

DESIGNING A BENCHMARKING PLAN

Introduction

This guide provides a framework for developing an internal benchmarking plan. The outline walks through the various stages of the benchmarking planning process, providing tips and resources to help support organizations at each stage. Not all organizations will choose to implement each stage; however, each section is useful for consideration.

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1. Establish the Goal for Benchmarking

Establishing the purpose for benchmarking will influence the way data is collected and analyzed. Some of the goals for benchmarking include the following:

- **Energy management strategy.** Benchmarking is an integrated component of a comprehensive energy management system. Additional resources for establishing an energy management system are found at the end of this section.
- **Demonstrating results from energy efficiency programs.** Benchmarking can be used to track pre- and post-project savings for documenting energy efficiency results.
 - Benchmarking building energy use can validate energy savings from efficiency projects internally, for energy service performance contracts (ESPC), and for program evaluation, measurement, and verification (EM&V).
 - The U.S. Department of Energy (DOE) provided an overview of the EM&V process for energy efficiency projects through its webinar [Developing an Evaluation, Measurement, and Verification Plan for Municipal Building Energy Efficiency Projects](#).

ABOUT BENCHMARKING

Benchmarking is the process of accounting for and comparing a metered building's current energy performance with its energy baseline, or comparing a metered building's energy performance with the energy performance of similar types of buildings (based on use, such as comparing the energy performance of a hospital to that of other hospitals). Benchmarking can be used to compare performance over time, within and between peer groups, or to document top savings from conservation measures.

Why benchmark? Energy expenditures average more than \$2 per square foot in commercial and government buildings, making energy a cost worth managing. By making energy performance measurable and visible, building owners can improve the efficiency of their buildings, which can drive new investment and create an estimated 5 to 15 green jobs per \$1 million invested.

Efficient buildings are also more profitable and more valuable at resale, which can increase property tax revenues. Building owners seek benchmarking data to differentiate a building or company, help value rental rates, and inform the sale or acquisition of existing buildings.

- **Participation in an environmental or energy efficiency program that requires energy benchmarking.** Many organizations are participating in energy efficiency programs that require benchmarking building energy use for documenting building performance, energy efficiency improvements, or greenhouse gas reductions.

The following resources provide additional guidance on establishing an energy management system.

DOE eGuide Lite	Intended for those organizations who are new to energy management and want to develop the internal expertise needed for better energy management
DOE eGuide for ISO 50001	A toolkit to help organizations implement an energy management system
Community Strategic Energy Plan Guidelines	Introduces the Community Energy Strategic Plan (CESP) approach, a step-by-step process for creating a robust strategic energy plan for local governments and communities. Available Spring 2013 on the Solution Center .



Example: As a part of the DOE [Better Buildings Challenge](#), partners are asked to benchmark their portfolio of buildings and commit to an energy use intensity (EUI) reduction goal of 20% by 2020. Partners share their building data with DOE semi-annually to demonstrate progress and build transparency in the market.

Additional Resources and References

ENERGY STAR® Building Manual	Chapter 2.2: Develop a Benchmarking Plan—Set Goals
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2. Secure Buy-in from Leadership

One of the most critical elements of success is the involvement of top management:

- It is important for top management to approve and communicate the commitment to the benchmarking plan. This endorsement establishes the importance of benchmarking for the organization and helps foster greater participation.
- Top management also needs to be a part of the regular communication and review of the benchmarking process. Continued support from top management helps maintain or even build momentum for benchmarking.



Part of pitching the business case for benchmarking—specifically for EPA’s ENERGY STAR Portfolio Manager—can be found in following fact sheets:

- [Benchmarking to Save Energy](#)
- [Benchmark with EPA’s ENERGY STAR Portfolio Manager](#)

3. Build a Benchmarking Team

First, establish the benchmarking program coordinator:

- Depending on your organization, it may work better for this role to be shared by more than one person. The benchmarking coordinator does not need to be an expert on energy. Important qualities include strong communication and leadership skills. Having respect and being established in the organization are also helpful.
- Clearly define the roles and responsibilities of the benchmarking coordinator position. The benchmarking coordinator will need cooperation and assistance from many different people and parts of the organization, so it is important that his/her role is clearly understood.

Then, identify key personnel in the organization to implement the benchmarking plan:

- The benchmarking process will involve many players. The team will need to collect and aggregate data from a variety of sources. Depending on the organizational structure, the benchmarking program will impact energy management at several levels or positions.
- Involve personnel with familiarity of the energy data and whose work will be affected by the benchmarking program. Good candidates include:
 - Operations and maintenance
 - Purchasing
 - Human resources
 - Environmental, health, and safety.



Collecting and tracking benchmarking data can be a substantial effort. When appropriate:

- Look for “pro bono” help with analysis from local stakeholders (e.g., interns or college/university expertise, non-profits, and local weatherization agencies).
- Use this part of the project as a professional development opportunity for a local government’s financial analysts or junior engineers.
- Hire consultants such as energy service companies (ESCOs) or third-party providers.
- Incorporate benchmarking into energy efficiency projects and contracts. Some ESCOs will offer free benchmarking as a way of developing business opportunities.

Additional Resources and References

ENERGY STAR Building Manual

[Chapter 2.2: Develop a Benchmarking Plan—Engage Partners](#)

4. Identify Output Metrics Needed to Support the Benchmarking Goal

Review the goals established for the benchmarking program to determine the data outputs required.

- Consider requirements as specified in energy policy, energy objectives, targets, action plans, as well as legal and other requirements:
 - *Gross Consumption*—measuring the total energy use allows for tracking energy use reduction, typically converted to a common unit such as British Thermal Units (Btu).
 - *Demand*—for some organizations, demand charges constitute a considerable portion of energy costs. A common unit for electricity demand is kilowatt (kW).
 - *Energy Use Intensity (EUI)*—a measure of energy consumption per production or footprint (common energy intensity metrics are shown below)

EUI Metric	Application
Btu per square foot	Any building
Btu per employee	Office building
Btu per unit of product	Assembly plant
Btu per pound of product	Manufacturer
Btu per pound of product processed	Refinery
Btu per number of beds occupied	Hotel or hospital
Kilowatt-hours per square foot	Lighting

Courtesy: E Source

- *Greenhouse gas (GHG) emissions*—typically a calculated value based on the energy consumption of facilities measured in carbon dioxide equivalents (CO₂e)
- *Energy cost savings*—the measurement of purchase cost for energy and energy fuel sources.
- Determine the granularity and frequency of the output metrics required. Select a level of detail and frequency that is achievable and that contains enough resolution for meaningful analysis. The output metrics should be appropriate for the audiences to whom the results are communicated.
 - Granularity:
 - *System level*—monitors the energy performance of individual equipment or systems. System level provides granular data for more precise energy management. Sub-metering may be required for this level of detail.
 - *Facility level*—monitors the energy use of the building as a whole, gathered from utility meter data. Facility level data provides whole building information, which is useful for tracking progress of facility energy use and identifying buildings that require further attention.
 - *Account level*—monitors the energy performance of multiple buildings that are all connected with a single meter. Account level monitoring is found at campuses where individual building data is not available (in this case, sub-metering is encouraged).
 - *Sub-group data*—aggregates energy performance of buildings by grouping multiple meters or accounts under a department. This higher level view can aid in identifying groups of buildings that require further attention, and for tracking progress more broadly.
 - *Portfolio wide*—aggregates energy use across all buildings or accounts within a portfolio. This high-level view provides a context for the building energy use of an organization as a whole and is useful for demonstrating the overall progress toward a goal.
 - Frequency:
 - *Interval*—monitors incremental data, typically on 15-minute intervals. Interval data allows for in-depth analysis for time-of-use or load shaping.
 - *Monthly*—monitors monthly energy use, typically through monthly meter data. Monthly data allows for energy analysis incorporating weather or operating characteristics in addition to month-by-month comparison.
 - *Seasonal* – monitors the consumption based on heating or cooling seasons to better understand the energy use required in each season specifically.
 - *Yearly*—monitors the annual energy use. Yearly data allows for annual planning and course analysis with weather and operating characteristics.



Example: Better Buildings Challenge Partners share facility-level data on six-month increments to track the progress of the EUI (kBtu/sqft) reduction goals for their entire portfolio of buildings.

Additional Resources and References

ENERGY STAR Building Manual

[Chapter 2.2: Develop a Benchmarking Plan—Define the Scope and Identify a Benchmark](#)

5. Identify the Data Input Requirements

Identify the data inputs required to generate the output metrics deemed important—the output metrics selected for the benchmarking program dictate the data inputs required.

- Select data inputs that will assist in analyzing energy use for decision making, even if not required to produce the outputs deemed important.
- Account for data inputs required by the benchmarking tool (see EPA’s [Portfolio Manager Data Collection Worksheet](#) for data requirement examples).
- Map out data availability and data access to identify where the data is located and how it is delivered (i.e., *are meter bills monitored by the facility manager and/or the accounting department? Are the bills delivered electronically or hard copy? How frequently are the bills provided and with how long of a delay?*).
- Account for all energy sources by inventorying all energy purchased and generated on-site (e.g., electricity, gas, steam, waste fuels) in physical units (e.g., kWh, MMBtu, Mcf, Therm, CCF, lbs of steam).
- Incorporate facility characteristics and general building attributes (e.g., footprint, facility type, age, and location) to help with comparisons across the portfolio or to statistical data.
- Consider including the following specific metrics:
 - *Operating characteristics*—document the characteristics that can affect the energy use in a building. By tracking metrics such as occupancy rates, operating hours, and number of key pieces of equipment, benchmarking can normalize energy use fluctuations caused by changes in operating characteristics (see EPA’s [Portfolio Manager Data Collection Worksheet](#) for data requirement examples).
 - *Production units*—document the production rate of facilities to compare with energy or environmental metrics. Some facilities’ energy use is largely impacted by the production that occurs within the facility. Monitoring the production level to compare with the energy use for that time period can help normalize energy use and highlight areas of inefficiency.
 - *Cost*—financial metrics are rarely excluded from the decision making process. In communicating building performance and the potential benefits of energy retrofits, cost is often a deciding factor. Tracking the cost associated with the energy use of buildings can help build a strong case for greater energy management.
 - *Energy project milestones*—verifying pre- and post-implementation savings from energy efficiency projects requires an understanding of project timelines. Additionally, recording project timelines can be helpful for continuous energy management as intermediate benchmarks with which to compare future energy use.

	Portfolio Manager Data Collection Worksheet	Use this tool to identify and gather data needed for benchmarking with Portfolio Manager.
	Portfolio Manager Import Templates	This list of MS-Excel templates provide a comprehensive look at the data inputs needed for various building types when benchmarking in Portfolio Manager.
	Better Buildings Challenge Data Collection Template	This template provides an example of space type, space use, and energy data used for monitoring EUI in the Better Buildings Challenge. Available Spring 2013 on the Solution Center .



Make the level of detail appropriate to end use. Depending on the goal of the benchmarking plan, some organizations use a detailed view at the facility management level and roll-up to high level for upper management. This allows for facility managers to use specific data for decision making and for top management to track the progress of the portfolio as a whole. Top management would also have the ability to view granular data as needed.



Example: In order to develop EUI values for facilities, Partners in the Better Buildings Challenge are encouraged to collect general building information, space use attributes, and energy use with ENERGY STAR's Portfolio Manager (see EPA's [Portfolio Manager Data Collection Worksheet](#) for data requirement examples).

Additional Resources and References

ENERGY STAR Building Manual

[Chapter 2.2: Develop a Benchmarking Plan—Develop Data Requirements](#)

6. Select a Benchmarking Tool

Benchmarking or energy tracking tools can range from simple spreadsheets to custom designed, web-based platforms. The benchmarking tool selection should be guided by the data needs deemed necessary for documenting progress toward the benchmarking program goal. Compare functionality of tools:

- *Outputs generated*—confirm that the tool can produce the outputs required by the benchmarking program.
- *Data inputs and frequency required*—evaluate the data inputs required to produce the outputs selected and the practicality of gathering and entering the data. (see the [Portfolio Manager Data Collection Worksheet](#) for data requirement examples)
- *Data entry methods*—identify the data entry methods available for the tool. This can range from manual to direct data exchange from utilities where available (see example [data entry techniques](#) below).
- *Data display capabilities*—evaluate the ability of the benchmarking tool to generate displays that are helpful in communicating results to the appropriate audiences. Consider the tool's ability to export data to other platforms for generating reports and graphs.
- *Cost*—products can range from free to hundreds of thousands of dollars. Cost-benefit must be determined using internal decision making protocol. If large investments in energy efficiency are made, the value of monitoring results increases.
- *Usability and support*—if the benchmarking tool is too difficult for the intended user, the capabilities of the tool are lost. Select a tool that is manageable and offers support as users develop.
- *Compatibility*—evaluate the tool's compatibility with existing processes or software, internal and external. Integrating the benchmarking tool with existing practices increases the likelihood for success. The tool's ability to share and compare data in a consistent manner with other portfolios should also be considered.

	ENERGY STAR's Portfolio Manager	<p>A free online tool that benchmarks monthly meter data for buildings. Portfolio Manager can generate GHG metrics, gross consumption, adjusted and weather normalized EUI, as well as compare building performance to the national median based on facility type.</p>
	Building Energy Software Tools Directory	<p>This directory provides information on nearly 400 building software tools for evaluating energy efficiency, renewable energy, and sustainability in buildings. The energy tools listed in this directory include databases, spreadsheets, component and systems analyses, and whole-building energy performance simulation programs.</p>
	<p>CESP Energy Data Calculation and Summary Tool</p>	<p>This worksheet, intended for high-level data review, assists with the collection of summary energy use information across sectors and prepares simple pie charts to illustrate relative contributions to total energy use. Available Spring 2013 on the Solution Center.</p>



- Select a tool to grow in to. While the capabilities and requirements of some tools may seem daunting, choosing a tool with some advanced capabilities to accommodate future needs can be helpful. The tool should have basic functionality for new users, but with advanced options to employ as users become more proficient.
- If not selecting ENERGY STAR's Portfolio Manager, it is recommended to select a tool that communicates with ENERGY STAR's Portfolio Manager in order to benefit from features such as weather normalization, adjusted EUI, comparison to the national median, ENERGY STAR recognition, and the most widely used benchmarking platform for compatibility.



Example: Better Buildings Challenge Partners are encouraged to use ENERGY STAR's Portfolio Manager—a free online tool that benchmarks monthly meter data for buildings. [Learn more about Portfolio Manager](#).

7. Determine a Collection Method

It is important to select a data collection method that addresses how the data is currently managed. Depending on the benchmarking tool selected and the organizational structure, data can be collected and aggregated in several ways. Common techniques include the following, described in greater detail in the table that follows:

- *Centralized*—create a central account to house all the data. Building information is shared with the benchmarking team or benchmarking coordinator for input.
- *Decentralized*—create multiple accounts to share with a central database. Data is managed by multiple contacts and shared with the 'master account.'

With either approach, it is helpful to develop standardized formats for data sharing. Using consistent naming conventions for buildings allows for easier grouping of facilities by department of space type as need. Additionally, using consistent usernames and passwords for multiple accounts allows for ease of transition between users on a given account.

Portfolio Manager Strategies for Data Collection

Approach	Concept	Relevant Tools
Centralized	Create a central account to host all organization benchmarking data. Department/facility data is shared with the benchmarking coordinator/team for input or aggregation.	Use the Portfolio Manager Data Collection Worksheet, Portfolio Manager Import Templates, or Portfolio Manager Multi-Meter Update to collect data from departments for manual upload or uploading by ENERGY STAR.
Decentralized	Create a central account to host all organization benchmarking data. Create separate accounts for department or facility managers to benchmark their subset of buildings. Use the sharing function in the tool to transfer benchmarking data to the central account.	Provide department benchmarking staff with facility sharing instructions (see Portfolio Manager's sharing instructions). Benchmarking staff may also find the Portfolio Manager Data Collection Worksheet, Portfolio Manager Import Templates, or Portfolio Manager Multi-meter update useful in their own data entry process.

	Portfolio Manager Data Collection Worksheet	Use this tool to identify and gather data needed for benchmarking with Portfolio Manager. Data collected through this worksheet can be entered manually into a benchmarking tool.
	Portfolio Manager Import Templates	The list of MS-Excel templates provides a spreadsheet for collecting the required data for various building types to be entered into Portfolio Manager. Spreadsheets with 10 or more facilities of a type can be sent to ENERGY STAR for uploading into Portfolio Manager.
	Multi Facility Meter Update	This template provides the ability to update energy and water data for a large number of facilities. Instructions on using this tool can be found in the Portfolio Manager 'Help' section.
	Automated Benchmarking Services (ABS)	Automated benchmarking is a service provided by some utilities and other third-party providers to automatically upload meter data into a Portfolio Manager Account.
	Better Buildings Challenge Data Collection Template	DOE uses this spreadsheet to collect facility-level data for the Better Buildings Challenge from Partners not using Portfolio Manager. Available Spring 2013 on the Solution Center .

TIP

- Contact your utility account representative to request unavailable data or to request data in a format that is more easily uploaded into your benchmarking tool.
- The [Utility Data Access Map](#) graphically displays information on the kind of data access provided by utilities across the country.
- Some utilities provide ABS for Portfolio Manager (see a [list of ABS providers](#)). ENERGY STAR has developed [resources](#) to help utilities and other service providers offer ABS.

Additional Resources and References

ENERGY STAR Building Manual

[Chapter 2.3: Implement the Benchmarking Plan—Collect Data](#)

8. Consider the Data Verification Process

Establish a quality assurance/quality control (QA/QC) plan to verify the data. Use the verification process to promote accurate and transparent reporting. Consider the following when developing a verification process:

- Filter for unusually high or low EUI values compared with the national median EUI values for buildings of specific types, as provided by the Commercial Buildings Energy Consumption Survey ([CBECS](#))
- Compare the reported footprint with building inventory lists or real property data
- Check that the appropriate facility type is selected for facilities
- Scan for gross rounding of footprint values
- Ensure facility names appear appropriate and real (e.g., not “sample facility”)
- Perform onsite verification (sometimes through a third party)
- Consider random sampling of utility meter data to allow for more in-depth spot checks
- Establish a protocol for filling in gaps in data as needed (since not all data will be perfect)
- Ensure staff is trained, which is of the best forms of ensuring quality reporting from the ground up.

	Benchmarking Starter Kit	Helps new users get started with Portfolio Manager, including animated training, a collection worksheet, and a quick reference guide for step by step instructions
	ENERGY STAR trainings	Web-based training—both live and pre-recorded—on a range of benchmarking topics using Portfolio Manager
	Animated ENERGY STAR presentations	Previously recorded training sessions on benchmarking and energy management including: Guide to Benchmarking, Entering Parking Area, Customizing Portfolio Manager, and Bulk Data Management.



Use the ‘alerts’ and performance ratings in Portfolio Manager to quickly identify potential issues:

- Check the ‘space use alerts’ and ‘energy use alerts’
- Examine facilities with performance ratings of 1 or 100.

9. Evaluate Analysis Techniques

Tracking and analyzing energy data provides insight into the impact of operations on energy use and consumption. Documentation of the energy consumption and cost analysis must be in a form that is meaningful and clear to all levels of the organization. It could be as simple as basic graphs of energy consumption or as complex as statistical models which identify the relevant variable(s) affecting energy consumption. Consider the following tips for analyzing building energy performance:

- Establish baseline of energy performance
- Benchmark and track facility energy consumption and EUI progress:
 - *Compare against the baseline*—use Portfolio Manager to see how a building’s or facility’s energy use compares against itself over time.
 - *Compare with energy simulation/energy modeling*—use an energy modeling tool to evaluate a building’s energy performance versus potential performance.

- *Perform a statistical review*—compare with Commercial Buildings Energy Consumption Survey (CBECS) data for national median EUI or Portfolio Manager’s national energy performance rating.
- *Compare across portfolio*—evaluate the performance of individual buildings to similar buildings or the portfolio average.
- *Start high-level and zoom in for detailed analysis as required*—review portfolio- or department-wide energy performance to identify low-performing groups of buildings; target buildings with high EUI’s for further investigation.



Normalizing the EUI for facilities based on weather data and operating characteristics allows for relevant comparison of data year over year. Organizations will need to account for values like operating hours, number of employees, pieces of equipment, and regional weather data to adjust for operating characteristics and weather. Portfolio Manager provides a free method for normalizing data.

Additional Resources and References

ENERGY STAR Building Manual

[Chapter 2.3: Implement the Benchmarking Plan—Evaluate Benchmarks and Apply the Results](#)

10. Communicate the Plan and Formalize the Process

Depending on an organization’s size, developing a formal process and communicating the plan can be an important aspect of the benchmarking program. Creating a sense of stability and support from top management can demonstrate the importance and continued commitment to the program. Clearly identifying goals and roles ensures transparency and outlines expectations. Consider the following tips when communicating the benchmarking plan:

- *Have top management share the plan with the organization*—hold a benchmarking launch event to communicate the goals and requirements of the program.
- *Demonstrate the value*—build a case for the program by showing the benefits of the reports generated by the benchmarking tool, such as linking demonstrated savings with budget items or connecting benchmarking to job security.
- *Be clear about the program intent*—some participants may feel exposed by a transparency of energy consumption and operations. Focus on the competitive advantage created by benchmarking.
- *Establish clear roles in the collection process*—lay out the responsibilities for the benchmarking team.
- *Include involved third-party organizations*—examples include utility account representatives to assist with data access, or vendors to include energy project timelines and existing data.
- *Empower participants*—integrate the benchmarking process into existing operations and provide training for the benchmarking tool.
- *Set timelines for deliverables*—establish the program critical path and set an achievable progression of milestones and project checkpoints.
- *Schedule check-ins and share results regularly*—build momentum, assess status, and add accountability.

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	ENERGY STAR trainings	Web-based training—both live and pre-recorded—on a range of benchmarking topics using Portfolio Manager
	Animated ENERGY STAR presentations	Previously recorded trainings on benchmarking and energy management including Guide to Benchmarking, Entering Parking Area, Customizing Portfolio Manager, and Bulk Data Management.
	Portfolio Manager FAQs	Houses frequently asked questions and the detailed answers provided by ENERGY STAR regarding Portfolio Manager; very useful for broad and specific questions about the tool
	Portfolio Manager Help Desk	Contact forms for connecting the ENERGY STAR support team for questions with benchmarking and Portfolio Manager



- Kick-off events, such as an employee luncheon (with contractors invited) or staff meetings, can be used to announce the organization's benchmarking plan.
- Simple steps—such as adding benchmarking progress to meeting agendas and having benchmarking email from top management—help keep everyone involved.

11. Planning for Change

Set a schedule for regular appraisal of the benchmarked portfolio after the initial investigation or when new measures have been implemented. Consider the following questions:

- *Are the metrics being tracked still valuable?*
- *Has the type of available data changed based on energy service provider, sub-metering, independent studies (e.g., GHG)?*
- *Is data being received and tracked in a timely way so as to be useful for planning and project execution?*
- *Have the building inventory or building use characteristics changed substantively?*

Check in with stakeholders:

- *Is the benchmarking tool and information useful, that is, does it assist in informed decision making?*
- *Is it accessible and usable for external communications (e.g., progress toward a goal) as well as internal planning?*
- *Who is responsible for approving any changes to the benchmarking plan, and does that need to be updated?*

Compile the feedback received from the re-appraisal process. Evaluate current capabilities and the need for additional training or staffing. Review other tools and service providers that may enhance your benchmarking activities. Identify possible gaps and update the plan. For continuous improvement, revamping the benchmarking process as improvements are made ensures an integrated energy management plan.