



# TRACKING ENERGY TO TAKE ACTION:

A GUIDE TO ENERGY BENCHMARKING FOR PENNSYLVANIA

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## EXECUTIVE SUMMARY

Tracking and comparing energy use in buildings, or “benchmarking,” is a management technique that has grown in prominence in recent years. From Pennsylvania’s small towns, such as New Berlin, to its most vibrant cities, Pittsburgh and Philadelphia, benchmarking is used to help building owners and energy consumers organize and analyze information, which enables better decision-making regarding the energy used to light, heat, and cool our state’s buildings.

In 2013, Pennsylvania’s businesses and communities spent \$5.9 billion on energy consumption in commercial and public buildings, such as schools and government offices (U.S. Energy Information Administration, 2012). With this magnitude of spending, even small opportunities to use energy more efficiently can direct scarce resources elsewhere to bolster our economy and lower utility bills for customers.

**TO HIGHLIGHT THIS POINT, A RECENT STUDY OF 35,000 BUILDINGS THAT BENCHMARKED THEIR ENERGY CONSUMPTION FOR THREE CONSECUTIVE YEARS FOUND THAT, ON AVERAGE, THEY USED 2.4 PERCENT LESS ENERGY ANNUALLY FOR A TOTAL OF 7 PERCENT ENERGY SAVINGS FROM 2008 TO 2011**

(U.S. ENVIRONMENTAL PROTECTION AGENCY, 2012).

Building owners, managers, and occupants need to invest in more efficient technology or change behavior to reduce energy consumption, and benchmarking can serve as the foundation for this work. As the adage suggests, one cannot manage what one cannot measure. A recent survey by the KEEA Energy Education Fund (KEEF) identified 46 energy benchmarking programs in 23 states, and the practice is already familiar to many communities in Pennsylvania. Such programs have diverse components, and this report defines

those elements, describes some key differences, and provides examples of two benchmarking initiatives in Pennsylvania: Philadelphia’s Building Energy Benchmarking Ordinance and the Green Workplace Challenge, serving the greater Pittsburgh area.

With this report, KEEF enables Pennsylvania’s local leaders to take advantage of this promising strategy, which is already used by many of the nation’s leading real estate businesses. Benchmarking facilitates increased investment in the energy efficiency of our state’s buildings, which can deliver myriad social, economic, and environmental benefits including lower energy costs and increased satisfaction for utility customers, the creation of jobs and healthier work environments, an increase in the stability and reliability of the electrical grid, and decreases in the emissions of carbon and other harmful pollutants.

Additionally, benchmarking can serve as the foundation for broader market transformation. Many benchmarking programs support the disclosure of energy consumption information to the public. Doing so allows leaders in real estate and financial markets to make more informed decisions about purchasing, leasing, and lending. Indeed, studies demonstrate that buildings deemed to perform well with respect to energy bear financial premiums, and increased property values can augment local tax revenues.

Pennsylvania’s leaders are ready to take the next step to improve the energy efficiency of our buildings. This report can serve as a guide of the available options through benchmarking and to support the creation of programs that expand our state’s energy efficient economy.

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## ABOUT KEEA & KEEA ENERGY EDUCATION FUND

The Keystone Energy Efficiency Alliance (KEEA) is a non-profit, tax-exempt 501(c)(6) corporation dedicated to promoting the energy efficiency and renewable energy industries in Pennsylvania. KEEA advocates among decision-makers on the local, state, and federal levels. By representing the interests of the clean energy industry in Pennsylvania, KEEA is growing the market for energy efficiency and helping the Keystone State secure a prosperous, sustainable tomorrow.

KEEA's sister organization, the KEEA Energy Education Fund (KEEF), is a nonprofit, tax-exempt 501(c)(3) corporation, whose mission is to increase the energy efficiency of Pennsylvania's buildings through advocacy, education, and training.

This report is a project of KEEF.

Learn more about us at [www.keealliance.org](http://www.keealliance.org).

Northumberland



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## INTRODUCTION: ENERGY BENCHMARKING CONTEXT AND DEFINITIONS

Nearly 23 percent of all the energy consumed in Pennsylvania's buildings is used in commercial properties for basic functions such as heating, cooling, and lighting. In 2013 this consumption cost the state's businesses and public sector \$5.9 billion (U.S. Energy Information Administration, 2012). With the grand scale of use and expenditure, any opportunity to decrease consumption can result in substantial energy and cost savings. But how does one begin to identify the opportunity? How do we begin to understand where we can save?

In many ways energy use is invisible and these questions dodge answers. Energy arrives in buildings through wires and pipes, barely noticed and easily overlooked by occupants. The lights turn on, the building heats and cools, but the means to do so is hidden in the basement, on the roof, or behind the walls. In buildings with multiple tenants with multiple utility accounts, the use of energy is fragmented and further hidden from view. These conditions resist management.

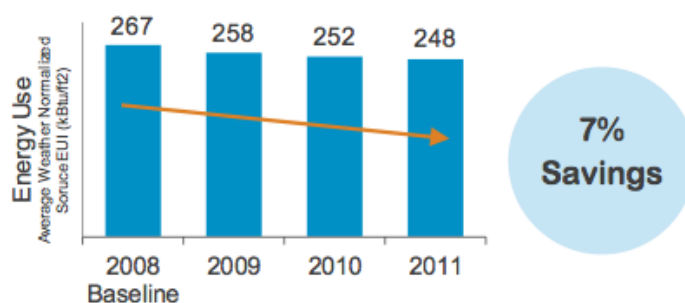
The elusive nature of energy is especially frustrating as the cost of energy, unlike many expenses of property ownership or occupancy, such as financing, taxes, and insurance, is one that can be managed by the owner or occupant. Most buildings offer opportunities to improve the efficient use of energy, which results in lower operating costs. A 2011 study of the Philadelphia region suggests that 77 percent of commercial buildings are ripe for energy efficiency upgrades (Econsult Corporation, 2011). But, again, where do we start?

Anyone who owns property or a business uses efficiency and productivity metrics as indicators of value. For example, most automobile purchasers rely on miles-per-gallon ratings

to understand expected fuel costs. However, in contrast to other elements that affect a building's value, such as an office building's occupancy rate or net operating income, energy efficiency can be difficult to quantify.

To address these issues, property owners and occupants are increasingly turning to benchmarking their energy consumption. Tracking and comparing, or "benchmarking," building energy use enables greater understanding of the energy consumed in a building or a portfolio of buildings. Energy benchmarking<sup>1</sup> is a management technique that is free, is used by some of the nation's largest real estate companies, and allows owners and managers to make more informed decisions about energy consumption. A recent study of 35,000 buildings that benchmarked their energy consumption for three consecutive years found that, on average, they used 2.4 percent less energy annually for a total of 7 percent energy savings from 2008 to 2011 (U.S. Environmental Protection Agency, 2012).

### Energy Savings in Portfolio Manager



Source: [http://www.energystar.gov/ia/business/downloads/datatrends/DataTrends\\_Savings\\_20121002.pdf](http://www.energystar.gov/ia/business/downloads/datatrends/DataTrends_Savings_20121002.pdf)

<sup>1</sup>In many cases, benchmarking initiatives also address water consumption, which offers many benefits. For the purposes of this report the discussion is limited to energy use.

In recent years many governmental, business, and advocacy organizations have launched initiatives to encourage or require energy benchmarking. In almost all cases these programs serve commercial, large residential (e.g. multifamily), or public buildings. The commercial sector is a priority as the savings opportunity in a building generally scales with its size, and with more concentrated ownership than the residential market the focus can be on actions to better manage energy use.

While benchmarking programs vary considerably they share a common goal: to promote more informed management of building energy consumption, which can deliver critical economic, social, and environmental benefits. With varied formats, an initial review of benchmarking programs may seem daunting. This report strives to outline the basic elements of benchmarking for those interested to leverage this promising strategy in Pennsylvania.

## Economic, Social, and Environmental Benefits of Improved Energy Efficiency

Improvements in the energy efficiency of buildings promise tremendous economic, social, and environmental benefits, and benchmarking provides a tool to focus these efforts. National and local research highlights the benefits, including: lower energy costs for customers, the creation of jobs and healthier work environments, an increase in the stability and reliability of the electrical grid, and decreases in the emissions of carbon and other harmful pollutants. A sample of relevant research includes the following:

- A 2009 study from the American Council for an Energy Efficient Economy estimates that by 2025, adoption of targeted, cost-effective energy efficiency policies could save Pennsylvania utility customers \$4.8 billion annually, create 27,000 new jobs, and reduce carbon emissions by 40 million tons as compared to business as usual projections (American Council for an Energy-Efficient Economy, Summit Blue Consulting, Vermont Energy Investment Corporation, ICF International, & Synapse Energy Economics, 2009);
- Pennsylvania Governor Tom Corbett's *Energy = Jobs: Pennsylvania State Energy Plan*, released in January 2014, reports that Pennsylvania has the "5th highest number of energy and resource efficiency jobs in the nation with 42,548 employees" and estimates that in 2013, energy efficiency and demand response programs created 1,600 Pennsylvania jobs and saved the state's electricity customers \$3 billion (Tom Corbett, Governor, 2014); and
- A collection of research at Carnegie Mellon University's Center for Building Performance Diagnostics suggests that energy efficient building environments can reduce symptoms of illnesses such as flu, asthma, and headaches by an average of 43 percent through improved control of outside air, lighting, moisture, and pollutants. Additionally, these studies suggest that improved office lighting increases worker productivity by a median of 3.2 percent (Optimal Energy, Inc., 2011).

## Benchmarking is the Beginning, Not the End

While benchmarking may be necessary it is not sufficient to improve building efficiency; action is required. Benchmarking "can tell a building owner how a given building rates, [but] it does not explain how to develop solutions ... or how to implement them. Thus, benchmarking should be part of a larger framework" of policies and programs that enable building owners and managers to improve their efficiency and to deliver cost savings to utility customers (State and Local Energy Efficiency Action Network, 2012, p. 5). With lower energy costs, Pennsylvania's businesses can invest scarce resources elsewhere which can yield better returns for our economy.

In many areas, Pennsylvania included, public programs provide incentives and rebates to building owners who invest in energy efficiency, and benchmarking can provide the energy-literacy and motivation to act. Our state's utilities administer the Act 129 Energy Efficiency and Conservation Programs, through which they provide incentives and services to building owners to reduce the state's electric use and demand. These initiatives decrease electric consumption, enhance the stability of the state's electrical grid, forestall the need to build new power plants, and can improve customer satisfaction with the utility provider.

Benchmarking enhances the propensity to act, especially when leveraged by energy efficiency program administrators such as Pennsylvania's electric utilities. The major investor-owned utilities in California implemented a benchmarking program in recent years. A 2012 evaluation by the California Public Utilities Commission finds that "84 percent of those who benchmarked their buildings said that they either had, or planned to, implement improvements.... For most



respondents, the improvements were associated with programs offered by their utility” (State and Local Energy Efficiency Action Network & Andrew Schulte, ICF International, 2013, p. 8).

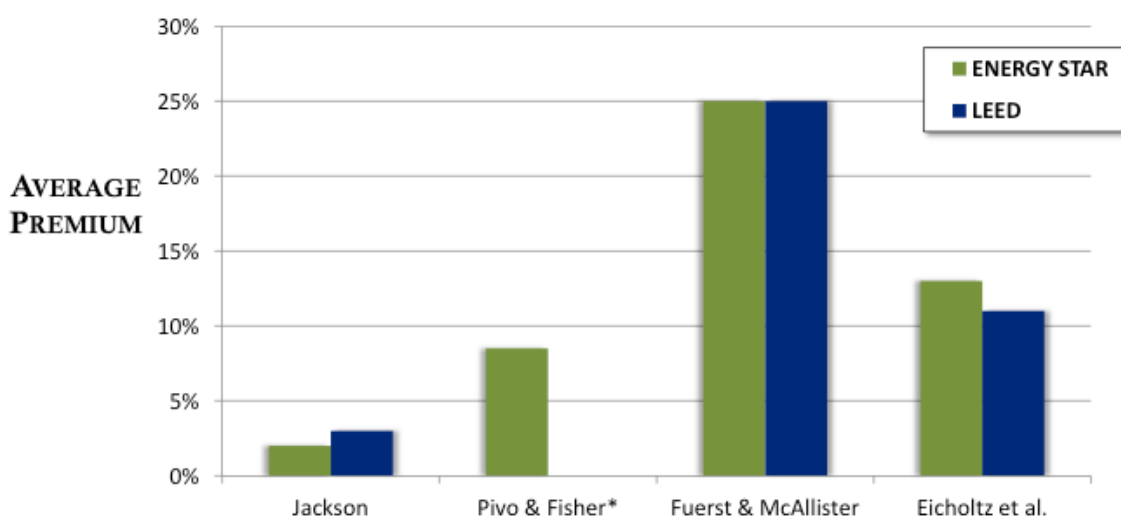
In addition to decreases in energy use and uptake in programs like Pennsylvania’s Act 129 initiatives, energy benchmarking can be the foundation for greater market transparency and efficiency and other public benefits – especially where the information benchmarked is shared with external parties.

Transparency enables market actors to make more informed choices and can motivate building owners and managers

to address energy consumption based upon the trends of peer buildings. A recent survey finds that 53 percent of those benchmarking either had or plan to use benchmarking to differentiate the property among other buildings (Vaidya, Nevius, Lamming, & Lyle, 2012).

Additionally, with greater transparency, prospective purchasers and tenants can incorporate energy costs into buying and leasing decisions. Studies show that green buildings are rewarded with financial premiums, and increased market value can result in higher tax revenues and improved public services (Institute for Market Transformation, 2011).

## Sale Premiums of Green Commercial Buildings in the U.S.



© Institute for Market Transformation, 2011.

\*Study did not include LEED buildings.

Sources: Jackson 2009; Pivo & Fischer 2010; Fuerst & McAllister 2009, 2011; Eicholtz, Kok, & Quigley 2010, 2011.

For more information, please contact David Leipziger at david@imt.org.



Source: Institute for Market Transformation:

[http://www.imt.org/uploads/resources/files/2Added\\_Value\\_of\\_Greener\\_Buildings\\_-\\_Sale\\_Price.pdf](http://www.imt.org/uploads/resources/files/2Added_Value_of_Greener_Buildings_-_Sale_Price.pdf)



## Voluntary and Mandatory Benchmarking

The next section summarizes key components of a benchmarking program and its administration. However, before wading into the details, it is worth addressing some critical differences among benchmarking programs and associated themes.

Participation in benchmarking programs may be voluntary or mandatory. Advocacy groups, real estate trade associations, such as the Building Owners and Managers Association (BOMA), and local and state governments have launched many voluntary benchmarking programs. They recruit participants and benchmarking is often one factor within a broader sustainability initiative. Mandatory benchmarking programs,

which have grown significantly in number recently, are an initiative of a unit of government and require the owners of certain buildings to benchmark their energy consumption. The adoption of a mandatory benchmarking program depends, at least in part, on local stakeholders' goals and the policy, regulatory, and political context.

Often, though certainly not always, mandatory benchmarking programs emerge after local stakeholders become familiar with benchmarking through voluntary initiatives. A mandatory program is likely to have a broader scale of application, as Table 1 suggests through a sample of three cities, and it introduces benchmarking to those businesses not already doing so.

**TABLE 1: SCALE OF APPLICATION OF VOLUNTARY AND MANDATORY BENCHMARKING PROGRESS**

City	Type	Program/Policy	Buildings Included	Floor area included (millions of square feet)
BOSTON	Voluntary	Challenge for Sustainability (2009-2013)	97	27
	Mandatory	Building Energy Reporting and Disclosure Ordinance (2013)	1600	250
MINNEAPOLIS	Voluntary	BOMA of Greater Minneapolis Kilowatt Crackdown (2012)	80	25
	Mandatory	Commercial Building Rating and Disclosure Ordinance (2013)	625	110
SEATTLE	Voluntary	Seattle Kilowatt Crackdown (2009)	53	18
	Mandatory	Council Bill 116731 (2010)	3600	295



## COMPONENTS OF A BENCHMARKING PROGRAM

This section outlines the components of a benchmarking program. Interested readers will find additional resources in the footnotes and suggestions for additional reading at the end of the report.

### Goals, Program Structure, and Stakeholder Engagement

The structure of a benchmarking program depends on the goal of the initiative, which should be defined by its proponents, intended administrators, and the community of buildings to be served. To define the goal and structure of a benchmarking initiative, including whether it will be voluntary or mandatory<sup>2</sup> or whether it will entail some type of disclosure, advocates and administrators of existing programs underscore the importance of convening relevant stakeholders early in the initiative's development phase (Hill & Dunsky, 2013). With a well-facilitated discussion, relevant parties can learn, deliberate, and define the program best suited to the local context.

### Benchmarking Methods and Tools

There are three benchmarking methods. Building energy consumption can be compared: 1) to the same building over time, 2) to similar buildings, or 3) to a modeled simulation of the building's consumption based on an established standard, such as an energy code. There are many benchmarking tools available from the public and private sector, and their capabilities vary.

ENERGY STAR Portfolio Manager (ESPM), for instance, is perhaps the most widely used benchmarking tool in the United States, and it is the preferred method of all mandatory benchmarking and disclosure programs nationally (Institute for Market Transformation, 2014). It currently benchmarks the energy used in 40 percent of the commercial building space in the United States and 35 percent of Fortune 500 companies ("Use Portfolio Manager: ENERGY STAR Buildings & Plants," n.d.). For these reasons this report references ESPM frequently.

Created and managed by the U.S. Environmental Protection Agency (EPA), ESPM is a free interactive online tool that helps building owners track energy over time and, for some buildings, enables a comparison to similar buildings. For any building, owners or managers provide basic information about the building's characteristics and the energy consumed. The tool organizes and presents the information to facilitate analysis and decision-making, to support energy performance improvements, and to track results.

For a subset of the most common building types ESPM reports an ENERGY STAR score based on a comparison of the subject facility and peer buildings.<sup>3</sup> A score of 1-100 is assigned by a method that accounts for variations in building size, location, and energy use profile. The peer references are determined through a survey of buildings nationally, not only other buildings benchmarked in ESPM.<sup>4</sup> A high score reflects low building energy use relative to similar buildings, and owners of buildings with scores above a 75 can request special certification and recognition by the ESPM program.<sup>5</sup>

<sup>2</sup> Of course, only units of government with the requisite statutory and regulatory authority can require buildings to participate in a benchmarking program.

<sup>3</sup> For a list of the building types eligible to receive an ESPM score, see: <http://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager/identify-your-property-type-0>.

<sup>4</sup> For information about how ESPM calculates the score, see: <http://www.energystar.gov/buildings/facilityowners-and-managers/existing-buildings/use-portfolio-manager/understand-metrics/how-1-100>.

<sup>5</sup> For information about how a building can be ENERGY STAR certified, see: <http://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earnrecognition/energy-star-certification>.

While ESPM delivers benchmarking over time and in comparison to similar buildings, it does not have the capability to benchmark a building against a design standard. Minnesota's B3 Benchmarking program, in contrast to ESPM, offers a tool that benchmarks a building's energy use against its predicted, or modeled, consumption as if the building's design and systems satisfied the current energy code.<sup>6</sup> In this manner, the B3 Benchmark suggests the potential energy savings available if the subject building were to upgrade its systems to current standards. Interestingly, while the B3 Benchmarking software provides a perspective uniquely different from ESPM, the B3 program is integrated with the EPA's tool to leverage ESPM's peer comparison – a testament to the broad market acceptance of ESPM.

## Buildings Covered

A benchmarking program needs to define the type (e.g. commercial, residential, etc.), size (e.g. threshold based on square footage), and the ownership (e.g. public or private) of buildings it seeks to serve. Benchmarking programs commonly focus on a subset of buildings within a designated region. This scope is often based upon the program's goals, stakeholder preferences, and administrative capacity. For example, New York City's benchmarking program seeks to help the city realize a 30 percent reduction in greenhouse gas emissions by 2030. It requires all commercial and residential buildings (with some exceptions) larger than 50,000 square feet to benchmark and disclose their energy consumption annually using ESPM (Institute for Market Transformation, 2014). With this size threshold the program covers about 2 percent of New York City's building stock by number, and about 50 percent of the total building floor area in the city (Keicher, 2014).

## Access to and Collection of Energy Consumption Information

Benchmarking programs rely on energy consumption data such as the kilowatt hours (kWh) of electricity, therms of natural gas, or gallons of fuel oil used over a period of time. The access to and the collection of this information can be more complicated than it initially seems due to logistical

complexities, regulatory guidance, and privacy concerns.<sup>7</sup> Fortunately, increased experience with benchmarking nationally and advances in information technology are now helping to overcome these hurdles.

There are two primary sources of energy consumption information: the local utility and, of course, the customer. As benchmarking seeks to support the building owner or manager to make more informed decisions, collecting this information from the customer is an obvious place to start. Where the energy consumed in a building passes through only one meter or account the situation is relatively simple. However, where there are multiple utility meters or accounts paid by the owner and numerous tenants the situation is more challenging. Mandatory benchmarking programs often require tenants to provide the owner with the information needed to benchmark the property (City of Boston, 2013; City of Philadelphia, 2012), but the added eyes on energy consumption information often conjures privacy concerns and the additional handling of the data creates opportunities for errors.

With the potential for complexity on the customer side of the meter, it is logical to turn to the utility provider for assistance. To support many benchmarking programs utilities transmit energy consumption data, with appropriate customer authorization, directly to online benchmarking tools, such as ESPM.<sup>8</sup> In some areas utilities are aggregating the consumption associated with multiple accounts in a building and delivering it to the owner or benchmarking tool. This arrangement masks individual consumption details, addresses privacy concerns, and mitigates the opportunities for data entry errors. Con Edison of New York, for example, provides aggregated, whole-building consumption information across all meters "without revealing particular or identifiable customer information" within 15 days of a request by a commercial or multifamily building owner (The Regulatory Assistance Project, 2013, p. 10).

Regardless of the means to access and collect energy consumption data for benchmarking, those with experience creating, administering, and participating in benchmarking

<sup>6</sup> For more information about B3 Benchmarking, see: <https://mn.b3benchmarking.com>.

<sup>7</sup> For thorough discussion of issues related to customer utility data access and management, see: [http://www1.eere.energy.gov/seeaction/pdfs/commercialbuildings\\_data\\_access\\_guide.pdf](http://www1.eere.energy.gov/seeaction/pdfs/commercialbuildings_data_access_guide.pdf).

<sup>8</sup> For an example of PECO's services to automatically transmit consumption data to ESPM, see: <https://www.peco.com/savings/programsandrebates/business/pages/pecosmartenergyusagedatatool.aspx>



programs underscore the importance of involving utilities early in the program development process (Burr, Keicher, & Leipziger, 2011; Hill & Dunskey, 2013; State and Local Energy Efficiency Action Network, 2012).

## Disclosure

Where an initiative intends to publicly disclose certain elements of the benchmarking information, the program needs to articulate: 1) the information that will be disclosed, 2) the circumstances under which the information will be disclosed, and 3) the means through which the information will be disclosed.

Benchmarking programs with a disclosure component can choose several metrics and accompanying information to report. All mandatory benchmarking and disclosure programs in the United States use ESPM, which easily generates and provides several relevant metrics to the administering agency. Common metrics include the units of energy consumed, greenhouse gas emissions from energy consumption, and the ESPM score (where applicable). Additionally, some jurisdictions, such as Cambridge, MA, are considering disclosing contextual information about the building to enable external parties, such as energy efficiency service providers, to better understand the energy metrics disclosed (John Bolduc, 2014).

Of existing benchmarking and disclosure programs, the act of disclosure either happens annually or at a point of transaction, such as a sale, leasing, or refinancing of the property. Additionally, there are several means of disclosure. Most programs in the United States currently disclose the information on a public website. Some of these programs also require the building owner to provide the information disclosed to tenants of the property or other relevant actors (Institute for Market Transformation, 2014).

## Phasing Implementation

Depending upon the goal and scope of the benchmarking program, it may be appropriate to phase or sequence its implementation. A voluntary benchmarking program, for example, may seek to initially target one type of building and then expand to others. For mandatory benchmarking programs the responsible jurisdiction often benchmarks publicly-owned buildings first and then requires privately-owned buildings to benchmark. Doing so enables the government jurisdiction to lead by example and to become comfortable with the benchmarking process, and therein to

become better prepared to support owners and managers in the private sector (State and Local Energy Efficiency Action Network, 2012). Similarly, it may be appropriate to first target larger buildings, fewer in number, and then to require benchmarking of smaller buildings, as the City of Boston's energy benchmarking and disclosure ordinance requires (City of Boston, 2013).

## Outreach, Education, and Capacity

The experiences of benchmarking program administrators across the United States underscore the critical need for a comprehensive outreach and educational initiative and the staff capacity to implement the program smoothly.

Outreach initiatives need to publicize the benchmarking initiative and provide opportunities to educate the owners and managers of buildings expected to benchmark. Often there are opportunities to leverage existing benchmarking resources and partners. For example, due to the scale and growth of the industry's use of ESPM, the EPA offers trainings on the use of the tool for free and at regular intervals. Real estate and industry trade organizations, such as the local chapters of BOMA and the United States Green Building Council, have been allies and advocates of benchmarking programs nationally and can facilitate peer-to-peer educational opportunities. Experience suggests that a variety of training modules can help spread the word, including general trainings online and in-person; distinct trainings for unique market subsectors, such as commercial real estate, retail, or hotels; and opportunities for one-on-one question and answer sessions (Burr et al., 2011).

Of course, the creation and coordination of an outreach and educational program requires staff resources. Program administrators frequently assign one or more staff to manage an initiative. The work can be substantial and it scales with the program's scope and complexity. Furthermore, the program's needs may change over time. In the early years, administrators need to focus on outreach and education, program guidance documents, data-sharing and management options, reporting templates, and, often, interaction with media. In subsequent years, the need for outreach and training may lessen, but program coordination and data management remain and new opportunities may emerge to layer efficiency actions upon the foundation benchmarking provides.

## Enforcement

Enforcement for non-compliance in a benchmarking program only applies to mandatory initiatives. Most mandatory benchmarking initiatives enable the administering authority to issue fines for non-compliance to owners and tenants, though such programs also structure their work to mitigate the need to issue penalties. For example, existing programs have worked diligently to properly identify and communicate with the owners of the buildings required to participate. Doing so facilitates more effective outreach, which can decrease the need to issue fines. Program administrators often use tax assessment records to identify buildings and their owners, and rely on membership information of trade associations such as BOMA, or the research of companies such as the CoStar Group (Burr et al., 2011). Program administrators often issue letters of non-compliance and strive to work with building owners before advancing to financial penalties (Hill & Dunskey, 2013).

## Quality Assurance

The accuracy of the information tracked is a critical component of a benchmarking program and it is fundamental for a mandatory benchmarking and disclosure initiative seeking to enhance market transparency.

Data quality challenges may emerge through simple errors of data entry and, in rare cases, by individuals trying to game the system. Several strategies can hedge against these problems. Many mandatory benchmarking programs authorize program administrators to audit building records should the need arise, but this solution is often impractical due to resource constraints. Some programs consider verification of the data inputs by a third party (State and Local Energy Efficiency Action Network & Andrew Burr, Institute for Market Transformation, 2012). Such a practice is well understood in the industry and is a requirement for those seeking public recognition through ESPM's certification program, but third party verification can add costs for program participants (State and Local Energy Efficiency Action Network & Andrew Burr,

Institute for Market Transformation, 2012). In many cases, the automatic upload of energy consumption data from utilities to the benchmarking tool, such as ESPM, can mitigate human errors. Additionally, program advocates suggest that with the increased transparency of disclosure additional eyes on the data can flag potential problems (Burr et al., 2011).

## Indicators of Success

Like any initiative, the possible indicators of a program's success depend upon the goals sought. Nevertheless, for all benchmarking programs an important metric is the participation or compliance rate among the population of buildings the initiative seeks to serve. Several high-profile benchmarking initiatives in the United States have demonstrated that high compliance rates are possible, and Philadelphia is among the leaders. In 2013, Philadelphia's mandatory benchmarking program achieved an 86 percent compliance rate (Dews, Freeh, & Wu, 2014).

With a longer-term perspective, and recognizing that benchmarking is a means to future action, benchmarking program administrators, and many others, may be interested to understand the initiative's impact on participation rates in energy efficiency programs or a reduction in the energy consumption or energy intensity of buildings the program serves.

Erie



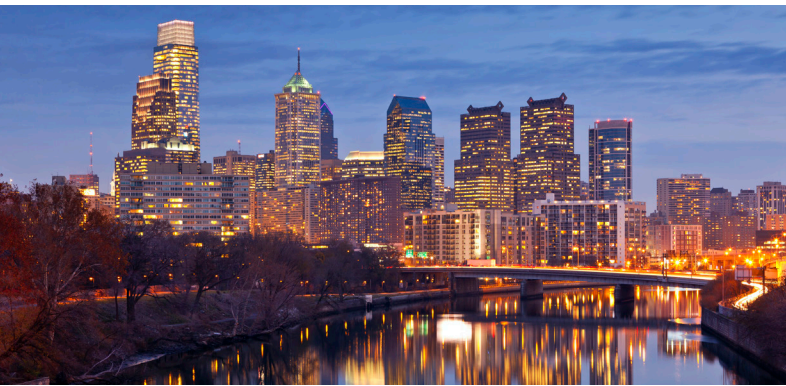
## BENCHMARKING IN ACTION

A recent KEEF survey identified 46 energy benchmarking programs in 23 states, and the practice is already familiar to many communities in Pennsylvania. SEDA-Council of Governments, which serves local and county governments, businesses, and community organizations in an 11-county region in Central Pennsylvania, helps its clients benchmark and manage their energy consumption<sup>9</sup>. Similarly, the Delaware Valley Regional Planning Commission has been working with municipalities in Southeastern Pennsylvania to support local benchmarking initiatives (Freeh, 2014). Additionally, the Borough of West Chester, PA requires new commercial buildings to benchmark their consumption annually (“West Chester ENERGY STAR Ordinance,” n.d.).

Detailed tables of the programs identified by KEEF are included in the Appendix to this report with embedded hyperlinks to explore these initiatives, and Table 2 summarizes key program characteristics.

**TABLE 2: KEY ELEMENTS OF BENCHMARKING PROGRAMS IN THE U.S.**

Program Characteristic	Count
<b>JURISDICTION</b>	
Municipal	29
County	5
State	12
<b>BUILDING TYPE</b>	
Public	16
Private	18
Public & Private	12
<b>PROGRAM TYPE</b>	
Mandatory	27
Voluntary	19



## PHILADELPHIA

The City of Philadelphia adopted a benchmarking ordinance in June 2012 that seeks a 10 percent reduction in the energy used by buildings in the city and a 20 percent reduction in the greenhouse gas emissions from the city by 2015 (from a 2006 baseline). (Alex Dews & Freeh, 2014; Dews et al., 2014)



## PITTSBURGH

Pittsburgh’s Green Workplace Challenge (GWC) is a project of Sustainable Pittsburgh (SP), an organization that seeks to encourage businesses, non-profits, institutes of higher education, and municipalities in Southwestern Pennsylvania to incorporate economic prosperity, social equity, and environmental quality into their decision-making.

<sup>9</sup>For more information about SEDA-COG and an informative demonstration program in New Berlin PA, see: <http://erc.sedacog.org/erc/Projects/Community-WideEnergyIndependence/EnergizingSmallCommunitiesGuide.aspx>



Additionally, KEEF strongly encourages those interested to explore information on websites maintained by the Institute for Market Transformation (IMT) and the EPA. IMT's website, [www.buildingrating.org](http://www.buildingrating.org), has up-to-date information as benchmarking expands globally and interactive features to compare policy components. The EPA's website<sup>10</sup> provides a useful inventory of all programs in the United States which use ESPM.

To explore benchmarking practice in Pennsylvania further, KEEF offers the following reviews of programs in Philadelphia and the greater Pittsburgh area.

## Philadelphia

### *Goals, Program Structure, and Stakeholder Engagement*

The City of Philadelphia adopted a benchmarking ordinance in June 2012 that seeks a 10 percent reduction in the energy used by buildings in the city and a 20 percent reduction in the greenhouse gas emissions from the city by 2015 from a 2006 baseline (Alex Dews & Freeh, 2014; Dews et al., 2014).

In 1990, energy consumed by residential buildings in Philadelphia exceeded that of commercial properties by more than 15,000,000 MMBtus – approximately the amount of electricity consumed annually by more than 400,000 average American households. By 2010, however, this relationship had changed dramatically. Commercial building energy use exceeded that of residential properties by more than 20,000,000 MMBtus (Freeh, 2013). As Philadelphia policy makers investigated this trend, they noted that owners of commercial properties were not taking advantage of the energy efficiency services newly available through Pennsylvania's Act 129 Energy Efficiency and Conservation Programs as rapidly as residential customers (Alex Dews & Freeh, 2014). Additionally, a 2011 report suggested that improvements in the energy efficiency of Philadelphia-area buildings could offer tremendous energy savings and job growth (Econsult Corporation, 2011). Policy makers, therefore, began to explore a benchmarking program.

To plan the initiative, the city and several partners, including the Delaware Valley Green Building Council and the Institute for Market Transformation, convened regular stakeholder meetings to discuss options, and policy makers became keen

to expand the benefits of benchmarking beyond those property owners and managers doing so voluntarily. The Philadelphia Mayor's Office of Sustainability (MOS) advocated for a mandatory benchmarking and disclosure ordinance, which ultimately won the unanimous support of Philadelphia's City Council (Alex Dews & Freeh, 2014).

Alex Dews, the Policy and Program Manager of the MOS, was involved throughout the ordinance's development, adoption, and implementation. Adopting a benchmarking ordinance is the "most powerful thing [the city] can do," says Dews, who adds that "it's the best tool [we] have to engage all building owners on energy efficiency issues." It's low or no cost, it collects and presents new information often not previously available, and it's the first step to identify opportunities to improve energy efficiency (Alex Dews & Freeh, 2014).

Only recently enacted, the MOS feels that the ordinance enables the city to more meaningfully engage building owners to encourage participation in Pennsylvania's Act 129 programs, and that it will enable the real estate market to make more strategic decisions with respect to building energy use (Alex Dews & Freeh, 2014). Rich Freeh, a Program Associate at the MOS, adds that benchmarking has already helped some property owners and managers think of energy as a manageable, not a fixed, cost (Alex Dews & Freeh, 2014).

### *Benchmarking Methods and Tools*

Philadelphia's benchmarking ordinance requires building owners to use ESPM (City of Philadelphia, 2012), which enables property owners to track energy consumption over time and, for eligible properties, provides a comparison to similar buildings nationally.

### *Buildings Covered*

The ordinance requires energy benchmarking of all non-residential properties, with some exceptions<sup>11</sup>, with an indoor floor area greater than 50,000 square feet. It also applies to all commercial portions of

<sup>10</sup> For a summary of programs and policies that use ESPM, see: [http://www.energystar.gov/ia/business/government/State\\_Local\\_Govts\\_Leveraging\\_ES.pdf](http://www.energystar.gov/ia/business/government/State_Local_Govts_Leveraging_ES.pdf)

<sup>11</sup>Exemptions may be granted for buildings with high vacancy rates, industrial uses, or special privacy concerns. For more information, see: <http://www.phillybuildingbenchmarking.com/guidance-resources/exemption-requested-form/>

mixed-use facilities if at least 50,000 square feet of that facility is used for commercial purposes (City of Philadelphia, 2012). The non-residential scope generally applies to commercial and municipal properties, though the city has been leading the field by benchmarking municipal properties greater than 10,000 square feet since 2011 (Agalloco & Freeh, 2014). Per the ordinance's mandate, 1,700 buildings benchmarked their energy consumption in 2012. These buildings encompass 250 million square feet, which is approximately 25 percent of the total floor area in the city (Dews & Freeh, n.d.).

At the time of the ordinance's adoption, the MOS was interested to include multifamily properties, but the complex mixture of commercial and residential metering at such sites and the lack of an ESPM certification protocol for multifamily properties, which has since been created, proved challenging to navigate in 2012 (Alex Dews & Freeh, 2014).

*Access to and Collection of Energy Consumption Information*  
Philadelphia policy makers and program partners worked closely with area utilities during the program design, adoption, and implementation phases, which greatly eased the reporting of energy consumption to ESPM and the city. Furthermore, the presence and support of the Chair of Pennsylvania's Public Utilities Commission at several stakeholder meetings proved helpful to advance a fruitful discussion of the means for utilities to share customer consumption information (Alex Dews & Freeh, 2014).

The electric and steam utilities serving the city, PECO and Veolia, developed web-based tools to facilitate direct reporting of historic consumption information from the utility to ESPM upon request by the utility customer.<sup>12</sup> This capability is not offered by the area gas utility, Philadelphia Gas Works (PGW), though upon customer request PGW provides 12 months of consumption data in a digital format, which facilitates data management and improves data quality by mitigating manual data entry (Alex Dews & Freeh, 2014).

Where tenants have their own utility accounts, the ordinance requires them to provide a report of their energy consumption when requested by the building owner (City of Philadelphia, 2012). Relative to other cities, however, Philadelphia has few large, non-residential properties that are not master metered, so few tenants are required to provide such consent (Alex Dews & Freeh, 2014).

<sup>12</sup>To explore the services offered by PECO and Veolia, see: <http://www.phillybuildingbenchmarking.com/who-what-where-when/next-steps/>

## SPOTLIGHT: LIBERTY PROPERTY TRUST

Headquartered in Malvern, PA and with a portfolio throughout much of the United States and the United Kingdom, Liberty Property Trust has more than 40 years of experience developing and managing commercial property and a portfolio of 750 office and industrial buildings exceeding 101 million square feet.

[HTTP://WWW.LIBERTYPROPERTY.COM/PDFS/FAST\\_FACTS.PDF](HTTP://WWW.LIBERTYPROPERTY.COM/PDFS/FAST_FACTS.PDF)

The firm prioritizes high-performance green buildings and uses ESPM to benchmark the energy consumption in 100 percent of the properties it manages. From a 2008 baseline, the company estimates that it has saved 43 million kWh, an estimated cost savings of \$4.7 million for its tenants. Furthermore, the firm states that the 116 ENERGY STAR buildings it has certified use approximately 25 percent less energy than conventional buildings.

<HTTP://WWW.LIBERTYPROPERTY.COM/PDFS/SUSTAINABILITY-FAST-FACTS.PDF>

Director of Sustainability Marla Thalheimer comments that “benchmarking our managed buildings in ENERGY STAR Portfolio Manager has been the cornerstone of the Liberty sustainability program. Understanding where buildings fall on the 1-100 scale helps us prioritize capital investments to make better asset management decisions, provides motivation and a sense of pride to staff and building operators. It also creates value for our tenants through reduced operating expenses. Tenants are becoming more educated and expect efficient space, and investors are increasingly expecting building owners to have efficient buildings. Benchmarking is a critical step to help owners stay ahead of these market demands while creating more desirable and sustainable real estate.”

When directed by the building owner, the energy benchmarked through ESPM is transmitted to the city through a web-based data sharing protocol (City of Philadelphia - Mayor's Office of Sustainability, n.d.).

#### *Disclosure*

Like many other mandatory benchmarking and disclosure ordinances, the city did not release the data reported in year one of the program, but will do so for year two. The MOS expects to disclose a subset of the data available through ESPM, such as the native units of energy consumed and the greenhouse gas emissions from energy use, to the public through a website in the fall 2014 (City of Philadelphia, n.d.; Dews, 2014).

#### *Phasing Implementation*

As noted above, the City of Philadelphia began benchmarking the energy consumption of municipal properties in 2010. This experience provided the city with credibility when discussing a mandatory benchmarking ordinance, experience with the process, and a data set to which the owners of private buildings could compare their energy use (Alex Dews & Freeh, 2014). Privately owned buildings were required to start benchmarking in 2013 and to do so annually thereafter (City of Philadelphia, n.d.).

#### *Outreach, Education, and Capacity*

The City of Philadelphia's benchmarking ordinance directs the MOS to coordinate the program. One the first cities to do so, the MOS prioritized the creation of a website to provide information to building owners, managers, and occupants (Alex Dews & Freeh, 2014). Dews and Freeh underscore the importance and efficacy of this approach to lessen the need for more individualized guidance. Additionally, the MOS worked with allies and partners to develop a comprehensive outreach, training, and education program which included letters to the owners of all buildings covered by the ordinance, trainings with industry and utility partners, a media campaign, and drop-in sessions for those needing assistance (Alex Dews & Freeh, 2014).

Staff capacity and information management were, and remain, critical factors to coordinate Philadelphia's benchmarking program. The MOS has two staff that spend approximately 60 and 90 percent of their time, respectively, on benchmarking non-municipal properties. The MOS has a third full time employee assigned to municipal energy benchmarking and conservation. With the scale of the city's program, the MOS encourages and relies heavily on email communication, which

facilitates systematic tracking of issues and questions raised and the delegation of responsibilities among colleagues (Alex Dews & Freeh, 2014).

#### *Enforcement*

The MOS, in cooperation with Philadelphia Licenses and Inspections, issues letters to owners who do not report their energy consumption by the annual deadline, and it seeks to work with those owners to facilitate compliance. While striving for compliance without taking enforcement action, the ordinance enables the city to issue fines for non-compliance. The city can cite an owner \$300 for failure to comply within the first 30 days after the reporting deadline and \$100 per day thereafter (City of Philadelphia, 2012).

#### *Quality Assurance*

The quality of benchmarking data reported and disclosed through Philadelphia's ordinance is monitored through review by the MOS staff. When the data reported seems unusual, staff contact the owner and encourage correction or confirmation (Dews, 2014). With public disclosure, the additional transparency may help flag anomalies.

#### *Indicators of Success*

Philadelphia's mandatory benchmarking program achieved an 86 percent compliance rate in 2013 (Dews et al., 2014). Given the recent adoption of the ordinance, it is too early to determine the policy's ability to facilitate reductions in building energy consumption and greenhouse gas emissions in the city. Nevertheless, the MOS believes that the program has effectively elevated the public's attention on building energy use – a first step towards action (Dews, 2014).

## **Pittsburgh**

#### *Goals, Program Structure, and Stakeholder Engagement*

Energy benchmarking is one element of Pittsburgh's Green Workplace Challenge (GWC), which is a voluntary competition that encourages participants to "save money and reduce emissions by using energy more efficiently" ("Pittsburgh Green Workplace Challenge - Overview," n.d.).

The GWC is a project of Sustainable Pittsburgh (SP), an organization that seeks to encourage businesses, non-profits, institutes of higher education, and municipalities in Southwestern Pennsylvania to incorporate economic prosperity, social equity, and environmental quality into their decision-making. For several years before it launched the GWC in 2011, SP had organized and facilitated the Champions of



Sustainability, a business network whose members desired a platform, based on verifiable metrics, through which they could engage in friendly competition to: 1) engage personnel, 2) create business channels that support sustainable action, and 3) provide the opportunity to recognize accomplishments. The GWC was created to meet that desire (Gould, 2014).

Sustainable Pittsburgh was further motivated to create the GWC by Pittsburgh's Climate Action Plan, which calls for a reduction of the city's greenhouse gas emissions by 20 percent by 2020 (from a 2003 baseline), and it structured the program to complement the longer-term vision of the Pittsburgh 2030 District plan. The 2030 District plan seeks to reduce energy use in existing buildings in the downtown area by 50 percent from the national average by 2030 ("Goals of the Pittsburgh 2030 District," n.d.), and the GWC underscores the value of short-term decisions and action. Participants are awarded points through the GWC for demonstrable actions taken, and winners in various categories (e.g. small, medium, and large business) are recognized at the conclusion of the 12-month competition ("Pittsburgh Green Workplace Challenge - Who Was Eligible to Participate," n.d.).

#### *Benchmarking Methods and Tools*

The GWC encourages participants to use ESPM to benchmark energy consumption. Participants may compete in the GWC based on the benchmarking of only one energy source, such as electricity, even if the subject facility also uses another energy source, such as natural gas. In this manner, a participant may track consumption over time for the fuel(s) benchmarked but if the tracking does not encompass all fuels used in the building the participant may not be able to take advantage of ESPM's comparative metrics for similar buildings nationwide.

#### *Buildings Covered*

The GWC is a competition among entities that have continually occupied a designated space since June 2012. Participants may be tenants or property owners who occupy the building they own, but they need not have utility accounts for all fuels serving the space (Mehalik, 2014a). This structure encourages participants to act on those factors regarding which they have control.

#### *Access to and Collection of Energy Consumption Information*

As the GWC participants are volunteers who occupy the space enrolled in the competition, the program circumvents some logistical complexities and privacy concerns of initiatives that seek to track energy use at the building level where the existence of multiple utility customers may pose a challenge.

## SPOTLIGHT: DMI COMPANIES

"At DMI Companies, we believe you have to plan the work before working the plan, and benchmarking your facility is an integral first step to developing a successful energy management plan," notes Peter Arnoldt II of DMI Companies. And the company knows a few things about energy management. Its subsidiaries design and manufacture efficient HVAC system components and provide building systems commissioning to property owners.

Headquartered 30 miles south of Pittsburgh in Charleroi, PA, DMI Companies moved into its current offices a decade ago after renovating what is now a registered National Historic Landmark. DMI has been benchmarking the facility's energy consumption for the last 9 years. The property consistently earns high ENERGY STAR scores, and has been an ENERGY STAR certified building since 2012. Built as a hotel in the late 1800s and repurposed as a bank until DMI acquired the property, the company believes its headquarters testifies to the potential of existing and historic buildings, the number of which far exceeds that of newly constructed properties in the United States.

DMI relies on energy benchmarking with ESPM to monitor the energy consumption in its headquarters as well as the other two buildings it owns in Pennsylvania, both of which combine manufacturing and warehouse spaces. At each of these buildings, DMI uses ESPM as a measurement and verification tool to track whether the building is performing as expected and to flag aberrations in need of prompt attention.

Currently, the utilities serving GWC participants do not offer an automatic upload of customer consumption data to ESPM. SP and others are working with local utilities to enable this functionality (Mehalik, 2014a).

To win GWC points, participants must enable the program administrator to view the energy benchmarked with ESPM, a simple data sharing function available through the EPA's tool (Mehalik, 2014a).

#### *Disclosure*

The energy consumption benchmarked by the GWC participants is not disclosed to the public, and the program places a high priority on maintaining the confidentiality of all information shared.

#### *Phasing Implementation*

Sustainable Pittsburgh launched a pilot version of the GWC in 2011-12 which focused on businesses (Gould, 2014). The program's next year of operation, 2013-14, expanded beyond businesses to include non-profits, colleges and universities, and municipalities ("Pittsburgh Green Workplace Challenge - Who Participated," n.d.). The GWC's third year is scheduled to launch in the fall of 2014 and will also serve K-12 schools (Gould, 2014).

#### *Outreach, Education, and Capacity*

As an initiative of the Champions for Sustainability network, the GWC was well positioned to recruit among Pittsburgh's largest and most influential institutions, and these industry leaders were both targets for participation in the GWC and the program's ambassadors to recruit their colleagues (Gould, 2014).

To gain and retain participants, the GWC offers a series of workshops that range from technical program implementation issues, such as setting up an ESPM account, to employee engagement and communications. Court Gould, the Executive Director of SP, notes that the workshops, peer-to-peer sharing opportunities, are especially valuable to keep participants engaged (Gould, 2014). Additionally GWC provides participants with a comprehensive program handbook that describes the means to receive GWC points and guidance to leverage additional resources.<sup>15</sup>

SP dedicates one-third of one staff person's time and two fellows from the Student Conservation Association to coordinate the GWC (Gould, 2014).

#### *Enforcement & Quality Assurance*

As a voluntary program, the GWC does not have a strict compliance, enforcement, or quality assurance element, but an Oversight Committee comprised of representatives from the industries the program serves is available to address problems ("Pittsburgh Green Workplace Challenge - Oversight Committee," n.d.).

#### *Indicators of Success*

The GWC encourages participants to focus on those actions that can be taken in the short term while facilitating systematic change in the structure and culture of participating organizations.

In terms of energy, the GWC measures success by the energy savings achieved. In the two program years, participants saved over 93,700,000 kWh of energy and diverted \$6.3 million from energy expenditures (Mehalik, 2014b; Sustainable Pittsburgh, 2012).

Sustainable Pittsburgh also measures the GWC's success by the total number of actions that participants undertake per year and the number of participants that remain active throughout the competition (Mehalik, 2014b). In years one and two, participants engaged in 574 and 1,668 actions<sup>16</sup>, respectively, for which they could earn GWC points. In both years, roughly half of the participants that signed up for the competition participated for the full program year (Mehalik, 2014b).

More difficult to quantify, SP is motivated by changes in participants' organizational direction or culture, and new business partnerships that have emerged among GWC competitors. Gould notes that some participants have established formal business relationships, thereby making the interdependent network more robust, and he is aware of others that now collaborate on supply chain management to deliver economic and environmental benefits to the region (Gould, 2014).

<sup>15</sup>See the GWC 2013-2014 Competition Guidebook here: <http://gwcpgh.org/images/GWCCompetitionManual040214.pdf>

<sup>16</sup>At the start of year two, the GWC modified the actions eligible for points, which explains some of the difference in the number of actions taken in the two years.

## BEYOND BENCHMARKING

Energy benchmarking is a vital step, but it is the beginning - not the end. It can organize and present information not previously or readily available and can inform decision-making, but further action is needed to unlock the economic, environmental, and social benefits of improved energy efficiency in buildings.

Energy benchmarking supports effective deployment and administration of energy efficiency initiatives, such as those available through Pennsylvania's Act 129 programs. Program administrators, building owners, utility customers, and the businesses that provide efficiency services can use the information to establish energy management goals and, possibly, the financial and technical support necessary to realize the targets. These leaders can use benchmarking data to identify trends in building energy use by property type, size, age, location, or other factors. Furthermore, communities, building owners, program administrators, utility customers, and others can use benchmarking data to better assess and verify the efficacy of energy efficiency services (Burr et al., 2011).

The disclosure of energy benchmarking information improves market transparency and facilitates the valuation of energy costs and performance. Building owners and managers, tenants, and prospective purchasers and renters can use the information to differentiate among properties. Indeed, studies show that properties deemed to be more efficient yield economic benefits such as higher rents and lower vacancy rates (Institute for Market Transformation, n.d.). Furthermore, energy consumption information can be leveraged by financial markets, as lenders could offer preferential interest rates for buildings with demonstrably lower operating costs and more efficient systems. And energy consumption data could be leveraged by building labeling initiatives or other applications that seek to incorporate energy efficiency into listings of properties for sale or lease.

In short, benchmarking energy use provides new, critical information to scale and improve the energy efficiency of buildings, and it lays an essential foundation to save money and resources.

## CONCLUSION

The preceding pages present a guide and examples of energy benchmarking, which KEEF believes is a promising strategy to improve the energy efficiency of Pennsylvania's commercial buildings.

Benchmarking offers a powerful management tool to better inform decision-making regarding energy efficiency investments, which can deliver social, economic, and environmental benefits including lower energy costs and increased satisfaction for utility customers, the creation of jobs and healthier work environments, an increase in the stability and reliability of the electrical grid, and decreases in the emissions of carbon and other harmful pollutants.

Additionally, benchmarking provides a foundation to transform real estate and financial markets through enhanced market transparency, which enables purchasers, tenants, and lenders to make more informed decisions. Doing so can deliver value premiums to energy efficient buildings and bolster tax revenues and public services through increased property values.

The benchmarking programs in Philadelphia and the Pittsburgh area, discussed in detail here, demonstrate that such initiatives can accommodate the diverse needs of Pennsylvania's communities and that they can meet the defined goal. Benchmarking is an effective first step towards better management of building energy consumption, and KEEF stands ready to work with Pennsylvania's leaders to expand this practice throughout the Keystone State.



## SUGGESTIONS FOR ADDITIONAL READING

For more information about benchmarking, KEEF recommends the following resources:

- The State and Local Energy Efficiency Action Network (SEE Action) is a coalition of energy efficiency experts facilitated by the U.S. Department of Energy. It has produced three helpful documents regarding benchmarking. They include:
  - *Energy Benchmarking, Rating, and Disclosure for Local Governments*, which is a short document that provides background information about benchmarking and suggests initial steps to develop a benchmarking program.
  - *Benchmarking and Disclosure: State and Local Policy Design Guide and Sample Policy Language*, which is located here. As the name suggests, it offers sample policy language for a benchmarking ordinance and outlines some key topics to address when creating a benchmarking program. <https://www4.eere.energy.gov/seeaction/publication/benchmarking-and-disclosure-state-and-local-policy-design-guide-and-sample-policy>
  - *A Utility Regulator's Guide to Data Access for Commercial Building Energy Performance Benchmarking*, which is a thorough exploration of issues related to utility customer data access and management.
- The Institute for Market Transformation's website, [www.imt.org](http://www.imt.org), and a related website, [www.buildingrating.org](http://www.buildingrating.org), provide a wealth of information regarding the state of building benchmarking policies in the United States and internationally. These resources focus on mandatory benchmarking policies more than voluntary benchmarking programs.
- The Environmental Protection Agency's website provides a great deal of information about benchmarking due to its management of the ENERGY STAR Portfolio Manger tool. Of great assistance to those seeking to survey other benchmarking programs, the EPA maintains a list of initiatives that use ESPM. [http://www.energystar.gov/ia/business/government/State\\_Local\\_Govts\\_Leveraging\\_ES.pdf](http://www.energystar.gov/ia/business/government/State_Local_Govts_Leveraging_ES.pdf)

## APPENDIX A: KEY TERMS AND DEFINITIONS

**Benchmarking.** This report uses a definition of benchmarking developed by the State and Local Energy Efficiency Action Network (SEE Action), a coalition of national experts facilitated by the U.S. Department of Energy. SEE Action defines benchmarking as “the process of comparing inputs, processes, or outputs within or between organizations, often to motivate performance improvement. Benchmarking typically [uses] an indicator per common unit (e.g., cost per unit produced), which allows for comparison over time, to others, or to an applicable standard” (State and Local Energy Efficiency Action Network & Andrew Burr, Institute for Market Transformation, 2012, p. 2).

**Energy efficiency and conservation.** Energy efficiency refers to a set of tools and practices that enable the provision of energy services at current or enhanced levels while using less energy than those services currently require. For example, improving a home’s insulation will keep more heat inside during the winter, thereby requiring less heating fuel to maintain a comfortable temperature. Energy efficiency differs from energy conservation. Here we define conservation as a reduction in energy used, which may or may not result in a decrease in the quality of service provided through the consumption of energy (“What’s Energy Efficiency?,” n.d.).

**Energy consumption and performance.** This report uses the terms energy consumption and energy performance discretely. Energy consumption is synonymous to energy usage; the term does not connote whether energy was used efficiently. Energy performance includes the concept of efficiency. For example, a heating system that performs well operates efficiently – meaning that little of the energy used to produce heat is wasted in the production of that heat.

Distinct and clear use of these terms is important. A building with energy intensive needs may consume a great deal of energy efficiently. Analogously, a building with light energy needs may use little energy in an inefficient manner.

## APPENDIX B: BENCHMARKING PROGRAMS IN THE UNITED STATES

Jurisdiction	State	Population	Program (Click name for link to more information)	Program Type	Eligible / Covered Buildings	
Alabama	AL	4,822,023	<a href="#">Executive Order 25</a>	Mandatory	Public	State
Alpharetta	GA	57,551	<a href="#">Green Communities Ordinance</a>	Mandatory	Public	Municipal
Arlington	VA	221,045	<a href="#">Arlington Green Games</a>	Voluntary	Private	Commercial, Residential, Retail
Arlington	VA	221,045	<a href="#">Green Building Density Incentive Program</a>	Voluntary	Private	Commercial, Residential, Multifamily
Austin	TX	842,592	<a href="#">Energy Conservation and Audit Disclosure Ordinance (ECAD)</a>	Mandatory	Private	Commercial, Residential, Multifamily
Berkeley	CA	112,580	<a href="#">Berkeley Climate Action Plan</a>	Mandatory	Public	Municipal
Berkeley	CA	112,580	<a href="#">Berkeley Energy Smart Rewards</a>	Voluntary	Private	Commercial
Boston	MA	636,479	<a href="#">Building Energy Reporting and Disclosure Ordinance</a>	Mandatory	Public & Private	Municipal, Commercial, Multifamily
Boston	MA	636,480	<a href="#">A Better City Challenge for Sustainability</a>	Voluntary	Private	Commercial
Boulder	CO	97,385	<a href="#">Commercial Building Energy Rating &amp; Reporting Pilot Program</a>	Voluntary	Private	Commercial
California	CA	38,041,430	<a href="#">Assembly Bill 1103</a>	Mandatory	Private	Commercial
Cambridge	MA	105,162	<a href="#">Tackling Climate Protection at the Local Level</a>	Mandatory	Public	Municipal
Cambridge	MA	105,162	<a href="#">Building Energy Usage and Disclosure Ordinance</a>	Mandatory	Public & Private	Municipal, Commercial, Multifamily
Chicago	IL	2,714,856	<a href="#">Energy Use Benchmarking Ordinance</a>	Mandatory	Public & Private	Municipal, Commercial, Multifamily
Denver	CO	634,265	<a href="#">Executive Order 123</a>	Mandatory	Public	Municipal
Denver	CO	634,265	<a href="#">Watts to Water</a>	Voluntary	Private	Commercial, Multifamily
Georgia	GA	9,919,945	<a href="#">Georgia State Building Competition</a>	Voluntary	Public	State
Hawaii	HI	1,392,313	<a href="#">House Bill 1464</a>	Mandatory	Public	State
Houston	TX	2,160,821	<a href="#">Houston Green Office Challenge</a>	Voluntary	Private	Commercial
Louisville	KY	605,110	<a href="#">Louisville Kilowatt Crackdown</a>	Voluntary	Private	Commercial
Massachusetts	MA	6,646,144	<a href="#">State of Massachusetts: Green Communities Act</a>	Voluntary	Public	State, Municipal
Medford	MA	56,173	<a href="#">Benchmarked Municipal Energy Use</a>	Mandatory	Public	Municipal
Michigan	MI	9,883,360	<a href="#">ED 2005-4</a>	Mandatory	Public	State
Minneapolis	MN	392,880	<a href="#">Commercial Building Rating and Disclosure Ordinance, Chapter 47 of the Minneapolis Code of Ordinances</a>	Mandatory	Public & Private	Municipal, Commercial
Minneapolis	MN	392,880	<a href="#">BOMA Greater Minneapolis Kilowatt Crackdown</a>	Voluntary	Private	Commercial
Minnesota	MN	5,379,139	<a href="#">State of Minnesota B3 Benchmarking</a>	Voluntary	Public	Municipal, State
Montgomery	MD	1,004,709	<a href="#">County Bill 2-14</a>	Mandatory	Public & Private	County, Commercial
New York	NY	19,570,261	<a href="#">Executive Order 88</a>	Mandatory	Public	State
New York City	NY	8,336,697	<a href="#">Local Law 84</a>	Mandatory	Public & Private	Municipal, Commercial, Multifamily
Ohio	OH	11,544,225	<a href="#">EO 2007-02</a>	Mandatory	Public	State
Oklahoma	OK	3,814,820	<a href="#">Senate Bill 1096</a>	Mandatory	Public	State
Philadelphia	PA	1,526,006	<a href="#">Building Energy Benchmarking Law, Bill No. 120428</a>	Mandatory	Public & Private	Municipal, Commercial
Phoenix	AZ	1,488,750	<a href="#">BOMA Phoenix Kilowatt Crackdown</a>	Voluntary	Public & Private	Municipal, Commercial
Pittsburgh	PA	306,211	<a href="#">Pittsburgh Green Workplace Challenge</a>	Voluntary	Public & Private	Municipal, Commercial



Jurisdiction	State	Population	Program	Program Type	Eligible / Covered Buildings	
Pittsburgh	PA	306,211	<a href="#">Pittsburgh 2030 District</a>	Voluntary	Public & Private	Municipal, Commercial
Portland	OR	587,865	<a href="#">Portland Carbon4Square Initiative</a>	Voluntary	Private	Commercial
San Francisco	CA	825,111	<a href="#">Existing Commercial Buildings Energy Performance Ordinance</a>	Mandatory	Public & Private	Municipal, Commercial
Seattle	WA	634,536	<a href="#">Energy Efficiency Performance Disclosure: Council Bill 116731</a>	Mandatory	Private	Commercial & Multifamily
Seattle	WA	634,536	<a href="#">Seattle Kilowatt Crackdown</a>	Voluntary	Private	Commercial
Utah	UT	2,855,287	<a href="#">ED 2006-0004</a>	Mandatory	Public	State
Washington	WA	6,897,012	<a href="#">SB 5854 - 2009-10</a>	Mandatory	Public & Private	State, Commercial
Washington, D.C.	DC	632,323	<a href="#">Green Building Act of 2006</a>	Mandatory	Public	Municipal
Washington, D.C.	DC	632,323	<a href="#">Clean and Affordable Energy Act of 2008</a>	Mandatory	Private	Commercial
West Chester	PA	18,461	<a href="#">ENERGY STAR Ordinance for Private Commercial Construction</a>	Mandatory	Private	Commercial
Westchester	NY	949,113	<a href="#">Westchester Green Business Challenge</a>	Voluntary	Private	Commercial
Winneshiek	IA	21,056	<a href="#">Winneshiek Energy District Green Business Challenge</a>	Voluntary	Private	Commercial

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