



Seattle
Municipal
Buildings

2011-2012
ENERGY
PERFORMANCE
REPORT

May 2013

ACKNOWLEDGMENTS

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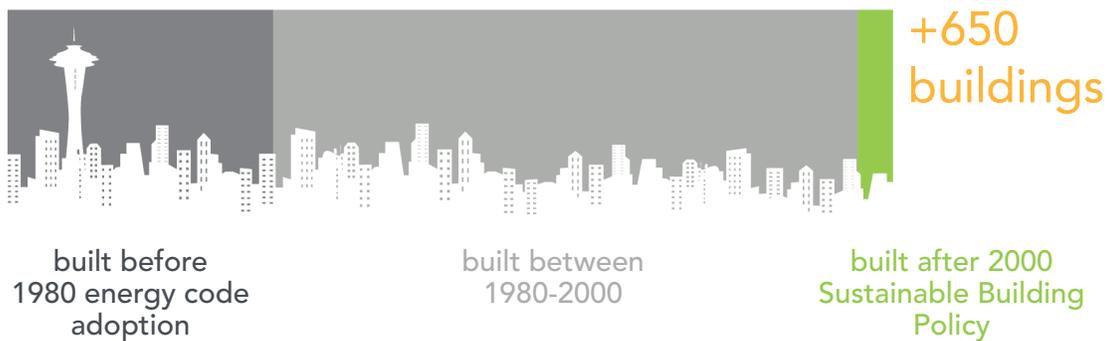


The City of Seattle has set an ambitious target to be a carbon neutral community by 2050. To get there, the entire community needs to reduce its environmental impact and City government must be a leader and an active participant. This report demonstrates that leadership by publicly sharing the results of the City’s work to rate the energy efficiency, or “energy performance” of City-owned facilities. It also details actions the City is taking to improve the energy efficiency of its facilities.

The City of Seattle has an excellent track record of reducing the environmental impact of City operations, among them: a **Commute Trip Reduction Program** to reduce miles employees travel to and from work, **Green Fleets** to reduce emissions from on-the-job travel, and a **Sustainable Buildings and Sites Policy** to ensure that new construction and renovations meet strict energy performance criteria. The City also recognizes the critical importance of improving the efficiency of existing buildings—and the Mayor has set a goal of reducing energy use across City-owned buildings 20% by 2020.

Most of the buildings that will shape Seattle in 2050 have already been built. This is equally true for City-owned buildings. Of the approximately 650 City-owned buildings, only 28—those built since the Sustainable Buildings Policy was implemented in 2000—were constructed to green building standards. In fact, 30% of the City’s buildings were built before 1980, the year the first Washington State Energy Code was adopted.

The first step toward reducing energy consumption is effectively tracking energy use to understand existing conditions. Monitoring the energy and water use of City-owned buildings is not new. City departments track utility bills, and those departments with many buildings use resource tracking software. In addition, greenhouse gas (GHG) emissions from municipal



City-owned building stock consists primarily of buildings built prior to the launch of City green building standards. (Source: City of Seattle)

buildings and facilities are reported in the City of Seattle Municipal GHG Emissions Inventory, which is a summary of GHG emissions from all municipal operations. At 32% of total emissions, buildings are the City's second largest source of emissions after vehicle fleets.

The **City of Seattle Energy Benchmarking and Reporting Program** requires building owners to track and annually report building energy efficiency, or “energy performance” to the City. The program also requires building owners to disclose the results to any current or prospective tenant, buyer, or lender upon request. Like many other building owners, the City is benchmarking the energy use of its facilities to understand, at a portfolio-wide scale, where it is doing well, and where improvement is needed. Energy benchmarking sets the baseline for a road map to significantly increase City-owned building energy efficiency and reduce GHG emissions by 2020. Improvements will help the City meet its environmental goals and reduce operating costs.

The City believes energy benchmarking is an important best management practice and public disclosure of building energy performance promotes transparency and accountability. To lead by example, the Mayor directed City departments to go beyond the minimum requirements of the benchmarking law by publicly sharing the energy performance of City-owned buildings. As a member of the Seattle 2030 District, a public-private effort to create a high performance building district in the heart of Seattle, the City is also sharing information to support collaboration among building owners. In addition, because the City values the energy performance of all its buildings, it is tracking and reporting as many City facilities as is feasible, including some buildings that are not required to report as part of the benchmarking law. All told, the City is benchmarking and reporting the energy performance of 6.2 million square feet of building area. The benchmarking data presented here will help building owners learn from the City's efforts and further public understanding of how to achieve more energy-efficient buildings.

This report covers City-owned building energy use for calendar years 2011-2012. It includes:

- Background on the Energy Benchmarking and Reporting Program
- An overview of the City's building stock and how it has performed
- Benchmarking results, reported by building type
- How the City will apply what it is learning to conserving resources
- A comprehensive table of all benchmarked City-owned buildings

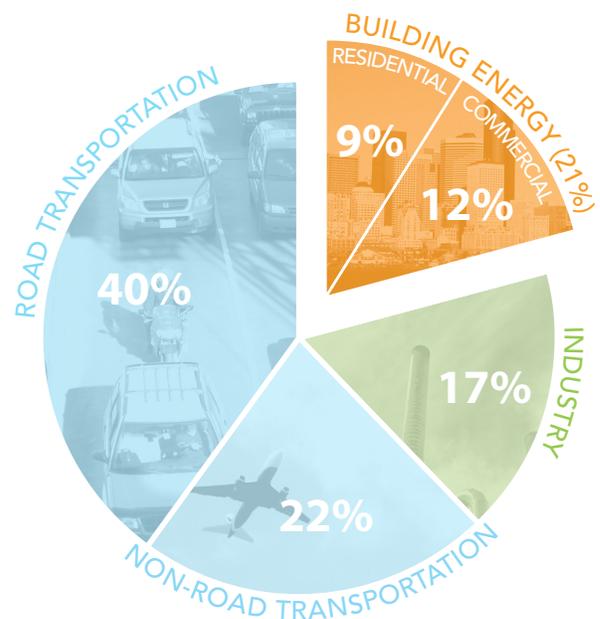


Annual Energy Performance Reports Required by April 1st for Non-Residential & Multifamily Buildings 20,000 SF or Larger

The **City of Seattle Energy Benchmarking and Reporting Program** was enacted into law in 2010 through Ordinance 123226 (updated in 2012 via Ordinance 123993). Non-residential and multifamily building owners of facilities 20,000 square feet or larger are required to track energy performance (benchmark) using the Environmental Protection Agency's (EPA) ENERGY STAR Portfolio Manager. Results for the prior year must be reported annually on April 1st to the City of Seattle. In addition, upon request, building owners must provide the building's energy performance results to any current or prospective tenant, buyer, or lender involved with a real estate or financing transaction.

Seattle's benchmarking law aims to help building owners manage energy resources, reduce energy costs and lower carbon emissions. Benchmarking establishes a baseline of energy performance for each property that can be used to guide energy efficiency investments. Annual reports of building energy performance will help the City monitor progress

towards citywide energy efficiency goals, identify market sectors with the greatest needs and opportunities, and guide the development of future policies and incentive programs. Lastly, energy performance disclosure allows an informed market to compare energy efficiency and future operating costs between similar properties and guide purchasing, leasing and financing decisions.



Energy use in buildings accounts for about 1/5th of Seattle's total carbon footprint (Source: 2008 Seattle Community GHG Inventory)

Seattle's benchmarking policy builds on Washington State Law (RCW 19.27A.170) that requires State and non-residential building owners and operators to disclose benchmarking results to potential buyers, renters or lenders. Seattle is one of seven cities nationwide that has building energy benchmarking requirements. Learn more at www.buildingrating.org.

The City has developed free services to help building owners understand the requirement and report, including a drop-in help center, benchmarking workshops, free technical assistance and a how-to guide. To learn more about the program, visit www.seattle.gov/energybenchmarking. Free technical assistance is available via e-mail: energybenchmarking@seattle.gov or phone: 206.727.8484.

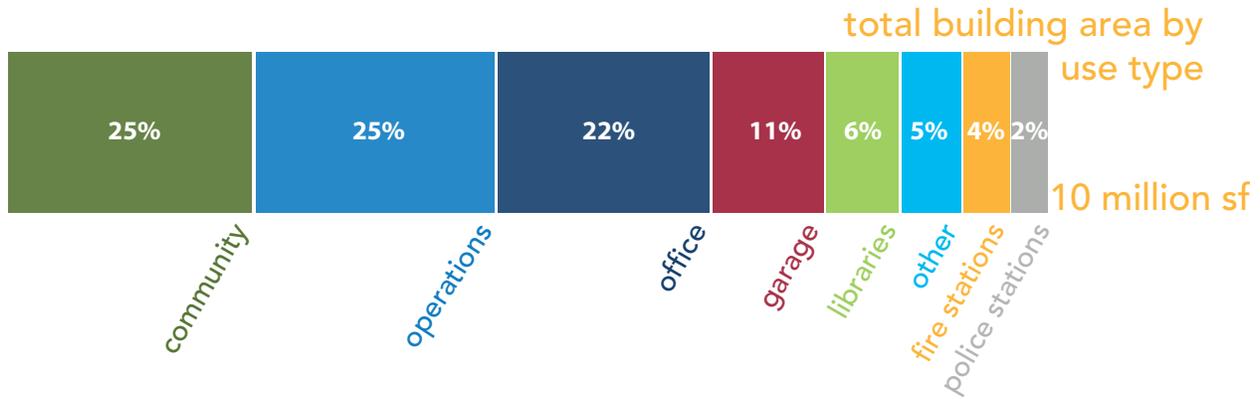
Benchmarking, or tracking a building's energy performance, gives owners and managers a better sense of how their buildings are using—and wasting—energy and also helps identify cost-effective opportunities to lower energy use and save money.



03 CITY BUILDING PORTFOLIO OVERVIEW

Benchmarking City-Owned Buildings

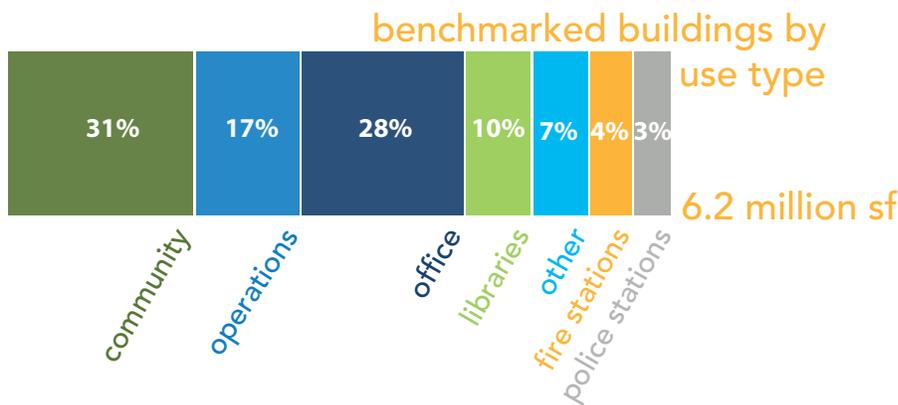
The City owns more than 650 buildings, totaling approximately 10 million square feet. These range from small storage sheds, to libraries, to the Seattle Municipal Tower, an office building of more than one million square feet. Offices, community facilities (e.g. performance halls and community centers), and operations support buildings make up the majority of the square footage. Libraries, police stations, and fire stations are numerous but each building is relatively small, so they account for a smaller percentage of the total building area.



City Building Area by Use Type

This chart was compiled from several sources with the assignment of each building to a single category based on its predominate use. Because many of the City's buildings are multi-use, some use types may be over or under-represented. (Source: City of Seattle)

Of the 10 million square feet of City buildings, 6.2 million square feet have been benchmarked to date. This accounts for more than 60% of the City's total building area. While tracking energy use is not new to the City, as part of the benchmarking program, the City is using Portfolio Manager to develop a baseline of energy performance across its buildings, with a focus on larger buildings and community facilities. However, the energy use of the City's smallest buildings—for example, unconditioned storage sheds and park restrooms—cannot be usefully tracked with Portfolio Manager.



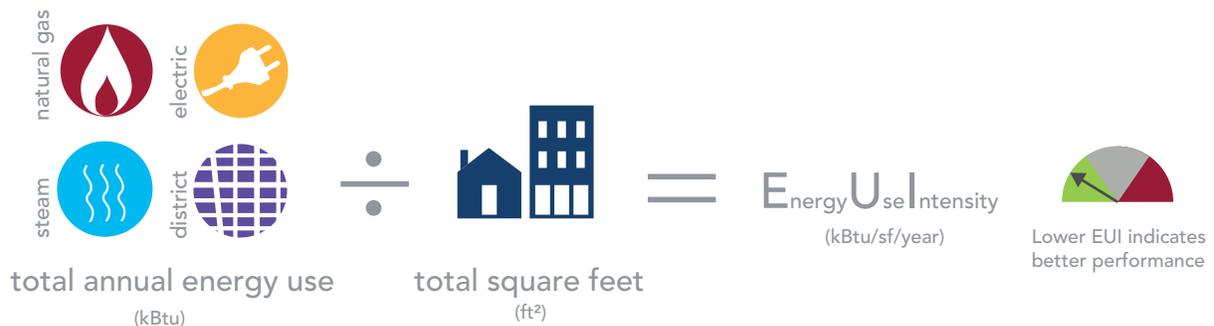
Benchmarked City Building Area by Use Type

(Source: City of Seattle)

About Benchmarking Energy Performance

Energy Use Intensity¹ – One of the most basic ways to benchmark a building’s energy efficiency or performance is to calculate the amount of energy used for each square foot, known as its Energy Use Intensity (EUI). The EUI is determined by totaling the annual energy used by all utilities that serve the building, such as electric and natural gas, and dividing that number by the total floor space of the building. It is typically measured in kBtu/sf (one thousand British thermal units per square foot). EUIs normalize for building size, which allows buildings of various sizes to be compared to each other. **Higher EUIs show greater energy use, whereas lower EUIs indicate more energy efficient buildings.**

What is an EUI?



ENERGY STAR Ratings – Portfolio Manager is a powerful tool for calculating EUIs for all types of buildings, and for calculating a more robust metric—the ENERGY STAR rating—for about 15 building types, such as offices, courthouses and warehouses. The 1 – 100 rating shows how the building’s energy efficiency compares to similar buildings in the United States. The EPA uses the Commercial Building Energy Consumption Surveys (CBECS) data (see page seven) to generate ENERGY STAR ratings, which also account for differences in local climate, yearly weather variations, number of occupants, and operating hours. Learn more at www.energystar.gov/benchmark. **In contrast to EUIs, higher ENERGY STAR scores represent better energy efficiency.**

The 1 – 100 ENERGY STAR rating represents the percentile ranking of the building’s energy performance:

- A score of 50 is average performance.
- A score of 75 means the building outperforms 74% of other buildings. This is the threshold for EPA’s ENERGY STAR certification.
- A score of 1 means the building is among the very poorest performers.
- A score of 100 indicates the best relative performance.



Higher ENERGY STAR rating indicates better performing buildings



¹ This report uses the “Site EUI” metric, which represents the total on-site energy use—the most relevant metric for facility managers. Site EUI, however, does not account for the environmental impacts of energy sources. Another metric, “Source EUI” that includes energy source impacts, is also available through Portfolio Manager. Energy sources for City-owned buildings include: electricity, natural gas, and steam.

03 CITY BUILDING PORTFOLIO OVERVIEW

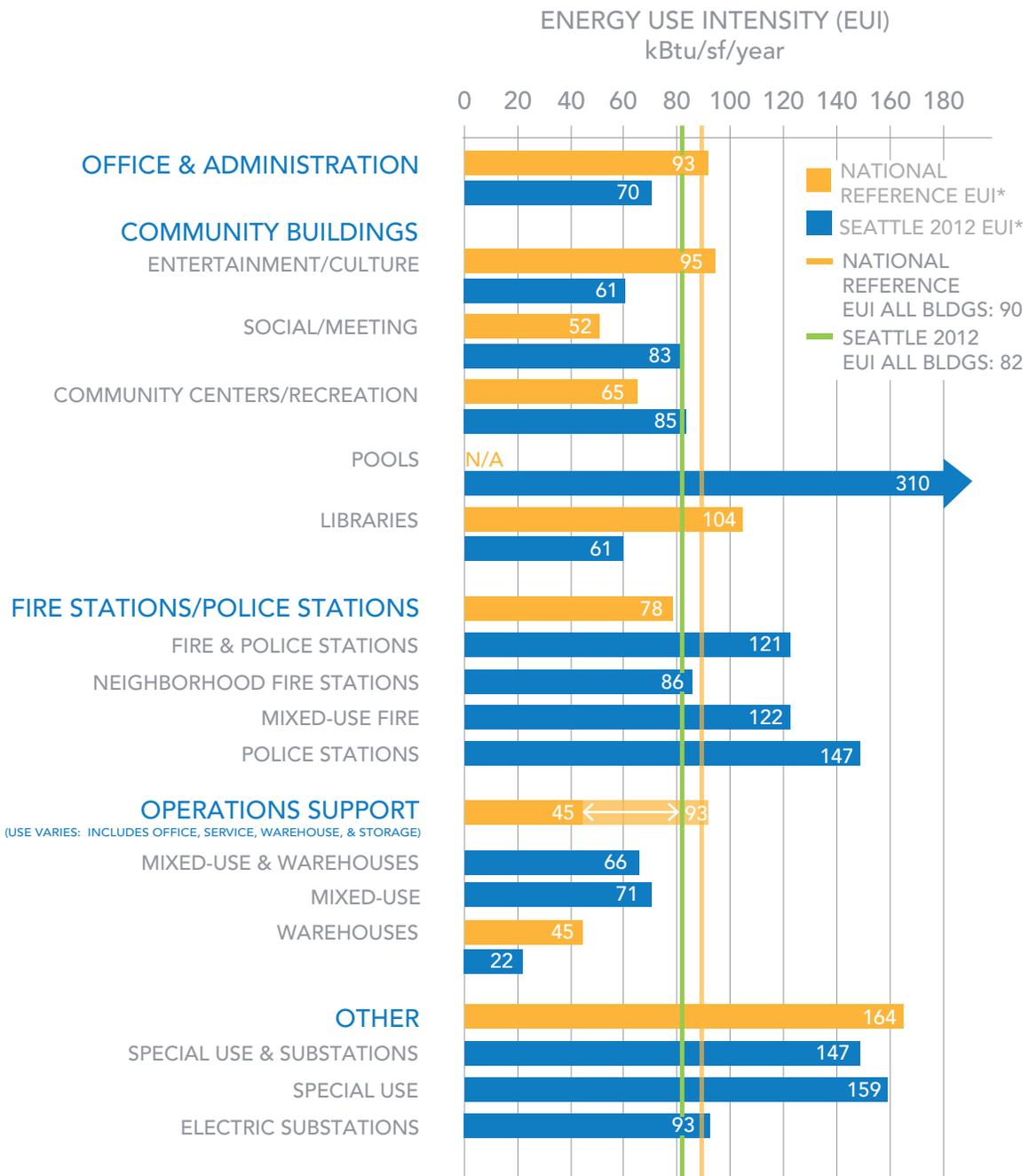
Overall Performance of City-Owned Buildings

City buildings in this report have been grouped into categories based on type of use, which allows the City to tap into one of the most powerful aspects of benchmarking—comparing energy performance across buildings in a portfolio. Even within a building type that is doing well overall, such as libraries, there is a wide range of energy performance. Examining the energy efficiency and characteristics of buildings based on type of use can help to identify opportunities for energy savings. Best practices may be learned from the efficient buildings and applied to those that need improvement.

A building's EUI and ENERGY STAR rating (if available) can also be used to compare buildings to other similar buildings in the United States. Good national references for EUIs are the Energy Information Agency's Commercial Building Energy Consumption Surveys (CBECS) 2003 dataset of commercial buildings in the United States, and the 2030 Challenge Targets, which are derived from CBECS data. Comparing a particular building's EUI to these national EUI values provides a rough idea for how a building's energy efficiency stacks up to similar buildings across the country, however, the specific characteristics and uses of the buildings are not always a good match for CBECS data.

The National Reference and City EUI graph on page eight identifies the CBECS and 2030 Challenge EUI means (averages) most relevant to City-owned building types, and compares them to the City's 2012 benchmarking results. Additional information is provided in Table 1: National Reference and City EUIs, in the Appendix.

Overall Performance of City-Owned Buildings



National Reference & City EUIs

Lower EUI indicates better performing buildings

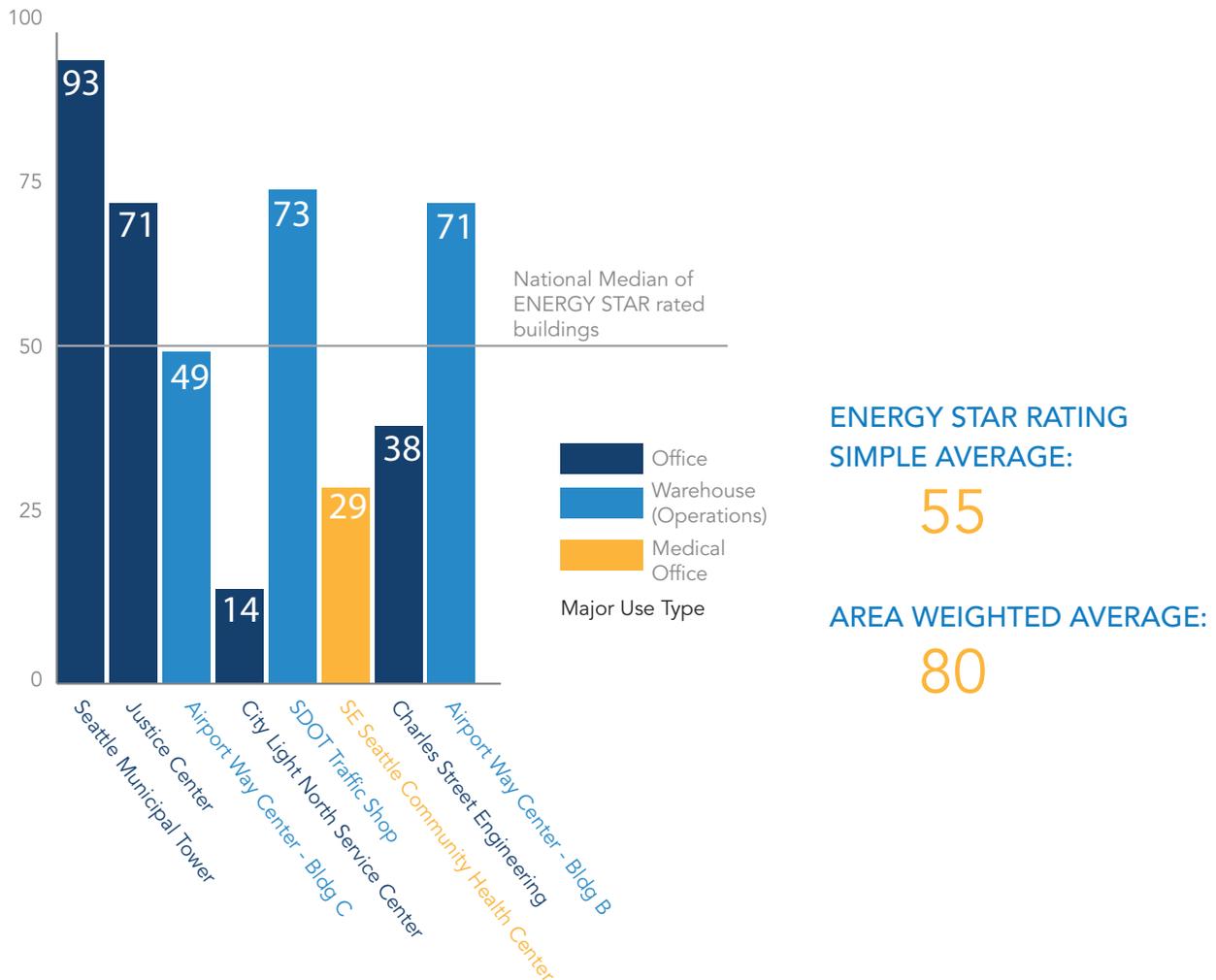
*Mean Site EUI - See Appendix for Table 1: National Reference & City EUI
(Source: 2003 CBECs and City of Seattle)

03 CITY BUILDING PORTFOLIO OVERVIEW

Overall Performance of City-Owned Buildings

Of the 94 buildings the City has benchmarked in Portfolio Manager, only eight are types eligible for an ENERGY STAR rating. The majority of City-owned buildings—including police and fire stations, libraries and community centers—are not eligible for the ENERGY STAR rating. Additionally, many of the City's buildings have multiple uses, making them ineligible. Private building owners with diverse building types often face similar challenges.

Of the City buildings with ENERGY STAR ratings, 50% are more energy efficient than average, and 50% are below. The Seattle Municipal Tower is a top performer, with a score of 93. The North Service Center, in contrast, only received a score of fourteen. This low score reflects both its age—it was built in 1978—and its usage. While characterized as an office in ENERGY STAR, only 60% is used as an office. These office spaces include energy intensive uses such as meter testing and server room cooling. In addition, the score doesn't account for the numerous field personnel who utilize the non-office areas, such as locker rooms.



City of Seattle 2012 ENERGY STAR Performance Ratings
See Appendix for detailed table (Source: City of Seattle)

Overall Performance of City-Owned Buildings

The City's 2011 and 2012 benchmarking results, along with information from additional departmental monitoring, highlights some trends relative to national benchmarks. Overall, the energy performance of Seattle's municipal buildings is similar to private building stock—some buildings are doing very well, while others have the opportunity to improve.

- Buildings in the downtown campus (City Hall, Justice Center, Seattle Municipal Tower, and Central Library), are generally more energy efficient than the City's other buildings. The four buildings combined, representing approximately 20% of the City's portfolio, are more efficient than the national average. The Seattle Municipal Tower is in the 93rd percentile of ENERGY STAR performance and the Central Library uses less than half the energy of libraries surveyed nationally.
- Libraries, on the whole, use about 42% less energy than other U.S. libraries. Seattle's libraries use about 61 kBtu of energy for each square foot of space, whereas U.S. libraries on average use about 104 kBtu per square foot.
- The performance of the City's operations support and community facilities is mixed. Community performance venues and some operational support facilities are beating the national average; while other community and operations support facilities do not.

Preliminary information acquired from benchmarking, the greenhouse gas inventory and departmental energy tracking indicates that overall energy consumption across the City's building portfolio has declined approximately 1% per year since 2008. In 2012 this savings was about 34 million kBtu/year. This represents an annual reduction in utility costs of approximately \$500,000. The 1% savings is over and above increases in energy use due to factors such as added data center capacity and increased use of electrical outlets (plug load) in office spaces. The savings reflect the City's efforts to reduce energy use and the investments made in energy and water efficiency at its facilities—which have resulted in corresponding utility cost savings.

The following chapter, Detailed Building Performance, provides the 2012 site EUI for each City-owned building benchmarked and compares it to national averages based on building type. The change in EUI from 2011 by building type, not adjusted for weather¹, is also included.

¹ The detailed results are not adjusted, or "normalized," for weather. This should be kept in mind when comparing changes from 2011 to 2012 because 2012 was about 4.7% warmer than 2011 as measured by Heating Degree Days at Boeing Field (60 degree base). Reductions in energy use of less than 2.5% are likely attributed to the warmer weather in 2012, not improvements in energy efficiency. Reductions greater than 2.5% may reflect actual strides in overall energy efficiency.

04 DETAILED BUILDING PERFORMANCE

Office & Administration



SUMMARY

The City of Seattle's office buildings are generally performing well. The Seattle Municipal Tower, the City's largest building, is ENERGY STAR certified. Although the Charles Street Engineering building appears to have significant potential for improvement compared to other "office" buildings, several fields crews stationed at it likely contribute to its high energy use. Overall, this group had a decrease in EUI from 2011 to 2012 beyond what could be attributed to 2012's warmer weather.

Buildings in this category principally consist of office space (more than 80%), lobbies and conference, meeting and training rooms. They may also include small amounts of other spaces, such as: data centers, courtrooms, retail shops, restaurants, and storage.

NATIONAL REFERENCE EUI:

93

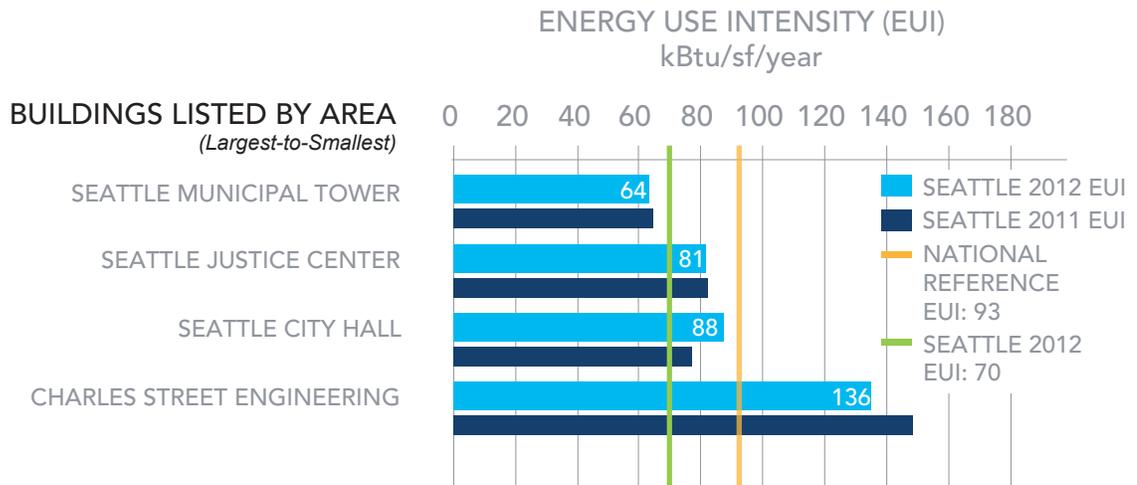
2012 CITY OF SEATTLE EUI:

70

SEATTLE PORTFOLIO
CHANGE IN EUI FROM 2011:

-3.2% (decrease)

Office & Administration



Community Buildings



SUMMARY

The energy performance of this single largest category of the City's benchmarking efforts (30% by area) is quite mixed. Benchmarks are best understood by using the following sub-categories:

- Performance Venues: Entertainment / Culture
- Public Assembly: Social / Meeting
- Community Centers: Recreation
- Pools

Performance Venues: Entertainment/Culture – Overall, this group is using about 35% less energy than the national average EUI (61 vs. 95 kBtu/sf), although the Playhouse is not as energy efficient, making it a good candidate for follow-up. These buildings typically consist of performance and rehearsal halls, sporting event venues, and administrative and support spaces.

Public Assembly: Social/Meeting – These buildings, on the whole, are using more energy than the national EUI (83 vs. 52 kBtu/sf). However, some of these buildings (Armory and Northwest Rooms) are compared to a single national category, when in fact they house multiple uses—a high school, retail, and administrative spaces, in addition to meeting and conference rooms. More typically, as represented in the national average, these types of buildings consist of halls and meeting rooms that accommodate trade shows, dances, receptions and meetings.

NATIONAL REFERENCE EUI:

95

Performance Venues
Entertainment/Culture

52

Public Assembly
Social/Meeting

2012 CITY OF SEATTLE EUI:

61

Performance Venues
Entertainment/ Culture

83

Public Assembly
Social/Meeting

SEATTLE PORTFOLIO

CHANGE IN EUI FROM 2011:

-6.0% (decrease)

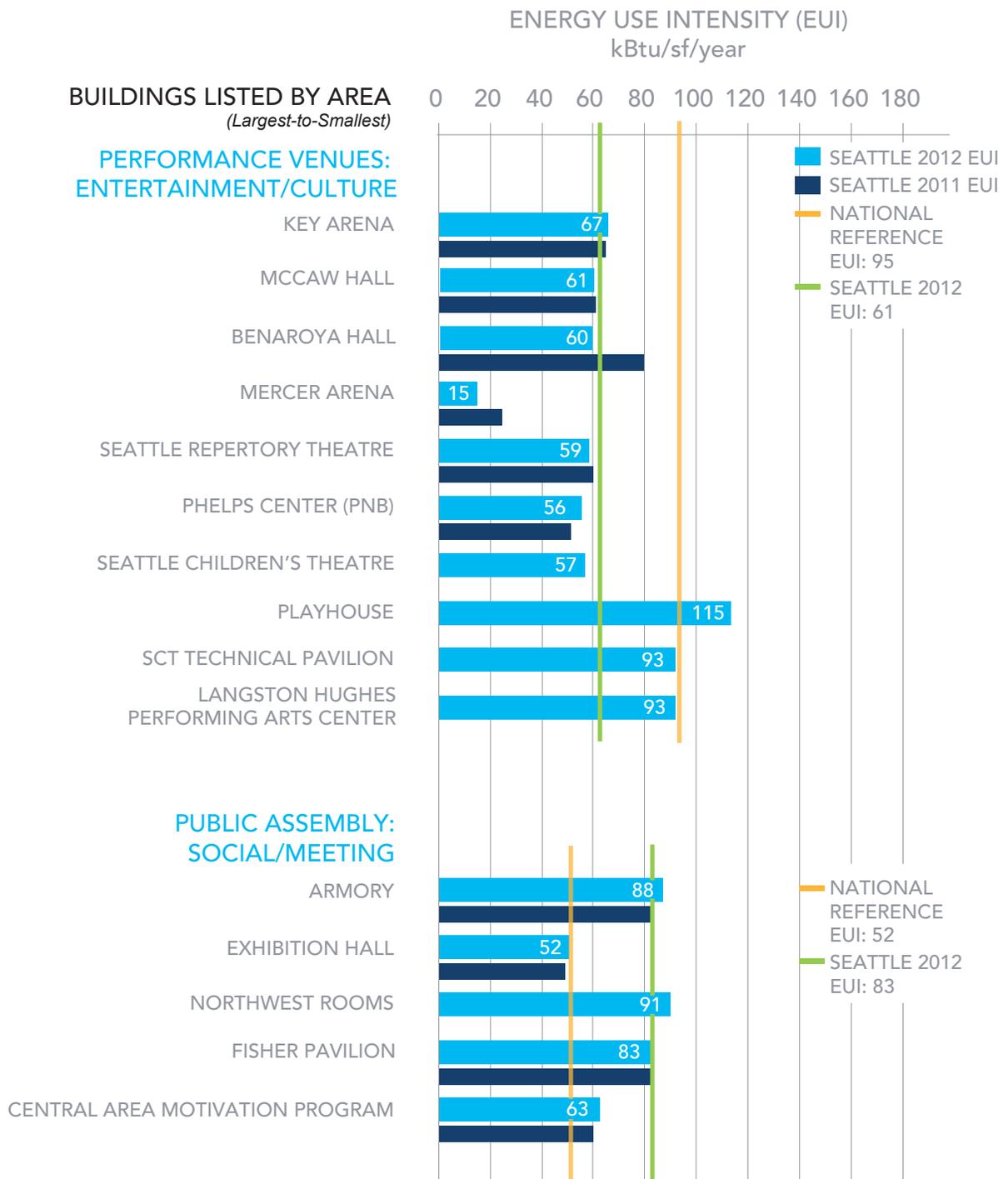
Performance Venues
Entertainment/Culture*

+2.3% (increase)

Public Assembly
Social/Meeting*

* Based only on buildings with data for both years

Community Buildings



Community Buildings



SUMMARY CONTINUED

Community Centers: Recreation – Five of the 23 community centers have been benchmarked to date. On the whole, these facilities are using more energy than similar buildings nationally (85 vs. 65 kBtu/sf). Progress is being made, however, as the Parks Department improves the energy efficiency of these buildings. From 2011 to 2012, four of the six buildings posted double digit efficiency improvements that can't be explained by warmer weather alone. A significant control problem at Rainier Community Center is being corrected and will further improve the performance of this group. These buildings typically consist of gyms, sport courts, public meeting rooms and administrative areas. Some have kitchens and many have extensive outdoor lighting for sports fields and courts, both of which are included on the building electric meter.

Pools – There is no meaningful national reference EUI for swimming pools because they are treated as a building feature as opposed to a space type in Portfolio Manager. That said, there is clearly an opportunity for energy efficiency improvements at the Green Lake Community Center and Pool, which is currently under assessment.

NATIONAL REFERENCE EUI:

65

Community Centers
Recreation

2012 CITY OF SEATTLE EUI:

85

Community Centers
Recreation

310

Pools

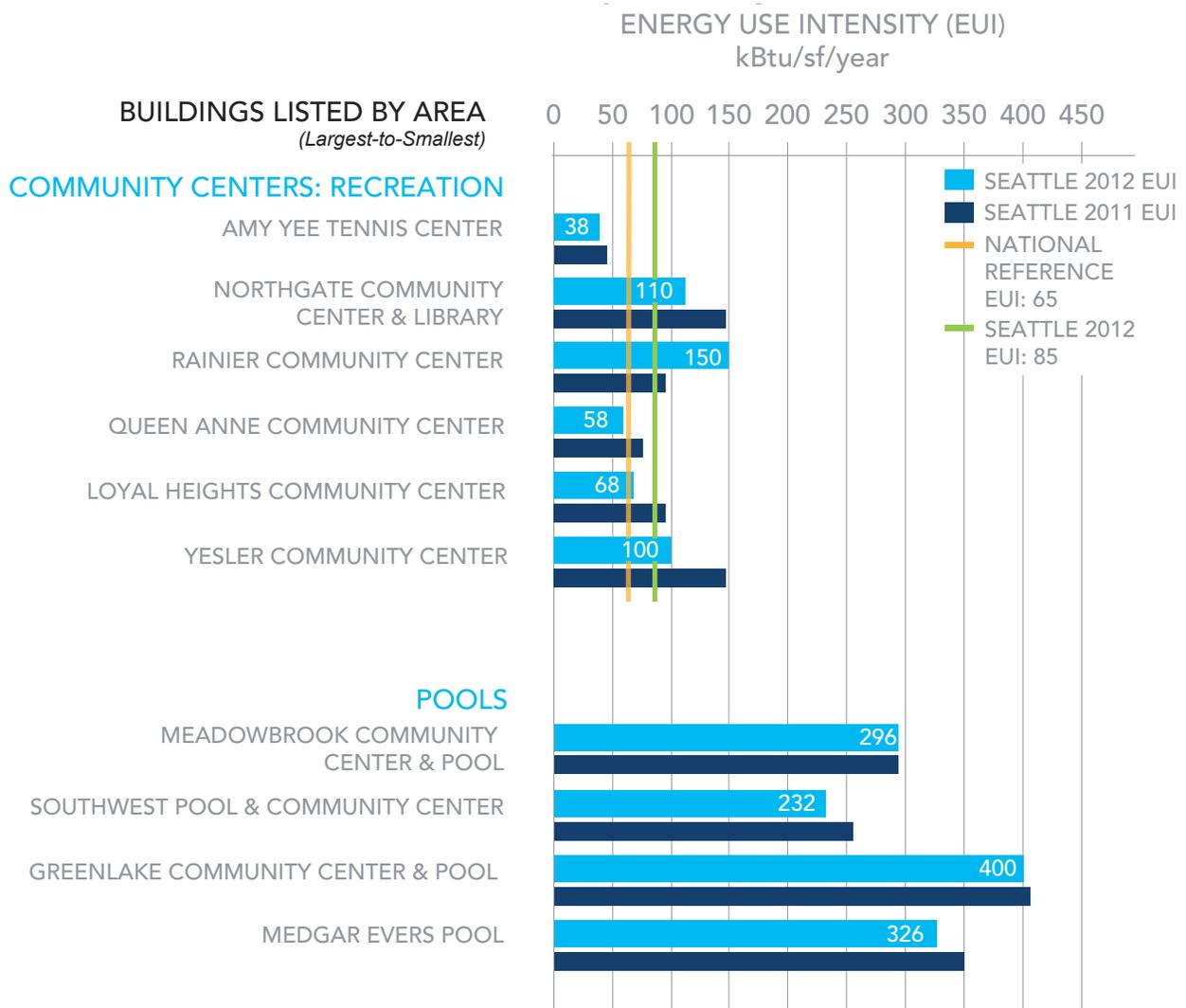
SEATTLE PORTFOLIO

CHANGE IN EUI FROM 2011:

+9.5% (increase)

-4.5% (decrease)

Community Buildings



04 DETAILED BUILDING PERFORMANCE

Libraries



SUMMARY

The City's libraries are quite energy efficient with an overall EUI 42% below other U.S. libraries (61 vs. 104 kBtu/sf) and all but two libraries exceed the national average. The Central Library uses 50% less energy per square foot than libraries surveyed nationally (48 vs. 104 kBtu/sf EUI).

Libraries in this category have traditional library and reading room spaces, quiet public work rooms, office and administrative spaces, data centers and public meeting rooms. Two of the branch libraries, Ballard and Lake City, host a Neighborhood Service Center. Seattle's Public Libraries also provide public access to a considerable number of computers.

NATIONAL REFERENCE EUI:

104

2012 CITY OF SEATTLE EUI:

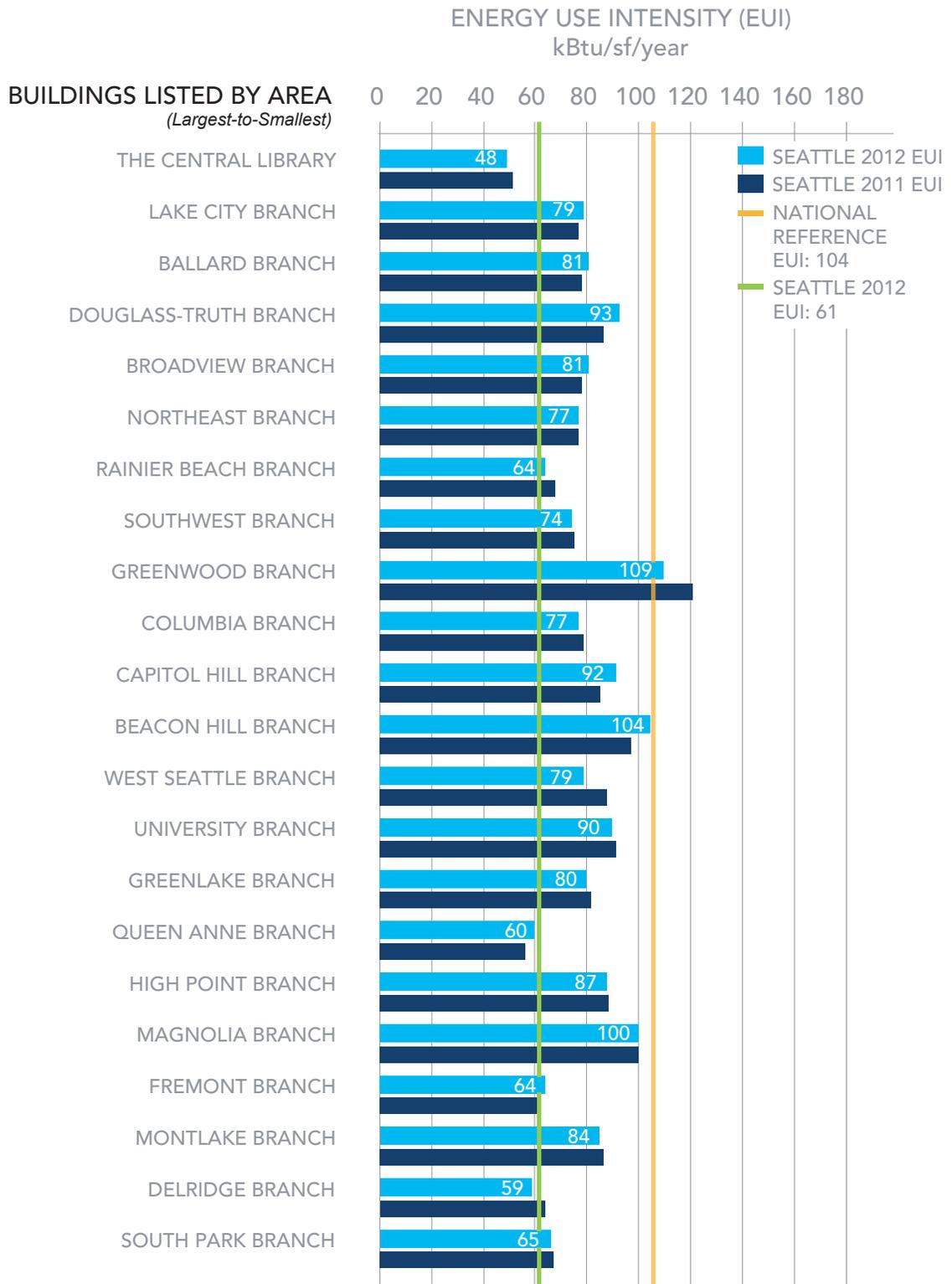
61

48 central library
82 branch library average

SEATTLE PORTFOLIO

CHANGE IN EUI FROM 2011:

-1.6% (decrease)



Fire Stations



SUMMARY

The City’s fire stations are best looked at in two groups: neighborhood fire stations and larger mixed-use stations. Seven of the 32 neighborhood fire stations and both mixed-use stations have been benchmarked in Portfolio Manager to date. Benchmarking of additional smaller neighborhood fire stations is underway. Both types of facilities have 24 hour operations.

Neighborhood Fire Stations – These buildings are lived in by Seattle Fire Department personnel while on extended shifts and include offices, meeting rooms, dormitories, locker rooms, and exercise spaces. They also house an apparatus (fire truck) bay that is somewhat heated. The kitchen or “beanery” is generally more extensive than a typical lunch room with the equivalent of a light commercial kitchen. Based on the seven benchmarked to date, Seattle stations use about 10% more energy than other stations nationally (86 vs. 78 kBtu/sf). In addition to benchmarking additional stations, a comprehensive utility bill analysis is underway to identify trends and energy efficiency opportunities. A representative facility is also undergoing an extensive energy audit to understand the extent of energy savings possible in fire stations.

Mixed-Use Fire – These buildings have functions beyond those of a basic fire station such as data centers, alarm and emergency operations centers, or office and meeting spaces. They also house a neighborhood fire station.

NATIONAL REFERENCE EUI:

78

2012 CITY OF SEATTLE EUI:

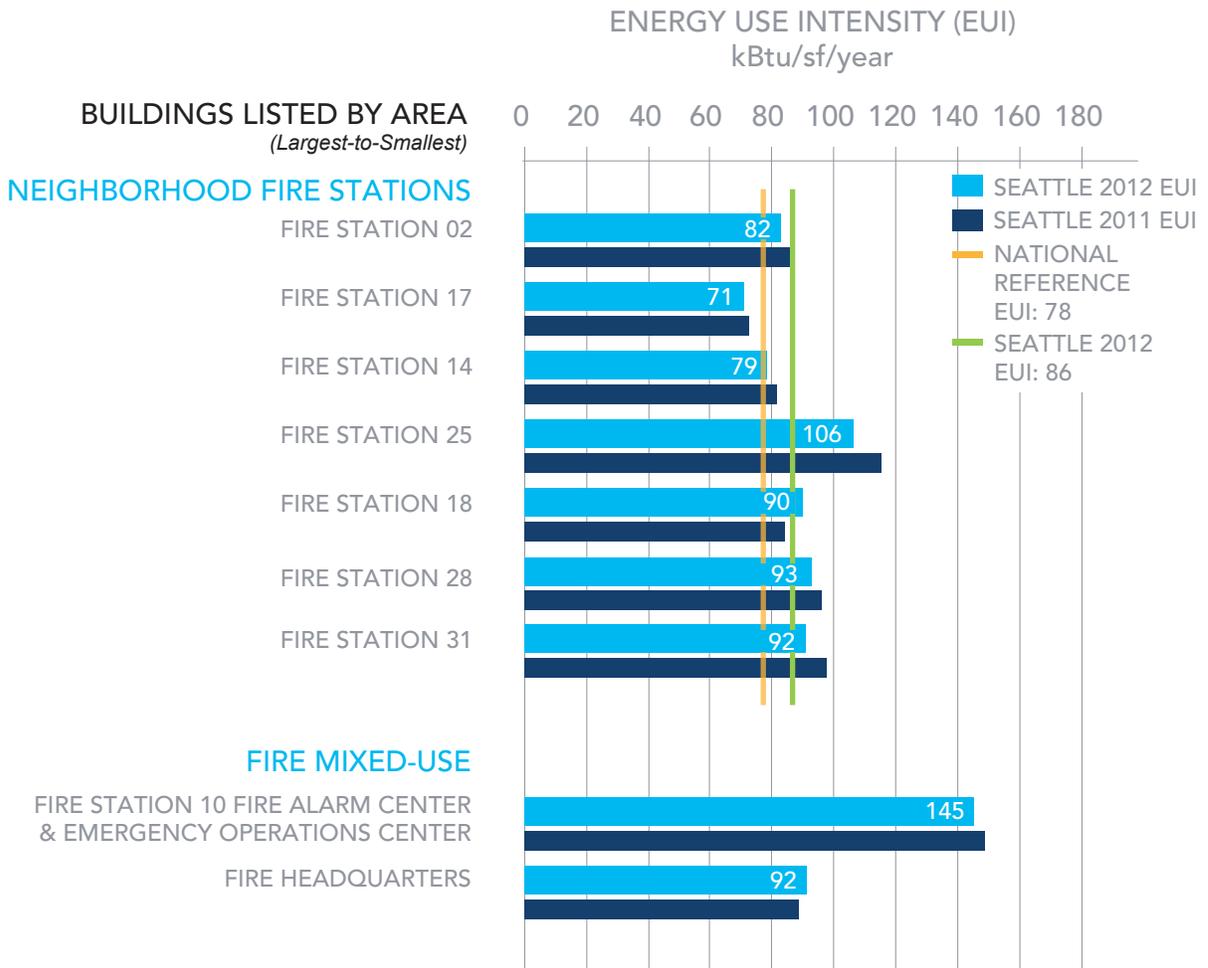
86

Neighborhood
Fire Stations

SEATTLE PORTFOLIO CHANGE IN EUI FROM 2011:

-4.0% (decrease)

Fire Stations



04 DETAILED BUILDING PERFORMANCE

Police Stations



SUMMARY

City police stations have 24 hour operations and consist of office and administrative spaces, holding cells, data and communication centers, locker rooms, meeting rooms, and training ranges. Overall, they are using considerably more energy than police stations surveyed nationally (147 vs. 78 kBtu/sf).

The City is aware of the high energy use, compared to the national average, and is taking steps to better understand how to reduce it. For example, the West Precinct is undergoing an extensive energy audit to identify ways to achieve a minimum 20% savings there and at similar police stations.

NATIONAL REFERENCE EUI:

78

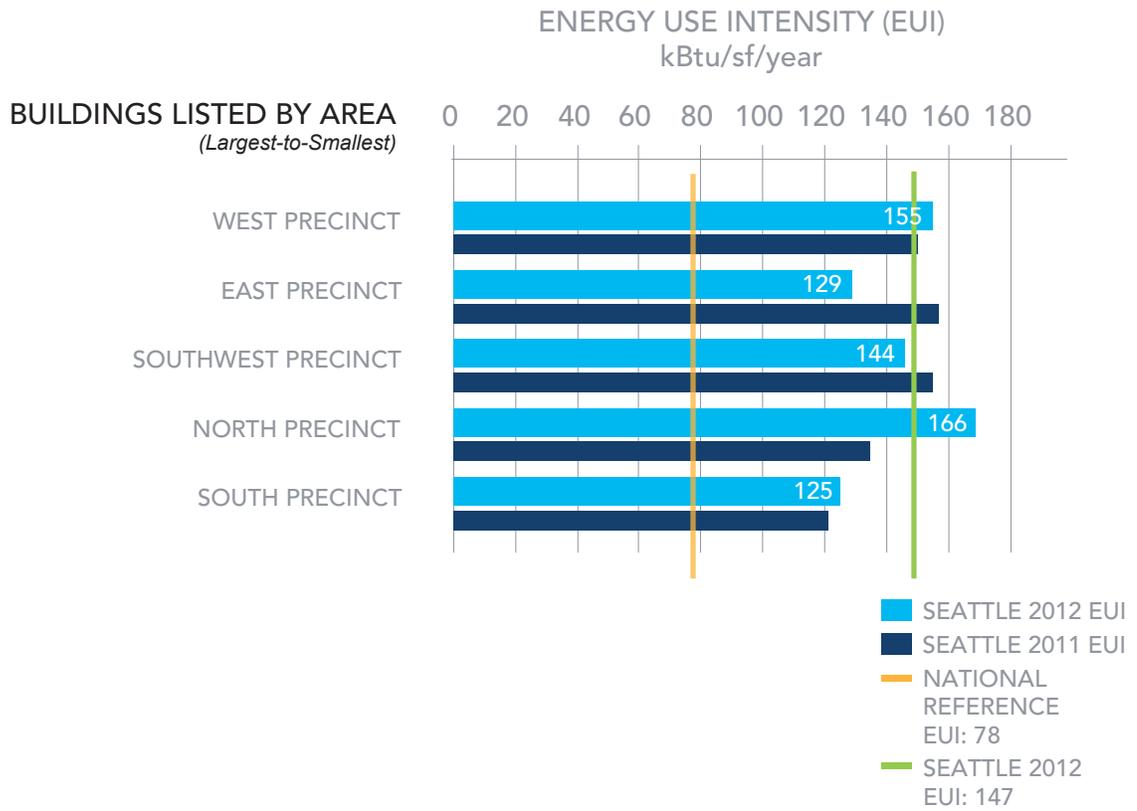
2012 CITY OF SEATTLE EUI:

147

SEATTLE PORTFOLIO CHANGE IN EUI FROM 2011:

-1.1% (decrease)

Police Stations



Operations Support



SUMMARY

Although the overall energy performance of this category cannot be determined for this group, the average EUI decreased by more than 11% from 2011 to 2012—well beyond the effects of warmer weather.

Mixed-Use – These facilities combine many uses within each building, such as offices, warehouses, distribution centers, data centers, service areas (vehicle maintenance and other repair and fabrication shops), locker rooms, and other miscellaneous uses. Some have field crews stationed at them and may conduct 24 hour operations in part of the building. Several national EUIs, ranging from 45 - 93 kBtu/sf, can be compared to this group and the overall 2012 EUI of 71 kBtu/sf falls roughly in the middle of the average range. Some of these buildings are quite energy efficient, such as Westbridge, SDOT Traffic Shop, and Airport Way Building D, and several posted significant decreases in EUI over 2011. However, five have 2012 EUIs above 100, making them good candidates for further energy use reductions. Audits are underway on several support facilities to outline opportunities for improving energy efficiency.

Non-Refrigerated Warehouses – Three operations support buildings have a fairly limited storage function and are performing 50% better than the national averages (22 vs 45 kBtu/sf). This good performance, however, is likely due to low use of the facilities.

NATIONAL REFERENCE EUI:

45-93

Use Varies

45

Non-Refrigerated Warehouses

2012 CITY OF SEATTLE EUI:

66*

71 Mixed-Use
*Mixed-Use & Warehouses

22

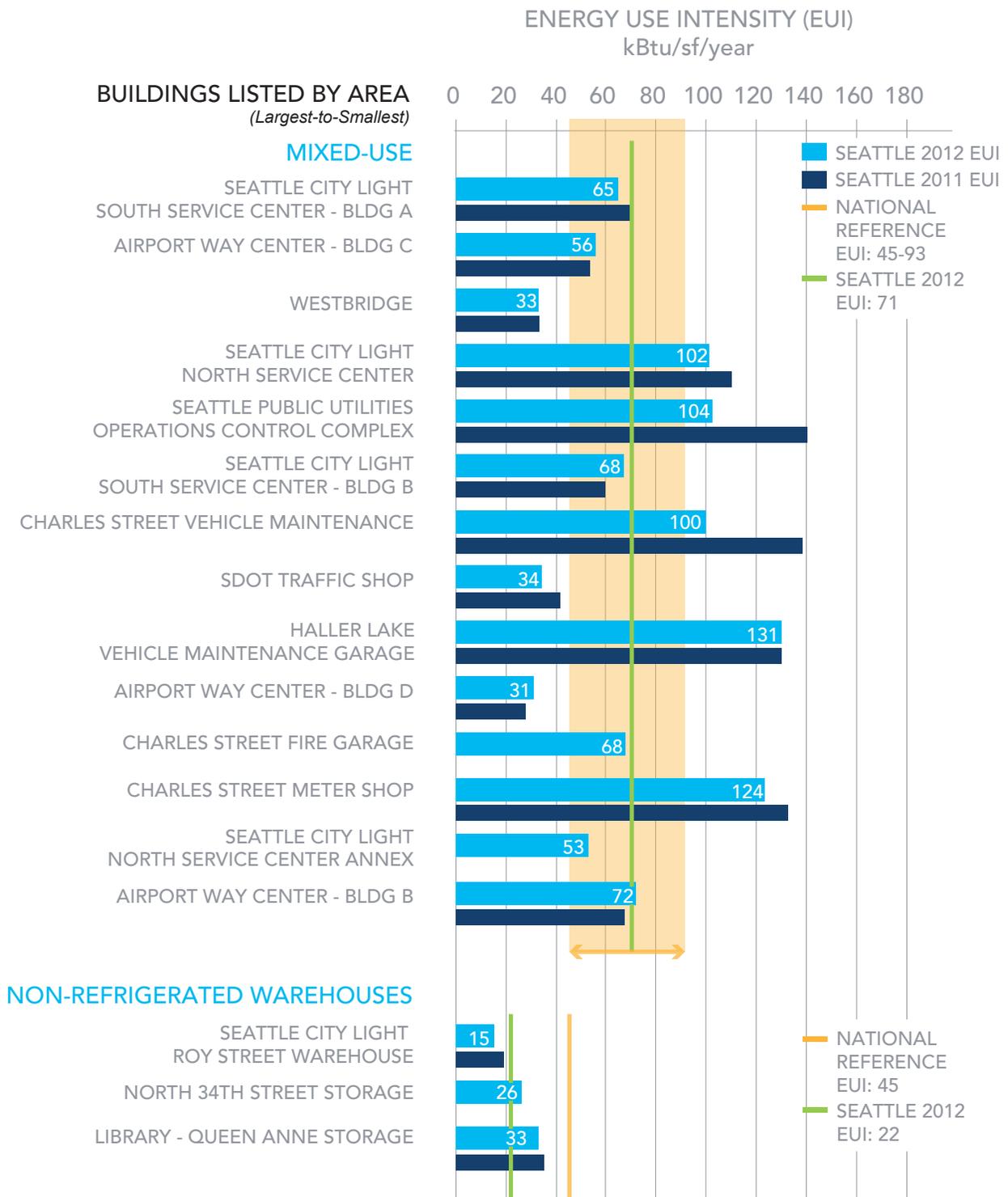
Non-Refrigerated Warehouses

SEATTLE PORTFOLIO

CHANGE IN EUI FROM 2011:

-11.1% (decrease)

*based on buildings with data for both years



04 DETAILED BUILDING PERFORMANCE

Other



SUMMARY

This is an eclectic category split between “Special Use” and “Substations” that can’t be well classified elsewhere. The “other” national reference of 164 kBtu/sf is of little analytical power when judging the energy performance of these buildings.

Special Use – Several unique space types, such as laboratory, medical office, specialty control room, transit station, aquarium, animal shelter, and a small museum in an historic steam plant are found in these buildings. The segment is doing slightly better than “other” buildings nationally (159 vs. 164 kBtu/sf.) The EUI also declined 4.1% from 2011, which was greater than the effect of warmer weather.

Substations – These four buildings are grouped together because of their similar function, although the only available national average is still the “other” EUI of 164 kBtu/sf. Nonetheless, they used 44% less energy per square foot (93 kBtu/sf) than the national average. Lighting upgrades at the Canal and Broad Street substations in 2011 likely played a part in significant energy reductions the following year. Energy use at the substations on the whole declined 32% from 2011 to 2012.

NATIONAL REFERENCE EUI:

164

2012 CITY OF SEATTLE EUI:

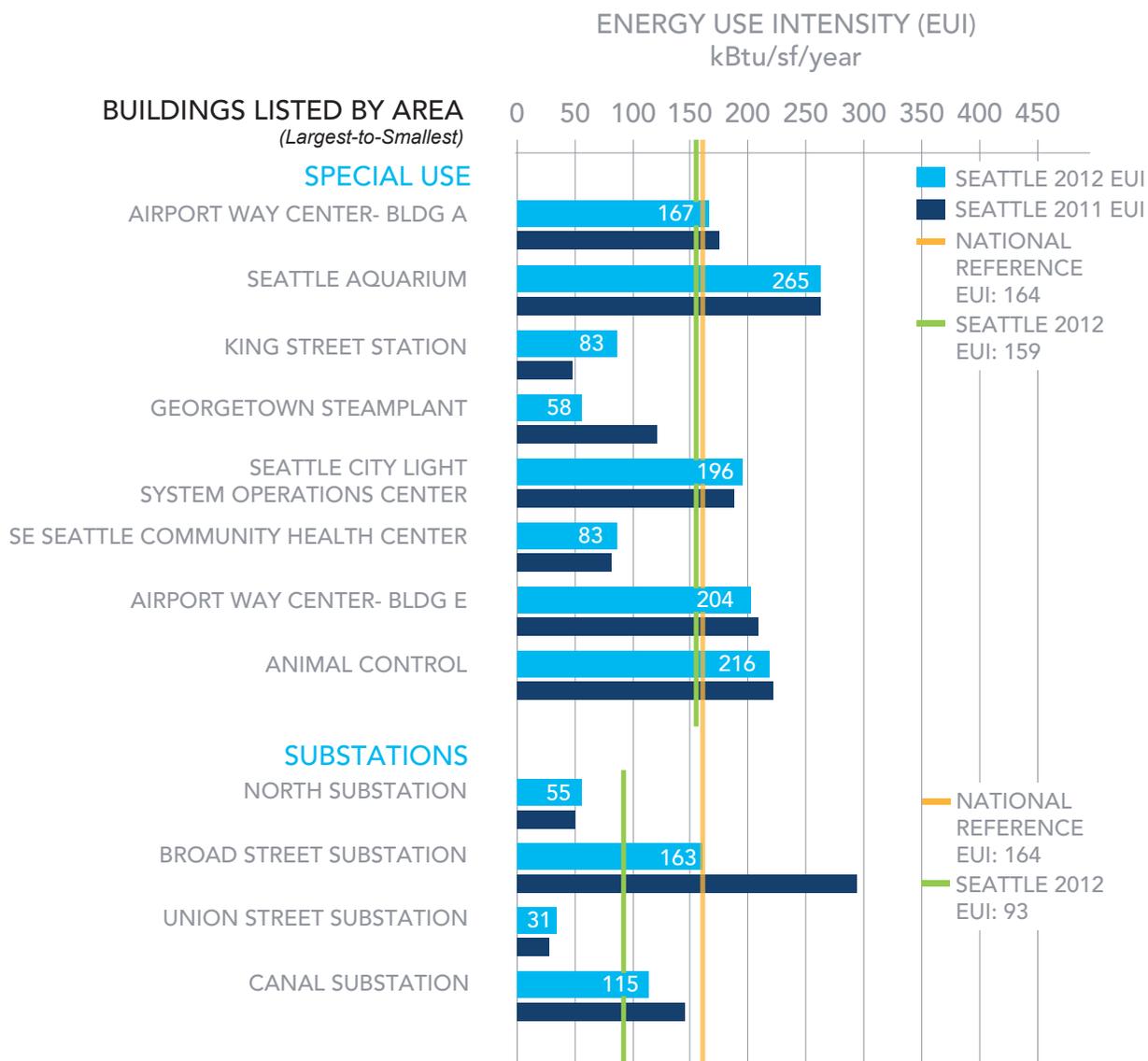
147

159 special use
93 substations

SEATTLE PORTFOLIO

CHANGE IN EUI FROM 2011:

-8.4% (decrease)





The challenges the City faces conserving resources used at its facilities are not uncommon, particularly among holders of large portfolios of buildings. This is further complicated by the great diversity of facility age, physical characteristics and specialized functions that are somewhat unique to local governments. For most organizations, resource conservation is not job one—operating and maintaining facilities to provide a safe and productive environment for accomplishing critical functions is the primary concern. The two, however, are certainly not mutually exclusive.

Although much can be learned about the energy performance of City-owned buildings relative to national benchmarks, the larger goal is to reduce energy use. Since energy use reductions are critical to meet long-term carbon neutrality and sustainability goals, as well as the intermediate

goal of reducing energy use 20% across the City's portfolio by 2020, the question turns from "How are we doing?" to "What are we going to do?"

Interdepartmental efforts to update the City's **Sustainable Buildings and Sites Policy** in 2011, which had initially focused only on new construction, raised the important issue of how to address existing buildings. In response, and at the direction of the Mayor's Office, the Office of Sustainability and Environment has embarked upon a comprehensive Citywide Resource Conservation Management program to reduce energy use and lower utility costs.

Without a focused effort to maintain systems, buildings tend to operate less efficiently over time. Buildings need to be regularly "tuned-up" and well managed to keep them operating efficiently. It turns out that the "low hanging fruit" of energy efficiency improvements so often talked about grows regularly, if allowed. The basic premise of effective resource conservation management is a cycle of evaluation and assessment, improvements, continued monitoring and assessment, and response. To proactively accelerate energy conservation, the City is increasing its efforts through improved tracking and assessment, operations and maintenance, and physical upgrades.

Highlights of the City's work in these three areas, both planned and underway, include:

Tracking & Assessment

- **Implement centralized resource accounting for City-owned buildings, to cover electricity, natural gas, steam, and district-supplied energy.** Comprehensive resource tracking is fundamental to conservation and will enable better linkage between actual utility usage and operations and maintenance staff as well as building occupants. Approximately 65% of the City's buildings have utility data tracked in a variety of a resource accounting systems. This effort will implement a common accounting system and expand the effort to cover nearly the City's entire portfolio.
- **Improve whole-building and high-energy use metering.** It is not possible to measure what isn't metered. The City will improve metering at some of its master-metered / campus style facilities to better measure energy use at each building and will sub-meter significant external loads and data centers.
- **Complete an energy signature analysis of fire stations and branch libraries.** Energy signature analysis is a productive next step after benchmarking that uses monthly utility information to show the relative performance of a building within a group of similar buildings. It is a useful way to identify potential areas for improvement, uncover operational savings, and a first step toward identifying worthwhile capital investments.
- **Perform characteristic audits.** Building characteristic audits will help the City better understand energy performance and conservation opportunities at community centers and pools, fire stations, branch libraries and support bases. Fire stations and branch libraries have been chosen for audits based on the energy signature analysis results. Other audit candidates are being targeted largely on the basis of high EUI and total energy consumption.
- **Create facility action plans.** City Resource Conservation Managers are conducting preliminary assessments of select buildings to identify operational and resource conservation upgrades. These assessments will result in facility action plans that outline strategies facility managers can use to achieve resource conservation.
- **Develop proposals for extensive energy use reductions in priority buildings.** This action will evaluate the cost and feasibility of a minimum 20% energy reduction in up to five buildings. The first two buildings selected for evaluation are a police precinct and a fire station. If these investigations prove informative, the study will be extended to up to three additional buildings.

Operations & Maintenance/Asset Management

- **Establish guidelines for resource-efficient operational practices.** Operational and maintenance improvements can pay dividends, ensure that capital investments yield optimal results, and have been found cost-effective over a range of conditions. These guidelines will focus on opportunities that can be recommended as best practices in most buildings, including:
 - HVAC system controls, scheduling and set points.
 - Control of ventilation loads and proper economizer function.
 - Lighting system controls, sensors and scheduling.
- **Create guidelines for recommended resource efficiency upgrade- at- replacement measures.** Conservation opportunities often have the lowest cost for implementation during equipment replacement or renovation—and this may be the only cost-effective chance to secure the efficiency measure. It is a “lost opportunity” when these situations pass by without implementation; the City’s goal is zero lost opportunities.
- **Develop guidelines for resource efficiency retrofit measures.** Many potential conservation retrofit measures and strategies are cost-effective over a range of conditions and will be evaluated and recommended as best practices.
- **Improve office equipment energy use and reduce plug load.** Additional reductions of loads on electrical outlets (plug load) in offices have been cited as a significant cost-effective opportunity to decrease electric consumption. The City will expand existing efforts through an interdepartmental team that will evaluate methods such as plug load management and improving energy awareness, and then develop recommendations. Simple daily activities like turning off equipment and lights when not in use add up to significant energy savings.

Capital Improvements

Ultimately, there is a limit as to how well operations and maintenance staff can get an intrinsically inefficient building to perform. Although energy conservation projects pay for themselves over time, up front investments will need to be made in some buildings and systems to achieve the City's goals.

Numerous capital improvements have been implemented over the past few years. For example, the Seattle Center has undertaken several energy and water conservation projects, Seattle Public Libraries has had an effective ongoing program to reduce use at the Central and branch libraries, Seattle Public Utilities extensively renovated the Operations Control Center, the Parks Department upgraded facilities for better efficiency, and Seattle City Light made energy efficiency improvements at the South Service Center and buildings at Newhalem. The benchmarking results reported in Chapter 4 and in Table 3 of the Appendix illustrate that these investments have proven effective.

In addition to projects supported by individual departments, Seattle Center, Parks and FAS participated in the citywide Municipal Retrofit program, a component of the Community Power Works program. Twenty-one upgrades at 17 facilities were completed in 2012 and 17 additional upgrades in 13 facilities are slated for completion in 2013.

Table 1: National Reference & City EUIs

Reference Building Category	Site EUI (kBtu/sf)	City Building Category	2012 Site EUI (kBtu/sf)
Office*	93	Office & Administrative	70
Public Assembly**		Community Buildings	
Entertainment/Culture	95	Entertainment/Culture Performance Venue	61
Social/Meeting	52	Social / Meeting Public Assembly	83
Recreation	65	Community Center / Recreation	85
	N/A	Pools (and Community Centers with Pools)	310
Library	104	Library	61
Fire Station / Police Station**	78	Fire Station + Police Station	121
		Fire Stations	103
		Mixed Use Fire	122
		Neighborhood Fire Stations	86
		Police Stations	147
Use Varies: office, service, warehouse, storage	45 - 93	Operations Support	66
		Mixed-use	71
Storage / Shipping / Non-Refrigerated Warehouse*	45	Non-Refrigerated Warehouse	22
Other *	164	Other	147
		Special Use	159
		Electric Substations	93
All Buildings*	90	All Benchmarked City Buildings	82
Reference Mean EUI's from:			
*Energy Information Administration 2003 Commercial Building Energy Consumption Survey (CBECS, Table C3. Consumption and Gross Energy Intensity for Sum of Major Fuels for Non-Mall Buildings, 2003 (http://www.eia.gov/consumption/commercial/data/archive/cbecs/cbecs2003/detailed_tables_2003/2003set9/2003html/c3.html).			
**2030 Challenge Targets: U.S. National Averages (http://www.architecture2030.org/downloads/2030_Challenge_Targets_National.pdf)			

Table 2: ENERGY STAR Ratings

Building	ENERGY STAR Category with (% of Building)	City Building Category	Area (sf)	ENERGY STAR Rating	Change from 2011
Seattle Municipal Tower	Office (94%)	Office and Administration	1,223,577	93	+2
Seattle Justice Center	Office (90%)	Office and Administration	297,678	71	+2
Airport Way Center - Bldg C	Warehouse (63%)	Operations Support	160,447	49	-4
City Light North Service Center	Office (61%)	Operations Support	94,288	14	+2
SDOT Traffic Shop	Warehouse (85%)	Operations Support	45,036	73	+10
SE Seattle Community Health Center	Medical Office (100%)	Other	27,492	29	0
Charles Street Engineering (A)	Office (100%)	Office and Administration	20,424	38	+5
Airport Way Center - Bldg B	Warehouse (53%)	Operations Support	16,725	71	-6

*Note: City Hall is mixed-use and is not eligible for an ENERGY STAR score. See below for its EUI.

Table 3: Benchmarked City-Owned Buildings

Management Group & Tenant Key

- CEN - Seattle Center
- FAS - Financial and Administrative Services
- Parks - Seattle Parks and Recreation
- SCL - Seattle City Light
- SDOT - Seattle Department of Transportation
- SFD - Seattle Fire Department
- SPD - Seattle Police Department
- SPL - Seattle Public Libraries
- SPU - Seattle Public Utilities
- Mixed - Multiple City Departments
- Other - Multiple Non-City Tenants

OFFICE & ADMINISTRATION							
Building	Mngmnt Grp	Tenant	Area (sf)	2012 EUI (kBtu/sf)	Change from 2011	Year Built/Renovated	Comments
Seattle Municipal Tower	FAS	Mixed	1,223,577	64.2	-3.5%	1990	
Seattle Justice Center	FAS	Mixed	297,678	80.6	-5.9%	2001	
Seattle City Hall	FAS	Mixed	180,495	88.4	4.6%	2003	More than 10% "Other"
Charles Street Engineering (A)	FAS	SDOT	20,424	136.3	-9.4%	1972	

Benchmarked City-Owned Buildings

COMMUNITY							
Building	Mngmnt Grp	Tenant	Area (sf)	2012 EUI (kBtu/sf)	Change from 2011	Year Built/Renovated	Comments
Key Arena	CEN	CEN	368,000	67.2	-3.9%	1995	
McCaw Hall	CEN	Arts Group	296,000	60.5	-3.6%	2003	
Benaroya Hall	Arts Group	Arts Group	189,750	60.0	-25.0%	1998	
Mercer Arena	CEN	Arts Group	108,000	15.3	-30.7%	1927	Limited, non-public use
Seattle Repertory Theatre	CEN	Arts Group	91,213	59.1	2.8%	1983	
Phelps Center (PNB)	CEN	Arts Group	49,680	56.4	3.9%	1962	
Seattle Children's Theatre (SCT)	CEN	Arts Group	46,300	56.7	NA	1992	
Playhouse	CEN	Arts Group	36,314	115.0	NA	1962	
SCT Technical Pavilion	CEN	Arts Group	29,000	92.8	NA	1999	
Langston Hughes Performing Arts Center	Parks	Arts Group	26,700	92.7	192.6%	1915	Closed for renovation in 2011
Armory	CEN	CEN	278,500	88.1	2.2%	1939	
Exhibition Hall	CEN	CEN	52,000	52.0	4.9%	1962	
Northwest Rooms	CEN	CEN	49,847	90.5	NA	1962	
Fisher Pavilion	CEN	CEN	21,018	82.6	-1.7%	2002	
Central Area Motivation Program	FAS	CEN	18,637	63.3	5.6%	1925	
Amy Yee Tennis Center	Parks	Parks	36,070	37.9	-10.9%	1971	
Northgate Community Center and Library	Parks/SPL	Parks/SPL	29,478	109.7	-22.2%	2005	Shared heating system
Rainier Community Center	Parks	Parks	28,425	150.2	96.3%	1995	Control issue in 2012
Queen Anne Community Center	Parks	Parks	27,247	58.3	-23.6%	1948	Upgraded in early 2012
Loyal Heights Community Center	Parks	Parks	26,500	67.7	-22.0%	1949	Upgraded in 2011
Yesler Community Center	Parks	Parks	23,000	100.3	-2.0%	1940	
Meadowbrook Community Center/Pool	Parks	Parks	35,448	296.2	0.9%	1974	
Southwest Pool/CC	Parks	Parks	34,880	232.2	-12.4%	1974	Change of use/shortened hours in 2012
Green Lake Community Center and Pool	Parks	Parks	31,500	400.4	-0.9%	1929	
Medgar Evers Pool	Parks	Parks	21,400	325.5	-8.5%	1968	Upgrades in 2011 and 2012

Benchmarked City-Owned Buildings

LIBRARIES							
Building	Mngmnt Grp	Tenant	Area (sf)	2012 EUI (kBtu/sf)	Change from 2011	Year Built/Renovated	Comments
The Central Library	SPL	SPL	365,987	48.4	-3.4%	2004	
Lake City Branch	SPL	SPL /FAS	20,017	78.9	2.3%	2005	Neighborhood Svc Ctr
Ballard Branch	SPL	SPL / FAS	18,100	81.1	2.7%	2005	Neighborhood Svc Ctr, Small PV
Douglass-Truth Branch	SPL	SPL	16,493	92.5	8.3%	2006	
Broadview Branch	SPL	SPL	15,000	81.1	4.1%	2007	
Northeast Branch	SPL	SPL	15,000	77.1	0.3%	2004	
Rainier Beach Branch	SPL	SPL	15,000	63.7	-5.2%	2004	
Southwest Branch	SPL	SPL	15,000	73.8	-1.6%	2007	
Greenwood Branch	SPL	SPL	12,806	108.9	-9.8%	2005	Partial lighting upgrade in 2011
Columbia Branch	SPL	SPL	12,420	76.9	-2.7%	2004	
Capitol Hill Branch	SPL	SPL	11,615	92.0	8.0%	2003	
Beacon Hill Branch	SPL	SPL	10,800	104.0	8.1%	2004	
West Seattle Branch	SPL	SPL	9,460	78.5	-9.5%	2004	
University Branch	SPL	SPL	8,140	89.9	-1.7%	2007	
Greenlake Branch	SPL	SPL	8,090	79.5	-2.5%	2004	
Queen Anne Branch	SPL	SPL	7,931	59.7	4.9%	2007	
High Point Branch	SPL	SPL	7,100	87.1	-0.9%	2004	
Magnolia Branch	SPL	SPL	7,000	100.4	0.4%	2008	
Fremont Branch	SPL	SPL	6,840	64.0	3.7%	2005	
Montlake Branch	SPL	SPL	5,652	83.5	-2.9%	2006	
Delridge Branch	SPL	SPL	5,600	58.6	-8.0%	2002	1st floor only
South Park Branch	SPL	SPL	5,019	64.8	-2.1%	2006	

FIRE STATIONS							
Building	Mngmnt Grp	Tenant	Area (sf)	2012 EUI (kBtu/sf)	Change from 2011	Year Built/Renovated	Comments
Fire Station 10 / Fire Alarm Ctr / Emergency Operations Ctr	FAS	SFD / SPD	71,974	144.6	-0.7%	2008	24 hour operations
Fire Headquarters	FAS	SFD	56,074	91.8	1.1%	1928	24 hour operations
Fire Station 02	FAS	SFD	38,939	81.7	-4.7%	1925	24 hour operations
Fire Station 17	FAS	SFD	21,886	70.9	-3.8%	1927	24 hour operations
Fire Station 14	FAS	SFD	19,446	78.9	-5.3%	1926	24 hour operations Began renovations in 2012
Fire Station 25	FAS	SFD	17,878	105.5	-8.7%	1969	24 hour operations
Fire Station 18	FAS	SFD	16,624	89.9	4.7%	1974	24 hour operations
Fire Station 28	FAS	SFD	14,650	93.4	-1.8%	2009	24 hour operations
Fire Station 31	FAS	SFD	11,293	91.6	-5.9%	1973	24 hour operations

Benchmarked City-Owned Buildings

POLICE STATIONS							
Building	Mngmnt Grp	Tenant	Area (sf)	2012 EUI (kBtu/sf)	Change from 2011	Year Built/Renovated	Comments
West Precinct	FAS	SPD	88,830	154.6	2.5%	1999	24 hour operations
East Precinct	FAS	SPD	36,280	129.3	-16.6%	1927	24 hour operations
Southwest Precinct	FAS	SPD	28,303	144.1	-6.1%	2003	24 hour operations
North Precinct	FAS	SPD	16,434	165.8	23.6%	1984	24 hour operations
South Precinct	FAS	SPD	12,603	125.4	2.9%	1983	24 hour operations

OPERATIONS SUPPORT							
Building	Mngmnt Grp	Tenant	Area (sf)	2012 EUI (kBtu/sf)	Change from 2011	Year Built/Renovated	Comments
SCL South Service Center Building A	SCL	SCL	180,725	65.0	-7.2%	1952	
Airport Way Center - Bldg C	FAS	SPD	160,447	56.4	3.9%	1985	
Westbridge	Parks	Parks	113,780	32.9	0.1%	1955	
SCL North Service Center	SCL	SCL	94,288	102.0	-6.3%	1978	
SPU Operations Control Complex	SPU	SPU	87,459	103.5	-37.3%	1960	3 Building Complex, Some 24 hour operations, Upgraded in 2011
SCL South Service Center Building B	SCL	SCL	70,320	68.2	10.4%	1952	
Charles Street Vehicle Maintenance (E)	FAS	FAS	68,359	100.0	-38.8%	1975	Upgraded in 2011, separated Fire Garage heating
SDOT Traffic Shop	FAS	SDOT	45,036	33.5	-25.1%	1970	Upgraded in 2011
Haller Lake Vehicle Maintenance Garage	FAS	SDOT/ FAS	26,994	131.4	0.3%	1958	
Airport Way Center - Bldg D	FAS	FAS	22,803	30.7	5.3%	1944	
Charles Street Fire Garage	FAS	FAS	20,000	68.0	NA	1975	
Charles Street Meter Shop	FAS	SDOT/ SPU	19,930	124.2	-7.9%	1966	
SCL North Service Center Annex	SCL	SCL	18,854	53.3	NA	1969	
Airport Way Center - Bldg B	FAS	Mixed	16,725	71.9	4.9%	1985	
SCL Roy Street Warehouse	SCL	SCL	53,944	15.3	-16.8%	1926	
North 34th Street Storage	SPU	SPU	30,000	25.7	NA	1969	
Library - Queen Anne Storage	SPL	SPL	23,040	32.6	-10.7%	1975	

Benchmarked City-Owned Buildings

OTHER							
Building	Mngmnt Grp	Tenant	Area (sf)	2012 EUI (kBtu/sf)	Change from 2011	Year Built/Renovated	Comments
Airport Way Center - Bldg A	FAS	SPD/Other	99,122	167.4	-13.6%	1944	Labs - ongoing upgrades
Seattle Aquarium	Seattle Aquarium	Seattle Aquarium	69,400	264.9	-0.3%	1977	
King Street Station	SDOT	Transit / Vacant	65,490	83.2	91.9%	2008	Under renovation
Georgetown Steamplant	SCL	Community Group	39,212	58.0	-51.5%	1906	Part-time use as a museum
SCL System Operations Center	SCL	SCL	27,744	195.5	2.2%	1993	
SE Seattle Community Health Center	FAS	Community Group	27,492	82.9	2.9%	2007	
Airport Way Center - Bldg E	FAS	SPU	23,100	204.3	-3.1%	1985	Labs
Animal Control	FAS	FAS	10,868	216.2	-0.9%	1981	
North Substation	SCL	SCL	25,987	55.0	8.2%	1923	
Broad Sreet Substation	SCL	SCL	23,802	163.2	-44.3%	1950	Lighting upgrade in 2011
Union Street Substation	SCL	SCL	16,728	31.4	10.5%	1968	
Canal Substation	SCL	SCL	13,914	115.3	-26.3%	1928	Lighting upgrade in 2011

Glossary

Btu - British Thermal Unit

The amount of energy required to raise one pound of water one degree Fahrenheit. It takes about 300 Btus to raise the temperature of one quart of cold tap water from 50 to 200 degrees F. Nominal Btu content of common units of energy:

- 1 kWh of electricity = 3413 Btu
- 1 gallon of No. 2 fuel oil = 140,000 Btu
- 1 therm of natural gas = 100,000 Btu

CBECs

The Commercial Building Energy Consumption Survey is a national sample survey that collects information on U.S. commercial buildings, their energy-related building characteristics, and their energy consumption and expenditures.

EIA

The Energy Information Administration. An independent agency within the U.S. Department of Energy that develops surveys, collects energy data, and analyzes and models energy issues. The Agency must meet the requests of Congress, other elements within the Department of Energy, Federal Energy Regulatory Commission, the Executive Branch, its own independent needs, and assist the general public, or other interest groups, without taking a policy position. See more information about EIA at <http://www.eia.gov/about>.

ENERGY STAR Rating

A numeric 1 – 100 score developed by the EPA that reflects the comparable performance of the rated building to other representative buildings across the country, while accounting for differences in climate, occupancy and operating hours. A high score represents high efficiency. An ENERGY STAR score of 75 denotes that the rated building performs in the 75th percentile of buildings within its category.

EPA

Environmental Protection Agency

Energy Audit

A performance evaluation of current energy use and energy conservation potential typically involving both a site visit to the building and a review of energy consumption history.

Energy Benchmark

The measurement of energy use according to specified standards which is compared to reference measurements. Typically an EUI is used but other metrics may be more appropriate for some buildings. These include energy per unit produced or energy per unit processed or pumped.

Energy Signature Analysis

An analysis technique where billing data is converted to an average hourly value and plotted against average daily temperature for the billing period. When used in segment analysis it can identify differences in heating, cooling and base load consumption between buildings.

EUI

Energy Use Intensity (EUI) is a unit of measurement that describes a building's energy use. EUI represents the energy consumed by a building relative to its size. It is calculated by taking the total energy consumed in one year (measured in kBtu) and dividing it by the total floor space of the building (measured in square feet).

Facility Action Plan

A written action plan, based on a walk through or audit outlining operations and maintenance issues to be addressed to reduce building energy use.

Heating Degree Day

A measure of weather intensity as it affects heating loads. Heating Degree Days (HDD) are calculated with respect to a base temperature with the base temperature reflecting the average temperature at which the building requires no active heating. This temperature is less than the thermostat setting due to solar and internal gains. For a 60 degree base temperature, a day with an average temperature of 52 degrees would have 8 HDD₆₀.

kBtu

One thousand Btus

Plug load

The amount of energy consumed by electrical devices that are plugged into outlets, such as computers and task lights.

Sources:

[EIA Glossary](#)

[Energy Star website](#)

[City of Seattle Website](#)

[Assessing and Reducing Plug and Process Loads in Office Buildings NREL](#)

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17	University Library	Hoshide Williams Architects (renovation)	Erik Stuhaug, via City of Seattle Archives: SPL
19	Fire Station 02	Arai Jackson Ellison Murakami, with TCA Architecture (renovation)	Ian Edelstein, via City of Seattle Archives: Fleets & Facilities
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