

ENERGIZE DENVER

ANNUAL REPORT

APPENDICES | 2018



DENVER
PUBLIC HEALTH &
ENVIRONMENT

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Additional Information & Annual Report can be found at:
www.denvergov.org/energizedenver

DATA QUALITY CHECKS

The data submitted to Denver as a requirement of the Energize Denver Benchmarking rule in 2018 was reviewed for completeness and accuracy by Energize Denver staff before any building was passed into compliance. About half of the submissions did not pass at least one of the data quality checks initially and received a manual review of the data, typically followed up by a phone call to help the person submitting the report correct any errors. The following list of Portfolio Manager fields was reviewed as part of the quality control process.

Fields Reviewed for Completeness
"Denver Building ID" field should have 4 digits and no letters, and should not have "Not Available"
"Electricity Use - Grid Purchase and Generated from Onsite Renewable Systems (kWh)" field should have a number > 0, and should not have "Not Available."
The "ENERGY STAR score" field should have a 1-100 value if the building is one of the property types currently eligible to receive an ENERGY STAR Score.
Fields Reviewed to Ensure That Data Was Reasonable
<i>Unusual data in the following fields does not necessarily indicate an error, but in these cases Help Center staff would call the person submitting the report to verify the data.</i>
ENERGY STAR score not below 5 or above 95
EUI not below 25 or above 375
No natural gas use: There are some all-electric buildings, but other times someone has forgotten to enter natural gas data.
Natural gas units wrong or missing steam: If these two are too low, a call is made to find out how the building is heated.
Year-over-year changes: Any change in square footage. More than a 10 (ten) percent change in Site EUI, electricity consumption, natural gas consumption or ENERGY STAR score.
Reported Gross Floor Area more than 10% greater or less than the Assessors Gross Floor Area on file
Office: Weekly Operating Hours unusually low or high
Office: Number of Workers on Main Shift unusually low or high
Office: Number of Computers unusually low or high
Financial Office: Weekly Operating Hours unusually low or high
Financial Office: Number of Workers on Main Shift unusually low or high
Financial Office: Number of Computers unusually low or high
Hotel: Number of Rooms unusually low or high per square foot
Medical Office: Weekly Operating Hours unusually low or high
Medical Office: Number of Workers on Main Shift unusually low or high

Multifamily Housing: Total Number of Residential Living Units unusually low or high per square foot

Multifamily Housing: Number of Units in Low-rise, Mid-rise, or High-rise setting (units in multiple settings is unusual and a common error)

Multifamily Housing: Number of Bedrooms unusually low or high per square foot

Portfolio Manager Alerts That Prompt Further Review by Energize Denver Staff

Alert: Data Center No IT Meter

Alert: Gross Floor Area is 0 ft2

Alert: Individual monthly meter > 65 days

Alert: Meter has overlaps

Alert: Meter has gaps

Alert: Meter has less than 12 months of data
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Alert: No meter associated with property
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Alert: Property has no uses

Whole building data: "Metered Areas (Energy)" field should be "Whole Building"
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EXEMPTIONS

The list of exemptions provided in 2018 is below.

Type of Exemption	Number of Approved Exemptions
A building for which the Owner can demonstrate that its energy performance is a confidential business practice that includes trade secrets, privileged, or confidential commercial information. In order to qualify for this exemption, the Owner shall specifically identify the information it believes is confidential and provide a written statement below describing the manner in which public disclosure would cause substantial harm to the Owner's competitive position. Inefficient energy usage alone will not be considered confidential commercial information.	2
A demolition permit has been issued for the entire building, and demolition work has commenced on or before the date the benchmarking report is due.	10
I am unable to obtain data from my third-party natural gas provider because the building was purchased in 2017, and the owners and natural gas provider have not responded or have refused to provide the data for the rest of the year.	4
I am unable to obtain whole-building data because my building has less than 4 tenants, or one tenant who is more than 50 (fifty) percent of the energy usage, so Xcel Energy will not aggregate whole-building energy data for me AND I have requested consent to obtain that data from my tenants and they have refused that request.	54
The building had an average physical occupancy of less than 60 (sixty) percent throughout the calendar year for which benchmarking is required.	79
The building is presently experiencing qualifying financial distress, as defined by any of the following: (1) the building is the subject of a qualified tax lien sale or public auction due to property tax arrearages; (2) the building is controlled by a court-appointed receiver; or (3) the building has been acquired by a deed in lieu of foreclosure.	0
The building is used primarily for manufacturing or agricultural processes. This exclusion applies only if the manufacturing or agricultural process uses significant energy. To qualify for this exemption, please explain below what sort of industrial or agricultural process is happening in the building and state if that process uses electricity or natural gas.	118
The building was not occupied, due to renovation, for all twelve (12) months of the calendar year for which benchmarking is required.	10
The building was not occupied and did not have a certificate of occupancy or temporary certificate of occupancy for all twelve (12) months of the calendar year for which benchmarking is required.	100

ADDITIONAL ANALYSES

This section provides additional analyses on the data submitted to the City and County of Denver as a part of the second year of benchmarking reporting. Given that this is also the second year of reporting, this appendix also provides analysis of how building performance changed from the 2017 reporting cycle to the 2018 cycle.

Figure 1 below shows the energy-use distribution of buildings that passed all data-quality checks. Offices represent 17 percent of total energy use (compared to 19 percent of square footage), apartments are 16 percent (19 percent square footage) and condominiums 7 percent (10 percent square footage). For additional comparison, municipal buildings represent 8 percent of total square footage but 11 percent of total energy use among the City's largest buildings.

Figure 1: Total Energy Use by Property Type (kBtu)

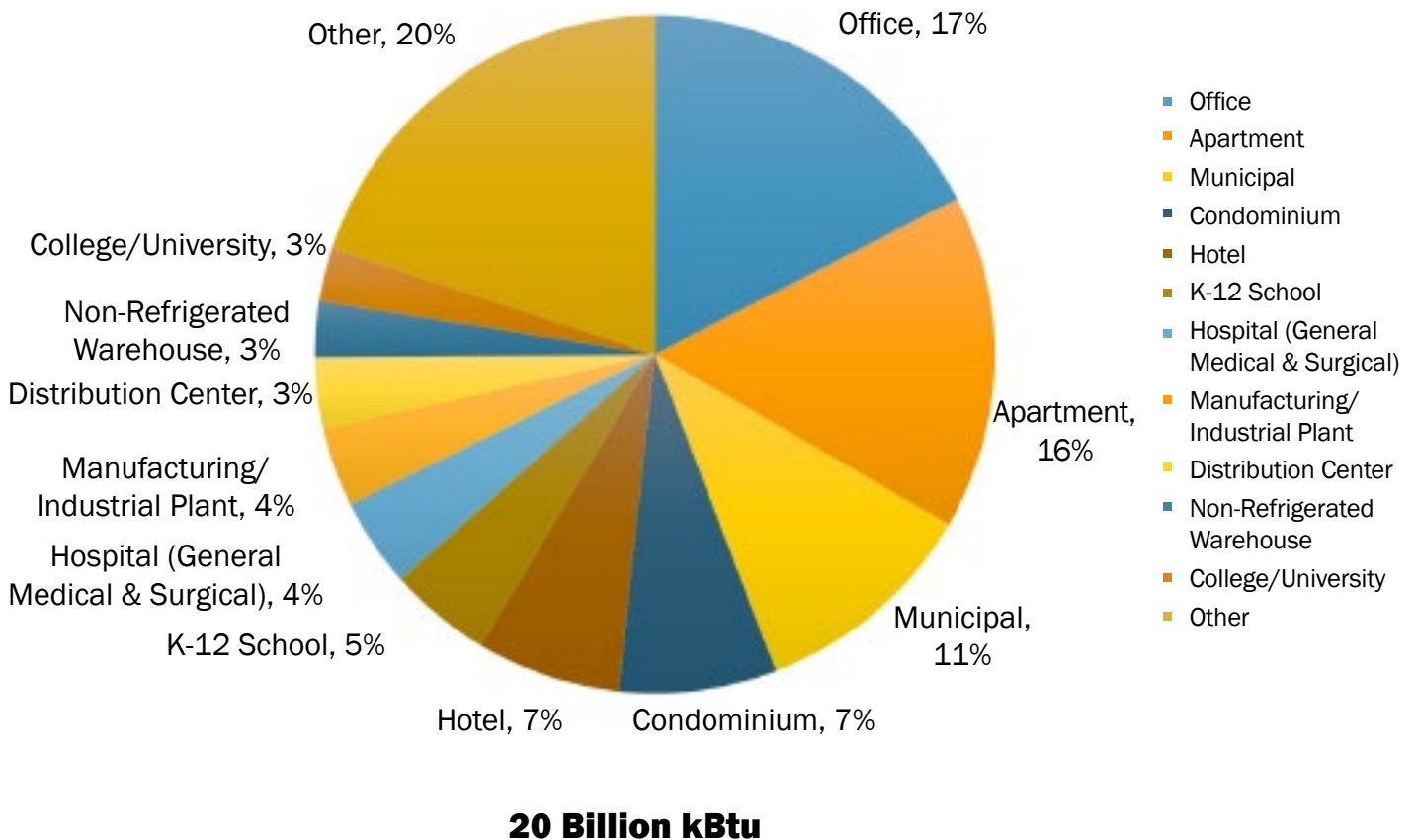
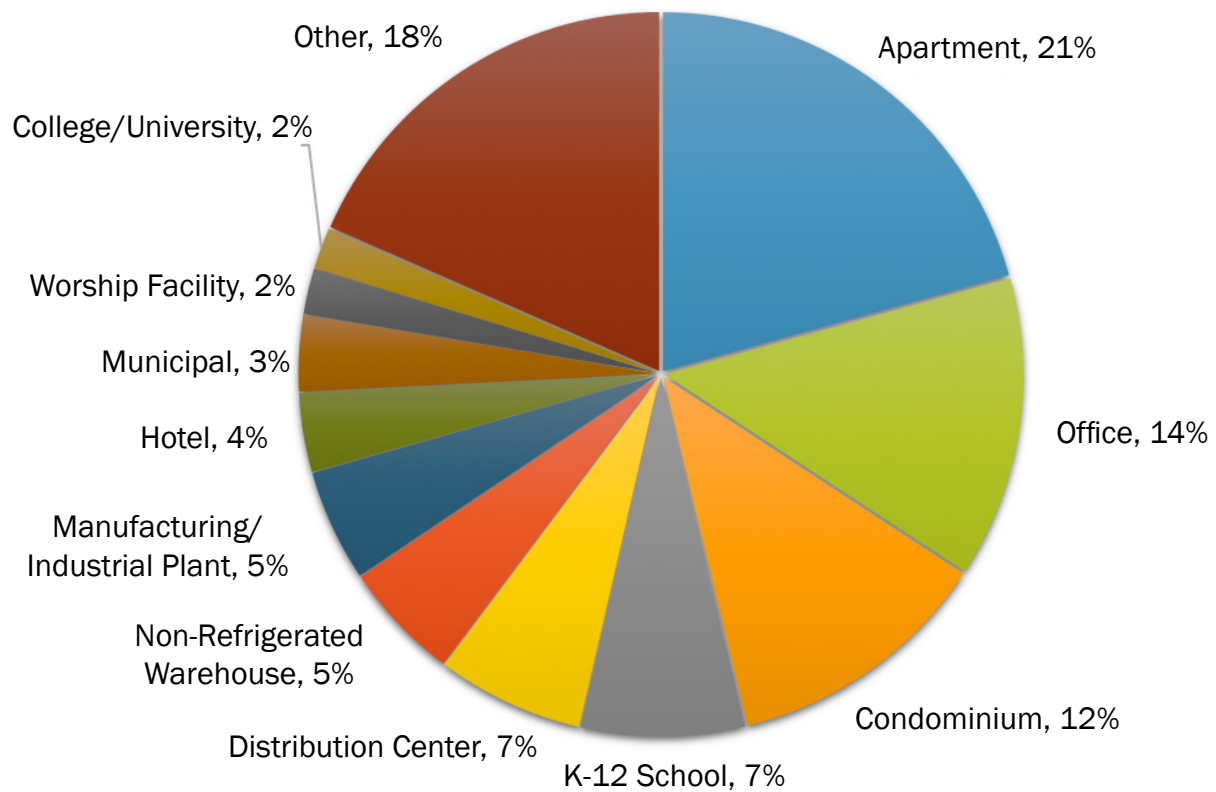


Figure 2 shows the building type distribution by number of buildings included in this analysis. While offices represent 19 percent of the total square footage of buildings in this analysis, they make up 14 percent of the total buildings. Apartments are about 19 percent of total square footage, but 21 percent of total buildings accounted for in the 2018 cycle. Condominiums are also 10 percent of total square footage, yet 12 percent of total buildings. These figures have become slightly more aligned since the 2017 reporting cycle, possibly attributable to the change in requirements for benchmarking in 2018 to include buildings 25,000 square feet or larger instead of only a square footage of 50,000 or higher.

Figure 2: Building type distribution by number of buildings.



2263 Total Buildings

Figure 3 shows the fuel mix distribution among the largest building types in Denver. Offices and manufacturing/industrial plants have the greatest share of electricity consumption. K-12 schools, hospitals, manufacturing and industrial plants, distribution centers and non-refrigerated warehouse buildings have a split between electricity and natural gas use. There are several buildings that use district steam and cooling, the largest of which includes municipal buildings, although district steam and cooling is used in office and university space, as well. These different fuel mixes affect the total emissions associated with each building type.

Figure 3: Fuel Breakdown for Property Types with Greatest Energy Consumption

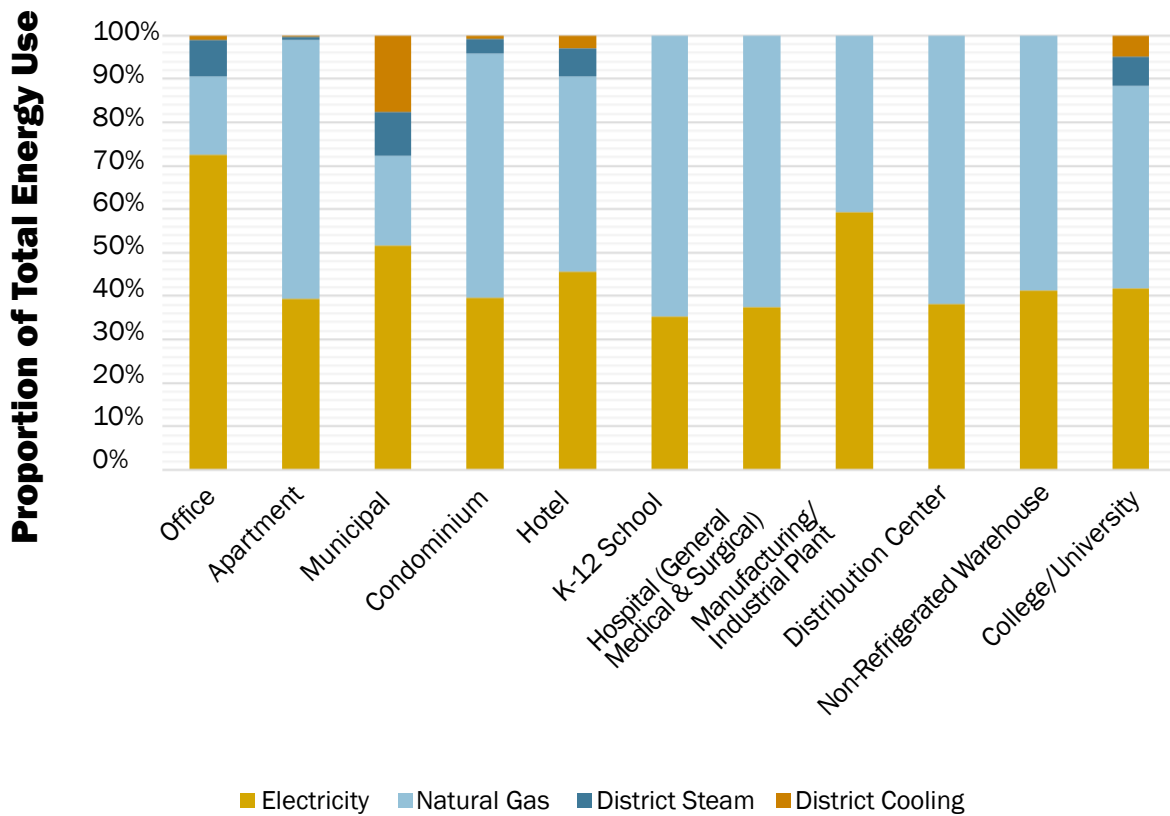


Figure 4 shows the total energy use and associated greenhouse gases for the various fuel types used in Denver. Grid-purchased electricity is the most commonly used fuel type in the City. Denver uses its own emission factors to understand the total emissions from buildings, and this is based on the actual emissions from the energy sources powering its buildings. Emissions from electricity use are produced as a part of the electric generation process at the power plant. Natural gas has a lower emission factor than electricity and has less consumption in the City, so its associated emissions are much less than electricity today, although electricity is quickly moving toward more renewable sources – so these emissions are likely to go down. District cooling and district steam also have little consumption in comparison to electricity.

Figure 4: Energy Use and GHG Emissions by Fuel Type

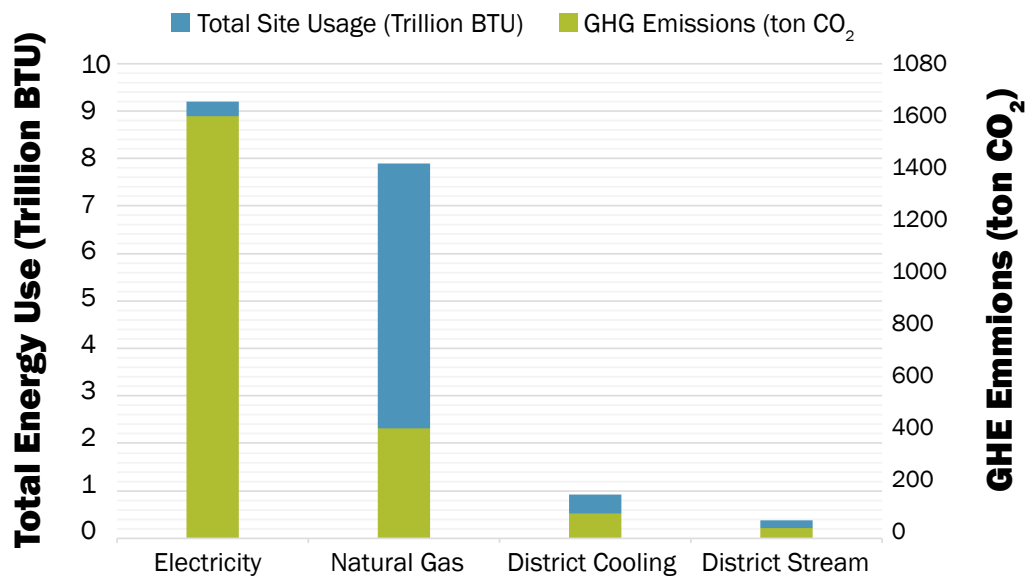


Figure 5 shows the emissions associated with the largest building types in Denver. The graph shows that the greatest emissions come from electricity use in all building types. Emissions from natural gas use are also significant in apartments, hotels, condominiums, K-12 schools, hospitals, distribution centers and university campuses.

Figure 5: Emissions by Fuel Type for Property Type with Greatest Energy Consumption

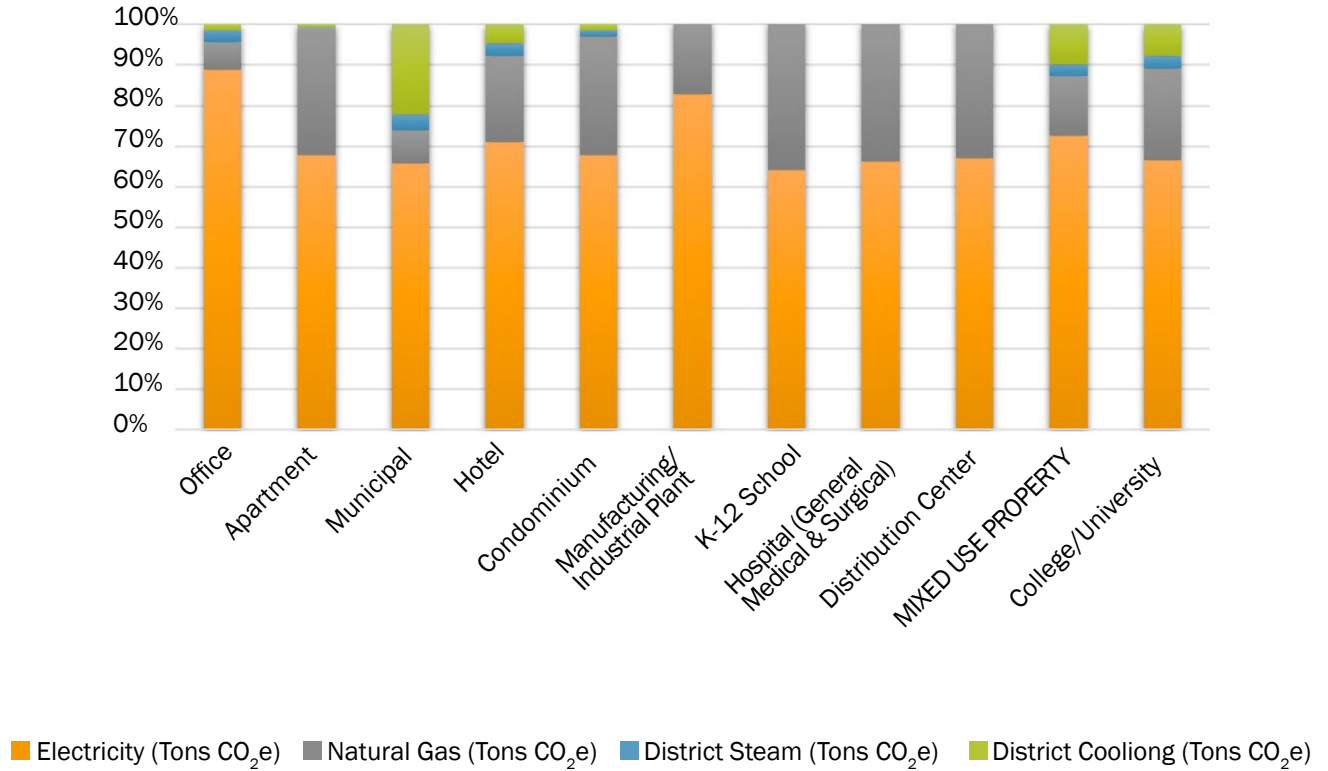


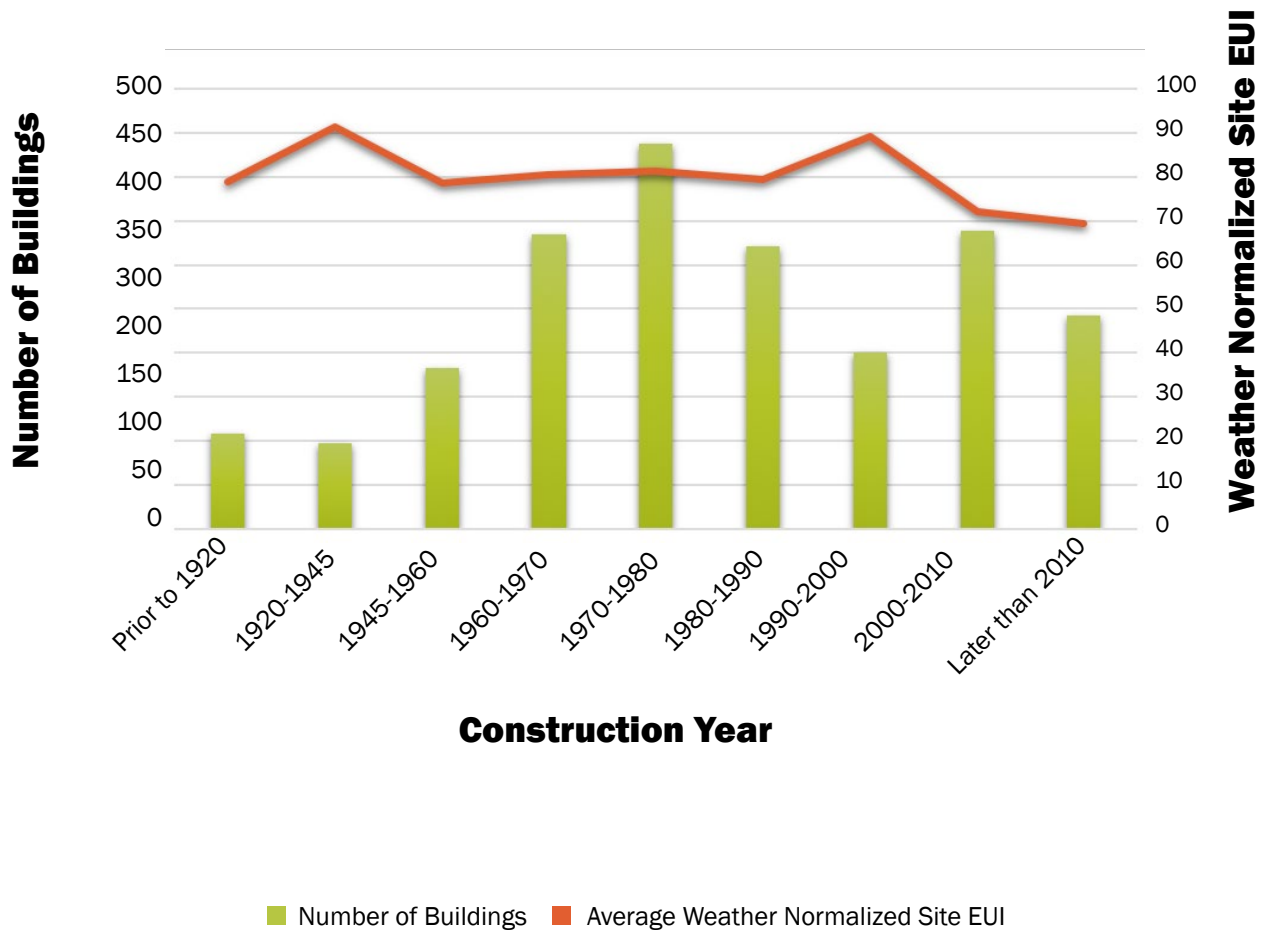
Figure 6 shows the average ENERGY STAR score distribution by construction year in Denver. Similar to the EUI and construction year comparison in the 2018 Annual Report, there is no clear relationship between ENERGY STAR score and construction year. For example, the group of buildings constructed between 1945 and 1960 have an average score of 75, while the newer group of buildings constructed between 2000 and 2010 have an average score of 63, the lowest of any time period.

Figure 6: Average ENERGY STAR® Score by Construction Year



Figure 7 shows the average weather normalized site EUI for all buildings according to the year they were constructed. As the blue line in the Figure 6 graph above shows, there is no clear relationship between construction year and weather normalized site EUI. Some of the oldest buildings in Denver (in the 1920-1945 range) have lower EUIs than relatively newer buildings constructed between 2000 and 2010. The selection of buildings in the 1990-2000 period has the highest average weather normalized site EUI than any other time period, while the most recent period has the lowest EUIs.

Figure 7: Construction Year Compared to Weather Normalized Site EUI



Figures 8 and 9 show the square footage distribution for all buildings included in the energy analysis according to their weather normalized site EUI and ENERGY STAR scores, respectively. The WN site EUI distribution shows that most buildings are less than 1 million square feet, with EUIs less than 100. There are more smaller buildings with high EUIs than large buildings with high EUIs. The ENERGY STAR distribution has a smaller number of buildings at the lower score end and generally increases towards the higher score end. There are more buildings that are better-performing than the 50 median in Denver than worse-performing.

Figure 8: Weather Normalized Site EUI and Square Footage Distribution

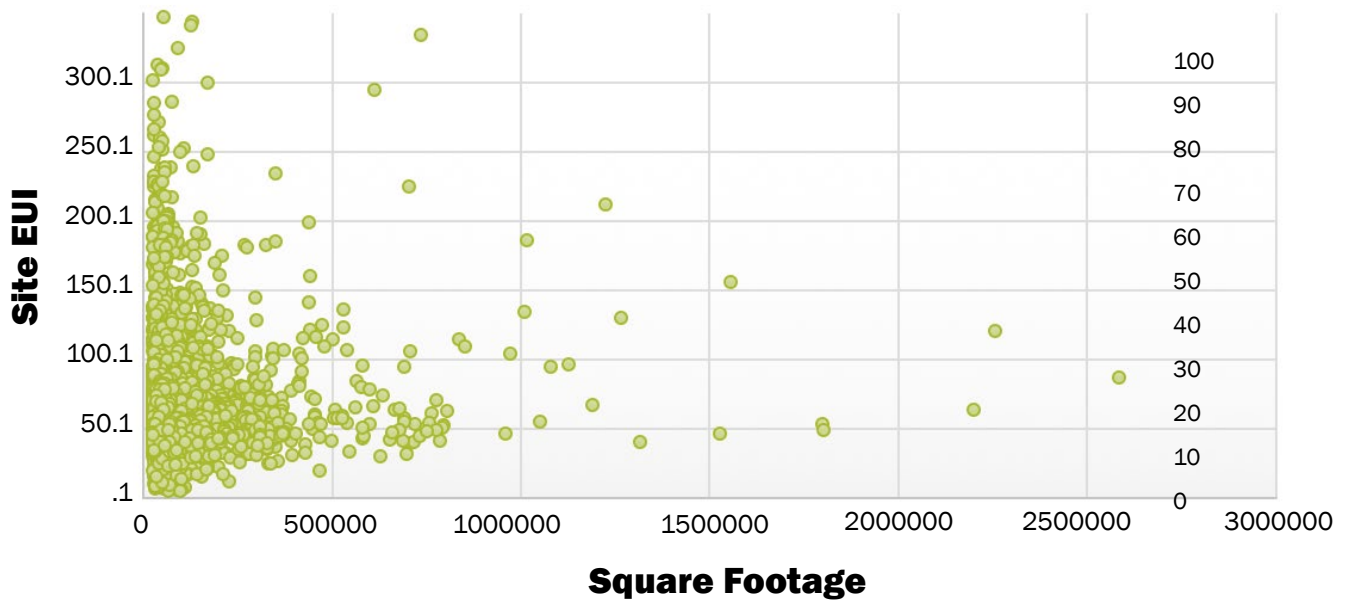
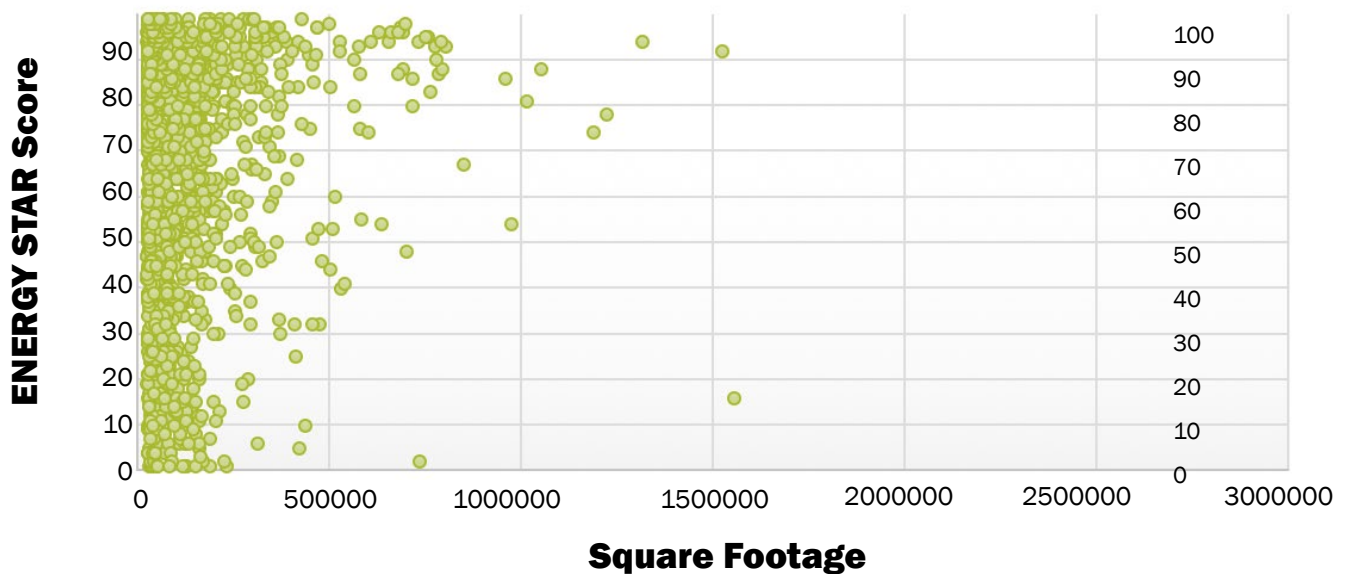
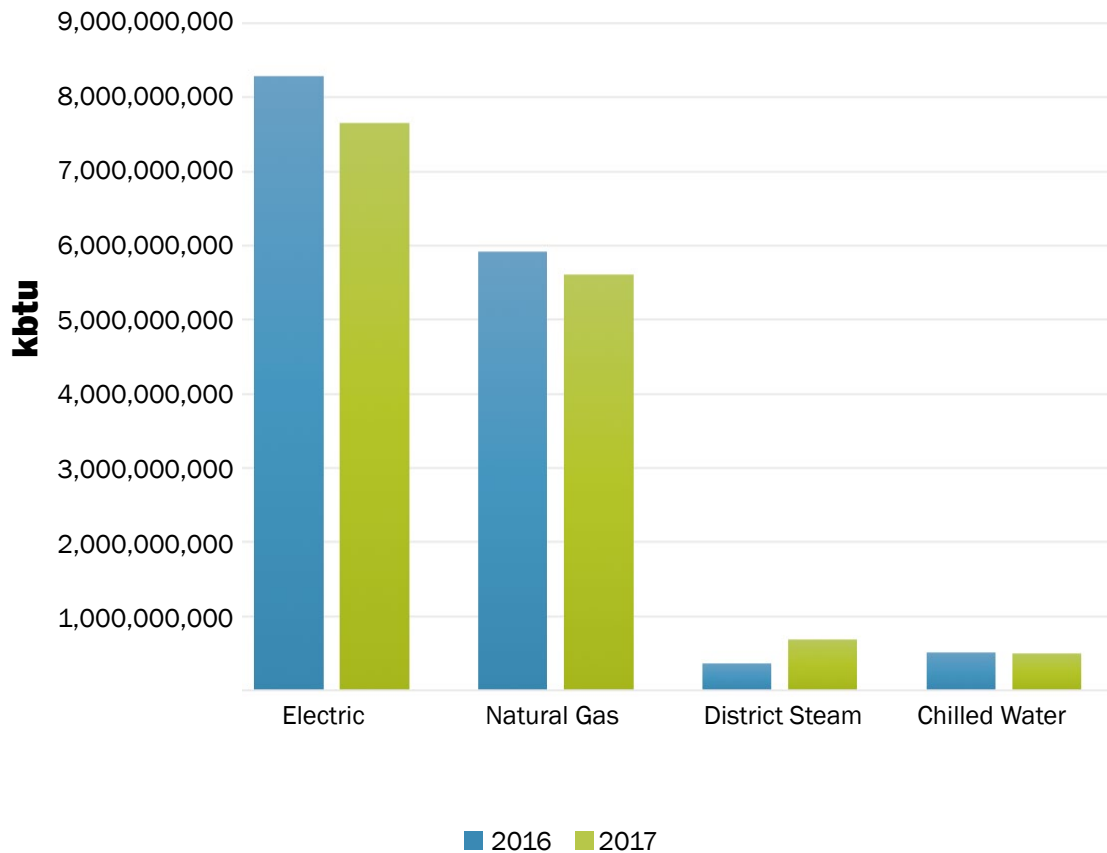


Figure 9: ENERGY STAR® Score and Square Footage Distribution



Below, Figure 10 offers an insightful look into the comparison between the 2017 and 2018 reporting cycles in terms of total energy use. From the buildings that were able to report two years of data to Energize Denver, the use of electric, natural gas and chilled water all were reduced. What is interesting to note is the increase in district steam use, perhaps because some buildings forgot to report steam in the first year. Energize Denver is doing additional research into why steam increased to ensure data accuracy going forward.

Figure 10: Total Energy Use Across Properties Reporting for Two Years (kBtu)





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TO LIVE BETTER, LONGER

