

LLOYD ECODISTRICT ENERGY STAR PORTFOLIO MANAGER DATA ANALYSIS PORTLAND, OR

2016 REPORT

November 20, 2017

SUBMITTED TO

Sarah Heinicke

Courtney Cross

Lloyd EcoDistrict
2203 Lloyd Center
Portland, OR 97232

SUBMITTED BY

Kellee Jackson

Consultant

Kellee@greenbuildingservices.com

RWDI | Green Building Services

421 SW 6th Avenue, Suite 450

Portland, OR 97204

T: 503.467.4710

Green Building Services is a consultancy within RWDI.

We help our clients access their buildings' full potential by pushing the bounds of building science.

greenbuildingservices.com



TABLE OF CONTENTS

1	EXECUTIVE SUMMARY	1
2	ENERGY STAR PORTFOLIO MANAGER PARTICIPANTS	2
3	ENERGY PERFORMANCE DATA ANALYSIS	3
3.1	Energy Use	3
3.2	Site Energy Use Intensity (EUI)	5
3.3	ENERGY STAR Score	7
3.4	Greenhouse Gas (GHG) Emissions	8
3.5	Energy Use Trends	9
4	RECOMMENDATIONS AND NEXT STEPS	15



1 EXECUTIVE SUMMARY

Lloyd EcoDistrict Energy Action Plan establishes an energy goal of “no net increase” in energy use above 2010 levels by 2035. To reach this objective, the Plan targets a 33 percent reduction in the total energy use of existing buildings over the 25-year period.

In February 2014, Green Building Services (GBS) began assisting Lloyd EcoDistrict (Lloyd) with the implementation of the Energy Action Plan, specifically focusing on benchmarking and monitoring energy use at the district level to track progress toward Lloyd’s energy goals.

Lloyd utilizes the U.S. Environmental Protection Agency (EPA) ENERGY STAR® Portfolio Manager® program as the primary mechanism for benchmarking district energy use. The program enables Lloyd building owners and operators to track and share energy performance metrics for analysis on an annual basis. Understanding current and past energy use is key to identifying opportunities to improve energy performance, reduce emissions, and make informed energy efficiency investments.

ENERGY STAR Portfolio Manager is a web-based tool for benchmarking and tracking energy and water consumption, as well as greenhouse gas (GHG) emissions. Building owners and operators can set goals, track consumption, and compare performance to similar buildings in the U.S. Buildings can receive recognition through certification as well. ENERGY STAR Certification is achieved when a property’s ENERGY STAR Score is 75 or greater.

This report summarizes the data collection, analysis and results for Lloyd’s third year of ENERGY STAR Portfolio Manager energy data analysis. GBS’ analysis focuses on energy performance metrics and GHG emissions by property type and several other attributes. The results show progress as well as opportunities for energy performance improvement at the building-specific and district-wide level. Recommendations and next steps are presented at the end of this report.

HIGHLIGHTS FROM 2016 LLOYD ECODISTRICT DATA ANALYSIS

- Of the 25 properties sharing access to energy data with Lloyd EcoDistrict ENERGY STAR Portfolio Manager master account, GBS received energy data from 23 properties for the calendar year 2016, resulting in a reporting rate of 92 percent.
- Energy consumption continues to decrease, showing a 12.4 percent reduction in energy use since 2010 levels.
- Median site EUI for Lloyd is 58.9 kBtu/ft², while Portland median EUI is 64.5 kBtu/ft², as published in the 2016 Building Energy Performance Reporting Results.
- Office, hospitality, and retail properties in Lloyd are performing better than the national median energy use of similar properties.
- Office buildings were responsible for the most GHG emissions, though site EUI for this cohort is 10 percent lower than in 2010.
- Of the 13 properties generating an ENERGY STAR Score, more than 75 percent scored 75 or above, making them eligible for ENERGY STAR Certification.
- Median ENERGY STAR Score for Lloyd is 85, whereas the Portland median ENERGY STAR Score is 72.
- GHG emissions have declined by 21.4 percent since 2010 for the 16 properties with a full set of energy data between 2010-2016.

Benchmarking Metrics

Metrics used for diagnosing performance include energy use, site energy use intensity (EUI), ENERGY STAR Score, and greenhouse gas (GHG) emissions.

- Annual energy use is reported in mmBtu, or one million British thermal units, a standard unit of measure to express energy content in fuel.
- Site energy use intensity (EUI) represents a building's total annual energy use, divided by gross floor area. EUI is measured in kBtu/sf and signifies overall building energy performance.
- ENERGY STAR Score considers EUI along with changes in weather conditions, utility fuel mix and building operations. A score of 50 represents the national median. Buildings with a score of 75 or higher may be eligible for ENERGY STAR Certification.
- Greenhouse gas (GHG) emissions, expressed in metric tons of carbon dioxide equivalent (MTCO₂e) are calculated by multiplying site energy values by emissions factors. Specific emissions factors for natural gas consumption were obtained from EPA sources, whereas emissions factors from electricity were provided by Pacific Power.

2 ENERGY STAR PORTFOLIO MANAGER PARTICIPANTS

To date, 25 properties have shared access to energy use data with Lloyd’s master Portfolio Manager account. These properties cover 7,370,609 square feet of building floor area, representing 64 percent of building area in the district, based on figures in Lloyd’s Energy Action Plan.

Lloyd EcoDistrict ENERGY STAR Portfolio Manager participants make up the district’s largest commercial buildings, representing 88 percent of commercial buildings containing a gross floor area (GFA) of at least 20,000 square feet. Portfolio Manager participants are categorized in this analysis into five property types: Healthcare, Retail, Hospitality, Office, and Public Assembly.

Figure 1 provides a breakdown by property type of the participants that have agreed to share Portfolio Manager accounts or energy data with Lloyd EcoDistrict.

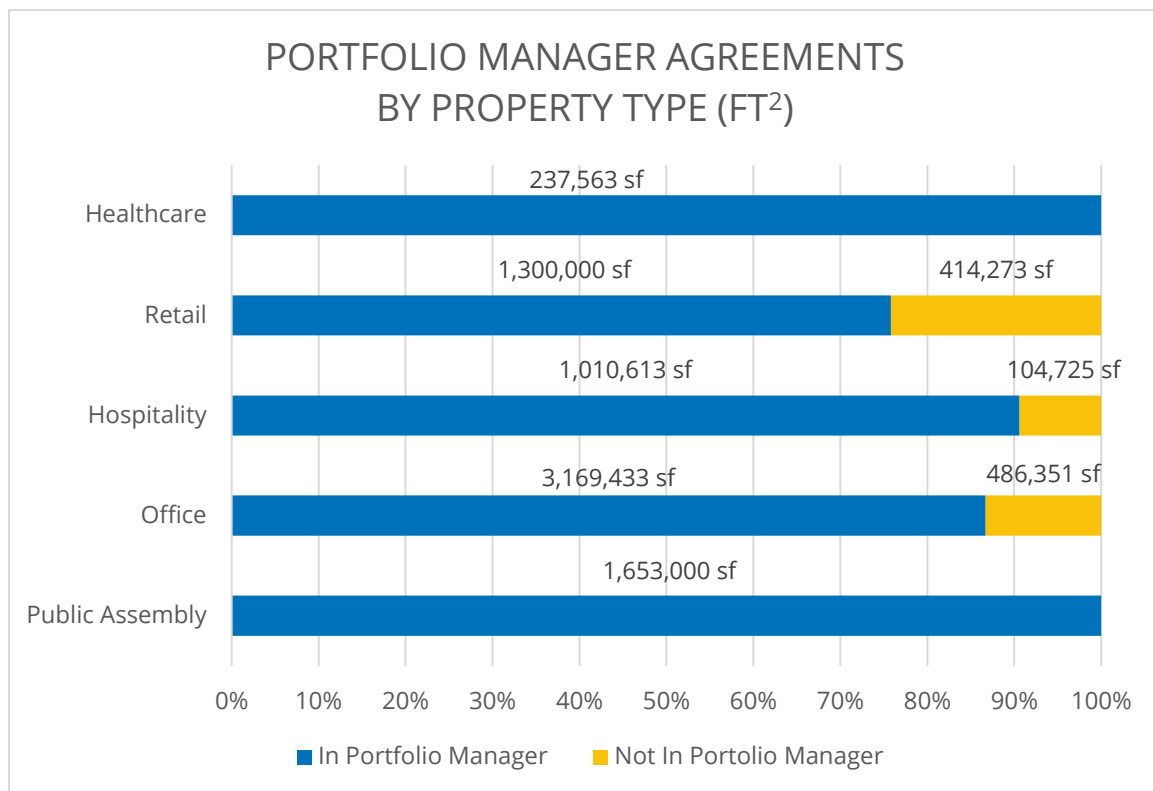


Figure 1. Portfolio Manager agreements by property type.

Office buildings cover the most floor area, followed by public assembly, retail, hospitality and healthcare, as displayed in Figure 2.

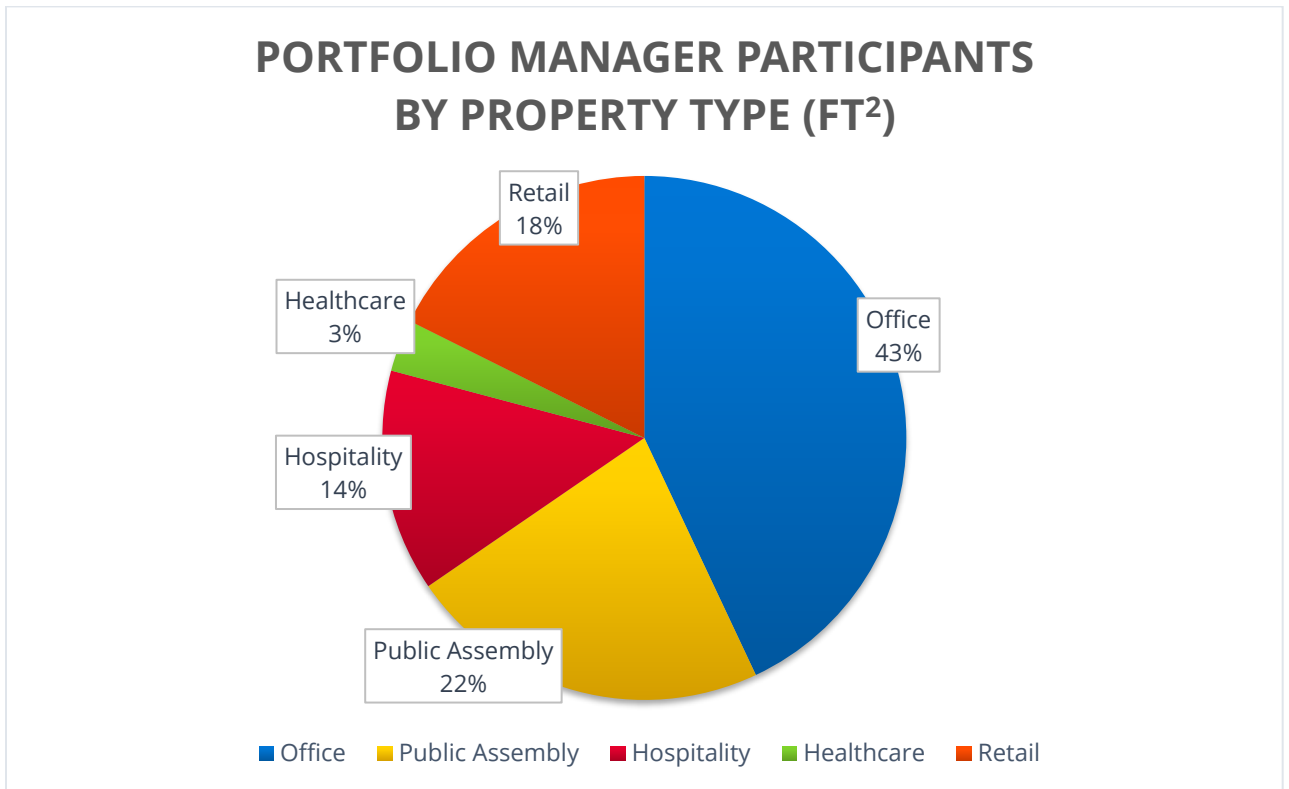


Figure 2. Percentage of building area by property type.

3 ENERGY PERFORMANCE DATA ANALYSIS

Of the 25 properties sharing access with Lloyd’s master account in Portfolio Manager, 23 buildings provided a full year of energy data for the calendar year 2016, resulting in a reporting rate of 92 percent. After removing the properties with an incomplete calendar year of energy data, a subset of 23 buildings covering 7,284,609 square feet remained for analysis. As the number of properties using Portfolio Manager increases and data quality improves, the analysis will become more comprehensive and robust. However, valuable information can be drawn from the existing dataset.

3.1 Energy Use

The buildings included in the analysis consumed a total of 475,782 mmBtu (an mmBtu is equal to 1,000 kBtu), of which 70 percent came from electricity, and the remaining 30 percent from natural gas, as displayed in Figure 3.

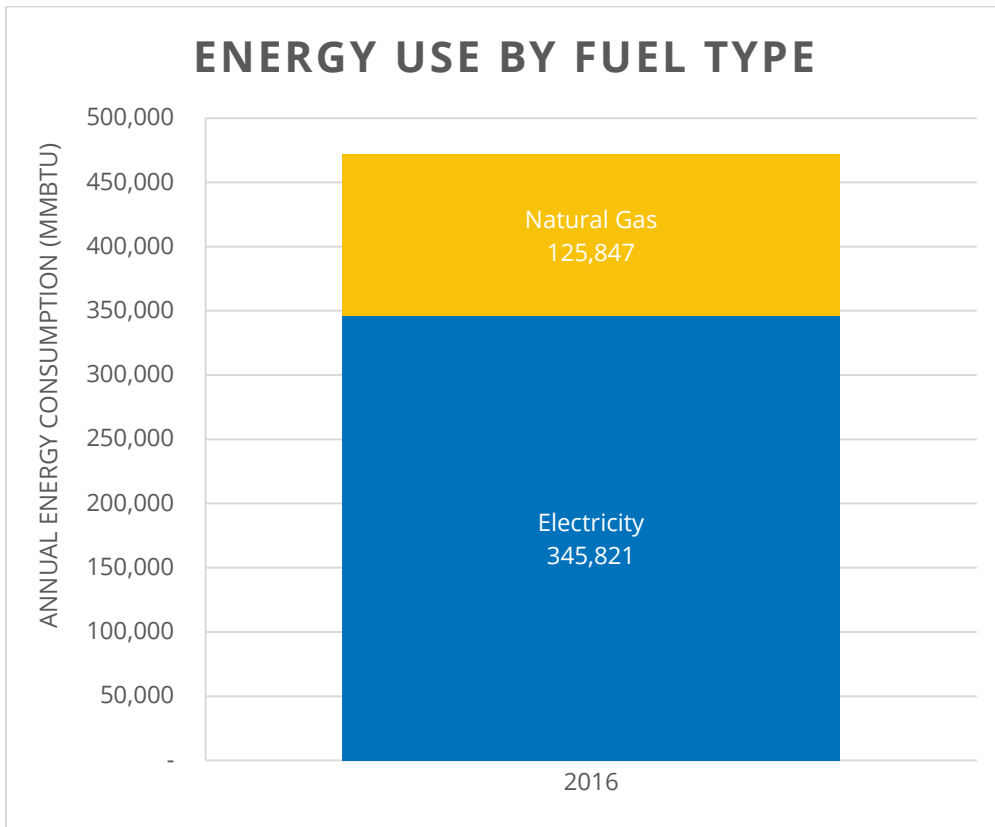


Figure 3. 2016 energy use by fuel type.

Lloyd EcoDistrict Energy Action Plan establishes a goal of maintaining energy use at 2010 levels over the 25-year Plan horizon. Energy use within the district in 2010 was an estimated 975,000 mmBtu (i.e., energy budget). Energy consumed by properties in this 2016 data analysis account for 48.7 percent of Lloyd EcoDistrict’s total energy budget.

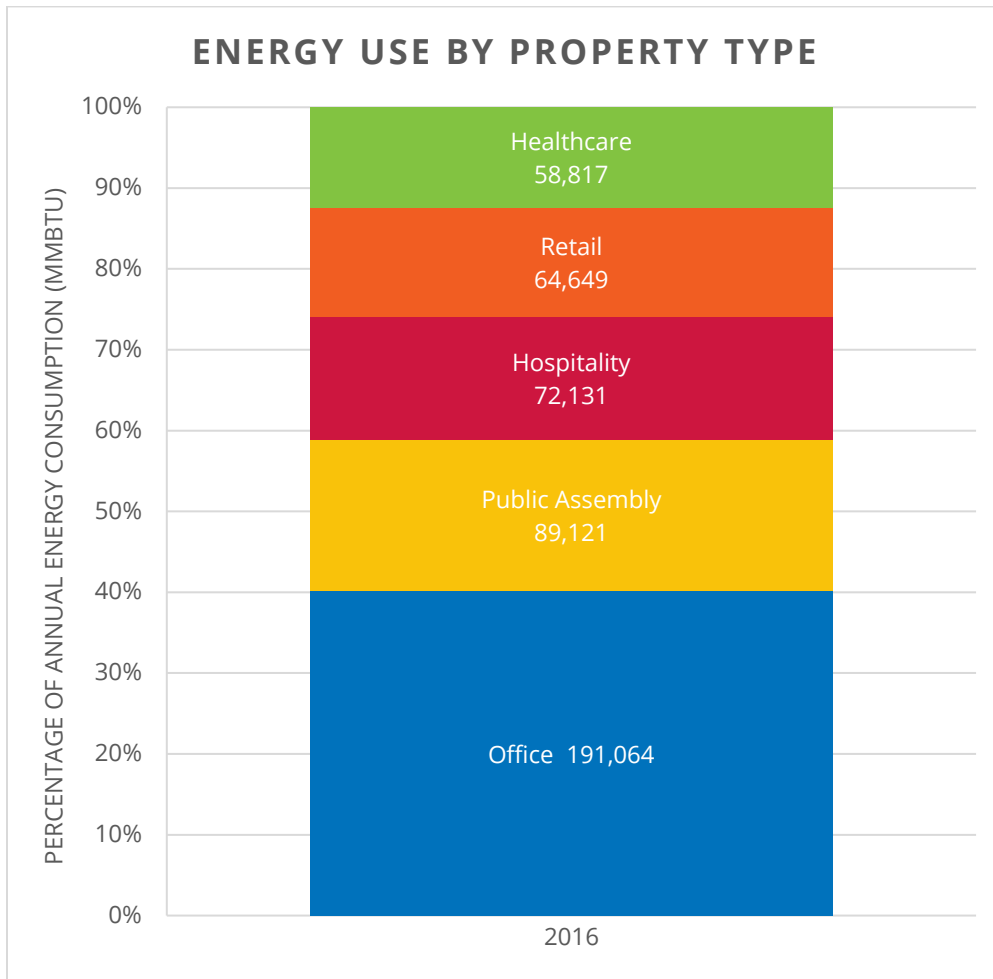


Figure 4. 2016 energy use by property type.

Office buildings consumed the largest share of the energy use in 2016, followed by public assembly, hospitality, retail and healthcare, respectively.

3.2 Weather Normalized Site Energy Use Intensity (EUI)

Although total energy use by source is useful, a more valuable measure of overall building energy performance is site energy use intensity (EUI), which expresses the total annual energy use, divided by the gross floor area measured in kBtu per square foot. Site EUI represents energy use based on the size of a building rather than in raw energy use. This analysis uses a weather normalized site EUI, which also accounts for changes in weather when accounting for changes in energy. The weather normalized site energy is the energy use a property would have consumed during 30-year average weather conditions. To maintain confidentiality, all properties in this analysis were assigned a “building” designation.

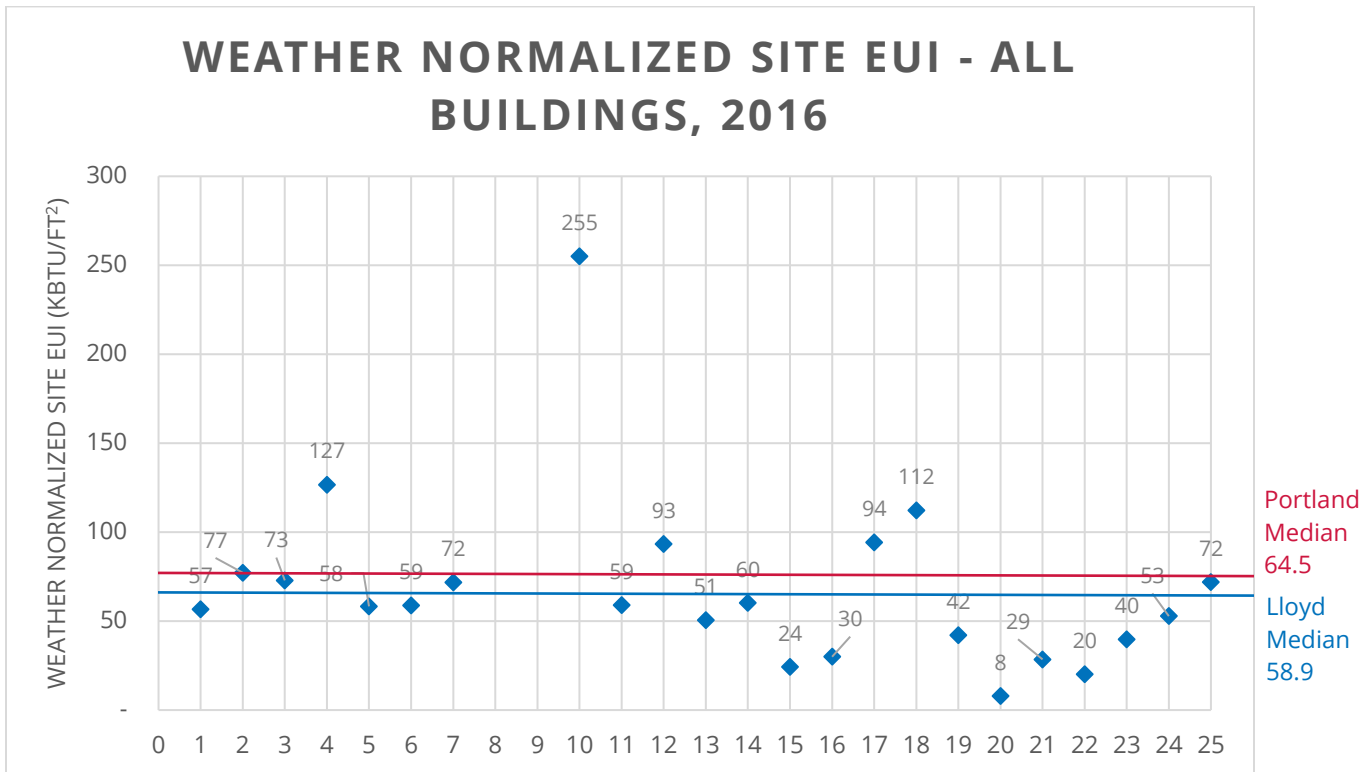


Figure 5. Weather normalized site energy use intensity distribution for 2016.

Overall, the buildings in Lloyd EcoDistrict are performing well. A low EUI generally indicates good energy performance, while a higher site EUI shows greater energy use. As shown in Figure 5, six buildings reported a low EUI in 2016 (below 40) and nine buildings showed a higher EUI (above 70). It should be noted that the reported site EUI for Building 10 is an anomaly. Due to the unique combination of use types within the site along with recent construction, remodeling activity and variations in occupancy over the past few years, the property is establishing a new baseline and no conclusions can be drawn about the site energy use until more data is available.

The median overall site EUI for this dataset is 58.90 kBTU/ft². The median overall EUI for Portland is 64.5 kBTU/ft², as published in the 2016 Building Energy Performance Reporting Results.

GBS compared site EUI to the national median as well as the Portland median EUI by property type. Figure 6 shows how the buildings compare to the median performance of buildings in each peer group. The national median is determined by nationally representative data from the Commercial Building Energy Consumption Survey (CBECS), while the Portland median is established by Portland’s Energy Performance Reporting Program as published in the 2016 Building Energy Performance Reporting Results.

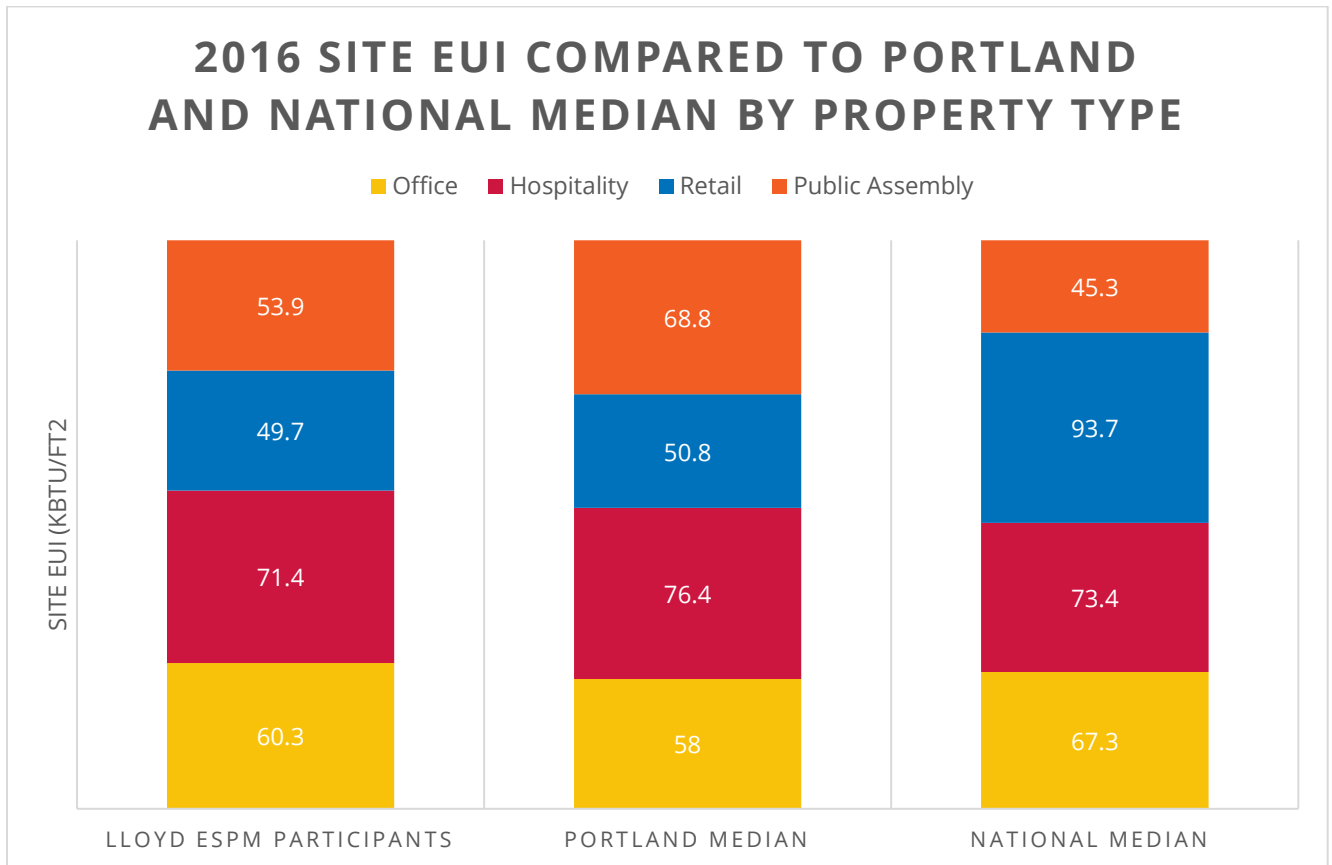


Figure 6. 2016 Site EUI compared to Portland and U.S. median EUI by property type (healthcare property type excluded).

As displayed in Figure 6, office, hospitality, and retail properties in Lloyd are performing better than the national median for their property type. The healthcare property type category was removed due to buildings with multiple distinctly different uses and no similar building type available for a valid comparison.

Hospitality, retail, and public assembly properties in Lloyd have higher energy performance than similar properties across Portland. However, it should be noted that there are differences in how properties were characterized in this data analysis as opposed to the City’s reporting. For example, the 2016 Building Energy Performance Reporting Results categorized a large retail property located in Lloyd as “Other” rather than “Retail”.

3.3 ENERGY STAR Score

The ENERGY STAR Score measures a property’s performance relative to similar properties, when normalized for climate and operational characteristics. An ENERGY STAR Score was calculated for 13 buildings in the dataset. These include office and hospitality properties in the district. As shown in Figure 7, more than 75 percent of the buildings scored 75 or above. ENERGY STAR Certification can be achieved for projects scoring 75 or greater. These buildings are poised to be ENERGY STAR-certified and Lloyd can work to assist in and celebrate their efforts.

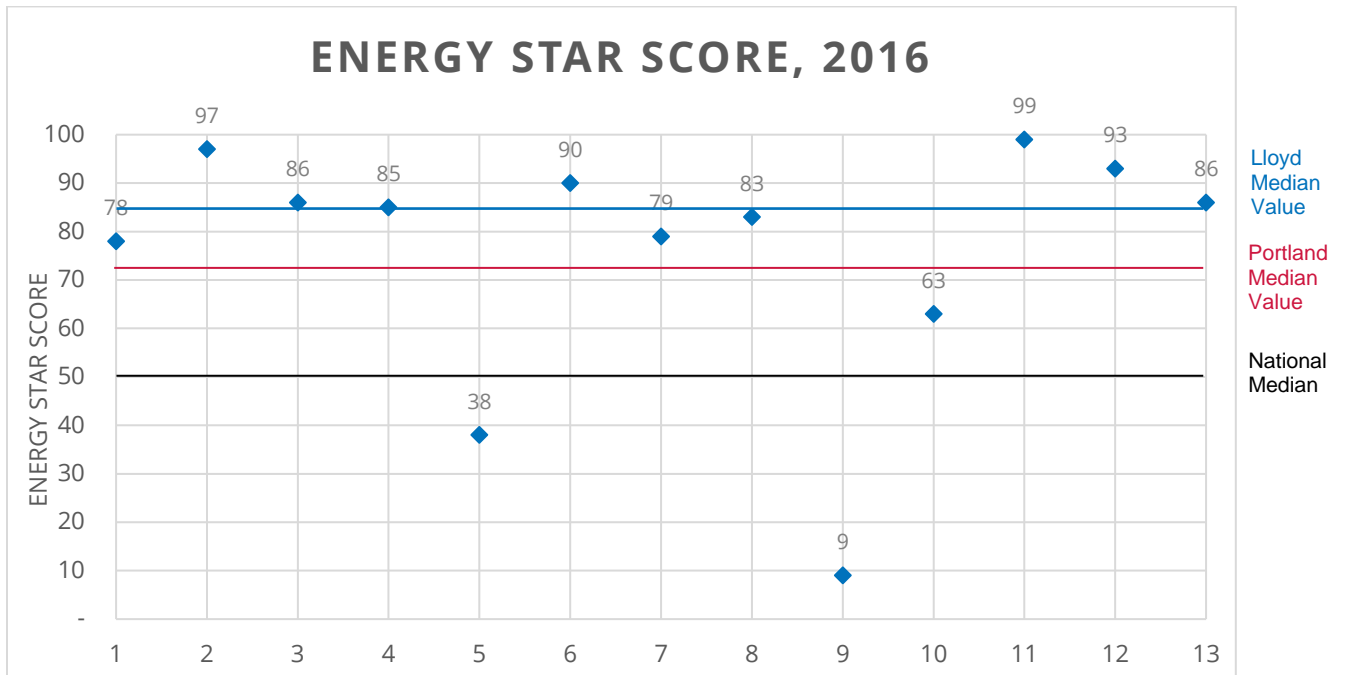


Figure 7. ENERGY STAR Score distribution for 2016.

Buildings that received an ENERGY STAR Score lower than the national median of 50 are likely to have the greatest opportunities to improve energy performance. The median overall ENERGY STAR Score for Lloyd is 85, whereas the median overall ENERGY STAR Score for Portland is 72, as published in the 2016 Building Energy Performance Reporting Results.

3.4 Greenhouse Gas (GHG) Emissions

In this analysis, greenhouse gas (GHG) emissions account for the carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) gases released into the atmosphere as a result of a property's energy consumption.

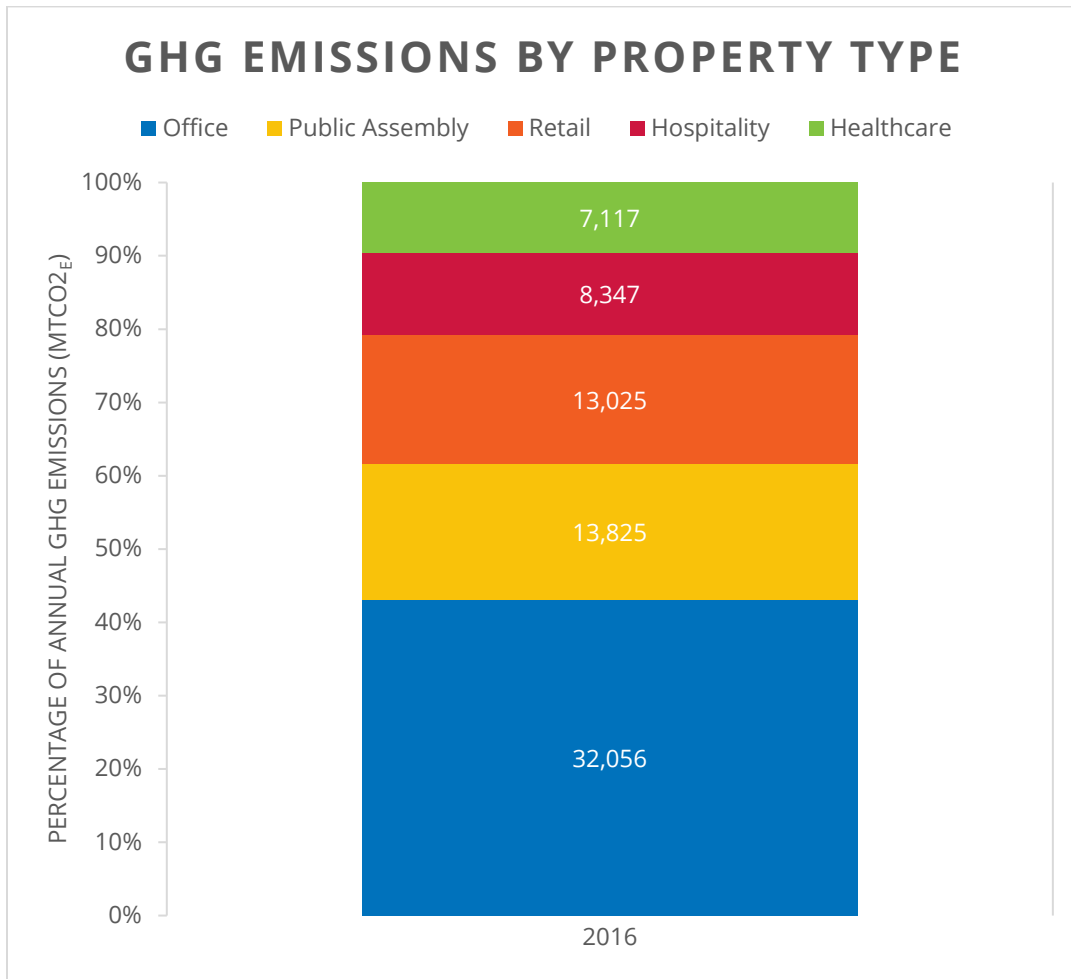


Figure 8. 2016 GHG emissions by property type.

Based on Portfolio Manager estimates, the 23 properties included in this analysis emitted 74,369 metric tons of carbon emissions equivalent (MTCO_{2e}). Office buildings were responsible for the most GHG emissions in 2016, as shown in Figure 8.

3.5 Energy Use Trends

Understanding current and past energy use can help identify opportunities to improve energy performance and measure efficiency efforts. Although the amount of historical data in Portfolio Manager varies, GBS evaluated energy use trends for the last six years wherever possible. Of the 23 properties in the dataset, 16 properties entered data for each year going back to 2010.

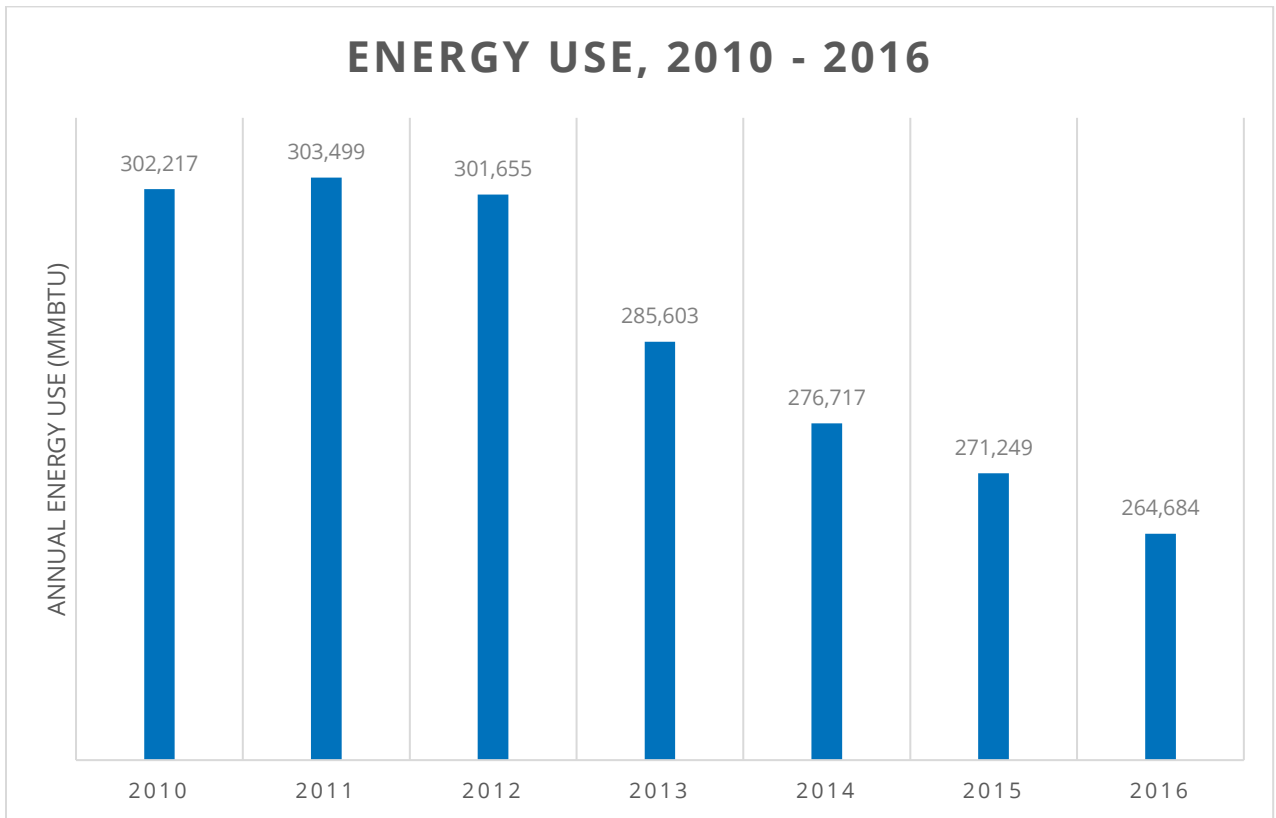


Figure 9. Energy use for properties with data between 2010 and 2016.

As shown in Figure 9, energy consumption decreased from 302,217 mmBtu to 264,684 mmBtu, a reduction of 12.4 percent since 2010. Energy use has steadily declined over the past five years. Through a combination of existing building retrofits and renewable energy projects, building owners and operators have captured inefficiencies and reduced their energy costs. These types of savings are critical to the achievement of the 33 percent reduction in energy targeted for existing buildings in Lloyd EcoDistrict’s Energy Action Plan.

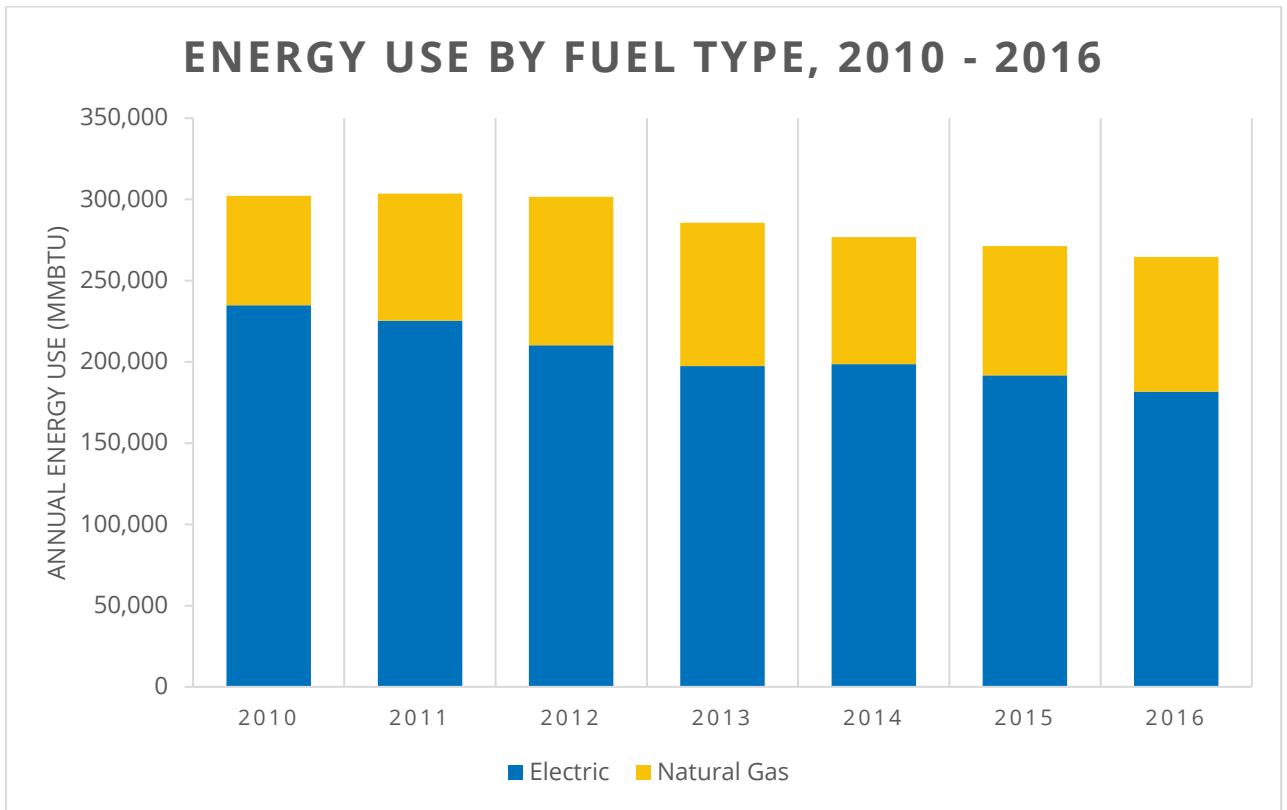


Figure 10. Energy use for properties with data between 2010 and 2016 by fuel type.

As displayed in Figure 10, natural gas consumption was slightly higher in 2016 than in the past two years, while electricity consumption has declined over the same time span. While Portfolio Manager accounts for weather, the particularly cold winter in 2016 may explain the slight rise in natural gas usage. Electricity usage has decreased 22.7 percent while natural gas usage has gone up 19 percent since 2010.

As stated above, site EUI is a more valuable metric for determining building energy performance because it incorporates building area into the energy use estimate and allows for a comparison of performance across buildings of various sizes.

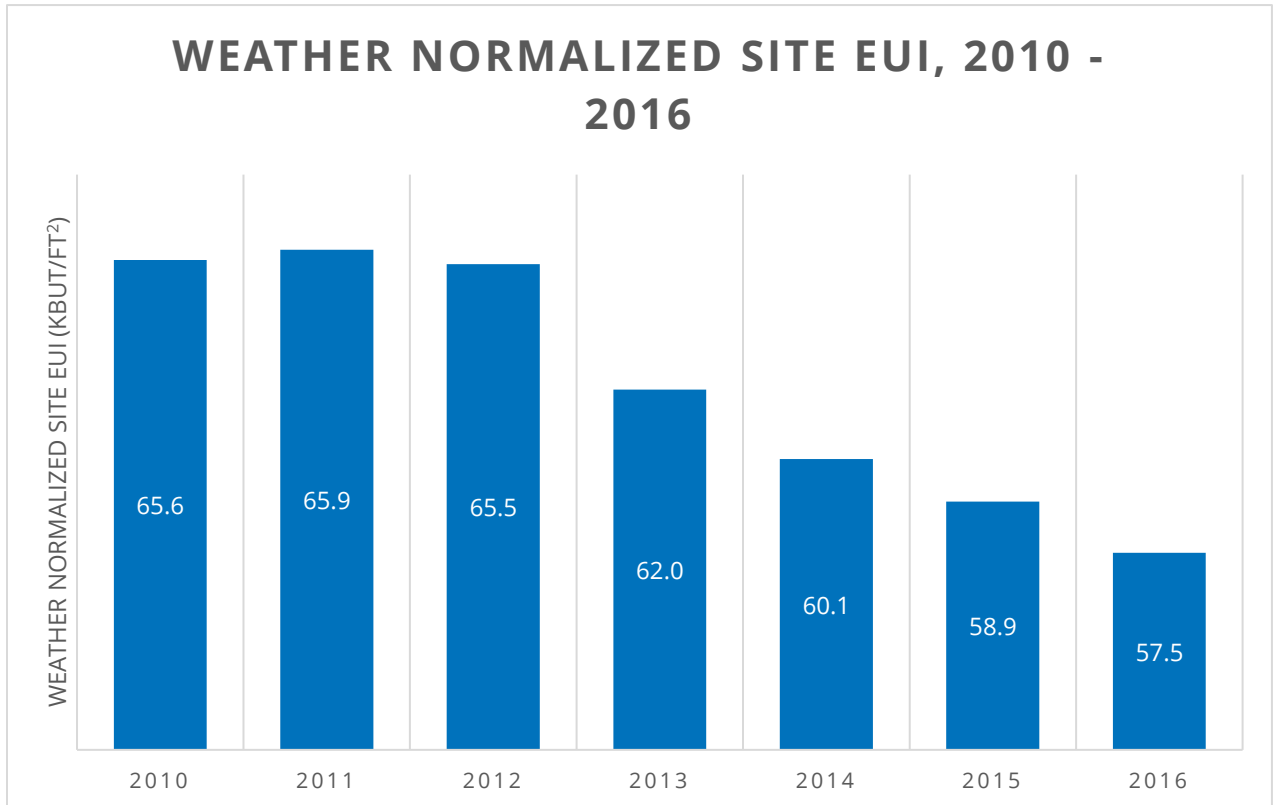


Figure 11. Weather normalized site EUI for properties with data between 2010 and 2016.

Figure 11 shows the average weather normalized site EUI is 12.3 percent lower than in 2010. Overall building energy performance has improved each year for the past five years.

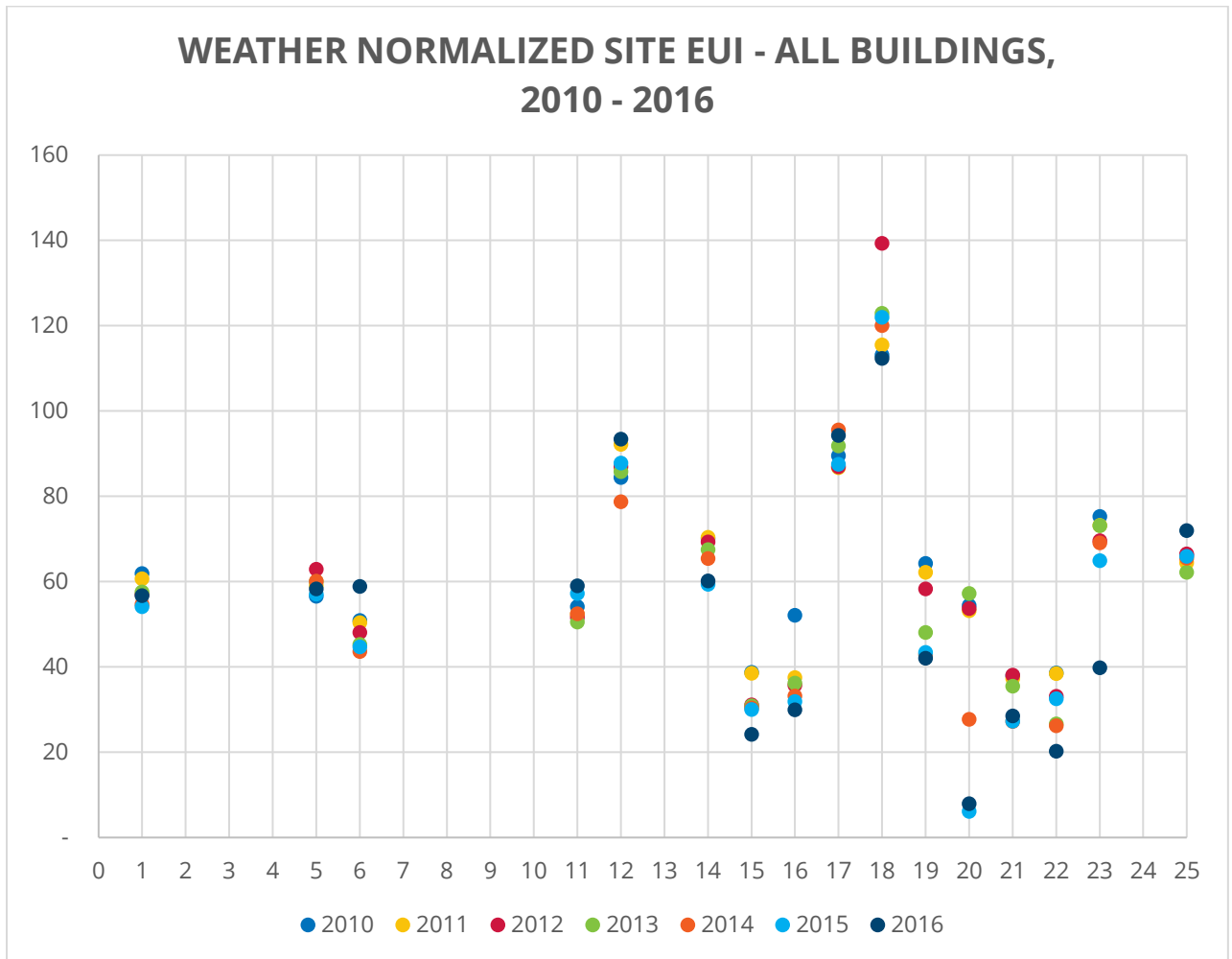


Figure 12. Weather normalized site EUI distribution for properties with data from 2010 to 2016.

For this cohort of buildings, site EUI has consistently decreased since 2010. Apart from a few properties, weather normalized site EUI in 2016 was lower than in previous years as shown in Figure 12. These results show significant progress towards Lloyd’s energy goal for existing buildings.

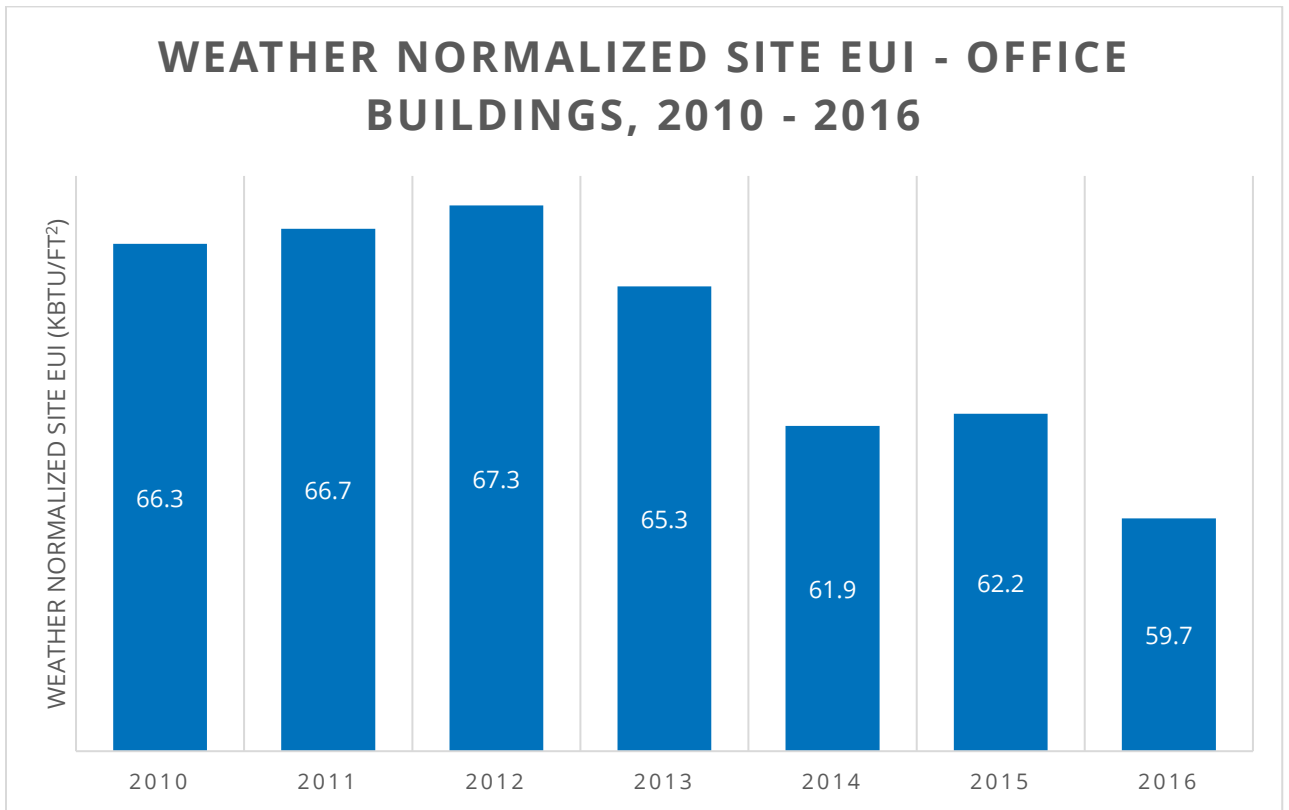


Figure 13. Weather normalized site energy use intensity for office buildings between 2010 and 2016.

GBS calculated the site EUI for office properties with data between 2010 and 2016. As displayed in Figure 13, the weather normalized site EUI for office buildings is 10 percent lower than in 2010, dropping below 60 for the first time in 2016. Office buildings in Lloyd EcoDistrict are performing 11 percent better than their peer facilities nationwide.

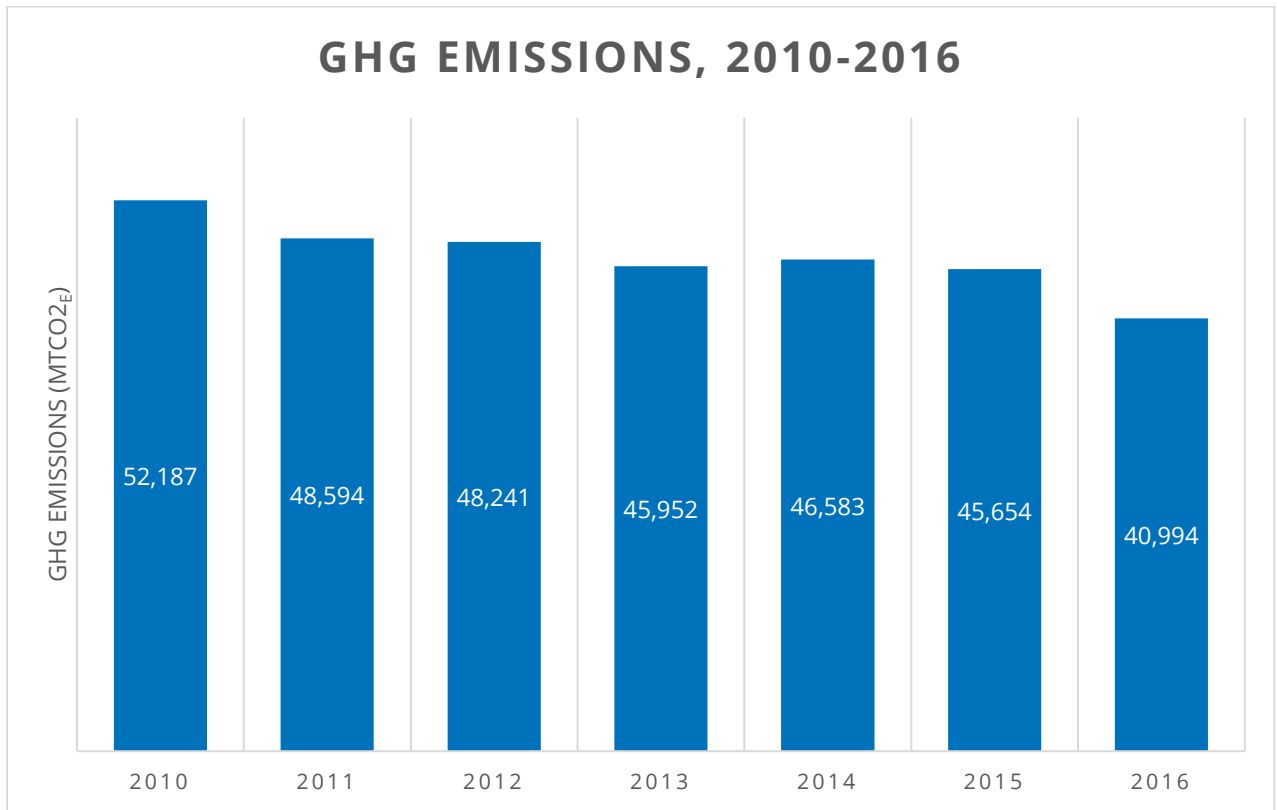


Figure 14. GHG emissions for properties with data between 2010 and 2016.

As displayed in Figure 14, GHG emissions have declined by 21.4 percent since 2010. For this cohort of properties, GHG emissions are generally trending downward, though a slight 1.3 percent increase occurred in 2014.

4 RECOMMENDATIONS AND NEXT STEPS

Overall, the results show continued progress on energy use reduction within Lloyd EcoDistrict. Energy consumption continues to decrease, showing a 12.4 percent reduction in consumption since 2010. Lloyd's median site EUI is 58.9 kBtu/ft² whereas the Portland median EUI is 64.5 kBtu/ft², demonstrating a commendable achievement for Lloyd and its building owners and operators. The office, retail, and hospitality sectors are using less energy than their peers nationwide. Although office buildings were responsible for the most GHG emissions, the site EUI for this cohort is 10 percent lower than in 2010. Again, a significant success for building owners and operators in the district.

As Lloyd EcoDistrict continues to make progress towards its goals, the results of this third year of data analysis also show opportunity for further improvement. GBS will continue working with Lloyd to benchmark and analyze energy use patterns and trends. The following next steps are recommended:

- Expand participation in ENERGY STAR Portfolio Manager within Lloyd EcoDistrict to enable greater understanding of energy use, greenhouse gas emissions, and trends in the district.
- Continue to improve the quality of data through outreach and technical assistance.
- Establish target EUI's for each sector informed by current performance, regional and national trends, and Lloyd EcoDistrict Energy Action Plan energy use goals.
- Target underperforming properties by connecting building owners with technical resources to evaluate operating performance and identify strategies for improvement.
- Recognize the results and achievements of high performing properties and communicate achievements and replicable practices.
- Continue investing in existing building retrofits and renewable energy projects to capture inefficiencies and reduce energy costs. These efforts are critical to achieving Lloyd's energy goals.
- Maintain Lloyd EcoDistrict Energy Efficiency Group as an information-sharing platform for building owners and operators to seek informed input from others, as well as anecdotes and lessons learned.

