ENERGY BENCHMARKING GUIDE

For Building Owners & Facility Managers

A Practical Resource for Understanding, Measuring, and Improving Your Building's Energy Performance

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• Energy Use Intensity (EUI) • ENERGY STAR Portfolio Manager

• Peer Benchmarking • Mandatory Reporting • Capital Planning

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01 Energy Benchmarking Fundamentals

Why Benchmarking Comes First

The principle is straightforward: **you cannot manage what you don't measure.** Energy benchmarking establishes the quantitative foundation for every successful building performance improvement program, transforming vague concerns about utility costs into actionable data.

■ Key EPA Finding

Benchmarking alone leads to an average **2.4% annual energy reduction**. Buildings benchmarking consistently over 7 years achieve an average **12% reduction** in total energy use.

What Benchmarking Is and Isn't

Energy benchmarking is the systematic process of measuring your building's energy consumption and comparing it against a meaningful standard — your own historical performance, similar buildings in your portfolio, or industry-wide data for comparable facilities.

■ Benchmarking IS	■ Benchmarking is NOT
A performance screening tool	An energy audit
A comparison against peers	Equipment-level diagnostics
A trend-tracking mechanism	A retrofit recommendation
A compliance tool	A guarantee of savings

Energy Use Intensity (EUI) — The Core Metric

EUI normalizes energy consumption by floor area, enabling meaningful comparisons between buildings of different sizes:

EUI = Total Annual Energy Use (kBtu) ÷ Gross Floor Area (sq ft)

Energy Conversion Factors

Fuel Type	Unit	kBtu Equivalent
Electricity	1 kWh	3.412 kBtu
Natural Gas	1 therm	100 kBtu

Fuel Oil (#2)	1 gallon	138.5 kBtu
District Steam	1 lb	1.194 kBtu

Weather Normalization

Raw EUI comparisons between buildings in Miami and Minneapolis are meaningless without accounting for climate differences. Weather normalization adjusts energy data using **heating degree days (HDD)** and **cooling degree days (CDD)** to isolate building performance from weather impacts. ENERGY STAR Portfolio Manager performs this normalization automatically.

Source Energy vs. Site Energy

	Site Energy	Source Energy
Definition	Consumption at the building meter	All energy to deliver site consumption (incl. generation & transmission losses)
Electricity ratio	1x	~3x (grid losses)
Best for	Operational budgeting & cost analysis	Environmental comparisons & ENERGY STAR certification

02 Setting Up ENERGY STAR Portfolio Manager

Account Creation & Property Setup

ENERGY STAR Portfolio Manager, maintained by the EPA, is the industry-standard platform for commercial building benchmarking. Account creation is free at **energystar.gov/portfoliomanager**.

Step 1	**Create your account** Use your professional email to establish login credentials and basic contact information.
Step 2	**Add a property** Select 'Add a Property' from your portfolio dashboard. Enter the street address — the system uses this for automatic weather data assignment.
Step 3	**Define property use details** Select the correct property type (office, retail, school, etc.) and enter operational characteristics. Accuracy is critical — it directly affects your ENERGY STAR score.

Required Inputs for Office Buildings

Input Field	Why It Matters
Gross Floor Area (sq ft)	Foundation of EUI calculation
Weekly Operating Hours	Normalizes for occupancy duration
Workers on Main Shift	Accounts for internal heat gains
% Heated / Cooled	Adjusts for conditioned area
Number of Computers	Proxy for plug-load density

■■ Accuracy Warning

Underreporting operating hours **artificially inflates** your score; overreporting **depresses** it. Always cross-check inputs against actual building schedules before submitting data.

Utility Data Entry

Portfolio Manager accepts utility data through manual entry or automatic upload via utility company partnerships. For manual entry: navigate to the Energy tab, click 'Add a Meter' for each utility type, then enter 12 months of consecutive billing data including usage amounts and billing periods.

Major utilities including Con Edison, Pacific Gas & Electric, and Duke Energy offer direct integration via EPA's Utility Data Exchange, reducing data entry errors and ensuring consistent monthly updates.

Understanding Your ENERGY STAR Score

The ENERGY STAR score ranks your building's source energy performance on a **1–100 scale** against similar buildings nationwide, normalized for climate, occupancy, and operating hours. A score of 75 means your building performs better than 75% of comparable facilities.

■ ENERGY STAR Certification

Buildings scoring **75 or higher** for 12 consecutive months may apply for ENERGY STAR certification — a recognized credential demonstrating top-quartile performance. Certification requires third-party verification by a licensed Professional Engineer or Registered Architect.

03 Benchmarking Against Peer Buildings

CBECS as the National Reference

The Commercial Buildings Energy Consumption Survey (CBECS), conducted approximately every four years by the U.S. Energy Information Administration, provides the statistical foundation for peer comparisons. The most recent complete dataset (CBECS 2018) surveyed over **6,400 buildings** representing the 5.9 million commercial buildings nationwide.

Median EUI by Building Type (CBECS 2018)

Building Type	Median EUI	Top Quartile	Performance Gap
Office	72	**44**	**39% better at top quartile**
Retail (non-mall)	57	**32**	**44% better at top quartile**
K-12 School	58	**38**	**34% better at top quartile**
Hospital	203	**145**	**29% better at top quartile**
Hotel / Lodging	85	**56**	**34% better at top quartile**
Warehouse	28	**14**	**50% better at top quartile**
Grocery / Food	199	**138**	**31% better at top quartile**
Restaurant	258	**165**	**36% better at top quartile**

All values in kBtu/sf/yr (site energy). Source: CBECS 2018.

Regional Climate Adjustments

City	Climate	Annual HDD	Annual CDD	Implication
Minneapolis, MN	Cold	~7,500	~700	High heating load
Chicago, IL	Cold/Mixed	~6,200	~900	Heating dominated
Atlanta, GA	Mixed/Humid	~2,800	~1,800	Balanced loads
Miami, FL	Hot/Humid	~200	~4,400	Cooling dominated
Los Angeles, CA	Mild	~1,300	~600	Low overall load

Interpreting Your Position

Position your EUI against both the **median (50th percentile)** and **top-quartile (25th percentile)** values for your building type:

Your EUI vs. Median	Signal	Recommended Action
> 30% above median	Poor performance	Prioritize energy audit
10–30% above median	Below average	Investigate key systems
Within 10% of median	Average performance	Retro-commissioning candidate
Below median	Good performance	Target top-quartile
At/below top quartile	Top quartile	Pursue ENERGY STAR cert.

04 Using Benchmarking Data for Improvement

Identifying Anomalies & Outliers

Monthly energy data reveals patterns that annual totals obscure. Plot 24 months of consumption data and examine each point for deviations from expected patterns.

- Do shoulder months (April, October) show expected drops from peak summer/winter consumption?
- Does baseload (minimum monthly consumption) seem reasonable for building size and type?
- Are there unexplained spikes in specific months?
- Does summer cooling consumption seem proportionate to the building's cooling system capacity?

Disaggregating End Uses

Whole-building benchmarking cannot distinguish whether high consumption stems from lighting, HVAC, plug loads, or process equipment. Use these typical office building breakdowns from CBECS as a starting point:

End Use	Typical Share	Improvement Lever
HVAC	**35–45%**	Controls, schedules, economizers
Lighting	**15–25%**	LED retrofit, daylighting, occupancy sensors
Plug loads & equipment	**15–20%**	Power management, procurement standards
Water heating	**5–10%**	Heat pump water heaters, pipe insulation
Other / misc.	**10–15%**	Submetering to identify sources

Interval Data Analysis

Smart meters recording consumption in 15-minute or hourly intervals enable load shape analysis impossible with monthly billing data. Key indicators:

Indicator	What to Look For	Red Flag
Peak demand timing	Peaks during occupied hours	Peaks in unoccupied hours
Unoccupied consumption	<20% of daily energy	>35% after-hours use
Morning ramp-up	Gradual rise with occupancy	Sudden spikes at startup

■ Key Insight

Many buildings consume **30–40% of their energy during unoccupied periods** — a significant opportunity for scheduling and controls improvements that often require little or no capital investment.

Linking Benchmarking to Capital Planning

Benchmarking data supports capital improvement decisions by establishing performance baselines and quantifying improvement potential. Example calculation:

Example: Peer buildings achieve EUI of 55 kBtu/sf/yr. Your building operates at 90 kBtu/sf/yr. The 35 kBtu/sf/yr gap, across 100,000 sq ft at $0.03/kBtu average energy cost, equals **$105,000 in annual savings potential** — a figure that directly supports business case development for retrofit investments.

Following improvements, continued benchmarking provides **measurement and verification (M&V)** confirming whether implemented measures achieve projected savings. This closed-loop process — benchmark → improve → verify — defines mature energy management programs.

05 Mandatory Benchmarking Requirements

Jurisdictions with Benchmarking Ordinances

Dozens of U.S. cities and several Canadian municipalities now mandate annual energy benchmarking and public disclosure for commercial buildings above threshold sizes.

Jurisdiction	Ordinance	Threshold	Notes
New York City	Local Law 84/133	>25,000 sf	Publicly disclosed scores
Chicago	Energy Benchmarking Ord.	>50,000 sf	Phasing to 10,000 sf
San Francisco	Env. Code Ch. 20	>10,000 sf	Commercial buildings
Washington D.C.	BEPS	>10,000 sf	Performance standards apply
Toronto	Energy & Water Reporting	>50,000 sf	Canadian municipality
Vancouver	Building By-law	Large commercial	Multi-residential included

Disclosure & Penalties

Most ordinances require annual submission to municipal portals by specified deadlines — typically **May 1** for the prior calendar year. Many jurisdictions publicly disclose results, allowing tenants and buyers to compare building efficiency before leasing or purchase decisions.

■ NYC Penalty Example

New York City assesses fines up to **$500 per violation**, with each quarterly reporting period constituting a separate violation. Repeat non-compliance triggers escalating penalties. Non-compliance can cost over **$2,000 per year** in fines alone.

Maintaining Compliance — Action Checklist

- ✓ Set calendar reminders for annual submission deadlines (typically May 1)
- ✓ Verify utility account access before reporting periods begin
- ✓ Document all property use details and update when operations change
- ✓ Perform quality control review of all data before submission

- ✓ Maintain 3 years of historical utility data for audit purposes
- ✓ Enroll in automatic utility data sharing where available

A EUI Reference Table by Building Type

Source: CBECS 2018 — Site EUI (kBtu/sf/yr). Use these values to position your building against national peers. Top Quartile represents the 25th percentile (bottom 25% of energy users — i.e., most efficient).

Building Type	Median EUI (50th pctile)	Top Quartile (25th pctile)	Ratio (Med/TQ)
Office	72	44	1.64x
Retail (non-mall)	57	32	1.78x
K-12 School	58	38	1.53x
Hospital (inpatient)	203	145	1.40x
Hotel / Lodging	85	56	1.52x
Warehouse	28	14	2.00x
Grocery / Food Sales	199	138	1.44x
Restaurant	258	165	1.56x

B ENERGY STAR Score Interpretation Guide

1 – 25	**Bottom Quartile** Significant improvement opportunity. Prioritize investigation and likely energy audit.
26 – 50	**Below Median** Below median performance. Improvement warranted — likely cost-effective opportunities exist.
51 – 74	**Above Median** Above median performance. Targeted improvements may be beneficial; good retro-commissioning candidate.

75 – 89	**Top Quartile** Top quartile performance. Eligible for ENERGY STAR certification. Focus on maintaining performance.
90 – 100	**Exceptional** Exceptional, industry-leading performance. Document and replicate practices across portfolio.

Benchmarking establishes the foundation — but transforming data into results requires expertise in building systems, measurement protocols, and improvement implementation. Use this guide as your starting point, then engage qualified energy professionals to move from measurement to meaningful change.