



# Oregon Department of Energy Building Performance Standards Energy Use Intensity Targets

Submitted to the

## **OREGON DEPARTMENT OF ENERGY**

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**In Association with**

2050 Institute  
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**OREGON**  
DEPARTMENT OF  
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## **Acknowledgements**

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## Glossary

**ASHRAE Standard 100: American Society for Heating, Refrigerating and Air-Conditioning Engineers Standard 100** – building performance standard developed by ASHRAE, an international society of professionals that provides processes and procedures for reducing energy consumption and carbon emissions through improved energy efficiency and performance of all types of existing buildings, including residential, commercial, institutional, and industrial, and can be found at [ASHRAE Standard 100](#).

**Average** – Average refers to the “mean average,” The average is calculated by summing all data points within a set, then dividing but the number of data points.

**BPS: Building Performance Standards** – a policy that addresses energy use and emissions from existing commercial buildings. Modeled after [ASHRAE Standard 100](#), it requires many large commercial buildings to evaluate their energy use, enhance energy management practices, and implement efficiency measures to meet energy use targets.

**Building activity types** – Labels that describe the primary purpose of a building, such as office space or food service.

**CBECS: Commercial Building Energy Consumption Survey** – a national survey that collects information from a sample of the stock of U.S. commercial buildings, including their energy-related building characteristics and energy usage data (consumption and expenditures). The Energy Information Agency conducts the CBECS approximately every five years.

**Climate zone** – Areas of the U.S. that had similar weather characteristics from 1994 to 2019, based on temperatures as defined by annual average heating degree days and cooling degree days, and then further classified by precipitation level into marine, dry, or humid moisture zones.

**CBSA: Commercial Building Stock Assessment** – a building stock assessment that collects, analyzes, and publishes building characteristics and energy usage data for commercial buildings in the Northwest. The Northwest Energy Efficiency Alliance (NEEA) conducts the CBSA approximately every five years.

**EUI: Energy Use Intensity** – expresses a building’s energy use as a function of its size or other characteristics. EUI for the Oregon BPS program is defined as energy per square foot per year and is calculated by dividing the total energy consumed by the building in one year (measured in kBtu) by the total gross floor area of the building (measured in square feet).

**EUI<sub>t</sub>** – the target for net energy use intensity of a BPS covered building expressed as energy use in kBtu per square foot per year.

**Normalization factors** – multipliers used to scale or adjust energy use or EUI to give a more equal basis for comparison of buildings required to comply with BPS EUI targets. For example, normalization factors can be used to account for variations in weather or operating schedules.

**ODOE: Oregon Department of Energy** – a statewide Oregon agency focused on advancing solutions to shape an equitable clean energy transition, protecting the environment and public health, and responsibly balancing energy needs and impacts for current and future generations.

**Tier 1 buildings:** nonresidential, hotel, or motel buildings with at least 35,000 square feet of space (not including any parking garage area) to which provisions of the Oregon BPS program apply.

**Tier 2 buildings:** Hospitals, schools, dormitories or university buildings with at least 35,000 square feet of space (not including any parking garage area) or nonresidential, hotel, or motel buildings with at least 20,000 square feet of space and less than 35,000 square feet of space (not including any parking garage area) to which provisions of the Oregon BPS program apply.

## Introduction

The final rules for Oregon’s Building Performance Standards (BPS)<sup>1</sup>, published by December 31, 2024 by the Oregon Department of Energy (ODOE), include energy use intensity (EUI) targets for buildings. The main BPS compliance pathway requires that buildings evaluate and report their EUI, and then decrease their EUI over time until they reach a specified EUI target. To ensure appropriate EUI targets in line with the requirements of HB 3409, ODOE hired SBW Consulting in partnership with 2050 Institute and Unrooz Solutions (the analysis team) to develop the targets using the best available data sources.

As part of the rulemaking process, ODOE worked with the Rulemaking Advisory Committee (RAC) to develop the rules and targets. The RAC is made up of 18 members, including property managers, government representatives, advocacy groups, utilities, and energy efficiency program managers. Between February and October 2024, the RAC met eight times. On August 21, 2024, the SBW Team presented their method for calculating the average EUIs to the RAC, then incorporated RAC feedback to improve this method. Suggested improvements and input included analyzing pre-COVID pandemic data, the value of specific local datasets, and target setting criteria. The analysis team then shared the updated average EUIs in public meetings on September 11 and October 15, 2024. The first meeting focused on explaining how the EUI targets were developed and gathering feedback from the public, while the second meeting further explained the calculation process and answered questions. The rulemaking process finished on December 31<sup>st</sup>, 2024.

In Oregon, the EUI targets are based on average site EUI, in units of kBtu per square foot per year. The analysis team used the highest-quality data available from the Northwest or the United States for each building activity type to get the most accurate average EUI. They then adjusted these values to reflect local conditions and energy use trends.

This report examines the methods the analysis team used to determine EUI targets for Oregon’s BPS, and is organized into several key sections:

**Background:** Describes the intent and goals of Oregon HB3409 and defines EUI and its significance in the target setting context.

**Methodology:** Examines the steps the analysis team implemented to calculate average EUIs and to develop final EUI targets, from collecting data to making custom adjustments.

**EUI Targets:** Lists the final EUI targets for different building activity types as calculated by these methods.

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<sup>1</sup> The Energy Performance Standard policy for commercial buildings addresses energy use and emissions from existing commercial buildings and will require many large commercial buildings to enhance energy management practices and implement efficiency measures to meet energy use targets. Read more about the [Building Energy Performance Standards](#).

## Background

### Oregon HB3409 Overview

In 2023, Oregon passed House Bill 3409<sup>2</sup> which established a BPS for commercial buildings and designated the Oregon Department of Energy (ODOE) to implement the standard. The primary goal of the BPS is to reduce energy use and greenhouse gas emissions from large commercial buildings, and thereby help Oregon attain its climate action goals. Beginning in 2028, compliance with the BPS is phased in over a schedule based on building activity type and building square footage. The standards require building owners to report on their energy use and either meet specified EUI targets or comply with alternative requirements set by ODOE, including energy audits and implementation of cost-effective energy efficiency measures.

### Energy Use Intensity (EUI) Overview

Under the Oregon BPS, an EUI metric is used to compare the energy use of commercial buildings. EUI can be thought of as an energy scorecard and is defined as the annual energy use of a building divided by its square footage excluding any parking garage area.

Jurisdictions typically establish EUI targets for specific building activity types (e.g., offices, retail, restaurants, etc.) to reflect their distinct levels of energy use. HB3409 requires that the EUI target for a given building activity type be no more stringent than the average EUI for that type.

Energy use in a building also differs depending on its climate. HB 3409 directs ODOE to establish BPS EUI targets for Oregon's diverse climate zones. The two Oregon climate zones are 4C (cooler and more humid coastal region) and 5B (warmer and drier inland region), as defined by ASHRAE Standard 169-2013). EUIs for buildings from one climate zone can be adjusted to represent buildings located in a different climate zone.

The methodology detailed below was developed to determine an average EUI for different building activity types and climate zones in Oregon.

### Average EUI Overview

Each building activity type has unique energy needs and tends to have very different EUIs. To help ensure that EUI values are reliable and applicable to the overall number of Oregon buildings, the analysis team calculated an average EUI for as many building activity types as possible. The team was able to determine EUI averages for 41 unique building activity types using representative samples of data. A representative sample is a subset with enough buildings to reflect the overall characteristics of the larger building type population.

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<sup>2</sup> Learn more about [House Bill 3409](#).

## Methodology

### Methodology Overview

To establish EUI targets, the analysis team took several steps. First, the team collected building energy use data for various building activity types from reliable national, regional, and local sources. The analysis team then adjusted the national data for the Northwest climate and using this climate adjusted national and regional data developed Northwest average EUIs. The team compared local Oregon energy use data with the Northwest averages to create Oregon-specific average EUIs. Finally, the analysis team adjusted the Oregon average EUIs to align with the BPS compliance timeline and used trend adjusted average EUIs to establish final EUI targets for each building activity type.

### Development of Average Energy Use Intensities (EUIs)

HB 3409 is the Oregon law that lays out the BPS program and its requirements. Figure 2 presents key elements of this law. HB 3409 provisions include the condition that the EUI target be no more stringent than the average EUI for that building activity type.

	Directive	Key Detail
Building Performance	Establish energy performance standards	Standards are for commercial buildings >35,000sqft
Average EUI	Set energy use intensity targets (EUI) for specific building types	The <b>average</b> EUI serves as the <b>minimum allowable</b> EUI for buildings.
Compliance Pathways	Buildings can comply using multiply pathways	Conditional compliance through energy audits, energy investments and energy management plans

Figure 1. Understanding HB 3409 BPS Directives

The analysis team developed BPS EUI targets using average EUIs for each building activity type, following a rigorous process that combined data from high-quality data sources to determine the average EUIs. As outlined in Figure 3, the analysis team first collected EUI data from high-quality, publicly available data sources, then analyzed that data to create Northwest average EUIs, and finally, included local data to create the Oregon average EUIs.





**Step 1: Data Collection**

**Objective:** Gather EUI data from various sources.

**Sources Include:** Regional, national, and local EUI data.



**Step 2: Northwest Average EUIs**

**Objective:** Determine the baseline EUI for the Northwest.

**Approach:** Combine regional and national data to establish the average.



**Step 3: Oregon Average EUIs**

**Objective:** Tailor EUI benchmarks for Oregon.

**Approach:** Make Oregon adjustments to specific building types and use trends to adjust to Oregon average EUIs.

Figure 2. Oregon Average EUI Development Process Overview

**Step 1: Data Collection and Assembly**

For the first step in developing the EUI targets for Oregon, the analysis team collected and combined building energy use data from national and regional sources. High-quality datasets were available that represent a substantial proportion of buildings that are covered by the BPS. The analysis team used the data to create average EUIs to represent energy consumption in the Northwest for each building activity type. Commercial buildings in Oregon are similar to those in the Northwest overall, but the analysis team also used smaller, local data sets in this analysis to account for specific local nuances in building energy use.

*Data Sources*

To establish averages that were both precise and accurate, it was imperative that the analysis team collect a large sample of building energy use data. To achieve this, the team used national data in addition to regional and local data. The data sources included:

1. **National:** 2012 and 2018 Commercial Buildings Energy Consumption Survey (CBECS)<sup>3</sup>
2. **Regional:** 2009, 2014, and 2019 Commercial Building Stock Assessment (CBSA)<sup>4</sup>  
2018, 2019, and 2022 City of Seattle benchmarking program data<sup>5</sup>

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<sup>3</sup> The Commercial Buildings Energy Consumption Survey (CBECS) is a national sample survey that collects information on the stock of U.S. commercial buildings, including their energy-related building characteristics and energy usage data (consumption and expenditures). Read more about [CBECS](#).

<sup>4</sup> The Commercial Building Stock Assessment (CBSA) collects, analyzes, and publishes building characteristics and energy usage data for commercial buildings in the Northwest. Read more about [CBSA](#).

<sup>5</sup> The City of Seattle annually publishes building energy and emissions performance data from more than 3,600 of Seattle's largest nonresidential and multifamily buildings at [data.seattle.gov](http://data.seattle.gov) and through the [Seattle Energy Benchmarking Map](#) to facilitate transparency in the market and spur demand for energy efficiency. Read more about the [City of Seattle Benchmarking Program](#).

3. **Local:** 2021 and 2022 Oregon State-Owned Buildings data<sup>6</sup>  
2011-2021 Oregon public schools data<sup>7</sup>  
2019 and 2023 City of Portland benchmarking program data<sup>8</sup>

The national data used to inform the Northwest average EUIs were from the Commercial Buildings Energy Consumption Survey (CBECS). CBECS is a national survey that collects energy-related building characteristics and energy usage data. CBECS is conducted approximately every five years and the most current version available for EUI development was 2018. This was the largest of the data sets because it encompasses buildings from across the United States. To use this data effectively, the analysis team used climate adjustment factors from ASHRAE Standard 100 to convert the national average EUIs to Northwest specific EUIs for climate zones 4C and 5B.

The regional data came from the Commercial Building Stock Assessment (CBSA). The CBSA data set is comprised of commercial buildings located in the Northwest<sup>9</sup> with published characteristics and energy usage data. The CBSA is conducted approximately every five years and the most current version available for EUI development was 2019. The analysis team also used regional City of Seattle benchmarking program data during later stages in the analysis process to compare EUI averages for the same building activity type across various sources.

The analysis team used local data to develop the Oregon average EUIs, including Oregon state-owned buildings data, Oregon schools data, and City of Portland benchmarking program data. Each of these data sets only include data from buildings located within the state of Oregon. The analysis team used these local data sources when developing the Oregon average EUIs to make adjustments to ensure the averages were Oregon specific.

### *Building Activity Types*

Differentiating buildings into numerous building activity types enables their EUI targets to be more closely tailored to the energy use characteristics of each building activity type. Because of this, the analysis team included as many applicable building activity types as possible into the Oregon EUI target development. However, the analysis team dropped some building activity types from the target development because their description was too broad or vague, because they were better covered by a different building activity type, or because they were not building activity types covered within the scope of HB 3409. The table below describes the building activity types the analysis team excluded.

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<sup>6</sup> The Oregon State-Owned Buildings dataset was provided by ODOE for buildings owned by the state of Oregon and includes building location and annual energy use.

<sup>7</sup> The Oregon Schools dataset was provided by ODOE and includes energy use data for public elementary, middle, and high schools across the state of Oregon.

<sup>8</sup> Commercial buildings 20,000 square feet and larger are required to track building energy performance and report this information each year. This [data](#) is available publicly. Read more about the [City of Portland benchmarking](#).

<sup>9</sup> The CBSA covers Washington, Oregon, Idaho, and Montana. The analysis team estimated that 43% of the sampled buildings in the region are in Oregon.

Table 1. List of excluded building activity types

Building Activity Type	General Building Type	Explanation
Vacant	Vacant	Not covered by HB 3409
Other food sales	Food Sales	Merged with Grocery
Other food service	Food Service	Merged with Restaurant
Convenience store with gas	Food Sales	Now covered by convenience store as a single type
Medical office (nondiagnostic)	Office	Vague description better covered by more specific types, or a blend of other types.
Other office	Office	Vague description better covered by more specific types, or a blend of other types.
Strip shopping mall	Mercantile (Enclosed and Strip Malls)	Better covered by more specific types, or a blend of other types.
Other	Other	Vague description better covered by more specific types, or a blend of other types.
Mixed-use office	Office	Vague description better covered by more specific types, or a blend of other types.

**Step 2: Northwest Average EUIs**

The analysis team established Northwest average EUIs for 41 building activity types across Oregon’s two climate zones. The team prioritized the use of the regional CBSA dataset wherever possible, using national CBECS data when a more local dataset was not available or reliable. Figure 4 includes average EUIs for the regional CBSA dataset and the national CBECS dataset. Appendix A includes more detailed information on the methodology for determining the CBSA and CBECS EUIs.

# ODOE Building Performance Standards Energy Use Intensity Targets – 2024

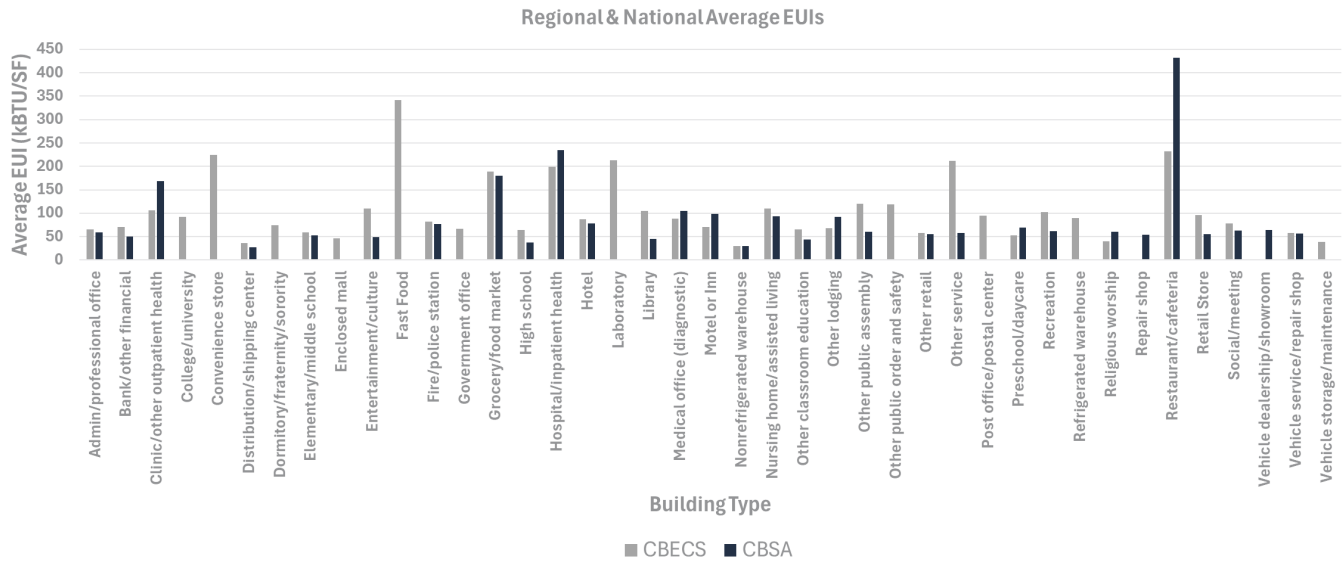


Figure 3. Average EUIs from regional (CBSA) and national (CBECS) data

To determine which EUI average should be used for each building activity type, the analysis team examined two major criteria. The number of buildings of a given type in the dataset was important for determining whether the sample size was large enough. Additionally, the variability between EUI values amongst buildings of the same type was important for ensuring that averages would be accurate.

Using these criteria, the analysis team established Northwest average EUIs for each building activity type as follows:

- If the CBSA sample for a specific building activity type average EUI included more than five buildings and had variability below 15%, then the CBSA average was chosen,
- If there was no CBSA average available, the CBECS sample included more than five buildings, and the sample had a variability below 15%, then the CBECS average was selected,
- If there were averages for both CBSA and CBECS, but neither met the criteria above, then the CBECS average was chosen and adjusted to one standard deviation toward the CBSA average.

Using these criteria, the analysis team established the Northwest average EUIs as visualized in Figure 5 and listed in Table 2. Since the most current national and regional datasets are from 2018 (CBECS) and 2019 (CBSA), the Northwest average EUIs represent historical average EUIs from the 2018/2019 timeframe. As discussed in the following section, the analysis team considered EUI trends to determine average EUIs for the first Oregon BPS compliance cycle which begins in the late 2020s.

Figure 4. Final Northwest average EUIs

# ODOE Building Performance Standards Energy Use Intensity Targets – 2024

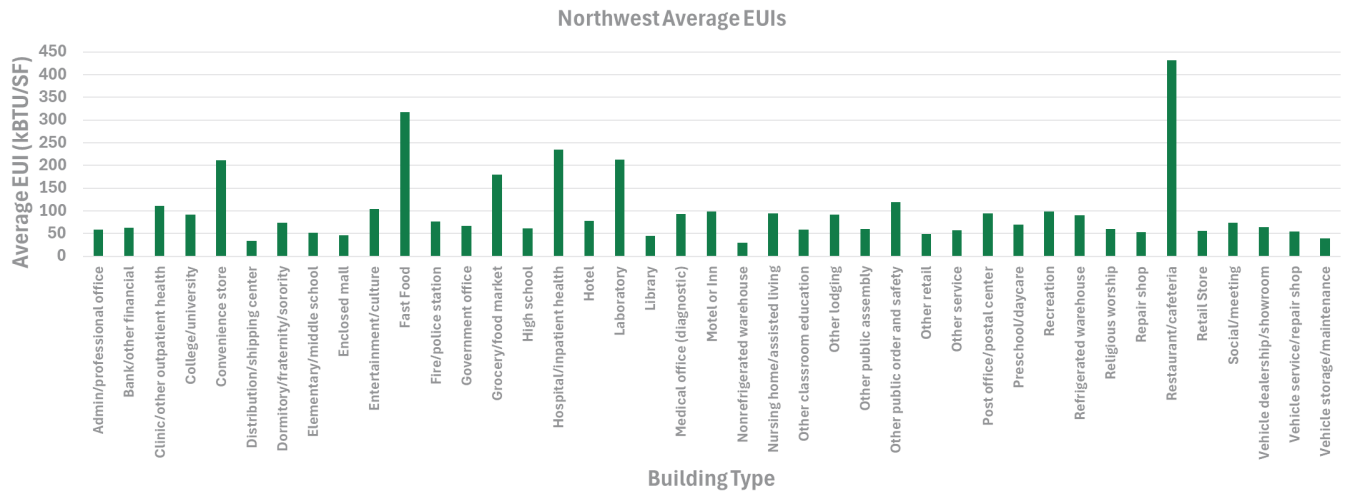


Table 2. Regional and national average EUIs and the chosen/calculated Northwest averages.

Building Type	CBCECS Average EUI	CBSA Average EUI	Northwest Average EUI
Admin/professional office	66	59	59
Bank/other financial	70	50	63
Clinic/other outpatient health	106	168	111
College/university	92	NA	92
Convenience store	224	NA	211
Distribution/shipping center	36	27	34
Dormitory/fraternity/sorority	74	NA	74
Elementary/middle school	59	52	52
Enclosed mall	46	NA	46
Entertainment/culture	110	49	104
Fast Food	342	NA	317
Fire/police station	81	76	76
Government office	67	NA	67
Grocery/food market	189	180	180
High school	64	37	62
Hospital/inpatient health	199	235	235
Hotel	87	78	78
Laboratory	213	NA	213
Library	105	45	45
Medical office (diagnostic)	88	105	92
Motel or Inn	71	98	98
Nonrefrigerated warehouse	30	30	30
Nursing home/assisted living	110	94	94
Other classroom education	66	44	59
Other lodging	68	92	92
Other public assembly	121	60	60

Building Type	CBECS Average EUI	CBSA Average EUI	Northwest Average EUI
Other public order and safety	119	NA	119
Other retail	57	55	49
Other service	212	58	58
Post office/postal center	94	NA	94
Preschool/daycare	53	69	69
Recreation	103	62	98
Refrigerated warehouse	90	NA	90
Religious worship	40	60	60
Repair shop	NA	54	54
Restaurant/cafeteria	232	432	432
Retail Store	96	56	56
Social/meeting	78	62	74
Vehicle dealership/showroom	NA	64	64
Vehicle service/repair shop	58	56	55
Vehicle storage/maintenance	39	NA	39

### Step 3: Oregon Average EUIs

The analysis team developed Oregon-specific average EUIs by comparing the Northwest average EUIs with local data from Oregon state-owned buildings, Oregon public schools, and City of Seattle and Portland benchmarking datasets. This step enabled the analysis team to identify where local energy use differed from regional or national energy use. Four building activity types were determined to need custom adjustments after comparing Oregon EUIs to the Northwest average EUIs<sup>10</sup>.

Additionally, a trends analysis confirmed that building energy use is generally decreasing over time. The analysis team applied an adjustment to the average EUIs for most building types to ensure that the EUI averages and targets developed in 2024 reflect the expected average EUIs for buildings when the program compliance goes into effect in the late 2020s.

### Custom Adjustments for Three Types of Educational Buildings

The local data available for Oregon schools included EUIs for public schools across Oregon. This data included only schools, showed consistent EUI averages across specific school building types, and represents a clear picture of a large majority of Oregon schools (966 schools).

The chart below shows that Oregon school averages are at or below the averages for the Northwest.

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<sup>10</sup> Building activity types as listed in the datasets comprise: elementary/middle schools, high schools, other classroom education, and restaurants.

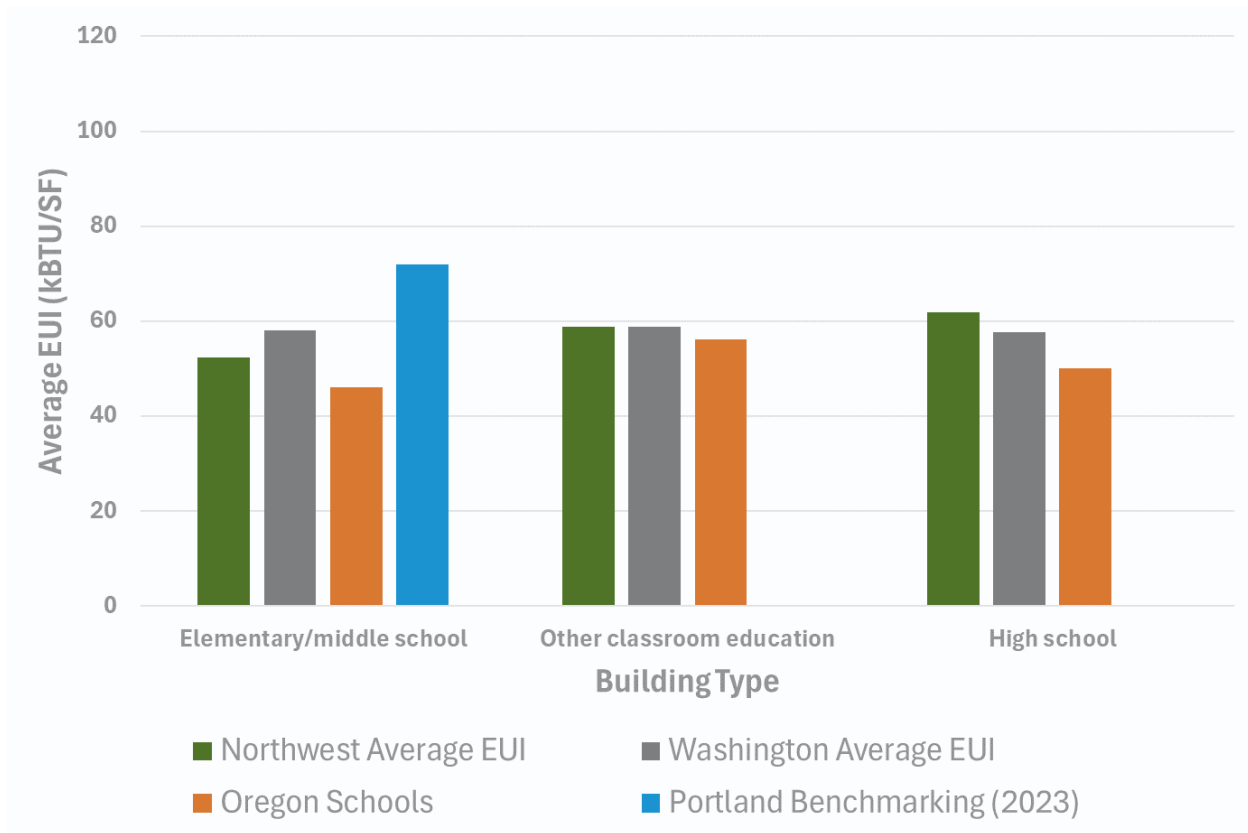


Figure 5. Education EUIs by dataset

Because this Oregon data provides a more complete picture of Oregon schools, the analysis team relied on it rather than national or regional data to create a custom average EUI for the three building activity types represented in the data: elementary/middle school, high school, and other classroom education.

### Custom Adjustments for Restaurants

The analysis team made a custom adjustment to the restaurant average EUI to better align with national, Portland, and Seattle data. Figure 9 shows the average EUI for restaurants across different datasets. National, Portland, and Seattle average EUIs for restaurants are significantly lower than the Northwest average. To account for this variation, the analysis team reduced the Northwest average EUI by 23%, which represents half of the difference between the Northwest average EUI and the CBECS average EUI.

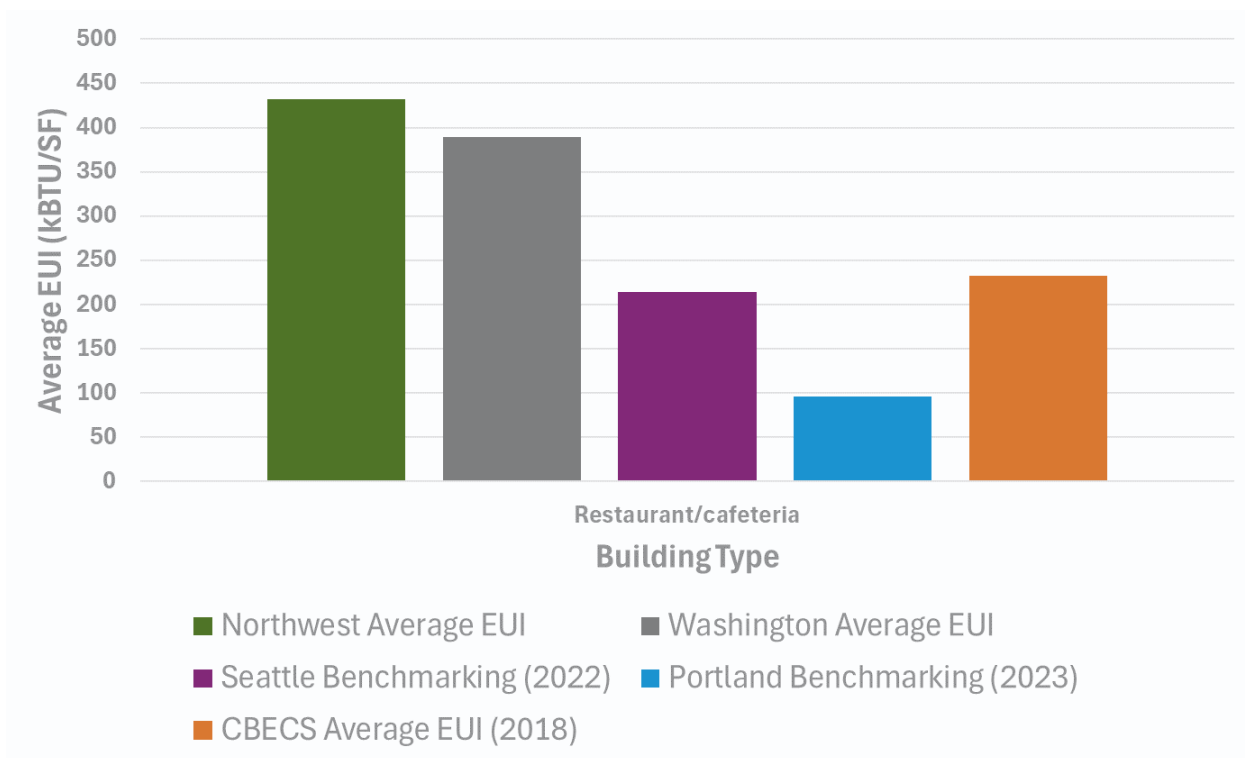


Figure 6. Restaurant (not including fast food) EUIs by dataset.

*Trend Adjustment for Most Building Activity Types*

Energy use in buildings is affected by various forces, including energy codes, equipment standards, market preferences, and price. To ensure that the downward trend was not due to the COVID-19 pandemic<sup>11</sup>, the analysis team compared trend data from regional and national data available from 2012-2019. The team compared energy use trends across the datasets and found that the EUIs are generally trending downwards (Figure 6 and Figure 7).<sup>12</sup> The regional datasets demonstrated a larger downward trend in energy use for some building activity types compared to the national average. However, the analysis team used the more conservative national trend factor of 1.7% per year. The team considered the trends in the national dataset to be more applicable; CBECS has the largest representative sample of more than 6,000 sites, includes highly vetted data and analysis, and is based on pre-COVID trends.

<sup>11</sup> The COVID-19 pandemic had different impacts on different building types, so to avoid the influence of lockdown regulations, the analysis team only used pre-pandemic data.

<sup>12</sup> Restaurants showed an increase in the CBSA and CBECS data. Hospitals showed a decrease in the CBECS data but showed an increase in the CBSA data. The 2019 CBSA report discusses this difference in the hospital EUIs and estimates that the 2019 CBSA EUI represents an adjustment to a more reasonable EUI, rather than an increase in energy usage from 2014. The 2019 CBSA analysts determined that the 2019 hospital EUI aligned more closely with other national data sources and the 2014 EUI of 174 was likely not representative of Northwest hospital EUIs at that time.



# ODOE Building Performance Standards Energy Use Intensity Targets – 2024

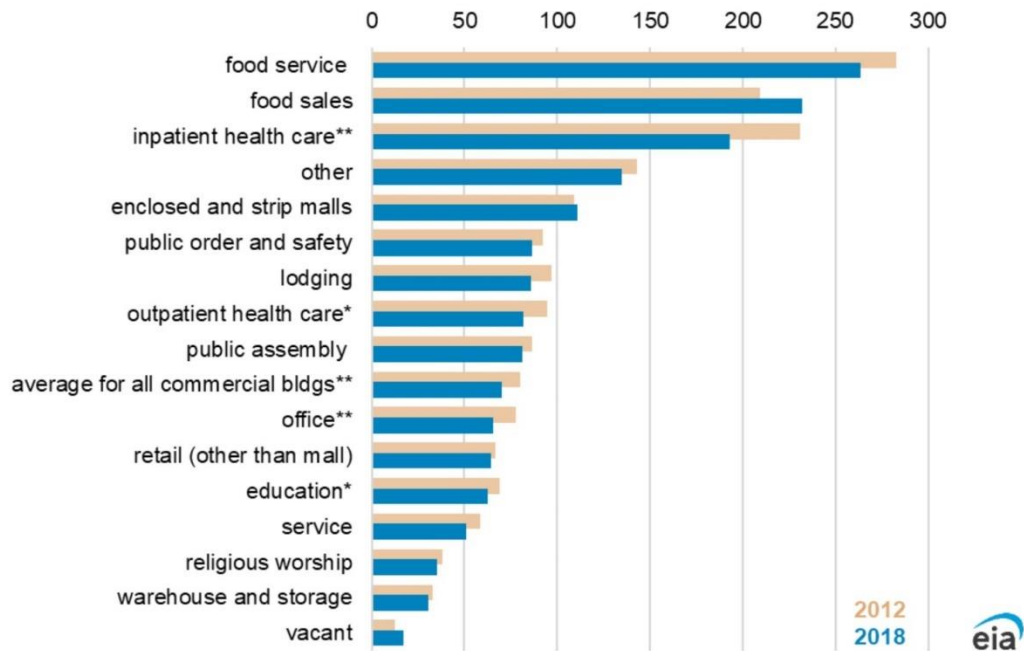


Figure 7. CBECS energy intensity trends

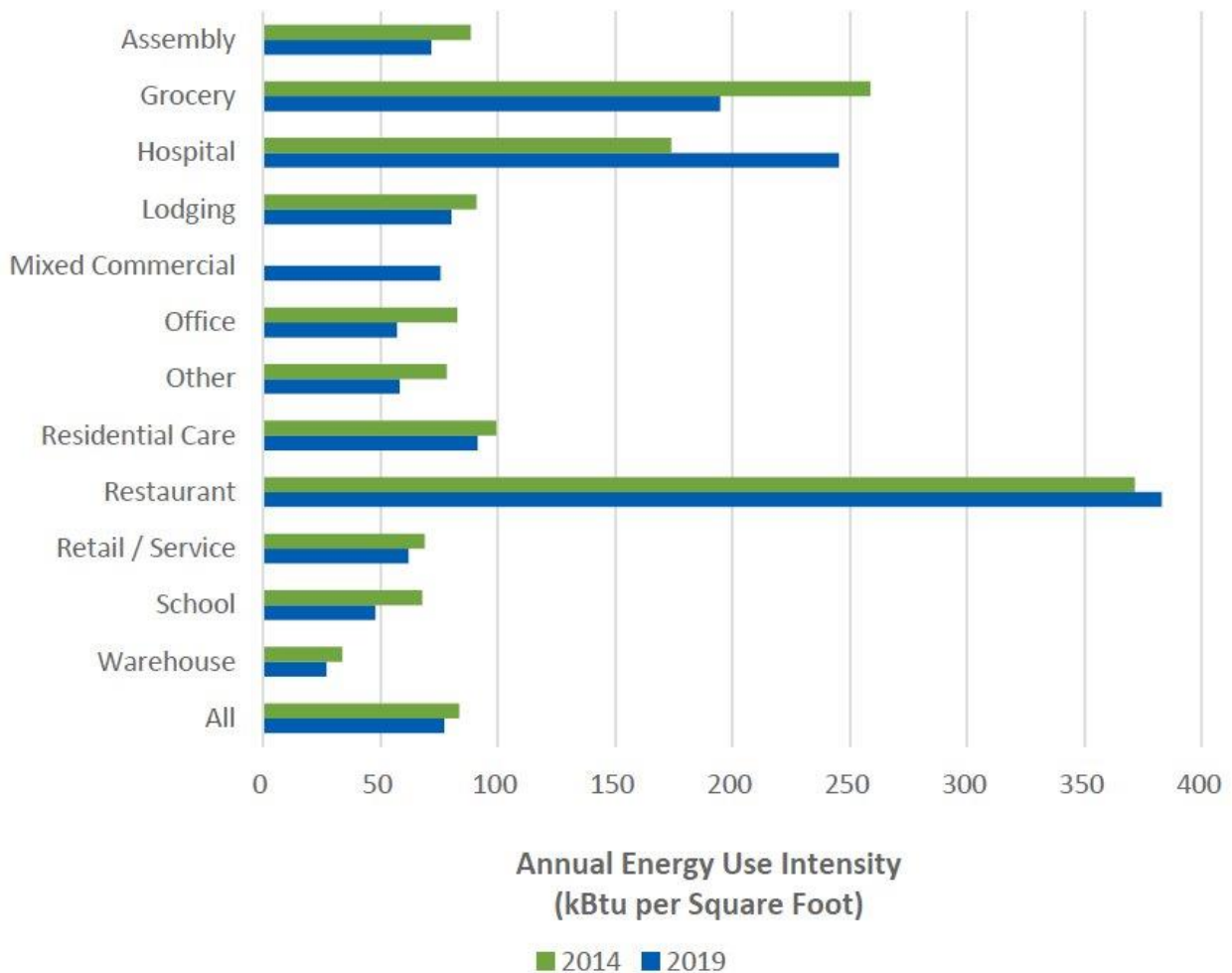


Figure 8. CBSA energy intensity trends

The compliance deadline for the first cohort of Tier 1 buildings (gross floor area  $\geq$  200,000 sq ft) is June 1, 2028, and is based on an EUI measurement encompassing the year of 2027. To align the Oregon average EUIs with the first measurement year for Compliance Cycle One, the analysis team selected 2027 as the baseline year for the average EUIs and applied a trend factor to adjust the average EUIs from approximately 2019 to 2027. The team applied this trend adjustment to all building activity types and building sizes, except restaurants and fast food. Food service building activity types were excluded by the team because they did not show a decrease overtime in the national dataset or regional dataset, and energy codes and standards, for example for lighting, have a less significant impact on food service EUIs over time.

### Development of EUI Targets

The Oregon average EUIs represent typical building energy use, while the EUI *targets* are what the buildings will need to meet to comply with the BPS. After developing the Oregon average EUIs, the analysis team applied the criteria required by HB 3409 to establish the EUI targets. The criteria include that the EUI targets must:

- Be weather normalized
- Apply to two or more climate zones
- Be adjusted as necessary for unique energy-using features
- Consider regional and local energy use
- Exclude EV supply equipment
- Be no more stringent than average EUIs
- Maximize GHG reductions.

The methodology for establishing the average EUIs account for the first five criteria. HB 3409 specifies that the EUI target be no more stringent than the average EUI. During the target development process as outlined in Figure 10, ODOE and the RAC recommended using the average EUIs as targets to maximize GHG reductions. The analysis team then used the Oregon average EUIs as the basis for the EUI targets.



Figure 9. EUI Target Development Process Overview

HB 3409 also requires separate targets for climate zone 4C (mostly west of the Cascade Mountain range) and climate zone 5B (mostly east of the Cascade Mountain range). Table 3 includes the full list of Oregon average EUIs as adjusted for Oregon’s two climate zones for use as EUI targets. Values listed in Table 3 for Tier 1 buildings have been approved via rulemaking process and codified into the BPS program rules.

Table 3 also includes EUI targets for some building activity types that apply only to Tier 2 buildings (hospitals, schools, dormitories, universities), also set at the average EUI level for these building activity

types. Note that Tier 2 buildings are not required to meet EUI targets, nor have any of the Tier 2 targets gone through a rulemaking and public approval process. Therefore, any Tier 2 targets listed in Table 3 are considered preliminary and informative only.

### EUI Targets

Below are the finalized Oregon EUI targets for 41 building activity types in climate zones 4C and 5B. Tier 2 building types, with preliminary EUI targets, are noted with an asterisk.

Table 3. Oregon EUI Targets for Compliance Cycle One.

<b>Building Activity Type</b>	<b>4C Target EUI</b>	<b>5B Target EUI</b>
Admin/professional office	50	52
Bank/other financial	53	55
Clinic/other outpatient health	92	99
College/university *	79	79
Convenience store	179	185
Distribution/shipping center	25	34
Dormitory/fraternity/sorority *	63	64
Elementary/middle school *	39	40
Entertainment/culture	88	91
Enclosed mall	38	42
Fast Food	308	326
Fire/police station	64	67
Government office	57	59
Grocery/food market	153	157
High school *	43	44
Hospital/inpatient health *	203	203
Hotel	65	69
Laboratory	180	188
Library	38	40
Medical office (diagnostic)	77	83
Motel or Inn	83	87
Nonrefrigerated warehouse	23	29
Nursing home/assisted living	79	83
Other classroom education	48	49
Other lodging	78	81
Other public assembly	50	54
Other public order and safety	100	105
Other retail	40	45
Other service	48	51
Post office/postal center	80	83
Preschool/daycare	60	60
Recreation	82	88

Building Activity Type	4C Target EUI	5B Target EUI
Refrigerated warehouse	76	79
Religious worship	50	54
Repair shop	45	48
Restaurant/cafeteria	325	340
Retail Store	46	50
Social/meeting	63	65
Vehicle dealership/showroom	52	58
Vehicle service/repair shop	46	49
Vehicle storage/maintenance	33	35

\* These are Tier 2 Building Activity Types. They are only here for reference. Tier 2 buildings are not required to meet the targets for Compliance Cycle One starting in 2028. A Tier 2 building is defined as:  
 (A) A building with gross floor area, excluding any parking garage, that equals or exceeds 35,000 square feet and that is used as a multifamily residential building, a hospital, a school, a dormitory or a university building; or  
 (B) A building in which the sum of gross floor area for hotel, motel and nonresidential use exceeds 20,000 square feet but does not exceed 35,000 square feet, excluding any parking garage.  
 “Tier 2 building” does not include a covered commercial building that is classified as a Tier 1 building.

## Normalizations

The energy consumption for buildings can vary based on a building’s annual operating hours, since these hours are when heating and cooling the building occurs and other energy-using equipment, such as lighting, is operated. The Oregon BPS provides normalization factors to adjust EUI targets for individual buildings to account for different operating hours. The Oregon BPS adopted the operating hour factors developed by the Washington Department of Commerce for the Washington Clean Buildings Performance Standard<sup>13</sup>. Appendix B of this report includes the Oregon BPS normalization factors.

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<sup>13</sup> In 2019, the Clean Buildings bill was signed into law in Washington State, expanded in 2022, and augmented in 2023. The objective is to lower costs and pollution from fossil fuel consumption in the state’s existing covered buildings, multifamily buildings, and campus district energy systems. Read more about the [Washington Clean Buildings Performance Standard](#).

## Appendix A: Steps to Reproduce Average EUIs

This appendix describes how the team calculated the average northwest EUIs for each building activity type. The repository of code and source data files are in the zipped folder “Companion code.zip”. To replicate the analysis, the user may unzip the file and follow the outlined procedure using R Studio and Microsoft Excel.

1. Retrieve published data from CBECS and CBSA
  - a. **cbecs2018\_final\_public.csv**
  - b. Published CBSA 2009 data<sup>14</sup>
  - c. **cbsa-public-site-summary-table.csv** (CBSA 2014)
  - d. **site\_details-facility.csv** (CBSA 2019)
2. Generate crosswalks from CBECS and CBSA to ASHRAE 100 building types
  - a. **Crosswalk\_btype.xlsx**
3. Create a combined CBSA 2009 and 2014 data set
  - a. Convert 2009 energy data to Btus and sum, calculate EUIs
  - b. Convert 2014 normalized energy data to Btus and, calculate EUIs
  - c. Results in **CBSA\_combined\_sigma.csv**
4. Calculate climate zone conversion factors from ASHRAE100
  - a. Eg. divide zone 4C target EUI by Zone 2A EUI. This is the conversion factor from zone 2A to 6A.
  - b. Repeat for all zones to get climate conversions for zones 4C and 5B
  - c. Factors calculated in **ASHRAE\_CBECS\_2018.xlsx**
5. Assign ASHRAE Climate zones to CBECS data based on the climate map in CBECS documentation.
  - a. In **CBECS\_CLIM\_ADJ\_Means.R**
    - i. Eg. CBECS zone 5 ~ 5B, CBECS zone 4~ 4C, CBECS Zone 6 ~ 6B
    - ii. Use ASHRAE climate zone multipliers to estimate equivalent EUIs for each CBECS building for Zone 4C and 5B
    - iii. Values shown in **cbecs2018\_final\_public\_CLIM\_ADJ.csv**
6. Match climate adjusted CBECS to ASHRAE 100 building types
7. Merge CBECS and CBSA data sets and calculate mean EUIs for each
  - a. In R script **CBECS\_Regional\_Comparison.R**
    - i. Bind **CBSA\_combined\_sigma.csv** with Hospital buildings from **CBSA2019**.
    - ii. Match building types to ASHRAE 100 using crosswalk.
    - iii. Remove non-relevant CBSA buildings
      1. No energy data record
      2. Idaho and Montana Buildings
    - iv. Merge **cbecs2018\_final\_public\_CLIM\_ADJ.csv** with CBSA data

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<sup>14</sup> No longer on NEEA’s website

- v. Calculate CBECS Northwest EUI climate zone averages for each building
  1. Add EUI for 4C and 5B, then divide by 2 to calculate regional EUI
  2. Calculate mean EUI for each ASHRAE building type in both CBECS and CBSA data sets
- vi. Sum all EUIs for each data set by each building type, divide by number of buildings
- vii. Calculate standard error for each mean EUI
- viii. Export results for target setting to (**OutputQC.csv**)
8. Calculate CBECS Mean EUI for all buildings that had climate masked data
  - a. In R Script **CBECS Splits.R**
    - i. Sum all EUIs for each building type, divide by number of buildings
    - ii. Calculate standard error for each mean EUI
    - iii. Export results for target setting to (**CBECS\_STDERR**)
9. Import results from **CBECS\_STDERR.csv** and **OutputQC.csv** to target setting workbook **Comparison\_ASHRAEbtype\_Means QC.xlsx**

**Appendix B: Oregon BPS Operating Hours Normalization Factors**

Building Activity Type				Weekly Hours <sup>1,2</sup>			
No.	Portfolio Manager Types	Portfolio Manager Subtypes	Subtypes: Detailed	Notes	50 or Less	51 to 167	168
1	Banking/financial services	Bank branch		3	0.8	1.0	1.5
2	Banking/financial services	Financial office		3	0.8	1.0	1.5
3	Education	Adult education		4, 10	0.9	1.1	1.9
4	Education	College/university		4, 10	0.9	1.1	1.9
5	Education	K-12 school	Elementary/middle school	4, 10	0.9	1.1	1.9
6	Education	K-12 school	High school	4, 10	0.9	1.1	1.9
7	Education	Preschool/daycare		4, 10	0.9	1.1	1.9
8	Education	Vocational school		4, 10	0.9	1.1	1.9
9	Education	Other—education		4, 10	0.9	1.1	1.9
10	Entertainment/public assembly	Aquarium		4, 9	0.6	1.1	1.6
11	Entertainment/public assembly	Bar/nightclub		4	0.6	1.1	1.6
12	Entertainment/public assembly	Bowling alley		4	0.6	1.1	1.6
13	Entertainment/public assembly	Casino		4	0.6	1.1	1.6
14	Entertainment/public assembly	Convention center		4	0.6	1.1	1.6
15	Entertainment/public assembly	Fitness center/health club/gym		4	0.6	1.1	1.6
16	Entertainment/public assembly	Ice/curling rink		4	0.6	1.1	1.6
17	Entertainment/public assembly	Indoor arena		4	0.6	1.1	1.6
18	Entertainment/public assembly	Movie theater		4	0.6	1.1	1.6
19	Entertainment/public assembly	Museum		4, 9	0.6	1.1	1.6
20	Entertainment/public assembly	Performing arts		4	0.6	1.1	1.6
21	Entertainment/public assembly	Race track		4	0.6	1.1	1.6
22	Entertainment/public assembly	Roller rink		4	0.6	1.1	1.6
23	Entertainment/public assembly	Social/meeting hall		4	0.6	1.1	1.6
24	Entertainment/public assembly	Stadium (closed)		4	0.6	1.1	1.6
25	Entertainment/public assembly	Stadium (open)		4	0.6	1.1	1.6
26	Entertainment/public assembly	Swimming pool		4	0.6	1.1	1.6
27	Entertainment/public assembly	Zoo		4, 9	0.6	1.1	1.6
28	Entertainment/public assembly	Other—entertainment/public assembly	Entertainment/culture	4	0.6	1.1	1.6
29	Entertainment/public assembly	Other—entertainment/public assembly	Library	4	0.6	1.1	1.6
30	Entertainment/public assembly	Other—entertainment/public assembly	Other public assembly	4	0.6	1.1	1.6
31	Entertainment/public assembly	Other—entertainment/public assembly	Recreation	4	0.6	1.1	1.6
32	Entertainment/public assembly	Other—entertainment/public assembly	Social/meeting	4	0.6	1.1	1.6
33	Entertainment/public assembly	Other—recreation		4	0.6	1.1	1.6
34	Entertainment/public assembly	Other—stadium		4	0.6	1.1	1.6
35	Food sales and service	Bar/nightclub		4	0.6	1.1	1.5
36	Food sales and service	Convenience store with gas station		4	0.5	0.9	1.3
37	Food sales and service	Convenience store without gas station		4	0.5	0.9	1.3

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38	Food sales and service	Fast food restaurant		4	0.6	1.1	1.5
39	Food sales and service	Food sales	Grocery/food market	4	0.5	0.9	1.3
40	Food sales and service	Food sales	Convenience store with gas	4	0.5	0.9	1.3
41	Food sales and service	Food sales	Convenience store	4	0.5	0.9	1.3
42	Food sales and service	Food sales	Other food sales	4	0.5	0.9	1.3
43	Food sales and service	Food service	Fast food	4	0.6	1.1	1.5
44	Food sales and service	Food service	Restaurant/cafeteria	4	0.6	1.1	1.5
45	Food sales and service	Food service	Other food service	4	0.6	1.1	1.5
46	Food sales and service	Restaurant		4	0.6	1.1	1.5
47	Food sales and service	Supermarket/grocery store		4	0.5	0.9	1.3
48	Food sales and service	Wholesale club/supercenter		4	0.6	1.0	1.5
49	Food sales and service	Other—restaurant/bar		4	0.6	1.1	1.5
50	Healthcare	Ambulatory surgical center		4,7	0.8	1.1	1.3
51	Healthcare	Hospital (general medical and surgical)		10	1.0	1.0	1.0
52	Healthcare	Medical office		4,7			
53	Healthcare	Outpatient rehabilitation/ physical therapy		4,7	0.8	1.1	1.3
54	Healthcare	Residential care facility		10	1.0	1.0	1.0
55	Healthcare	Senior care community		10	1.0	1.0	1.0
56	Healthcare	Urgent care/clinic/other outpatient		4,7	0.8	1.1	1.3
57	Healthcare	Other—specialty hospital		10	1.0	1.0	1.0
58	Lodging/residential	Barracks		10	1.0	1.0	1.0
59	Lodging/residential	Hotel	Hotel		1.0	1.0	1.0
60	Lodging/residential	Hotel	Motel or inn		1.0	1.0	1.0
61	Lodging/residential	Multifamily housing		10	1.0	1.0	1.0
62	Lodging/residential	Prison/incarceration		10	1.0	1.0	1.0
63	Lodging/residential	Residence hall/dormitory		10	1.0	1.0	1.0
64	Lodging/residential	Residential care facility		10	1.0	1.0	1.0
65	Lodging/residential	Senior care community		10	1.0	1.0	1.0
66	Lodging/residential	Other—lodging/residential		10	1.0	1.0	1.0
67	Mixed-use	Mixed-use property		6			
68	Office	Medical office		4,7	0.8	1.1	1.3
69	Office	Office	Admin/professional office	3	0.8	1.0	1.5
70	Office	Office	Bank/other financial	3	0.8	1.0	1.5
71	Office	Office	Government office	3	0.8	1.0	1.5
72	Office	Office	Medical office (diagnostic)	4	0.8	1.1	1.3
73	Office	Office	Other office	3	0.8	1.0	1.5
74	Office	Veterinary office		3	0.8	1.1	1.3
75	Office	Other—office		3	0.8	1.0	1.5
76	Public services	Courthouse		4	0.8	0.8	1.1
77	Public services	Fire station		3	0.8	0.8	1.1



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78	Public services	Library		4	0.6	1.1	1.6
79	Public services	Mailing center/post office		3	0.8	1.2	1.3
80	Public services	Police station		3	0.8	0.8	1.1
81	Public services	Prison/incarceration		10	1.0	1.0	1.0
82	Public services	Social/meeting hall		4	0.6	1.1	1.6
83	Public services	Transportation terminal/station		4	0.6	1.1	1.6
84	Public services	Other—public service		4	0.8	1.2	1.3
85	Religious worship	Worship facility		5	0.9	1.7	1.7
86	Retail	Automobile dealership		4	0.6	1.0	1.5
87	Retail	Convenience store with gas station		4	0.5	0.9	1.3
88	Retail	Convenience store without gas station		4	0.5	0.9	1.3
89	Retail	Enclosed mall		4	0.6	1.0	1.5
90	Retail	Lifestyle center	Enclosed mall	4	0.6	1.0	1.5
91	Retail	Lifestyle center	Other retail	4	0.6	1.0	1.5
92	Retail	Lifestyle center	Retail store	4	0.6	1.0	1.5
93	Retail	Lifestyle center					
94	Retail	Retail store		4	0.6	1.0	1.5
95	Retail	Strip mall					
96	Retail	Supermarket/grocery store		4	0.5	0.9	1.3
97	Retail	Wholesale club/supercenter		4	0.6	1.0	1.5
98	Retail	Other—retail/mall	Enclosed mall	4	0.6	1.0	1.5
99	Retail	Other—retail/mall					
100	Technology/science	Data center					
101	Technology/science	Laboratory		3	1.0	1.0	1.0
102	Technology/science	Other—technology/science	Other service	3	0.8	1.2	1.3
103	Services	Personal services (health/beauty, dry cleaning, etc.)		4	0.8	1.2	1.3
104	Services	Repair services (vehicle, shoe, locksmith, etc.)	Repair shop	4	0.8	1.2	1.3
105	Services	Repair services (vehicle, shoe, locksmith, etc.)	Vehicle service/repair shop	4	0.8	1.2	1.3
106	Services	Repair services (vehicle, shoe, locksmith, etc.)	Vehicle storage/maintenance	4	0.8	1.2	1.3
107	Services	Other—services		4	0.8	1.2	1.3
108	Utility	Energy/power station					
109	Utility	Other—utility					
110	Warehouse/storage	Self-storage facility		4	0.8	1.0	1.4
111	Warehouse/storage	Distribution center		3	0.8	1.0	1.4
112	Warehouse/storage	Nonrefrigerated warehouse		3	0.8	1.0	1.4
113	Warehouse/storage	Refrigerated warehouse		3,8	1.0	1.0	1.4

Notes:

1. Do not count the hours when the property is occupied only by maintenance, security, the cleaning crew, or other support personnel. Do not count the hours when the property is occupied only by maintenance staff.
2. Working hours are based on the average use over the 12-month period selected to document energy use in **Form C: Calculation of Energy Use Intensity**.
3. The weekly hours are the total number of hours per week where the majority of workers are present. If there are two or more shifts of workers, add the hours. When developing targets using Section 7.2.3 for mixed-use *buildings*, use the weekly hours for each separate activity, based on the hours per week the majority of workers are

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present.

4. The weekly hours are the hours that the majority of the *building* is open to serve the public. When developing targets using Section 7.2.3 for mixed-use *buildings*, use the hours each separate activity is open to the public.
5. The weekly hours the facility is open for operation, which may include worship services, choir practice, administrative use, committee meetings, classes, or other activities.
6. Must use Section 7.2.3 method for mixed-use *buildings*.
7. Health care *buildings* may use other weekly hours if they are required to operate building systems additional hours to protect patient and staff safety. Provide documentation of the requirement in the energy management plan.
8. Refrigerated warehouse using greater than 167 hours assumes the workers on shift are loading and/or unloading vehicles.
9. Aquariums, Museums and Zoos may use other weekly hours if they are required to operate building systems additional hours to protect *building* contents. Provide documentation of the requirement in the energy management plan.
10. College/university, K-12 school, Hospital (general medical and surgical) and Prison/incarceration *building activity types* complying at the campus-level (footnote 9 of Tables 7-1, 7-2a, and 7-4) shall apply the campus-level shift normalization factor to the area weighted aggregate  $EUI_t$ . Include all space uses listed in the campus-level *building activity type* (college/university, K-12 school, hospital, prison) Table 7-4 definitions. For space uses not listed in the campus-level *building activity type* definitions, the specific space use may use their specific shift normalization factor.
11. Multifamily buildings, hospitals, schools, dormitories, and university buildings over 35,000 square feet (not including parking garage area) are Tier 2 buildings whose target EUIs are considered placeholders until determined under a rulemaking process.

FOR MORE INFORMATION

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