



USING MONTHLY ENERGY DATA FROM BENCHMARKING PROGRAMS

Insights for Better Buildings and More Effective City Programs

PUTTING DATA TO WORK
TOOL





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ABOUT IMT

The Institute for Market Transformation (IMT) is a national nonprofit organization focused on increasing energy efficiency in buildings to save money, drive economic growth and job creation, reduce harmful pollution, and tackle climate change. IMT ignites greater investment in energy-efficient buildings through hands-on expert guidance, technical and market research, policy and program development and deployment, and promotion of best practices and knowledge exchange. For more information, visit imt.org.

PUTTING DATA TO WORK

This resource was developed as part of [*Putting Data to Work*](#), a multi-year pilot project aimed at using building performance data and asset information to help efficiency program implementers better target their outreach to building owners and increase the number of projects executed within these programs. The project team analyzed ways to use building performance data generated by city policies to improve energy efficiency program design and delivery in the District of Columbia and New York City, and resulted in a toolkit of resources to enable local governments, utilities, and program implementers to learn from activities to replicate success.

This guide provides an overview of the powerful ways in which monthly building consumption data can yield new insights, and how these insights can help cities to design more effective targeted programs.



Introduction

As of September 2019, more than 30 cities and local governments around the United States have adopted ordinances requiring benchmarking of energy performance of existing buildings.¹ Under these requirements, owners of buildings in certain categories must compile data on location, floor area, use type, year of construction, and other basic parameters, as well as 12 consecutive months of energy data. They must then enter the data into Portfolio Manager, the online tool created by the U.S. Environmental Protection Agency's ENERGY STAR program. Portfolio Manager provides summary information and analysis, including an ENERGY STAR rating score from 1 to 100 for applicable buildings.

To comply with the benchmarking requirements, owners must also submit specified Portfolio Manager data to the city on an annual basis. Until recently, cities had access only to total annual energy consumption data from Portfolio Manager for any given building.² Now, however, ENERGY STAR has expanded its tools and processes to allow cities to receive monthly energy consumption data from each building.

This document provides an overview of how monthly consumption data can yield powerful new insights on seasonal energy consumption patterns and anomalies, for both individual buildings and groups of buildings. Using these insights, cities can then provide feedback and support to building owners, and work with utilities and energy efficiency program implementers to refine program offerings to best suit the jurisdiction's building stock.



¹ For a map and further details, see <https://www.imt.org/resources/map-u-s-city-and-county-benchmarking-policies-for-existing-private-buildings/>

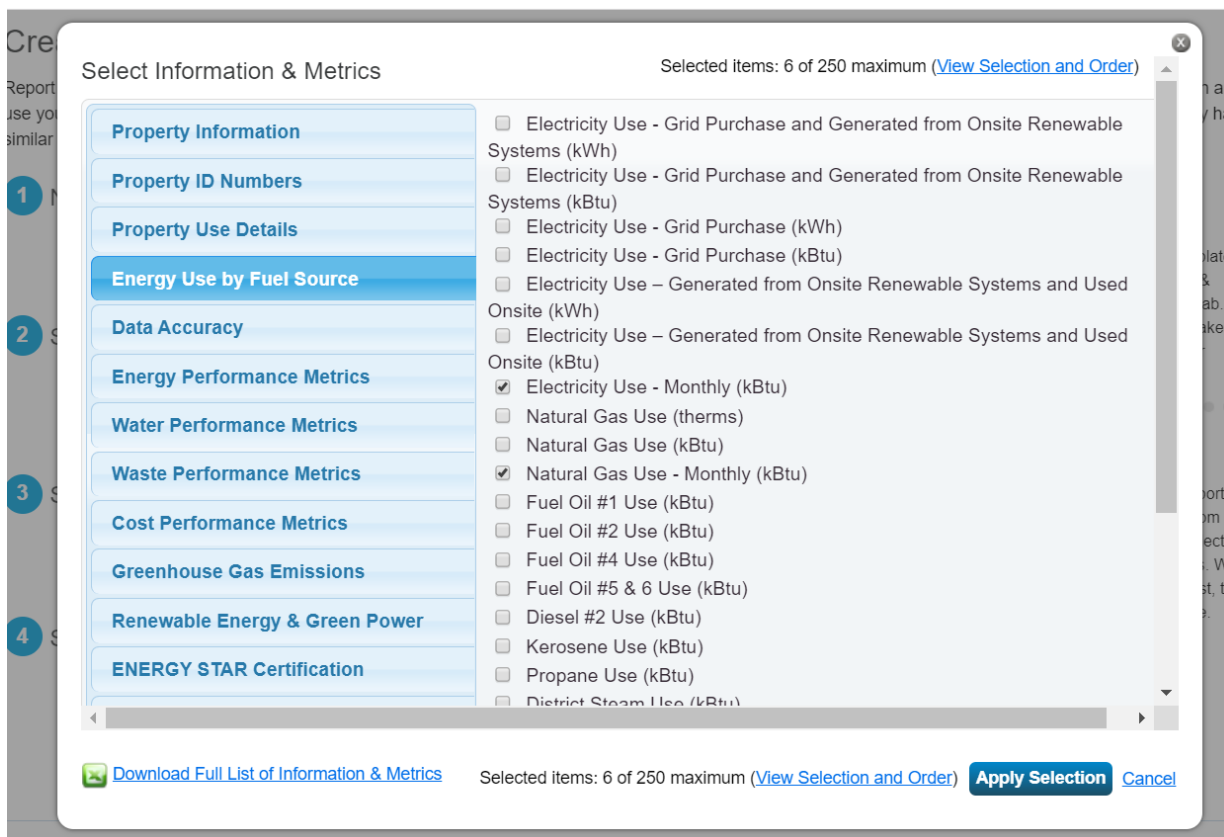
² For more information on how cities have used this information, reference *Putting Data to Work: How Cities are Using Building Energy Data to Drive Efficiency*, available at: <https://www.imt.org/resources/putting-data-to-work-how-cities-are-using-building-energy-data-to-drive-eff/>

Access to Monthly Data

Cities obtain benchmarking data from building owners by creating a **data request** in Portfolio Manager. After creating a Portfolio Manager account and logging in, city staff should go to the “Reporting” tab and click the button to create a new data request template. Portfolio Manager then prompts the user to identify the relevant time period, geographic area, and data fields sought for each building—normally, its address, use type(s), year of construction, floor area, and energy performance metrics such as electricity consumption, gas consumption, energy use intensity (EUI), and ENERGY STAR score, when available.

ENERGY STAR offers a video, “[How to Request Data from Portfolio Manager Users](#)” that lays out how to create a Portfolio Manager data request, step by step.³ To include monthly energy consumption data in the data request, city staff should select “Electricity Use (Monthly)” and “Natural Gas Use (Monthly)” from the menu of information and metrics used for creating the data request template (Figure 1).

Figure 1: Selecting Monthly Data for Inclusion in Portfolio Manager Data Request Template



³ The video, “How to Request Data from Portfolio Manager® Users,” from ENERGY STAR is available online at <https://www.youtube.com/watch?v=tIjIRtgPJc>

After the template is created, with all its key features confirmed by the creator, Portfolio Manager creates a unique URL for the data request. City staff send this URL out to building owners with an explanation of their obligations to respond to the data request. Then, by clicking on the link and logging into their own Portfolio Manager accounts, owners can fulfill the data request. For buildings whose data is already entered into Portfolio Manager, fulfilling the data request takes only a few clicks. ([This video](#) from ENERGY STAR explains how owners would respond to a data request, step by step.)⁴

Portfolio Manager compiles responses to data requests. The city staff who created the request can log back into Portfolio Manager to view the responses or download all the data as a Microsoft Excel file. The first worksheet of the Excel file shows the full-year summary of responses, while a second worksheet presents the full breakdown of monthly data. City staff can then store these files on their own servers, and receive updated versions via new data requests whenever desired.

For further support for use of Portfolio Manager data, city representatives should visit the ENERGY STAR website for city programs and policies.⁵



⁴ The video, “How to Respond to a Data Request in Portfolio Manager®” is available online at <https://www.youtube.com/watch?v=dfzoCGIIdc>

⁵ U.S. Environmental Protection Agency, ENERGY STAR Portfolio Manager: Develop programs and policies. Available via: <https://www.energystar.gov/buildings/program-administrators/state-and-local-governments/develop-programs-and-policies>

Data Quality

Because data for benchmarking building energy performance are self-reported by owners, errors and omissions regularly occur. Portfolio Manager provides data quality alerts to help users to avoid mistakes. Still, cities should take steps to cleanse the data to identify and, if warranted, correct or remove outlying records.

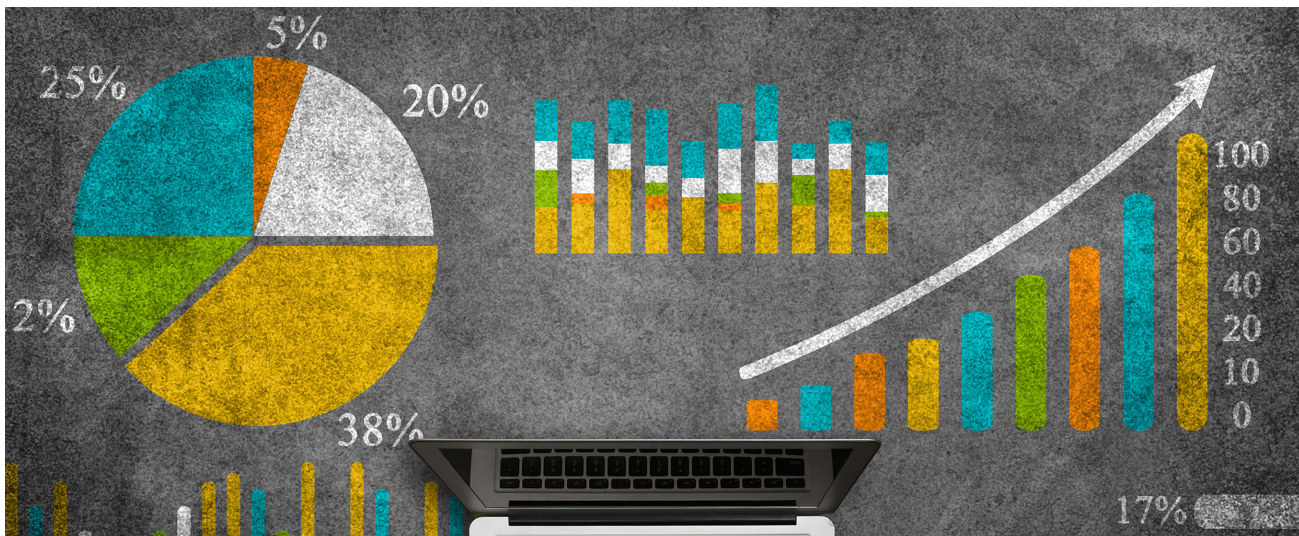
The Institute for Market Transformation (IMT) has produced a guide of best practices in this area, entitled *Managing Benchmarking Data Quality*.⁶ This guide describes both broad categories and specific examples of problems that can crop up in datasets. The guide also describes how city staff can help prevent or remedy these problems, with specific approaches and data-flagging criteria developed by leading cities. Cities may also make use of this [free, open-source tool](#) developed by Maalka under funding from the U.S. Department of Energy for evaluating the quality of Portfolio Manager datasets.⁷

Interpreting the Data

Once city staff have the file from the Portfolio Manager data request, they can interpret the data to gain surprisingly detailed and powerful insights about energy performance in individual buildings and groups of buildings.

For each building, the files will normally include figures for monthly gas and electricity consumption. In most of the United States, these monthly data will show the following general patterns:

- Energy consumption for heating will rise in colder months;
- Energy consumption for cooling will rise in warmer months;
- Except under unusual circumstances, energy consumption for lighting, cooking, and plug loads remain more or less constant throughout the year.



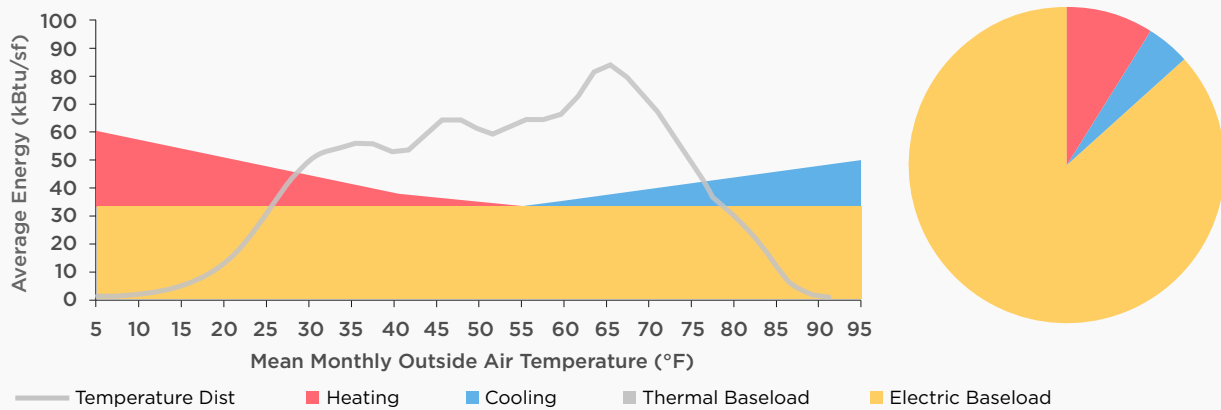
⁶ Zachary Hart, "Managing Benchmarking Data Quality," IMT, May 2018, accessed at <https://www.imt.org/wp-content/uploads/2018/05/Managing-Benchmarking-Data-Quality.pdf>.

⁷ Maalka, "Data Quality Tool," accessed at <http://dataquality.maalka.com/#/>

Monthly data make it possible to identify energy use by these broad end-use types, as shown in Figures 2-6, which are based on actual energy consumption data from real buildings. Note how lighting, cooking, water heating, and plug loads form an essentially flat level of baseline consumption, while cooling and heating appear as peaks in the relevant seasons. Observed across a population of buildings, these patterns can help reveal how individual buildings stand out for specific types of anomalous energy consumption, including:

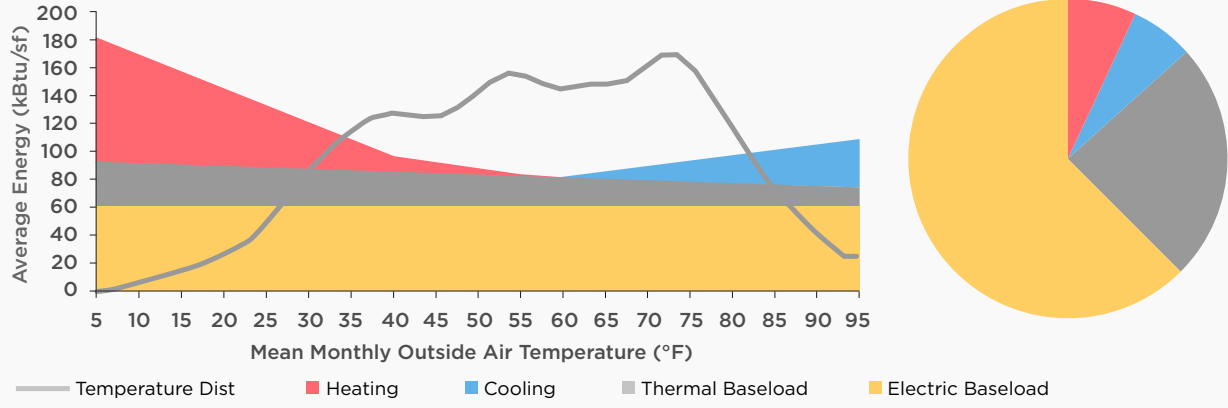
- Unusually high electric base loads can indicate inefficient lighting, cooking, water heating, or plug loads. (Figure 2);
- Unusually high thermal base loads can indicate inefficient use of hot water, or problems with hot-water recirculation or HVAC reheat systems. (Figure 3);
- Unusually high cooling or heating loads indicate inefficient HVAC equipment, controls, and building envelopes. (Figures 4 and 5);
- Overlapping heating and cooling loads indicate problems with HVAC controls or arrangement of zones in the building. (Figure 6).

Figure 2: High Electric Base Load



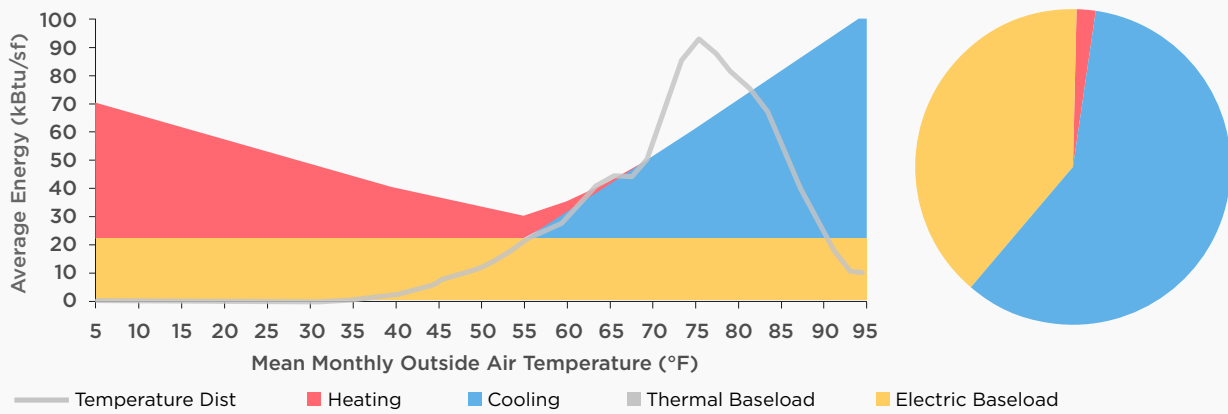
Source: New Buildings Institute (FirstView report based on actual building data).

Figure 3: High Thermal Base Load



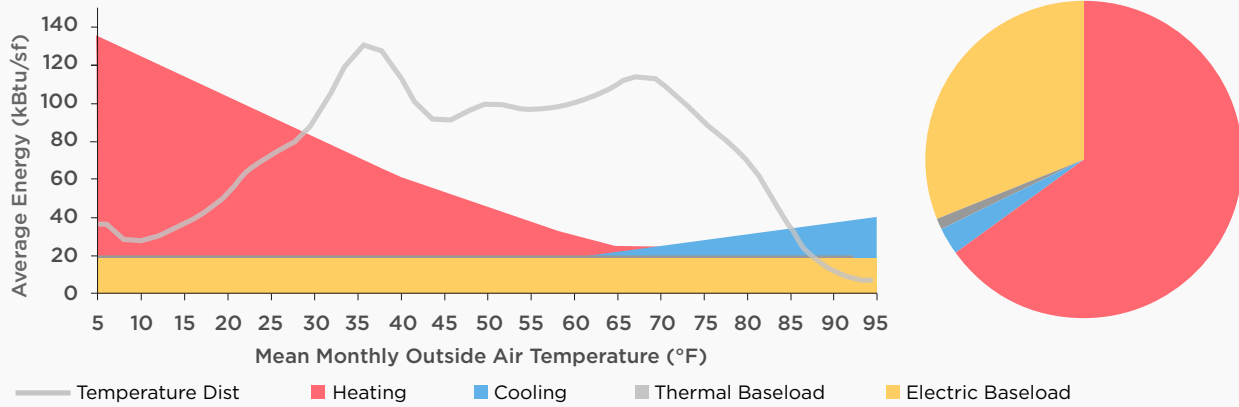
Source: New Buildings Institute (FirstView report based on actual building data).

Figure 4: High Cooling Load



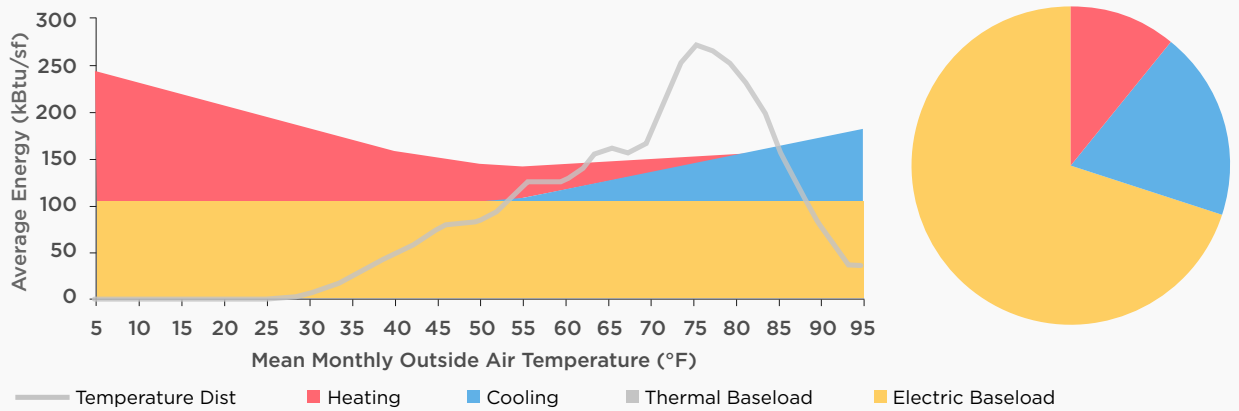
Source: New Buildings Institute (FirstView report based on actual building data).

Figure 5: High Heating Load



Source: New Buildings Institute (FirstView report based on actual building data).

Figure 6: Overlapping Heating and Cooling Loads



Source: New Buildings Institute (FirstView report based on actual building data).

Data Analytics and FirstView

Though these patterns are relatively straightforward, finding them in the data requires some work beyond simply inspecting the Excel file—including compilation of modest additional data (such as average outdoor temperatures for each month), determination of how to handle outlying data points, analysis, and graphic representation of the data.

Normally, a city would hire a contractor to perform these tasks. The clear industry leader in this area for the city government use case described here is **New Buildings Institute (NBI)**, a nonprofit organization based in Portland, Oregon. Under support from ENERGY STAR, NBI developed a virtual energy auditing software tool called [FirstView](#), which uses monthly data from Portfolio Manager to diagnose opportunities for improvement in buildings, provide actionable recommendations for energy savings, and compare buildings to their peers. Buildings can be compared to their peers in the same city or nationwide. FirstView has been designed not only to provide analysis for individual buildings (as in Figures 2–6, which are extracted from FirstView reports), but also to work across an entire portfolio to help cities and property owners strategically prioritize the specific buildings and end uses with the greatest opportunities for energy savings. FirstView has been used in thousands of buildings by states, cities, school districts, and the U.S. Green Building Council.



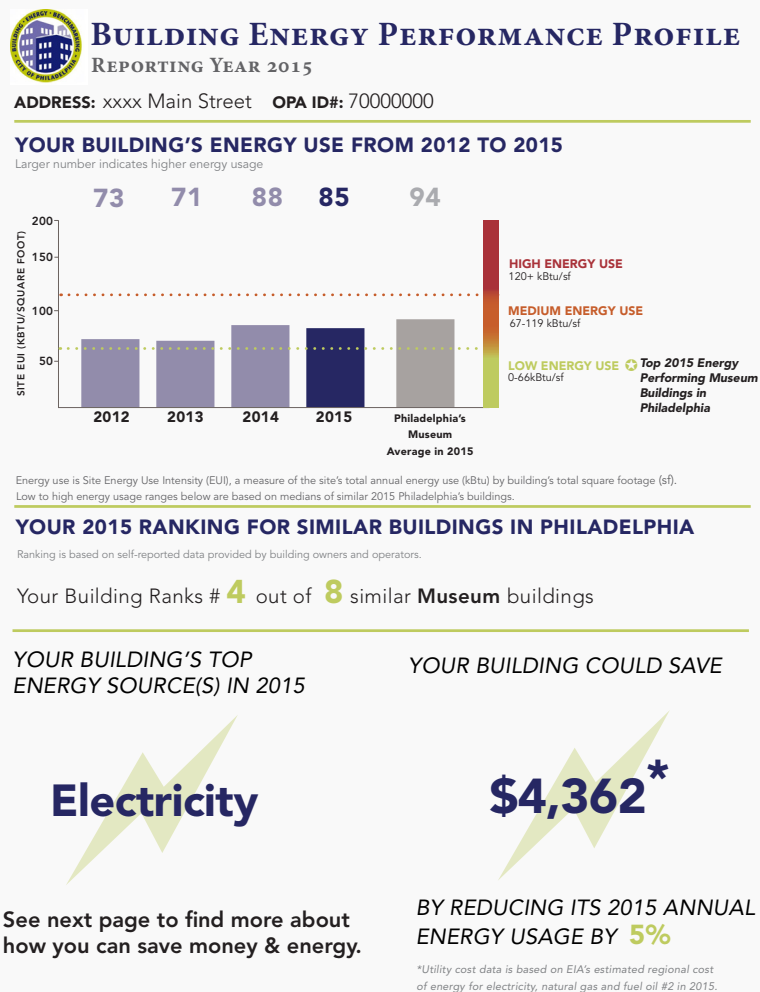
Using Insights from Monthly Data

Having identified buildings with various energy performance anomalies, cities and local governments can act on findings in two related ways.

The first way is to provide **feedback to owners**. The city, having flagged low-performing buildings, could notify the owners, explain the problems that the analysis uncovered, and provide recommendations and referrals to city programs, utility incentives, and vetted providers of services in energy audit, retrocommissioning, and energy management. Cities could even require remedial action within a specific timeframe.

The city could also provide a scorecard to all owners, as a kind of enhancement beyond standard Portfolio Manager outputs, similar to what Seattle, Philadelphia, and other cities are already providing to owners, as shown in Figure 7.

Figure 7: Philadelphia Energy Performance Profile



The second way is **to refine priorities and improve cost-effectiveness of city and utility efficiency programs**. Both utility and city energy efficiency programs for buildings face a common challenge. On the one hand, it is expensive and inefficient to blanket the entire population of buildings with informational outreach and incentives for efficiency. On the other hand, it is also expensive and time-consuming for programs to generate “qualified leads” by identifying low-performing buildings via audits, studies, surveys, and the like.

In contrast, in only a few keystrokes, cities can obtain monthly data that owners need to compile anyway in order to comply with benchmarking mandates. With some analysis, the data can lead to similar qualified leads to low-performing buildings and even specific problematic end uses. **Thus, at much less cost and inconvenience for program staff and owners alike, monthly data can help sharpen priorities and ensure that scarce program resources go where they will have the greatest impact.**



RESOURCES

Institute for Market Transformation

Putting Data to Work program: <https://www.imt.org/how-we-drive-demand/building-policies-and-programs/putting-data-to-work/>

New Buildings Institute

FirstView: <https://newbuildings.org/resource/firstview/>

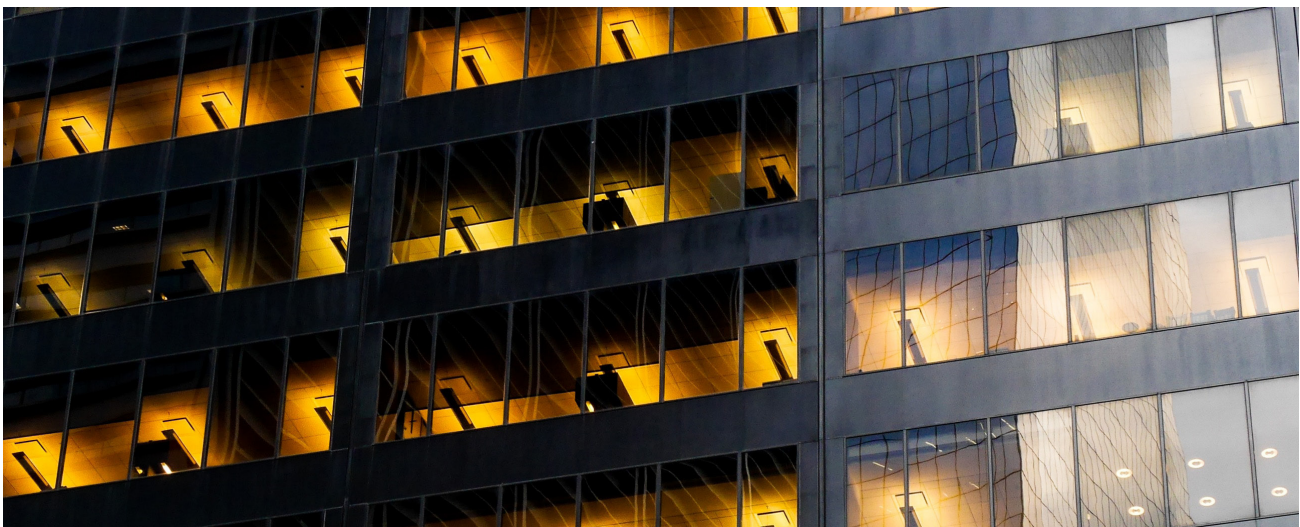
Public Buildings Portfolio Management program: <https://newbuildings.org/resource/public-buildings-portfolio-management/>

U.S. Department of Energy

DOE Data Tools: <https://www.energy.gov/eere/buildings/building-energy-data>

U.S. Environmental Protection Agency

Portfolio Manager: <https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager>



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