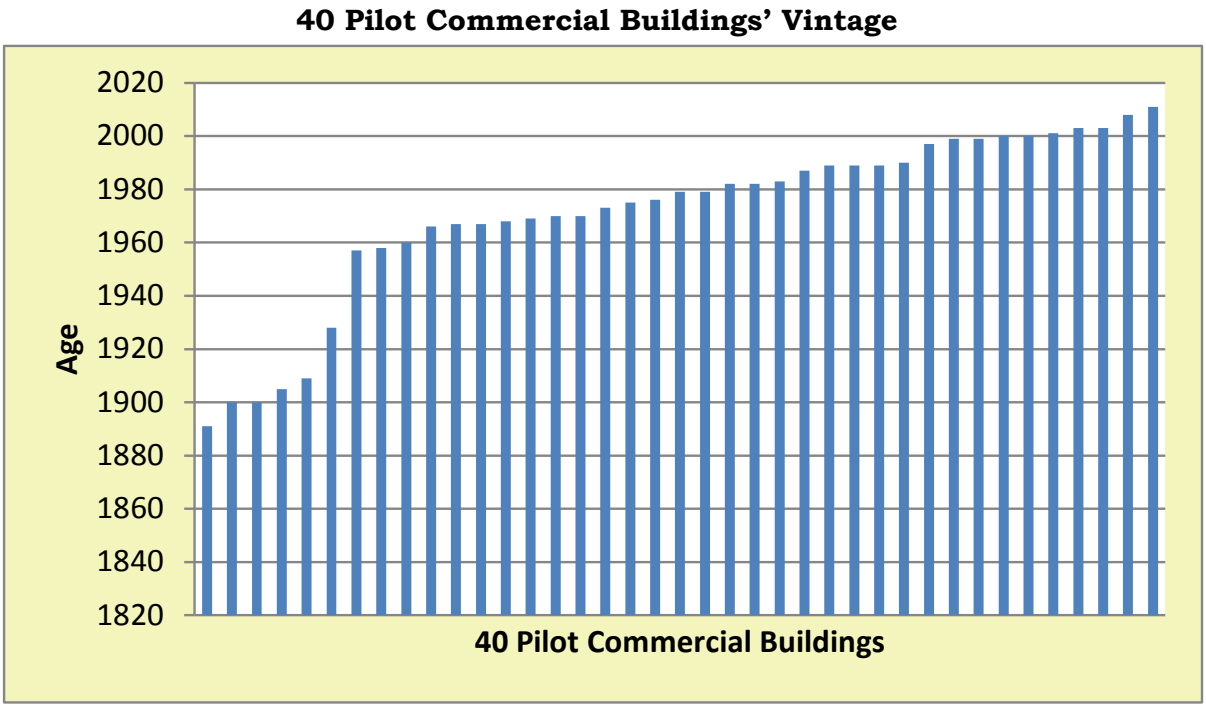
Source: Energy Information Administration

Geographical Location

The geographical location of a building is a key contributing factor to how much energy that building will consume on a national or world-wide scale due to the different climate zones in which a building can be located. For example, a building located in Atlanta will consume much more energy for air conditioning than a building located in Boulder, which has a much more temperate climate. While there is not climate differentiation within the limits of the city, the distribution of building efficiency provides anecdotal information on the location of efficient or inefficient buildings. More data would be required to draw any correlation between building efficiency and location; however, it is recommended that a geographical analysis be done once more commercial building performance data is available.

Building Vintage

Age is also a key indicator of the performance of a building since architecture and construction practices vary over time. These practices have a great influence on a building's ability to be energy efficient. For example, a building built in the early 1900s was limited to load-bearing walls, leaving less room for exterior windows along a building's façade. However, through advances in engineering, buildings built in the second half of the century were able to be structually-sound independent of the exterior walls. This allowed architects the ability for a much larger number of windows (e.g. window ribbons). Typically, while increased window to wall ratios allow for more natural daylight inside a building, the higher window to wall ratio, the less efficient the building is due to lack of insulation. Within the pilot participants, buildings were built between 1891 and 2011. The distribution of building age is seen in the below chart.

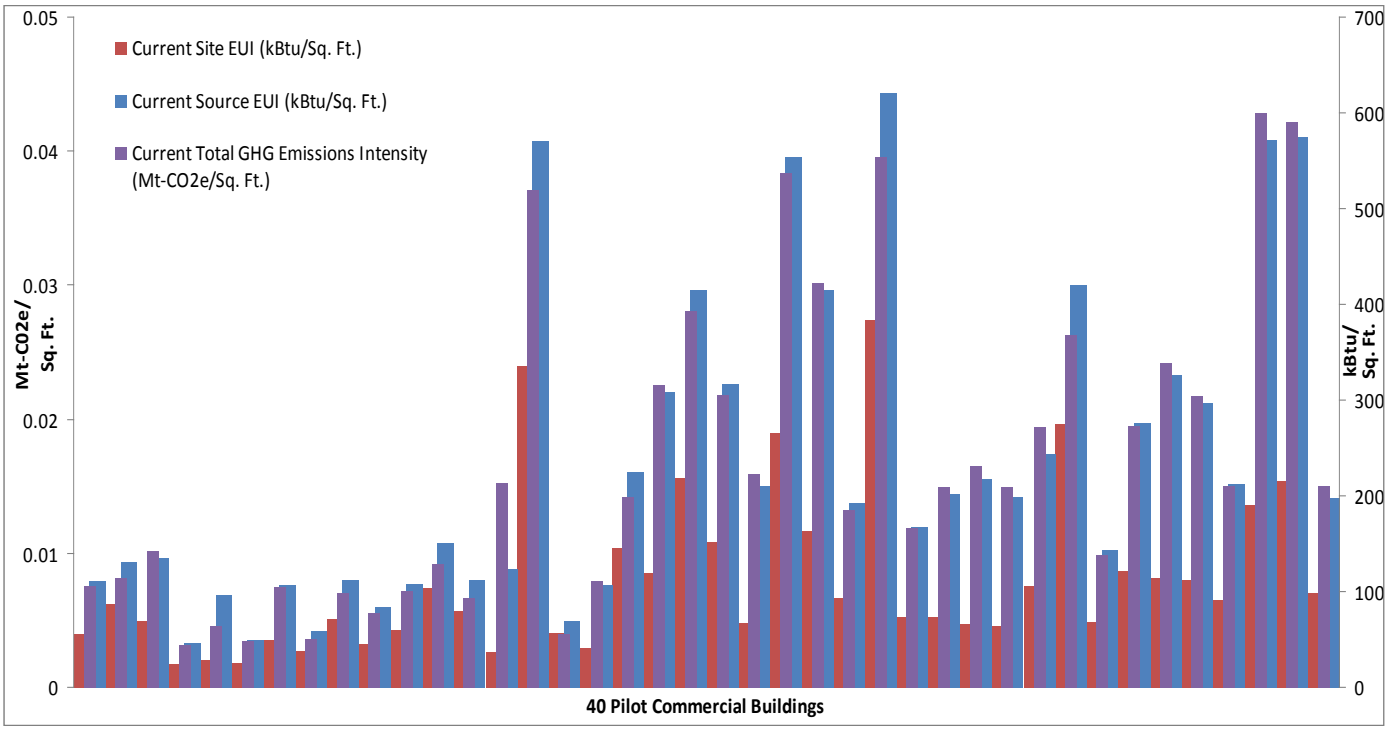


The vast majority of carbon emissions into the earth's atmosphere are energy-related, stemming from the combustion of fossil fuels. Curtailing these emissions is crucial to mitigating climate change. In the United States, the transportation and industrial sectors each use about a quarter of all the energy consumed, while buildings consume nearly half in the course of heating, cooling, ventilating, and lighting their spaces. Worldwide, buildings account for nearly 16 percent of all energy consumption. And with little of the building stock being built new—from two percent of U.S. commercial floor space to as much as 10 percent in India—most opportunities to improve efficiency over the next several decades will be in the existing building stock.

The city of Boulder has recognized that GHG emissions are an extremely important issue facing us all. The city's commitment to addressing GHG emissions is evidenced by its Climate Commitment, will set out to achieve climate neutrality by a specific date. To achieve carbon neutrality, the city must address its commercial buildings as a top priority.

The city of Boulder is no exception to these national and worldwide trends. The median annual GHG emissions per building among the 40 participating commercial buildings was 291mt-CO2e per year, which is equivalent to annual GHG emissions from 56 vehicles. As shown below, source EUI is closely correlated to GHG emissions intensity (GHG emissions per square foot) due to the fact that both benchmarks account for the source of energy; site EUI only accounts for on-site energy use, or what is shown on utility bills.

40 Pilot Commercial Buildings Energy Use and GHG Emissions Intensities



7. Pilot Process Feedback

Process and Energy Coach Background

As mentioned previously, the city contracted with the Colorado Green Building Guilds (Guild) Commercial Building Energy Coach Association to provide assistance to participating commercial buildings owners.

The energy coaches worked with the building owner and tenants to perform the following scope of work:

- Acquire appropriate consent forms to access utility bill data on assigned building(s)
- Collect utility data to input into Portfolio Manager and share it with the city's Portfolio Manager Master Account
- Request and complete online surveys required as part of the pilot participation, that involved soliciting feedback from building owners, tenants, and coaches for each building
- Complete energy rating completion form with signature from the building owner
- Submit all relevant documentation to Guild staff for accurate invoicing purposes to the city

The energy coaches were given thorough instructions for each of these items in the form of a predetermined protocol to ensure all information was collected and feedback was received to extract as much qualitative information as possible from the participants.

The next section details feedback from the energy coaches on this pilot process, both through a feedback session facilitated by city staff (14 participants), as well as through an online survey (26 responses). The following sections include feedback from building owners and tenants; as well as, Boulder County Public Health who provided a Quality Control/Quality Assurance (QA/QC) analysis.

Process Feedback: Energy Coaches

Overall, the energy coaches had positive feedback about the commercial building energy rating and reporting pilot program. When asked a few general questions about the program, responses from energy coaches surveyed included:

- 60 percent thought the energy rating pilot program was effective in providing useful information about the buildings' energy use
- Over 90 percent would recommend this program to others
- 70 percent felt that retrieving the energy use data was not difficult due to the fact the businesses were assisting them with the utility
- Most felt that the process took the amount of time they expected, maybe a little bit more in some instances (7 hours reported as the average per building)

Pilot Process

The majority of energy coaches (75 percent or higher) agreed or strongly agreed that this energy rating pilot program increased building owners' understanding of:

- Commercial building energy use;
- The energy rating process;
- The value of energy use tracking and benchmarking a building performance; and
- The importance of energy efficiency programs for commercial buildings.

The majority of energy coaches (70 percent) indicated that it was very likely that the building owners they worked with were going to continue to track energy use. Reasons for this included the following:

- Interest in energy use and how to save money
- Interest in tracking ongoing building performance, especially if they implement upgrades

- Useful tool for tracking and measuring progress
- Helpful in:
  - meeting and tracking goals to reduce energy use
  - making the case for potential upgrades
  - reducing energy costs
  - promoting efforts

The minority of energy coaches expressed that some building owners were too busy to rate their own buildings, or they didn't have a lot of energy saving opportunity (as they pass cost on to tenants), or because some buildings were small (<5,000 square feet) they were not even ENERGY STAR ratable (although the energy use intensity could be a helpful benchmark).

Overall, the majority of energy coaches had few major problems throughout the energy rating and reporting pilot program. However, there were noted challenges in the pilot program including the following:

- Excess paperwork;
- Rating multiple buildings on one campus;
- Rating eligibility/requirements; and
- Time spent collecting data and meeting with and/or getting approvals and signatures from building owners.

Data Collection

When asked what specific challenges the energy coaches had in collecting energy use data, the results were as follows:

- 46 percent of the energy coaches surveyed selected "no challenges"
- 40 percent reported "time required to retrieve energy use data from utility"
- 35 percent selected "other"
  - Under "other", a few additional challenges were noted, including the time it took working with utility account representatives (many didn't know their account representative or how to get in touch with Xcel), collecting gas data when it was through a different provider, and how to address buildings with vacant spaces and new tenants
- 23 percent of the remaining selections related to working with tenants on collecting data and signing the utility disclosure
- 20 percent selected "determining appropriate energy data to enter into Portfolio Manager"

The majority of energy coaches (nearly 80 percent) didn't work with tenants to collect energy use data; however those that did report some questions about why this is a city program and raised some concern about releasing data to the city. On a few multi-tenant buildings, there were tenants that were difficult to track down; it was time consuming and troublesome to identify and coordinate with the appropriate authority in that business to sign a consent to disclose form.

To address energy use data retrieval issues, energy coaches employed a variety of different tactics including the following:

- Working directly through the utility account representative
- Working with the building engineer or property owner
- Coordinating directly with other utilities (gas) for information
- Sending a "Statement of Good Standing" to Xcel to expedite process when working on multiple buildings at once
- Setting up the business accounts on Xcel's website (My Account feature)

Using Energy Star Portfolio Manager™

In general, energy coaches had a good experience working with Portfolio Manager. Of the energy coaches surveyed, 65 percent reported that Portfolio Manager was not difficult to use, followed by 35 percent reported it was somewhat difficult to use. There were some challenges with using Portfolio Manager that were noted, including issues with graphical display and usability as well as confusion about how to handle mixed use spaces (when to use "other" category), buildings with multiple meters, a campus of buildings, industrial buildings, and buildings with solar photovoltaics and net metering. Despite these challenges, Portfolio Manager was reported to be a fairly user-friendly and useful tool for both the energy coaches and building owners.

General Improvements or Suggestions Moving Forward

The energy coaches noted a few potential improvements or suggestions for an energy rating pilot program overall, including the following:

- Provide more educational and engagement opportunities for the building owners and tenants, including energy challenges across buildings
- Provide more information on building classification (address meter issue) and entering data in Portfolio Manager for a campus
- Clarify rating eligibility requirements – when you can get an ENERGY STAR rating or not – how to accurately measure square footages of spaces and what the resulting classification should be
- Include buildings that have less than 50,000 square feet – most larger building owners are already making energy efficiency improvements, and it provides more opportunities
- Collect energy data before start of program, or allow more time in the buildings
- Involve less paperwork, or a flowchart of the process and paperwork required
- Implement energy rating and reporting ordinance in a gradual, tiered way
- Look into low cost data logging to make reporting easier
- Investigate incentives for energy coaches or building owners
- Recommend utility data release forms in tenant lease, and/or set up an automatic data transfer, online account, etc.
- Portfolio Manager needs a more comprehensive list of buildings that can be classified and better visual display/graphics (note: this is coming in 2013 – see subsection 4 for more details)

Notable Observations

Through this pilot process, the energy coaches made a few interesting observations. The first is that the tenants seemed to like the idea of rating the building they are in, however the owners were not as interested in rating the building they own. Who decides to be rated through a voluntary program? This brings up the split incentive issue, which is the addressed for the residential sector through SmartRegs, but hasn't been addressed for the commercial building sector. If a commercial building energy rating and reporting ordinance was considered, the building owners wouldn't have a choice about rating their building, thus creating energy use transparency for current and potential tenants. Questions did come up about why the city wants this information and what they were going to do with it.

In terms of education, the energy coaches felt it would be helpful to have online tutorials regarding the following how-to topics:

- Read and analyze energy bills
- Use Portfolio Manager
- Utilize cost effective case studies
- Estimate savings from the most common improvement measures

All of which could be part of a permanent program, subsidized or provided by the city.

Process Feedback: Building Owners and Building Tenants

Building owners and tenants also had positive things to say about the pilot program. From the survey results, both owners and tenants surveyed indicated that the pilot program was either very effective or somewhat effective in providing useful information about their buildings' energy use; they also said they would definitely or probably recommend energy rating to others. Both owners and tenants surveyed responded that the process of retrieving energy use data wasn't too difficult, and took about the time they expected or less (between 1-to-5 hours per building).

Of the building owners and tenants surveyed (18 owners and 5 tenants), about half hadn't participated in any of the city current sustainability programs, with around half participating in either *EnergySmart* or water conservation programs, followed by a few that are involved with Partners for a Clean Environment (PACE), *GO BOULDER*, U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED), or *10 For Change*.

Almost all building owners reported that understanding the energy use of their building(s) was very important to them, and agreed that the pilot program increased this understanding. Almost all building owners ranked identifying cost effective upgrades to improve energy efficiency and identifying cost savings resulting from reducing energy use as important, and most agreed that this program helped them accomplish both. The majority of those surveyed rated enhancing the sustainability and knowing the energy performance of their building(s) as very important, while the majority of owners ranked the importance of offering tenants an energy efficient space to lease. Building tenants had similar reported results for ranking the importance of the above statements. ***Almost all building owners agreed that the information from this program was well worth the time spent gathering the data, and over half reported that the information would be helpful for marketing.***

While initially some building owners reported to have had concerns around staff time and resources, disclosing information, and interrupting tenants during the pilot program, all of their concerns (and similar tenant concerns) were addressed. When asked about using Portfolio Manager, building owners reported the following:

- 55 percent reported Portfolio Manager was not difficult to use
- 45 percent reported Portfolio Manager was somewhat difficult to use
- Over 80 percent reported that they definitely or probably would continue to use Portfolio Manager to track energy performance

A few challenges building owners reported during the process included, allocating resources and staff time and learning how to use Portfolio Manager (highest) to finding comparable buildings to benchmark, retrieving energy use data, and scheduling time with their energy coach (lowest). The largest problems noted were obtaining data from Xcel and having to go through tenants to access this data.

Overall comments from building owners included positive reviews for the energy coaches around their expertise, responsiveness, and knowledge; they also noted that the pilot program was immensely helpful and would have taken much more time to do something like this on their own.

The majority of comments from tenants included similarly rave reviews of the energy coaches. They noted that the pilot program was the catalyst they needed to engage their landlord on making energy efficiency improvements and hope the program goes forward. There was feedback that some tenants were concerned with disclosing their data to the city. They also noted that more assistance and expertise around next steps and larger improvement recommendations would be helpful, and there was some difficulty in working with tenants on obtaining data from Xcel Energy.

Process Feedback: Boulder County Public Health

The Boulder County Public Health (BCPH) Business Environmental Sustainability Team provided recommendations to help the city develop an Energy Rating Pilot Protocol (Protocol) for the energy coaches to use as a guideline for entering data into Portfolio Manager. BCPH also provided Quality Assurance/Quality Control (QA/QC) on the Portfolio Manager accounts and associated ratings that were entered by the energy coaches participating in the pilot. Note that *EnergySmart* advisors from BCPH also provide energy rating and reporting with Portfolio Manager for Boulder businesses and building owners as part of the advisor service and pilot. However, the QA/QC was only performed by them on the participating buildings that the energy coaches were working with in the pilot.

In general, BCPH found that the coaches performed very well in working with the businesses, gathering utility data, and entering it into Portfolio Manager according to the Protocol. The Protocol was developed to ensure that the data going into Portfolio Manager was consistent and standardized for quality reporting purposes. Lessons learned center around the difficulties of obtaining permission from tenants, and of obtaining a Portfolio Manager rating due to unsupported building types, small square footage, data gaps, and metering peculiarities. In practice, an energy rating and reporting program may need to use the easier-to-obtain source or site energy use index (EUI) metric in Portfolio Manager as a workaround to these limitations. Some of the software idiosyncrasies may be addressed in the anticipated 2013 upgrade of Portfolio Manager (see below).

Results of the ratings include:

- Seventeen of the 40 original pilot buildings were reviewed by BCPH. Six received an ENERGY STAR rating of 70 or higher (four achieved scores over 90); two of the buildings received a score below 15.
- Eight of the buildings were not eligible to receive a Portfolio Manager rating. Six of those were because more than 10 percent of the square footage was of a use type for which Portfolio Manager currently does not offer a rating (e.g. restaurant, manufacturing, recreation, vacant).

Most energy coaches did an excellent job of following data entry protocol, with some exceptions regarding naming protocols for facilities and spaces, which may have been due to the Portfolio Manager accounts having been created prior to the pilot by a property owner or building occupant. The energy coaches did well working around intricate metering and subdivided property types and quickly learned how to obtain data from the utility once they had the necessary approvals. Utility data was generally complete and sufficient to generate at least an EUI.

2013 Portfolio Manager Update

The Environmental Protection Agency (EPA) is planning to release an updated version of Portfolio Manager in summer of 2013. There is currently not much detail on the date when it is expected to be released, but it is assumed the updated version will resolve a number of the minor user hurdles mentioned above such as the graphical interface and the rigidity of the Username/Account Name.

The 2013 Portfolio Manager upgrade is expected to roughly coincide with the release of the updated Commercial Buildings Energy Consumption Survey (CBECS) data for 2011. Portfolio Manager metric calculations will not change with the 2013 upgrade. If 2011, CBECS data eventually replaces the current 2003 baseline against which buildings are compared, this may mean that Portfolio Manager ratings and EUI scores may change.

Due to the many changes coming to Portfolio Manager, it is recommend that the fully-launched 2013 upgrade be evaluated and its capabilities considered when further developing the city of Boulder's commercial building energy rating and reporting program.

8. City of Boulder Facilities

As part of its commitment to lead by example and Phase 3 of the Energy Performance Contract, 28 city of Boulder's most energy-intensive facilities are being tracked and rated by McKinstry using their database, which is linked with Portfolio Manager. Energy rating can be used to track performance and help prioritize energy efficiency improvement measures.

The two water treatment plants and the wastewater treatment plant will be rated after the Portfolio Manager upgrade is complete in the summer of 2013. The upgraded system has been developed to support these space types; therefore, at the time this report was written, only 25 facilities were rated or scored and reported.

Characteristics of City of Boulder Facilities

These 25 city facilities represent the majority of total energy use across all city of Boulder owned facilities. Below is a breakdown of the buildings' characteristics in terms of size, eligible rating in Portfolio Manager, and diversity of space type.

Participating city facilities include the following space types that receive an energy performance rating (ENERGY STAR rating, on scale of 1-100,100 being the most efficient) in Portfolio Manager:

- Office
- Water Treatment & Distribution Utility (coming in 2013[7])
- Wastewater Treatment (coming in 2013[6])

Participating city facilities include the following uses that only received an energy use intensity (EUI) score in Portfolio Manager:

- Fire Stations
- Police Station
- Recreation Centers
- Service Centers
- Libraries

In addition, the 25 city facilities that were rated or scored in Portfolio Manager have diverse characteristics, such as:

- Various energy use meter configurations
- Various ages
- Mixed space types within a facility

	Building Size (sq. ft.)						
	1,000-4,999	5,000 - 9,999	10,000 - 19,999	20,000 - 29,999	30,000 - 39,000	40,000 - 49,999	> 50,000
Number of City Facilities in Pilot Program (25)	4	5	7	4	1	0	4

[6,7] At this time, McKinstry does not have the capability to rate water and wastewater treatment facilities; however this capability will be developed in conjunction with the Portfolio Manager upgrade scheduled for later this year.

Results and Process for City of Boulder Facilities

Aggregate results reported that the median site EUI of city owned facilities was 79, with four out of six rated facilities scoring above a 75. Compared to a national average site EUI of 86, this demonstrates that city facilities are above average in terms of efficiency (which should be the case since these results were calculated after the completion of the Energy Performance Contract). See **Appendix 4** for aggregated site and source EUIs; as well as, ENERGY STAR ratings for eligible facilities.

In terms of process, acquiring whole building energy use data can be easier for the city of Boulder buildings than in the private sector because of the lack of complicated situations where buildings share meters and have multiple and varied tenant spaces. Also, the city staff is knowledgeable about the meter configuration at each building, which is helpful. However, the city buildings are less likely to be ratable, that is, fall into space type categories supported by Portfolio Manager. Of the 25 facilities benchmarked, only six were ratable and all were offices. Two more office buildings would have been ratable, but they included either a dance studio or an equipment workshop that measured larger than 10 percent of the gross square footage, thus eliminating them from receiving a rating.

It is important to be exhaustive about ensuring that all energy meters have been included in Portfolio Manager. There are two approaches, and both should be investigated where possible.

1. Facility management understands the physical meters themselves;

2. Administrative staff understand the utility bills, where usage is recorded.

Energy use data can be acquired directly from the utility providers (in spreadsheets or PDFs formats of utility bills and, in the best case, online) and/or from utility bills received by the building occupants. Attention needs to be paid to the units used on the bills, which can vary with natural gas. It is feasible that someone not familiar with electricity units could confuse kW and kWh readings on utility bills, some of which have many line items of each unit.

The focus should be on making sure energy use data is not only accurate, but it is also vital that Portfolio Manager receives the correct space attributes. For facilities that aren't eligible for a rating, only the gross square footage is important; however, for ratable spaces several other parameters are necessary. Tracking these requires organization, because benchmarking is an ongoing process, repeated regularly.

Each attribute is associated with an effective date required by Portfolio Manager, and this must be recorded carefully, as well as the attribute itself. For example, there were 100 computers and 125 workers on a shift on Jan., 1, 2012. On Aug. 15, 2012, those numbers changed to 105 computers and 156 workers. Portfolio Manager's rating calculations take into account when those numbers changed in the 12-month period for each rating, as well as the values themselves. The city of Boulder will need to decide how often building owners will update their attributes to balance a system that is not too cumbersome with one that is accurately using Portfolio Manager. Well-designed worksheets can help the collection of the attributes, with no room for misunderstanding. When collecting data, it's worth thinking through the intent of Portfolio Manager when interpreting the questions. How many people are typically using the building and affecting its performance, rather than simply how many are on the payroll. The EPA's Portfolio Manager website has Frequently Asked Questions that can be consulted. It is a sprawling website and is due to be overhauled at the same time as Portfolio Manager's upgrade this June.

In general, McKinstry found the utility provider helpful in sharing energy use data but their accessibility varies a great deal. However, Xcel Energy has very rigorous privacy rules about the transfer of information, in conjunction with encrypted emails that disappear after seven days.

9. Conclusion

The old adage "you can't manage what you can't measure" holds true when it comes to building energy consumption. The city of Boulder's commercial building energy rating and reporting pilot program is a testament to the fact that when building owners start to keep track of their energy consumption through a tool such as ENERGY STAR Portfolio Manager, they start to see tangible opportunities to reduce energy consumption.

The results of the pilot program have given some insight into the efficiency of commercial properties in the city of Boulder as compared to a national scale. However, the amount of participating properties represents only a small portion of the total number of commercial buildings within the city limits. Due to the small sample size, caution should be taken in extrapolating this data as key indicators for the entire city commercial portfolio. As is described in the recommendations section, broadening this rating and reporting program to a larger number of buildings would yield broader insight into how and why commercial buildings use energy, and, more importantly, bring visibility to decision-makers on how to reduce energy consumption.

In analyzing the aggregate data collected through ENERGY STAR Portfolio Manager, a few key indicators stand out:

- The median site EUI for the pilot commercial buildings was 87 (79 for city owned facilities) which is close to the national average EUI of 86
- The median source EUI for commercial pilot buildings was 199 (163 for city owned facilities)
- The median ENERGY STAR rating for pilot private commercial buildings was 81 (79 for city owned facilities), demonstrating above-average performance
- The median GHG emissions for commercial pilot buildings was 291 mt-CO_2e
- Only half of the buildings reported through ENERGY STAR Portfolio Manager received an actual ENERGY STAR rating due to incompatibility between percentage of space types and ENERGY STAR rating eligibility requirements
- The majority of commercial buildings that received an ENERGY STAR rating were top performing buildings when compared to similar buildings nationally
- In general, the data collected from the 40 pilot buildings is most representative of a building profile of 15,000 square foot office buildings built between 1960 and 1990

Acknowledgements

As stated previously, the pilot process went very well and is a recommended approach for a future energy rating and reporting program, with recommendations noted for energy coach training, education and incentives, access to utility data, and the data collection and approval process.

The city of Boulder would like to sincerely thank the following parties and organizations for making the Commercial Energy Rating and Reporting Pilot Program successful:

- **Participating commercial building owners and their tenants**
- **Colorado Green Building Guild – Commercial Building Energy Coach Association**
- **Boulder County Public Health – Business Environmental and Sustainability Team**
- **Boulder Chamber and Boulder Economic Council**
- **Cadmus and Nexant**

Appendices

Appendix 1 - Additional Recommendation

While the information gathered by the Portfolio Manager is extremely useful for understanding building operations and efficiency as compared with other buildings of similar characteristics, it is impossible to understand what building system types (e.g. lighting type, HVAC system, and mechanical distribution) are in place in more efficient or less efficient buildings. In addition to utilizing Portfolio Manager, the city should consider utilizing an asset rating program for commercial properties. An asset rating focuses on the energy performance of a building's component parts, enabling direct comparisons of performance among similar buildings regardless of hours of operation, tenant behavior, how well the systems are operated and maintained, and other factors that can have significant impacts on energy consumption. Asset rating of a building's systems (such as lighting, heating and cooling, and insulation) in terms of their energy efficiency offers a different way to objectively value property, creating a new way to value high-performance systems.

Appendix 2 - City of Boulder Energy Efficiency Programs

In 2006, the city of Boulder's Climate Action Plan (CAP) identified that energy use makes up 76 percent of the community's GHG emissions. The electricity consumption of the industrial and commercial sectors accounts for nearly 83 percent of those emissions. In response to this information, the city established several programs for businesses and commercial buildings to begin addressing this issue. Throughout the past five years, the city's commercial energy efficiency programs and services have evolved to increase their effectiveness.

Commercial services prior to 2008 focused on business and property owner communications. This outreach was designed to inform and assist commercial properties of the demand-side management (DSM) programs offered through Xcel Energy. As a result of this outreach, the "split incentive" barrier (i.e., those responsible for paying energy bills are different from those responsible for making the capital energy efficiency improvements decisions) became evident, at which point, the city, with assistance from private sector partners, created the *10 For Change* program which caters to business tenants. This program is a voluntary challenge for participating businesses to reduce their energy use by 10 percent.

Through a robust community engagement process in collaboration with Boulder County, some existing emission reduction strategies were retooled in 2009 based on the model of "Two Techs and a Truck" – a one-stop shop for residents, businesses and property owners to access information, resources and rebates. A CAP Commercial Technical Team was formed to help develop a concept and model for the commercial/business sector. This work and the existing Partners for a Clean Environment (PACE) Program laid the foundation for the commercial *EnergySmart* program, funded through the American Reinvestment and Recovery Act and implemented in partnership with Boulder County.

Beginning in 2010, the city and partners committed to expanding CAP services beyond communications, outreach and programs to connect property owners to existing rebates. Several new programs and services were designed and piloted to help businesses and property owners overcome barriers and support their efforts to invest in efficiency.

The successful programs included technical assistance that evolved into energy advising services that were incorporated into *EnergySmart*, which launched in 2011. Since 2011, *EnergySmart* has provided over 2,200 commercial services and rebates to more than 1,700 businesses and property owners in the city. Of the customers receiving advising service, 40 percent have undertaken projects and received over $800,000 in *EnergySmart* rebates including $300,000 in CAP tax funded rebates and incentives, and avoided over 5,000 mt-CO_2 emissions. This is equivalent to the GHG emissions avoided by 1,000 cars not being driven for one year.

In 2012, the City Council discussed moving forward with a three-phase commercial energy efficiency strategy that includes:

- Expanded voluntary and incentive based programs;
- Implement a regulatory policy that would require commercial energy rating and reporting; and;
- Eventually, require prescriptive energy efficiency measures and/or performance standards

The intention is to continue the highly successful advisor model, with *EnergySmart* advisors working directly with participants to identify energy efficiency and money saving opportunities.

Later in 2012, staff proposed a pilot program for the fourth quarter of 2012 to inform development of the commercial energy rating and reporting ordinance and program. In addition to a pilot program for private sector commercial buildings, the city of Boulder organization is leading by example by rating its own facilities as well.

Appendix 3 – Pilot Program Background

Pilot Program Objectives:

- To encourage the energy rating and reporting of energy use in a variety of commercial buildings in Boulder.
- To understand whole building energy use and the performance of commercial buildings calculated by an energy rating tool that is becoming the national standard throughout the country, U.S. EPA's ENERGY STAR Portfolio Manager.™
- To help inform the development of a potential energy rating and reporting ordinance by:
    - o Rating a cross-sample of commercial building sizes and types
    - o Evaluating the time/resources needed to rate commercial buildings
    - o Understanding the access to energy use data and the challenges associated with receiving aggregate whole building usage data

Pilot Program Desired Outcomes:

To better understand:

- The size threshold of buildings where rating will make the most impact for long term energy efficiency opportunities.
- The time, effort and resources it takes a building owner to rate their buildings' energy performance.
- The access and format of whole building aggregated energy use data.

Pilot Program Timeline

In December 2012, staff initially reported to City Council that the commercial energy rating and reporting ordinance work plan would consist of three phases. Initial research and identification of issues began in 2012 and has been completed. The second phase (January through Fall 2013) involves refining approaches and developing ordinance options. During the final (third) phase of the work plan (Fall through Winter 2013/2014), City Council will provide preliminary direction on the ordinance options.

Pilot Program Design

Staff developed the pilot program with significant input from local energy professionals, *EnergySmart* staff, and professionals and staff from other communities that currently have energy rating and reporting programs.

Pilot Program Implementation Steps:

1) The city contracted with the Colorado Green Building Guild (Guild)'s Commercial Building Energy Coach Association to provide assistance to participating building owners. The energy coaches signed a nondisclosure agreement as part of the contract, and were compensated on a per building basis.

2) Boulder County Public Health provided Quality Control/Quality Assurance (QA/QC) on energy coaches work with pilot participants and data inputs to Portfolio Manager and as part of the annual *EnergySmart* contract with the City

3) Staff reached out to prospective building owners through the following methods:

    a) *EnergySmart* and *10 For Change* participants

    b) Economic Vitality contacts and past Flexible Rebate Program participants

    c) Colorado Companies to Watch awardees

    d) Press releases

    e) Energy coach outreach

    f) Staff presentations at outreach events:

i) Boulder Tomorrow

ii) Commercial Brokers of Boulder

iii) Boulder Area Realtor Association

iv) Colorado Green Building Guild

4) Before a building owner applied for the program, the building was screened for eligibility based on the size and use of the buildings already participating.

5) To streamline the pilot process, building owners were required to have complete participation of all tenants in the building in order for the building to participate.

6) Energy coaches then worked with the building owner and tenants to access energy use data in one of three ways:

   a) Sign a utility consent to disclose form to give the energy coach access to the energy use data

   b) Provide hard copies of at least a full year of utility bills to the energy coach

   c) Contact Xcel Energy's Business Solution Center to retrieve the data

7) To address privacy concerns, tenants were required to sign a form acknowledging that the Portfolio Manager energy rating and/or EUI score would be shared with the City.

8) The Portfolio Manager data entered by the energy coaches was required to be shared with the City's Master Portfolio Manager account used to collect shared data from individual building owners and surveys completed by the energy coaches, building owners, and tenants in order to complete the pilot process.

Appendix 4 - Aggregate Results of city of Boulder Facilities

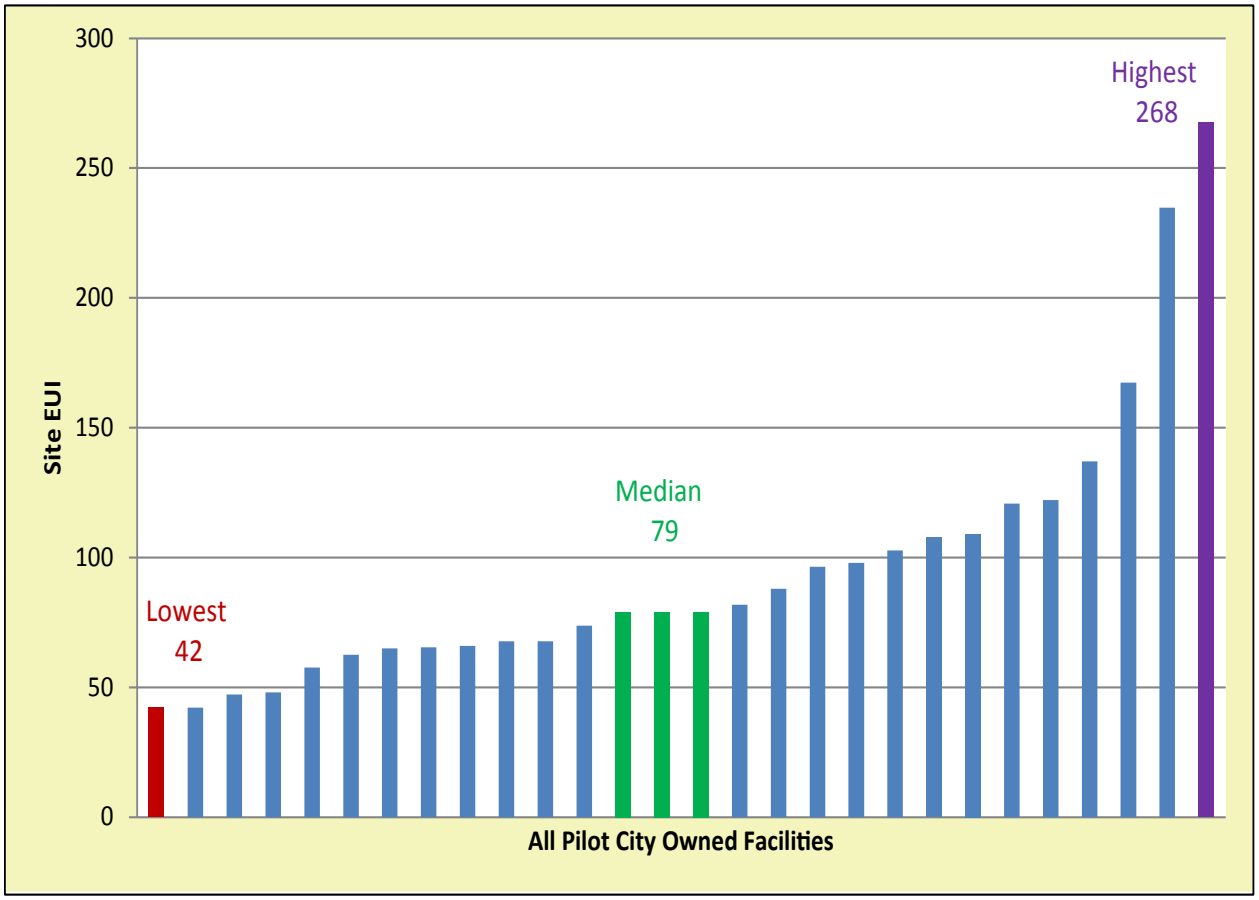
Below and on the following pages are the aggregated data results for the city facilities, displayed as site EUI, source EUI, and ENERGY STAR rating. Only six (out of 25) of the city of Boulder facilities are ENERGY STAR ratable and all are of the office space type; their ratings range from 31 to 99. The other facilities are benchmarked with an EUI value with which they can be compared within their use group. That is, the three libraries can be ranked against each other to show which one uses the most or least energy per square foot. If libraries were a ratable space type, the rating would show how much energy each library used compared to other libraries across the country, normalized for weather, size, operating hours and other attributes, which would be very useful.

As assumed, the results show that City offices tend to use quite a bit less energy per square foot than recreation centers and more than or the same as libraries in Boulder. Comparing EUIs across different building use groups is difficult because of various issues connected to function and operation. Police and Fire Stations operate 24/7, whereas an office might have a 45 hour work week, and a recreation center might house a swimming pool that is heated. See below and on the following pages, for the reported site and source EUIs; as well as, ENERGY STAR ratings for eligible facilities.

Aggregate Site Energy Use Index

Among city facilities participating in the pilot program, the range of site EUIs are from 42 to 268 with a median site EUI of 79, well below the national average EUI of 86.

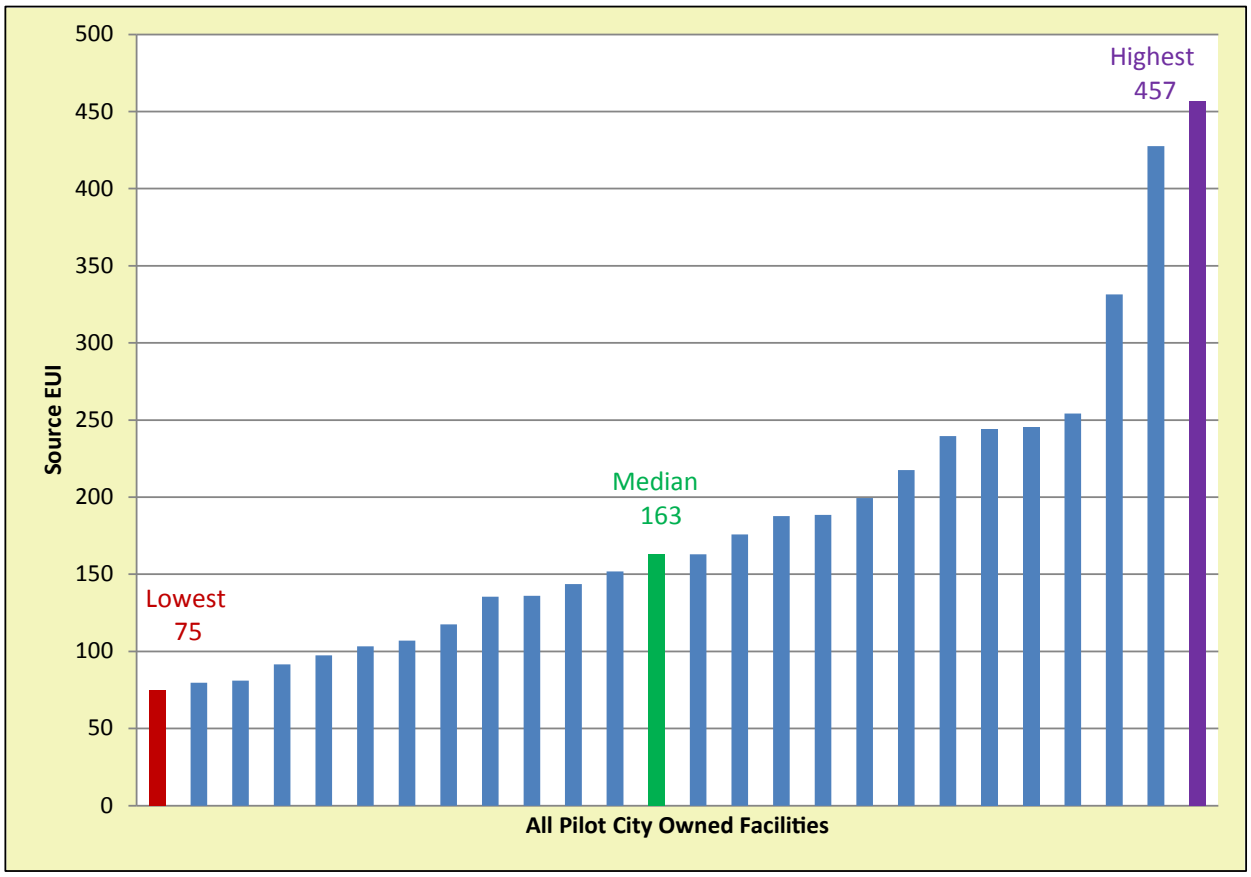
25 Pilot City Owned Aggregate Site Energy Use Index



Aggregate Source Energy Use Index

Among city facilities participating in the pilot program, the range of source EUIs are from 75 to 457 with a median source EUI of 163.

25 Pilot City Owned Facilities Aggregate Source Energy Use Index



Aggregate Energy Star Rating

Among city's facilities participating in the pilot program, the range of eligible ENERGY STAR ratings went from 31 to 99 with a median ENERGY STAR rating of 79.

25 Pilot City Owned Facilities Aggregate Energy Star Rating