



ENERGY • WATER • EFFICIENCY

Memorandum

FROM: SBW Consulting, Inc.
TO: Blake Shelide, Oregon Department of Energy
DATE: 9/24/2024
RE: Oregon Building Performance Standards EUI Targets for Compliance Cycle One

The draft rules for Oregon’s Building Energy Performance Standards (BEPS) published on October 1st, 2024, by the Oregon Department of Energy (ODOE) include the draft energy use intensity targets (EUI target) for buildings. BEPS requires that buildings decrease their EUI over time until they reach an appropriate EUI target. To ensure an appropriate target was developed in line with the requirements of HB 3409, ODOE hired a consultant, SBW Consulting (the analysis team) to develop the targets using the best available data sources.

Under BEPS, buildings will gradually lower energy use and emissions over time to support Oregon’s climate action goals. As part of the rulemaking process, ODOE has worked with the Rulemaking Advisory Committee (RAC) to develop well-rounded and holistic rules and targets.¹ The rulemaking process will be finished by December 31st, 2024.

In Oregon, the EUI targets are based on average site energy use intensity. Developing the targets requires developing average energy use intensities based on high-quality data and ensuring that the final EUI target for each building type accurately reflects energy use in that building type at large and is adjusted to reflect local conditions and energy use trends.

1.1 Development of Average Energy Use Intensities (EUIs)

Commercial buildings can use a standard energy use intensity (EUI) metric to represent their energy use. An EUI is the total energy use of a building divided by its square footage, excluding parking and can be thought of like an energy scorecard. EUI targets for building performance standards are typically established for specific building types (e.g., offices, schools, hospitals, etc.) and reflect that each uses energy uniquely. The Oregon draft targets have unique EUIs for 40 different commercial building types. Buildings also change how they use energy over time as new laws, standards, technologies, and use patterns change. EUIs can have adjustments to them based on trends in energy use over time. Energy use in a building also differs depending on the climate, and EUIs are adjusted based on a location’s climate. HB 3409 specifies that BEPS

¹ The RAC comprises building tenants, building owners, public utilities, local governments, and other organizations with interest in the rulemaking process.

targets be different based on climate zones, for which there are two in Oregon (Climate Zones 4C and 5B).

EUI targets need to be achievable by most buildings. To enable that, EUI targets are developed using average EUIs for each building type. HB 3409 ensures that EUI targets will be reachable by requiring that the final target a building needs to meet be no lower than the average EUI for that building type. The specific language in HB 3409 is shown in Figure 1.

	Directive	Key Detail
Building Performance	Establish energy performance standards	Standards are for commercial buildings >35,000sqft
Average EUI	Set energy use intensity targets (EUI _t) for specific building types	The average EUI serves as the minimum allowable EUI _t 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

As HB 3409 requires that the average EUI be the minimum allowable EUI target for buildings, it is necessary to determine the average EUI. No one source can be used to calculate an average or mean for each building type. The analysis team followed a rigorous process that combined data from high-quality data sources to determine the average EUIs.

As outlined in Figure 2, the analysis team first collected EUI data from high-quality, publicly available data sources, then analyzed that data to create 2019 Northwest average EUIs, and

finally, added 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: 2019 Northwest Average EUIs

Objective: Determine the baseline EUI for the Northwest.

Approach: Combine regional and national data to establish the 2019 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

1.1.1 Step 1: Data Collection

The first step in developing the EUI targets for Oregon was to collect and combine building energy use data from national and regional sources to create average EUIs for each building type that represents energy consumption in the Pacific Northwest. Commercial buildings in the Northwest are similar to those in Oregon, and there are high-quality datasets that represent a large proportion of buildings that are covered by BEPS. Finally, smaller, local data sets were woven into the analysis to account for specific local nuances in building energy use.

The data sources included:

- 1. National:** The Commercial Buildings Energy Consumption Survey (CBECS)², adjusted to match Oregon climate,
- 2. Regional:** The Commercial Building Stock Assessment (CBSA)³, City of Seattle benchmarking program data, and
- 3. Local:** Oregon state-owned buildings data, Oregon schools' data, and City of Portland benchmarking program data.

² 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](#).

³ 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](#).

1.1.2 Step 2: 2019 Northwest Average EUIs

The analysis team used these sources to establish a Northwest average EUI for 40 building types across Oregon's two climate zones. The analysis team prioritized the regional dataset wherever possible, and national data was used when a more local dataset was not available or appropriate.

The analysis team then used the local datasets and the City of Seattle benchmarking data to establish the Oregon-specific average EUIs.

1.1.3 Step 3: Oregon Average EUIs

The analysis team developed the Oregon-specific EUIs by overlaying the 2019 Northwest average EUIs with local data from state-owned buildings, 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. A trends analysis covering 12 years confirmed that building energy use is decreasing over time, and the analysis team made a trend adjustment to all building types to account for this. Additionally, four building types needed custom adjustments after comparing the local EUIs to the regional EUIs.⁴

1.1.3.1 Trend Adjustment for All Building Types

Energy use in buildings is affected by various forces outside the control of building owners, including codes, equipment standards, market preferences, and price. The analysis team applied an adjustment to ensure that the EUI targets developed in 2024 reflect the conditions likely for buildings as their compliance date approaches. The compliance dates for BEPS for tier 1 buildings, as listed in HB 3409, are:

1. For tier 1 buildings with a gross floor area of 200,000 square feet or more: June 1, 2028.
2. For tier 1 buildings with a gross floor area of 90,000 square feet or more but less than 200,000 square feet: June 1, 2029.
3. For tier 1 buildings with a gross floor area of 35,000 square feet or more but less than 90,000 square feet: June 1, 2030

The analysis team compared energy use trends across the datasets from 2012-2024 and found, as expected that EUIs are trending downwards.

To ensure that the downward trend was not due to the COVID-19 pandemic, the analysis team compared the recent trend data to regional and national data available from 2012-2019. The downward trend appears in data collected across multiple data sets, both before and after the pandemic. The local and regional datasets demonstrated a larger downward trend in energy use

⁴ Building types as listed in the datasets include: elementary/middle schools, high schools, other classroom education, and restaurants.

(~2.7% per year post-COVID, ~2.3% per year pre-COVID) compared to the national data (1.7% per year). To represent the decrease in energy use over time, excluding COVID, the analysis team applied a forward-facing universal adjustment factor to the EUIs by -1.7% per year between 2019 and 2027.

This adjustment applied to all building types. Educational buildings and restaurants also received custom adjustments based on specific local data.

1.1.3.2 Custom Adjustments for Educational Buildings

The local data available for Oregon schools included a sample from most schools in Oregon. This sample provides a clear picture of how Oregon schools use energy. This high-quality data included only schools, showed consistent EUI averages across schools, and was a complete picture of 966 Oregon schools.

The chart in Figure 3 shows that Oregon Schools' averages are at or below the averages for the Northwest.

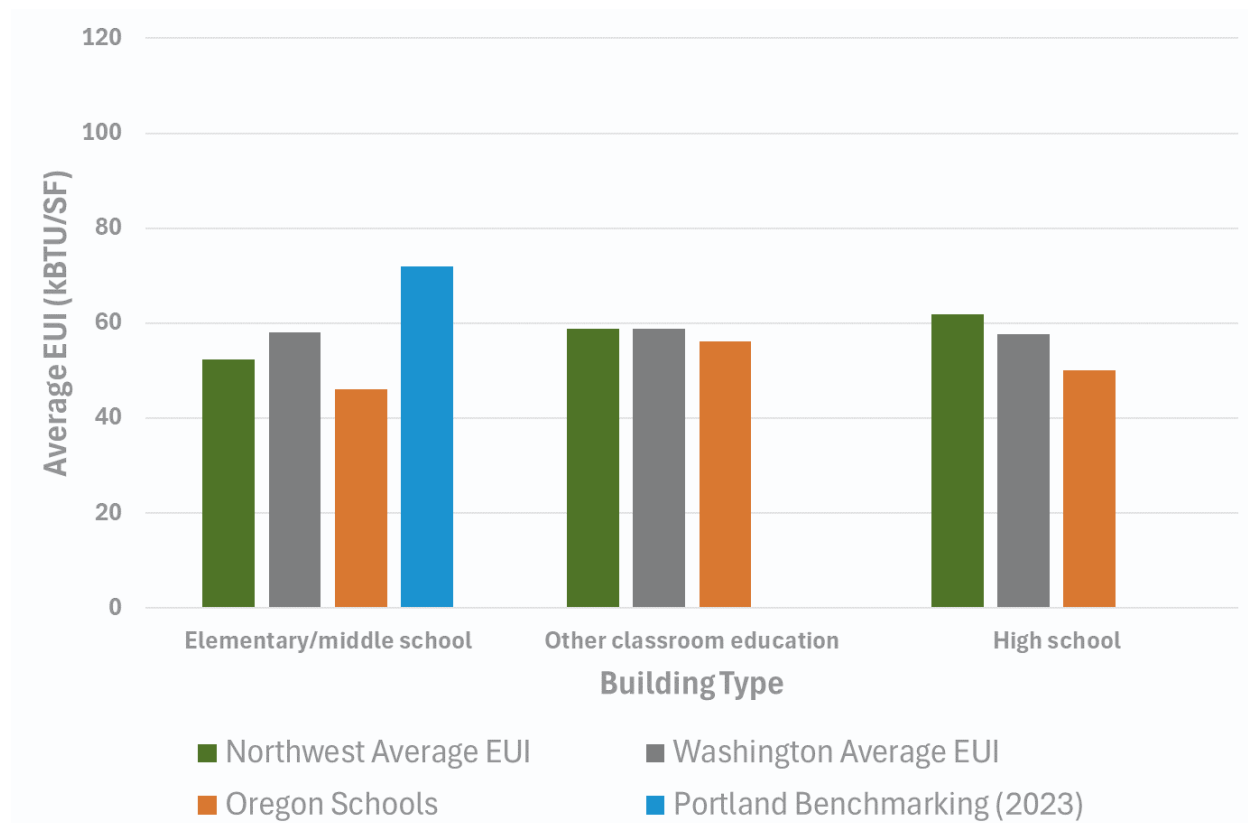


Figure 3. Education EUIs by dataset

Because this data provides a near-complete picture of all Oregon schools, the analysis team relied on it rather than national or regional data to create a custom average EUI for the three

school types represented in the data: elementary/middle school, high school, and other classroom education building types.

1.1.3.3 Custom Adjustments for Restaurants

The custom adjustment made for restaurants shows the value of using local datasets when developing EUI targets. Figure 4 shows the average EUI for restaurants across the different datasets.

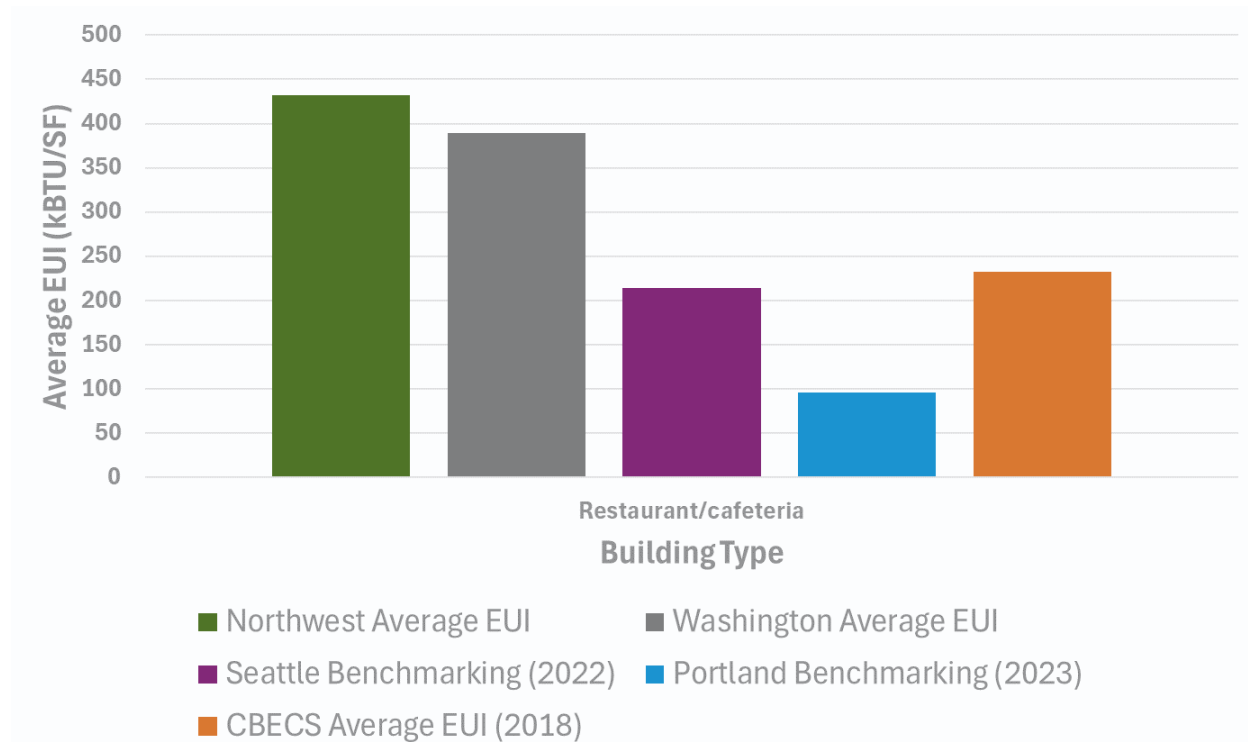


Figure 4. Restaurant EUIs by dataset

The blue bar, which represents the highest-quality local data, is significantly lower than the EUIs demonstrated by the other datasets assessed to create the average EUIs.

1.2 Development of EUI Targets

The Oregon average EUIs represent typical building energy use, while the EUI targets are the energy use targets that buildings will need to meet to comply with BEPS. 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,
- Be equal to or greater than average EUIs,
- Include two or more climate zones,

- Be adjusted as necessary for unique energy-using features,
- Consider regional and local energy use,
- Exclude EV supply equipment, and
- Maximize GHG reductions.

After considering the criteria above, ODOE and the RAC recommended using the Oregon average EUIs developed as detailed in this process as the targets for Compliance Cycle One following the process outlined in Figure 5.



Figure 5. EUI Target Development Process Overview

The analysis team developed the EUI targets for Compliance Cycle One for Tier 1 buildings in Oregon. HB 3409 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).

The full list of Oregon average EUIs for Oregon’s two climate zones are available in Table 1. Oregon EUI Targets for Compliance Cycle One.

2 EUI Targets

Table 1. Oregon EUI Targets for Compliance Cycle One.

ASHRAE Building Type	Climate Zone 4C Target EUI	Climate Zone 5B Target EUI
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
Fast Food	266	282
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
Refrigerated warehouse	76	79
Religious worship	50	54

Repair shop	45	48
Restaurant/cafeteria	281	293
Retail Store	46	50
Social/meeting	63	65
Vehicle dealership/showroom	52	58
Vehicle service/repair shop	46	49