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Can Benchmarking and Disclosure Laws Provide Incentives for Energy Efficiency Improvements in Buildings?

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Abstract

Building energy use accounted for 38 percent of total US carbon dioxide (CO_2) emissions in 2012, and roughly half of those emissions were attributable to the commercial building sector. A new policy that has been adopted in 10 US cities and one US county is a requirement that commercial and sometimes also multifamily residential building owners disclose their annual energy use and benchmark it relative to other buildings. We discuss these nascent policies, preliminary analyses of the data that have been collected so far, and how to evaluate whether they are having an effect on energy use and CO_2 emissions. Missing or imperfect information is a contributor to the energy efficiency gap, the finding that many low-cost options for improving energy efficiency fail to be adopted. These new laws may be an important step in closing the gap in the commercial and multifamily building sectors, but careful evaluation of the programs will be essential.

Key Words: energy efficiency, commercial buildings, disclosure, benchmarking, energy use intensity, Energy Star, LEED

JEL Classification Numbers: Q40, Q48

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Introduction

Building energy use accounted for 38 percent of total US carbon dioxide (CO_2) emissions in 2012, and roughly half of these emissions were attributable to the commercial building sector (EPA 2014). In many jurisdictions, building codes require minimum levels of energy efficiency in new buildings, but few policies are directed at older buildings. The average age of commercial buildings in the United States in 2011 was 50 years and even older for apartment buildings (CBI 2012). In many cities, especially in the midwestern and eastern United States, older buildings make up a significant portion of the building stock. In Washington, DC, for example, recent information suggests that over 45 percent of the largest commercial buildings are more than 35 years old.[1]

Designing policies to spur retrofits and improvements to existing buildings is difficult. An increasingly popular policy that has been adopted in 10 US cities and one county is a requirement that building owners disclose their annual energy use and benchmark it relative to other buildings. As of July 2014, the cities of New York, Philadelphia, Washington, DC, Minneapolis, San Francisco, Seattle, Chicago, Boston, Cambridge, Massachusetts, and Austin, Texas, all had passed local benchmarking and disclosure ordinances, as had Montgomery County, Maryland. The approach is also popular in Europe and is under consideration in Portland, Oregon, and other US cities.

The rationale typically given for such programs is that publicizing building energy efficiency will provide valuable information to potential renters, buyers, and financiers. This will make it easier for them to take into account the energy characteristics of buildings, in particular

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[1] Percentage calculated from disclosed energy use data from the District Department of Environment (DDOE), http://ddoe.dc.gov/node/784702.

the likely energy costs of building operation, when making purchase, lease, and financing decisions. Gradually, the information is expected to move the commercial and multifamily residential building markets toward greater efficiency as building owners invest in energy improvements in order to compete for tenants and buyers.

Whether such change is effected and whether it translates into significant reductions in energy use and CO_2 emissions depend on several factors. Most important, the information has to be reliable, easily accessible, and presented in such a form that it is useful to buyers and tenants in making their decisions. Then buyers and tenants need to care about energy efficiency enough to drive up occupancy rates or prices and rents on relatively efficient properties. If this occurs, owners of less efficient buildings must be motivated to make improvements. It also matters that any realized energy savings are reaped over the long term; when buildings change hands, what happens to energy use? And finally, it is important that reductions in energy use translate into CO_2 emissions reductions; this depends on the carbon content of the fuels used to heat the buildings and generate electricity.

In this paper, we discuss the factors that are key to determining whether disclosure and benchmarking programs are likely to achieve these goals. We begin by describing the motivation for such programs, emphasizing the existence of the so-called "energy efficiency gap," or "energy paradox," the observation that consumers and firms fail to make investments that appear to more than pay for themselves in the stream of energy savings they yield (Gillingham and Palmer 2014; Jaffe and Stavins 1994). We then examine the programs that have been adopted in the 11 local jurisdictions, looking at the requirements, implementation dates, and key characteristics that we believe will determine their success. We discuss how to ideally conduct a good evaluation of the policies and some of the challenges posed by the way the programs are set up, as well as some of the difficulties associated with reporting. Finally, we describe the limited number of analyses that have taken place thus far—studies of the New York City, Washington, DC, and Seattle programs and our own recent analysis using a unique national dataset of commercial office and retail buildings. In the last section of the paper, we offer some concluding remarks.

The Energy Efficiency Gap and Buildings

Much has been written about the energy efficiency gap in general, what phenomena might explain it, and the role of different types of policy to address it (Jaffe and Stavins 1994; Gillingham et al. 2006, 2009; Gillingham and Palmer 2014). Reasons for the gap tend to fall into three categories: market failures, behavioral anomalies, and hidden costs. In the commercial and multifamily residential building context, four specific problems could be relevant for policy design, and each is related in some way to information: missing or imperfect information, principal-agent problems, credit constraints, and "inattentiveness" to energy issues. We discuss each of these issues in turn and how disclosure and benchmarking programs might address them.

Missing or Imperfect Information

Buildings are inherently a bundled good consisting of many attributes, some of which are more readily observable than others. In a commercial or large apartment building, energy efficiency is a function of how a building is constructed and how equipment is operated. Observing features such as the amount of insulation in the walls and the performance of boilers, chillers and air handling systems, and elevators can be very difficult. With energy use representing about one-third of building operating costs, building owners would be well served to make cost-effective energy efficiency investments, but with multiyear paybacks and uncertainty about energy savings, many building owners may not have enough information to decide to make these risky investments.[2] Compounding the problem is the difficulty owners face in conveying energy efficiency information to potential future buyers.

Principal-Agent Problems

Information problems may be particularly acute in the face of potential principal-agent problems in real estate markets. The principal-agent problem, also known in this context as the landlord-tenant problem, occurs when one party makes an investment and another party reaps the benefits or pays the costs that result from that investment (Gillingham et al. 2012; Myers 2014). A manifestation of the landlord-tenant problem is when a landlord pays for the key energy investments, such as insulation and equipment, but the tenant pays the energy bills. The landlord has little incentive to invest in efficiency improvements because he does not directly reap the benefit, nor can he typically recoup the cost through higher rents because he cannot credibly convey the building's energy efficiency properties to prospective tenants.[3] Information failures loom large in this instance.

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[2] See https://www.energystar.gov/ia/business/challenge/learn_more/CommercialRealEstate.pdf (accessed April 11, 2014).

[3] The principal-agent problem in rental properties does not go away if the landlord pays the bills; in this case, tenants have no incentive to economize on their energy use.

Credit Market Failures

Most building owners, especially owners of large commercial buildings, will need to finance any investments they make in energy improvements and retrofits. They may choose to finance internally through their capital or operating budgets, but for some companies, internal competition for capital may favor alternative investments (Palmer et al. 2012). For commercial property owners who are mainly in the real estate business, commercial mortgage underwriting practices present a hurdle. According to Jaffee and Wallace (2011a,b), energy costs are essentially a “wash” in the net operating income calculations that lenders make and use for mortgage approval: they are a component of operating costs but in most cases are assumed to be offset by tenant lease payments. Lenders evaluate overall risks rather than energy risks, typically setting maximum loan-to-value ratios and minimum debt service coverage ratios (Palmer et al. 2012). Even though owners of buildings with lower energy costs may be at lower risk for default on a loan, it is not common practice for this to be reflected in these ratios.[4] Again, if better information were readily available to lenders, it is possible that this problem in credit markets could be resolved.

Rational Inattention

A fourth potential problem recently discussed in the literature is inattentiveness to energy efficiency attributes when purchasing an energy-using durable, such as a car or new appliance (Hausman 1979; Sallee 2013; Allcott et al. 2014). If it takes time and effort to figure out the energy costs associated with a product, it may be rational for a consumer to ignore this attribute when making a purchase decision. Real estate transactions and the contracts involved can be very complex, and thus the inattentiveness problem could apply to buildings as well. Inattentiveness often results in choices that are ex post suboptimal, which suggests a potential role for policy.

[4] Well-known studies by Akerlof (1970) and Stiglitz and Weiss (1981) show that credit rationing can be an equilibrium outcome in situations in which lenders cannot distinguish ex ante between high-risk and low-risk borrowers. This result may apply to energy investments: if lower energy costs make a borrower less likely to default but this is difficult for the lender to observe, many low-risk borrowers may not get loans.

Key Attributes of Benchmarking and Disclosure Programs

Information plays an important role in each of the above four problems in the commercial and multifamily building sector, and benchmarking and disclosure programs are one form of information provision. But could they alleviate some of the energy efficiency gap problems we described? This section provides more detail about how the programs work, including implementation, reporting, benchmarking tools, and ancillary requirements. The next section then describes how evaluation should be conducted and lays out some of the program design issues that can pose problems for evaluation.

The first municipal benchmarking and disclosure law was enacted in Washington, DC, in August 2008, followed by Austin, Texas, three months later and then New York City a year later. The West Coast cities of Seattle and San Francisco were the next to adopt, in February 2010 and February 2011, respectively. Between May 2012 and June 2013, four additional cities—Philadelphia, Minneapolis, Boston, and Chicago—adopted policies of their own. In late April 2014, Montgomery County, Maryland, a suburb of Washington, DC, became the first county in the country to adopt a benchmarking ordinance. Most recently, the city of Cambridge passed an ordinance in July 2014. Other cities, such as Atlanta, Portland, Oregon, and Kansas City, Missouri, are actively considering a benchmarking policy.[5]

The benchmarking and disclosure laws adopted in these various cities all bring a building's energy use to the attention of its owners and occupants, as well as potential tenants or new owners and those who might finance any real estate transactions or property investments. In many cases, the information is also disclosed to the public at large via a government website and published government reports. We summarize several of the key parameters of the policies in each city in Table 1. All of the programs cover commercial buildings, although the minimum building size varies across the cities. In most of the cities, buildings have been or are being phased in over time by size, with the largest buildings required to report first.

In addition to minimum size thresholds, each benchmarking law specifies a set of additional provisions regarding the reporting and disclosure of building energy use information. Eight of the 11 localities require disclosure by municipal government buildings (not shown in Table 1), and seven cities include multifamily residential buildings. All of the programs require

[5] See http://www.buildingrating.org/content/us-policy-briefs. Delays in the development of enabling regulation in Washington, DC, postponed the initial reporting deadline there by several years, until April 2013.

that energy use be reported to the government, and most require disclosure on a public website of some subset of that information, sometimes with a delay or exempting the first year of data from public disclosure. Austin and Seattle do not require public disclosure of building-level data, but instead require disclosure as a part of certain real estate transactions or to current building tenants.

All of the cities have very similar reporting requirements. Building owners or their energy providers are required to submit monthly electric and natural gas bills (as well as other energy purchases and purchases of district steam) and certain building characteristics, including gross square footage, year built, and operating hours, to the administering agency in the city. (Many of the localities, with the exception of Austin, Chicago, San Francisco, and Seattle, and Montgomery County require reporting of water usage as well.) Additionally, Austin, Boston, Cambridge, New York, and San Francisco all require buildings to submit engineering audit data. For example, Local Law 87, which covers some of the additional requirements under New York's benchmarking program, stipulates that covered buildings of 50,000 gross square feet or more must undergo an energy audit every 10 years. The program ordinances for Cambridge, New York, and San Francisco also contain retrocommissioning provisions for buildings that do not meet a minimum level of performance. Retrocommissioning involves a systematic process for identifying inefficiencies in a building's equipment, lighting, and control systems and making changes to improve their functioning without system replacements. For benchmarking energy use to other buildings, most of the programs require (and all allow) the use of EPA's Energy Star Portfolio Manager (PM) software program. We describe how the PM program works in Box 1.

Table 1. Municipal Benchmarking and Disclosure Ordinance Provisions for Privately Owned Buildings

City	*Enactment date*	*Covered buildings: commercial*		*Covered buildings: multifamily*		*Disclosed to*	*Audit, water use, RCx?*
		Size	*Initial reporting date*	*Size*	*Initial reporting date*		
Austin	11/2008	≥75K sf	6/2012	≥5 units and ≥10 yrs old	6/2011	Government Buyers Tenants[a]	Audit
		≥30K sf	6/2013				
		≥10K sf	6/2014				
Boston	02/2013	≥50K sf	9/2014	≥50K sf or 50 units	5/2015	Government Public	Audit Water
		≥35K sf	5/2016	≥35K sf or 35 units	5/2017		
Cambridge	07/2014	≥50k sf	5/2015	≥50 units	5/2016	Government Public	Audit Water RCx
		≥25K sf	5/2016				
Chicago	09/2013	≥250K sf	6/2014	≥250K sf	6/2015	Government Public[b]	
		≥50K sf	6/2015	≥50K sf	6/2016		
Minneapolis	01/2013	≥100K sf	6/2014			Government Public	Water
		≥50K sf	6/2015				
Montgomery County, MD	4/2014	≥250K sf	12/2016			Government Public	
		≥50K sf	12/2017				
New York	12/2009	>50K sf	12/2011[c]	>50K sf	12/2011	Government Public	Audit Water RCx
Philadelphia	05/2012	≥50K sf[d]	10/2013			Government Buyers Leasers/lenders Public	Water
San Francisco	02/2011	≥50K sf	10/2011			Government Buyers Tenants Leasers/lenders Public[e]	Audit RCx
		≥25K sf	4/2012				
		≥10K sf	4/2013				
Seattle	02/2010[f]	≥50K sf	4/2012	≥50K sf	10/2012	Government Buyers Tenants Leasers/lenders	
		≥20K sf	4/2013	≥20K sf	4/2013		
Washington, DC	08/2008	≥100K sf[g]	4/2013	≥100K sf	4/2013	Government Buyers Public	Water
		≥50K sf	4/2014	≥50K sf	4/2014		

Note: K = 1,000, sf = square feet, RCx = retrocommissioning.
[a] Only owners of multifamily buildings must report to tenants or prospective tenants.
[b] Starts in year two; buildings with >10% of floor space in certain businesses exempt from public disclosure.
[c] Original date was May 2011, but it was pushed back to December 2011.
[d] Also, commercial sections of multiuse buildings.
[e] Only summary statistics in San Francisco publicly disclosed initially; disclosure for individual buildings phased in over time by building size, and as of April 2013, public disclosure for all buildings over 10,000 square feet.
[f] Seattle passed an amendment to the ordinance in September 2012 that raised the size threshold from 10K sf to 20K sf.
[g] Original legislation required buildings over 200K sf, 150K sf, and 100K sf to report beginning on 7/1/2011, 4/1/2012, and 4/1/2013, respectively. Because implementing regulations were not finalized until January 2013, the dates were changed.

Box 1. Benchmarking Building Energy Use with EPA's Energy Star Portfolio Manager

Most benchmarking is carried out using the Energy Star Portfolio Manager (PM) program, developed by EPA in 1999 and used for more than 300,000 buildings across the country. The program assigns an Energy Star score between 1 and 100, based on how the ratio of actual to model predicted energy use per square foot compares with the same ratio for a representative sample of buildings of its type across the country. An Energy Star score of 50 means that a building's energy performance is at the median for all buildings of its type. Higher scores mean better performance (lower energy use relative to predictions) compared with other buildings. A minimum score of 75 is required for Energy Star certification.

The Portfolio Manager Algorithm.[i] The PM software program relies on information on energy use and characteristics (size, age, operating hours, occupancy, number of computers, amount of space cooled/heated, etc.) from a nationally representative sample of buildings. For most commercial building types, this information comes from the Energy Information Administration's (EIA) Commercial Building Energy Consumption Survey (CBECS). For hospitals, senior care facilities, and data centers, EPA uses other surveys. EPA has only recently developed a PM program for multifamily residential buildings. It is based on a survey conducted by Fannie Mae in 2012 (Fannie Mae 2014).

For each building type, metered data on electricity and natural gas use and other fuels (e.g., propane, wood, fuel oil) are aggregated to an annual basis and converted from site energy use to source energy use using national average conversion ratios that vary by fuel type.[ii] Total source energy use intensity (EUI) is then calculated by summing these measures across different energy sources and dividing by gross floor area.

EPA then estimates an econometric model of EUIs for each building type. The equations are used to solve for a predicted source EUI for each building in the dataset, and the ratio of actual energy intensity to predicted energy intensity is calculated. A cumulative distribution function (cdf) of these efficiency ratios for each building type is plotted, and EPA uses a nonlinear least squares approach to estimate the gamma function that best fits this cdf. To calculate its benchmark score, a building owner or manager must upload data to EPA on all of the required building characteristics as well as monthly energy use. PM then uses this information to solve for a predicted source adjusted EUI (using the econometric model) and an actual source EUI; it then calculates an Energy Star score using the cdf for the particular building type.[iii]

Issues with Portfolio Manager. Portfolio Manager is the de facto option in the United States for benchmarking and has some advantages in that it is free, does not require installation of additional software, and is backed by EPA. The underlying CBECS data, however, is from 2003 and thus over 10 years old. EIA fielded a CBECS survey to collect information on buildings and energy use for 2007, but the results were deemed unreliable because of poor sample construction and issues in execution and thus never released by EIA. The 2012 CBECS is wrapping up, and EIA is expected to make the preliminary summary statistics on energy consumption available in spring 2015, with the full dataset released in winter 2015.

Additionally, questions have been raised regarding the robustness of the EPA Energy Star energy performance rating system. Kontokosta (2014) and Hsu (2014) have pointed out that the EPA model is based on a sample of only 498 commercial buildings distributed across nine US Census regions and thus does a poor job of capturing building heterogeneity in a localized context. Hsu (2014) emphasizes that the entire New York City commercial office market is represented by 41 buildings in the sample. Given the rapid growth of building-level data being reported in major metropolitan areas, it may no longer make sense to restrict the data to the CBECS sample. Kontokosta (2014) suggests that creating a city-specific econometric model, using higher-resolution building data, can perhaps provide cities with more nuanced and actionable insights. In a paper evaluating the implications of market-specific benchmarking, Kontokosta (2014) creates such a model for New York and finds that it predicts 33 percent of the variation in commercial building EUI in New York, whereas the EPA model explains only about 11 percent.

[i] For more information, see http://www.energystar.gov/buildings/tools-and-resources/portfolio-manager-technical-reference-energy-star-score (accessed April 18, 2014).
[ii] For more information on the conversion factors used by EPA, see http://www.energystar.gov/buildings/tools-and-resources/portfolio-manager-technical-reference-thermal-conversion-factors (accessed April 18, 2014).
[iii] For buildings that have multiple uses, scores are computed for the portion of the building related to each use, and then they are weighted together based on the portion of floor space devoted to each use.

Because public disclosure has yet to happen in most cities, exactly what building level information will be reported is not yet known, but several of the ordinances list only energy use intensities and Energy Star scores. Energy Star scores are based on measures of source energy use intensity, which captures the energy inputs used to create electricity and the effects of losses in the production and transmission processes on the total energy requirements for delivering electricity-based energy services to the building.[6] A small adjustment also applies to natural gas to capture losses in distribution. Source energy use allows for more relevant comparisons across buildings than site energy use. However, disclosure of the actual fuel and electricity consumption would provide a richer source of information. As the first city to report building-level benchmarking results, New York is providing both source and site energy use intensity measures and the building's Energy Star score. The city also reports greenhouse gas emissions and water usage. In its recent data release for 2011 and 2012, Washington went one step further, reporting annual energy use by type (electricity, natural gas, etc.) and building owner and year built, as well as GIS coordinates. In the appendix, we provide a table with more details about program requirements in each city.

Evaluating Energy Savings: Mechanisms, Limitations, and Data Needs

We see three ways in which benchmarking and disclosure programs may directly lead to reductions in energy use and emissions. First, if building owners are currently inattentive to energy costs, the simple act of entering energy use and building characteristics into Portfolio Manager may bring energy issues into focus and lead to some reductions that might otherwise be ignored. Seeing their energy use benchmarked against other buildings may reinforce that effect; peer effects have also been shown to influence energy consumption (Allcott 2011; Costa and Kahn 2013, Ayres et al. 2013).

Second, if tenants prefer to lease space in more efficient buildings and the disclosure laws provide new energy information to the marketplace, this could lead to improvements in efficiency. Prospective tenants may get value from both private and public good aspects of energy efficiency (Kotchen 2006). In terms of private benefits, tenants may prefer to rent in efficient buildings in order to lower their energy bills or because they are more comfortable. But prospective tenants may also have "green" preferences. Such preferences have been found by

[6] To make the comparisons robust to fluctuations in weather, the energy use intensity measures are adjusted for deviations in weather around a typical year for the relevant location.

Kahn (2007) to exist in the market for hybrid cars and by Kotchen and Moore (2008) in the market for green electricity. Building owners would respond to these market pressures by making improvements and retrofits as a means of competing for tenants.[7]

A third way that the programs may have an effect is through investor behavior. Many commercial buildings are owned by real estate investment fiduciaries or real estate investment trusts (REITs). REITs are similar to mutual funds and are traded on public stock exchanges. Investors could prefer more efficient buildings because the lower energy costs increase net income, because of "green" preferences, or as a quality signal to prospective tenants. This increased demand could drive up the value of more efficient buildings.[8] The market for REITs may already be moving in this direction. In late 2012, the National Association of Real Estate Investment Trusts (NAREIT), the US Green Building Council, and FTSE Group, a British provider of stock market indices and related services, announced a new green property index (Thomas 2012). While the index will be based on LEED and Energy Star certification, it is possible that the next step could be an index based on data from disclosure programs.

Potential Limitations and Opportunities

There are several reasons to be cautious about the ability of these programs to provide significant reductions in energy use. In some cities (Austin and Seattle), energy use information is not being made available to the public, but only to tenants, prospective tenants, and others involved in real estate transactions. Having the information readily available to the public on a website is preferable. Even in these cases, though, it is not clear how helpful the information disclosed is to prospective tenants trying to choose space to lease based on expected energy costs. In New York, annual average source and site energy use intensity is reported, along with an Energy Star score, an index useful only for comparison among similar types of buildings. In a large building, the average energy use intensity also may not be that helpful, as it may not be representative of the particular space a prospective tenant is considering leasing. The EUI provides only a rough indicator of expected energy costs, which is the information the tenant

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[7] This market pressure argument is the main rationale that the cities usually give for adoption of the programs. The Washington, DC, *Green Building Report* states that "transparent building performance information is expected to drive the real estate market toward greater energy efficiency, without explicitly requiring that retrofit improvements be made" (DDOE 2014).

[8] Studies by Hamilton (1995) and Khanna et al. (1998) have found stock market effects on firms that disclose their toxic chemical releases in the Toxics Release Inventory.

needs for decisionmaking. The ordinances in Boston, Chicago, and Minneapolis indicate that these cities will disclose in the same way as New York, though the Boston ordinance states that the government could choose to disclose additional information. In cities that use Portfolio Manager, building owners must report energy use separately for natural gas, electricity, and other fuels, and in Washington, DC, this detailed information is included in the public disclosure. In our view, this is an improvement, as prospective tenants can use local prices to estimate costs and compare the numbers with those on their current utility bills.

In most cities, building owners are required to report whole building energy use, and in Seattle, New York, and Washington, nonresidential tenants are required to provide the data to their landlords. Obtaining information from tenants can be difficult, however, and this is another reason to be concerned about the quality of the information disclosed.[9] The general issue of energy billing data access in benchmarking and disclosure programs has been identified as a key issue for utilities and their regulators (SEE Action 2013). Washington may be ahead of some other cities in this regard. It worked out an agreement with the local electric utility, Pepco, under which Pepco will provide building-level billing data to authorized requestors—namely, building owners and their agents—when five or more accounts are present in a building and a single account does not represent more than 80 percent of total energy consumption for the building (DDOE 2014).[10] Use of this service was optional for the 2012 reporting year but will be required for 2013 and beyond. The city is working with the local gas utility to follow Pepco's lead and also provide tenant billing data to building owners. Seattle is also ahead of others in provision of whole building data, as it has facilitated and now requires automatic upload of energy use data by utilities into the PM software.

Another concern, pointed out by Stavins et al. (2013), is the veracity of the information disclosed. One problem in this regard is the estimate of building size that is used to calculate the EUI. In some cities, such as Minneapolis, the ordinances provide no guidance on what to use for size. In others, such as Chicago, the ordinance is very specific, listing exactly which areas to include.[11] However, it still is not clear that all building owners will calculate square footage in

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[9] While separate metering of tenant energy use poses challenges for whole building disclosure, separate billing of tenants does provide a way to give individual tenants a full sense of the costs of their own energy use and a direct incentive to reduce energy consumption in order to reduce those costs.

[10] The utility and the government feel that there are privacy concerns when the number is below five.

[11] City of Chicago, amendment of Title 18 of Municipal Code by adding new Chapter 18-14 regarding building energy use benchmarking (June 26, 2013).

the same way, and periodic independent verification may not be enough to adequately maintain a consistent standard for this measurement. In Washington, DC, only 12 percent of buildings reported exactly the same square footage as what is recorded in the tax records (DDOE 2014). The numbers reported in the disclosure requirements are generally larger than those in the tax records. Without further information, it is not clear which numbers are more accurate.

Kontakosta (2013), who has carefully studied the New York program, also argues that manual input of the energy disclosure data leads to significant errors. A recent analysis using PM data from the New York City benchmarking program identifies some common data entry problems (Kontokosta 2014). As an example, Kontokosta (2014) finds a frequent misallocation of energy consumption data in the case where two buildings on separate parcels share the same meter. Other common data reporting errors, such as entering in incorrect energy units, can be easily identified in the data cleaning process. In general, Hsu (2014) notes that building owners may simply not have the necessary expertise or knowledge of a building's energy system to correctly provide, without independent verification, all of the information requested by the benchmarking software.

Despite these concerns, these programs provide an important source of information on building energy use that was previously unavailable. This is particularly true for the confidential data on building characteristics and use that feed into Portfolio Manager and that will make possible more detailed analysis of how building features and use affect energy use intensity. The data that these programs provide are also being used by utilities and other entities that operate energy efficiency programs in these cities, such as the DC Sustainable Energy Utility, to target investment of rate payer and public dollars into buildings where the data suggest there are large unrealized opportunities for energy savings.[12]

The advent of these programs is coincident with an increase in the development of new businesses whose mission is to provide energy information analytics to the commercial building industry as well as to utilities and energy service providers.[13] These technological advances might lead to further efficiency improvements over the long run.

[12] See http://green.dc.gov/release/district-releases-benchmarking-performance-large-privately-owned-buildings.

[13] Examples include companies such as FirstFuel, Retroficiency, BrightPower, WegoWise, and Goby, to name just a few. Many of these companies are in the process of expanding their business models. See http://www.greentechmedia.com/articles/read/Will-There-Ever-Be-an-Opower-of-Commercial-Building-Efficiency and http://www.greentechmedia.com/articles/read/firstfuel-is-now-much-more-than-a-virtual-auditing-company.

Perhaps most important, certainly from a research perspective, is that by seeking to move the market through information provision, these programs may be serving as useful real-world experiments. Information provision is widely touted as something that will be necessary to improve energy efficiency more broadly; these programs are one way to investigate that claim.

Data Needs for Evaluation

While the data that building owners are required to report are useful for understanding building energy use and what affects it, they are not sufficient for assessing the full effects of the policy. Performing such an assessment requires a representation of what energy demand would have been in the absence of the program, which by definition is unobservable. As a substitute, analysts need data for a control or comparison group that approximates energy use under baseline conditions by those that are subject to the policy (SEE Action 2012). Energy use by affected buildings before the policy takes effect (which is required for reporting in some cities, including Washington, DC) is a potential baseline. However, because other factors that affect energy use, such as weather or economic conditions, also change over time, the prepolicy data are generally insufficient, and an analysis that compares the use of energy in affected buildings before and after the policy takes effect could confound the effects of the policy with other factors, thereby producing a biased estimate of the program effects. A better comparison group is one that allows the analyst to capture the effects of other factors that change over time and distinguish those effects from the effects of the policy.

The inclusion of building size thresholds in the design of municipal benchmarking and disclosure programs creates a natural experiment that provides a well-defined control group for assessing program effects. Buildings that fall just short of the minimum size threshold are similar to those just above the threshold. Thus one could compare energy use before and after the policy takes effect between these two groups of buildings, controlling for other factors such as weather. This should provide an unbiased estimate of the energy savings resulting from the policy. A regression discontinuity approach enables such an evaluation (Imbens and Lemieux 2008).

Conducting such an analysis requires energy consumption data beyond that collected under the policy, however. For buildings below and above the minimum size threshold, data should be collected for a minimum of 12 months prior to implementation and for similar spans of time after the policy has been in place. These data are typically in the possession of utilities and subject to strict confidentiality requirements, but providing researchers with access to them under nondisclosure agreements will be necessary to evaluate how well the policy is working.[14]

Another possibility is to compare buildings in cities with benchmarking and disclosure programs before and after adoption of the program with buildings in other cities that do not have such programs. Again, a source of data would be necessary for the latter group, but the data would allow a cleaner comparison of the real program effects.

Another potential concern with measurement of energy savings could be the "rebound effect," the increase in energy use that can occur when energy costs fall because of efficiency improvements. Economists have been worried about this issue for energy efficiency policies in general for years (Khazzoom 1980; Sorrell 2007; Azevedo 2014). The canonical example is fuel economy standards for motor vehicles—as the cost per mile of driving declines, people will drive more, and this will partially offset the energy savings from a tighter standard (Linn 2013; Greene 2012; Small and van Dender 2007; Frondel et al. 2012; Gillingham 2012). This issue may be of concern here, especially when there is tenant turnover or a building changes hands. If prospective tenants or buyers seek out more efficient buildings, as reflected in the disclosed EUIs and Energy Star information, they may respond by increasing their energy use once they occupy the building. A proper evaluation will look at the policy's impact over the long run and account for this possibility.

Analysis of Program Results to Date

No regression discontinuity style analysis has been done yet on benchmarking programs. Moreover, it is still early in the evolution of the programs, with two years of data from only two cities, New York and Washington, DC, publicly available as of November 1, 2014.[15] These cities have published reports that summarize the disclosed data for the first two years of their programs, and Kontokosta (2012, 2014) and Hsu (2012) have undertaken a detailed analysis of

[14] Challenges remain even if utility-level data are available. While benchmarking programs will collect information on building features and use that would affect energy consumption, such information typically will not be available to the utilities for those buildings that are not covered by the reporting requirements. Analysts would need to use property fixed effects or find a way to match with other available data, such as from tax records, which provides its own set of challenges.

[15] New York City's third year of data was released on November 15, 2014.

the New York data, including some of the confidential data reported to the government but not publicly disclosed. The Seattle Office of Sustainability and Environment (OSE 2014) has also summarized the data reported by building owners in that city, and some minimal results are available from San Francisco (Burr 2013; Hooper 2013). In this section, we briefly summarize the main findings in these studies and some of our own analysis of the Washington data. These findings focus on average energy use intensities, Energy Star scores, and relationships among building size, age, and energy use, as well as issues related to data quality and rates of compliance with the law. We also describe some ongoing research we are conducting that uses a unique national dataset to analyze the impacts of the new laws on utility expenditures.

Some Early Results from Four Cities

Table 2 shows the number and square footage of benchmarked buildings in four cities, along with compliance rates (i.e., percentage of buildings required to report that reported), average energy use intensities, and median Energy Star scores. All of the cities report very high compliance rates, from 75 percent in New York to as high as 93 percent in Seattle. In most of the cities, building owners did not meet the requirements by the original reporting dates set in the laws, but after city prompting and the threat of fines, compliance rates increased. Table 2 gives the final rates reported by the cities for the year listed. In Washington, DC, compliance rates vary substantially by building type, with office buildings at 88 percent and multifamily buildings at 73 percent, whereas only 52 percent of retail buildings and 42 percent of hospitals are in compliance (DDOE 2014).

Table 2. Benchmarking Results in Selected Cities

City	Year	No. of benchmarked buildings	Square footage of benchmarked buildings	Compliance rate[a]	Median Energy Star score[b]	Mean weather normalized source EUI
Washington, DC	2012	2,048	357.7 mill	83%	75	220
New York	2011	12,565	1.7 bill	75%	64	132 (MF) 213 (C)
San Francisco[c]	2012	N/A	205 mill	79%	80	N/A
Seattle	2012	2,686[d]	228.7 mill[d]	93%	68	248

Sources: DDOE (2014); City of New York (2013); OSE (2014); Baker (2013); Hooper (2013); Burr (2013).

Notes: Statistics reported are for private buildings only, not government buildings. MF = multifamily; comm = commercial.

[a] Compliance rate is the share of buildings required to report that actually do report. For Washington, DC, the rate in the table is the rate reported by the city in DDOE (2014). However, the compliance rate calculated from the disclosed data is much lower, at 49%. We are not sure why this discrepancy exists, but one possibility is that the calculation does not reflect potential exclusions from the reporting requirements because of buildings that are for sale and not required to report. In general, the compliance rates we report in the table are based on the most recently available data (November 2013 in Washington, DC, and San Francisco; January 2014 in Seattle; January 2013 in New York City).

[b] Energy Star scores are available so far only for commercial and not multifamily buildings.

[c] San Francisco data not yet available. Information in the table is from two presentations on the program (Burr 2013; Hooper 2013). Number of buildings and EUI not available (N/A).

[d] Number and square footage of buildings and related EUI and Energy Star score are for buildings reported in either 2011 or 2012. As of January 2014, the number of benchmarked buildings had risen to 3,250 and square footage to 281.2 million (OSE 2014).

MF refers to multifamily and C refers to commercial buildings

The table makes clear that New York City dwarfs other cities in terms of the number and square footage of the buildings required to disclose. In fact, the city reports that the square footage covered by its law accounts for 61 percent of the square footage covered by all disclosure and benchmarking laws (City of New York 2013).

The median Energy Star score for commercial buildings in each of the four cities is significantly above the nationwide average of 50. A score of 75 is needed for a building to be Energy Star certified, so in Washington, DC, and San Francisco, the median score is high enough for certification. In San Francisco, Hooper (2013) reports that 93 percent of the floor area in benchmarked buildings reported an Energy Star score of 75 or above. In Washington, which has the second-largest number of Energy Star–certified buildings in the United States, after Los

Angeles, 76 percent of the buildings have a score of 75 or above.[16] In Seattle, 74 percent of the buildings have Energy Star scores of 75 or above (OSE 2014).

There are some consistent findings across New York, Washington, and Seattle that are noteworthy. First, all three cities show a significant amount of variability in energy use across buildings, even within the same building type category. Among office buildings, for example, the source EUI for the 95th percentile in New York is 4.5 times that of the 5th percentile; in Washington, the 95th percentile is 2.4 times that of the 5th percentile (DDOE 2014; City of New York 2013). Similar findings show up in the Seattle data. The Seattle and New York reports provide calculations of the energy savings potential that could be reached if the poorer-performing buildings improved. If buildings below the median energy use intensity increased their energy efficiency just enough to reach the median, Seattle estimates that total energy use in all buildings would drop by 25 percent; in New York, the figure is 18 percent (OSE 2014; City of New York 2013).[17]

The second consistent finding across the three cities is the relationship between energy use and building age. In all three cities, older office buildings use less energy than newer ones or roughly the same amount. Comparing averages across building age categories, older buildings in New York appear to use decidedly less energy, and the city speculates that this may be due to less extensive ventilation, better insulation, and a lower intensity of use in older buildings (City of New York 2013). Kontokosta (2014) also finds that newer buildings consume approximately 40 percent more energy per square foot, on average, than buildings built before 1930. New York and Seattle find little difference in energy use in multifamily buildings across age categories, though each city shows a peak for buildings constructed in the 1970s. Kontokosta (2013) estimates a regression model with the New York data, regressing source EUI on many building characteristics and dummy variables for various age categories; the only statistically significant coefficient on the age dummies is for buildings 81 or more years old, which have lower energy use, all else equal. In a regression model for predicting building EUI in New York City, Kontokosta (2014) finds that several variables related to a building's structure, whether it is

[16] Statistics calculated from disclosed Washington data; 76 percent of the square footage also has a score of 75 or above. Interestingly, many of these buildings have not gone through the process of becoming Energy Star certified. DDOE (2014) reports that only 55 percent were certified in 2012 or 2013, and more than one-third have never been certified in any year.

[17] The New York calculation is the percentage reduction in large buildings—those over 50,000 square feet, which account for 45 percent of the city's total energy consumption across all sources (including transportation).

Energy Star certified, and certain occupant behavioral characteristics are significant determinants of building energy use, expanding the set of variables to control for in future peer group analysis. DDOE (2014) also estimates a regression with the Washington data and finds no statistically significant effect from building age.

Finally, the three cities show wide variation in median EUIs by building category. While the cities do not report exactly the same categories, they appear to have some consistencies. In Seattle and Washington, DC, hospitals have the highest or second-highest median EUIs and K-12 schools have relatively low median EUIs in comparison with other building categories. A graphic for Seattle reported in Baker (2013) highlights the differences, as the two highest-use categories, supermarkets and hospitals, have median site EUIs that are 5.4 to 7 times greater than the site EUIs of the lowest two categories, warehouses and multifamily buildings.[18]

Independent Verification? (Preliminary) Findings Using Alternative Data

In research currently under way (Palmer and Walls forthcoming), we are using a national dataset on investor-owned commercial buildings to assess the impact of disclosure and benchmarking programs. The data come from the National Council of Real Estate Investment Fiduciaries (NCREIF), a member-based organization that represents the institutional real estate investment community. NCREIF has maintained a property database from its members since 1979 that includes quarterly information on income and cash flow, property valuation, capital improvement expenditures, operating expenditures, and other information; since 2000, the database has also included quarterly utility expenditures.[19] Approximately 30,000 buildings are in the database as of 2013.

This research focuses on the early adopter cities and explores the effects of implementation of the law on building-level utility expenditures per square foot in commercial office buildings. The recent implementation of municipal benchmarking and disclosure policies means that it is too early to assess their long-term effects through retrofits or investments in response to market pressures. Instead, we view this research as seeking to identify primarily an

[18] Supermarkets are the highest energy use category in Seattle, but this category is not reported separately by Washington or New York.

[19] The data have been used in many academic studies focused on general real estate market trends and the well-known NCREIF Property Index (NPI) (see, for example, Geltner and Goetzmann 2000). We were provided access to the individual property-level data through an academic research confidentiality agreement with NCREIF.

"attentiveness" effect of reporting. Through the use of utility expenditures reported to NCREIF and not the EUIs disclosed by law, we feel that the analysis may provide an independent assessment of the programs' effects. Two limitations to this analysis are that there is no way to separate energy expenditures from water in the utility expenditures, which means there could be some measurement error in the data, and the sample of buildings consists only of investor-owned office and retail buildings (and only those owners that are NCREIF members). While investor-owned properties make up a large portion of commercial real estate, the sample omits properties held by traditional sole owners, partnerships, or limited liability companies (LLCs).

We use the NCREIF data to estimate a difference-in-difference regression model comparing utility expenditures per square foot in office buildings in cities with and without benchmarking policies, before and after the initial reporting deadlines in each city for the four early adopters: Austin, New York City, San Francisco, and Seattle.[20] We run the regressions with three alternative sets of "controls": (i) all those in the NCREIF data that do not have a benchmarking and disclosure law during the sample time period, (ii) a more limited group of buildings located in U.S. Census defined Core Based Statistical Areas (CBSAs) which include cities that have either adopted benchmarking laws yet to take effect or that are participating in the Natural Resources Defense Council and Institute for Market Transformation City Energy Project, and (iii) an even more restricted group of buildings located only in the cities described in (ii) but not the entire CBSA.

Our preliminary findings indicate that disclosure laws have a statistically significant negative effect on utility expenditures after the first reporting deadline. In the central specification, which includes property-level fixed effects and thus controls for many unobserved building-level characteristics, the results show that, all else equal, utility expenditures per square foot are approximately 3 percent lower after the laws' reporting requirements take effect in office buildings covered by the laws. We emphasize that these results are preliminary and could be specific to the data that we use. However, they are robust to some alternative specifications and "placebo" regressions that use alternative sets of (false) treatment cities and alternative reporting deadlines find no negative effect of treatment on utility expenditures. This kind of independent

[20] We exclude buildings located in Washington, DC, altogether because of the long delay between passage of the law and the initial reporting date. Most of our data are from before the initial reporting deadline of April 1, 2013, so it is not feasible to include Washington as a treated city, but the early passage of the law means it does not serve as a useful control.

analysis with alternative data sources provides a promising avenue for analysis of benchmarking and disclosure programs.

Other Performance Metrics: Emissions and Costs

Energy reductions matter for purposes of reducing CO_2 emissions and slowing global warming, and thus it is important to consider the ultimate effects of disclosure policies—and all energy policies—on emissions. In addition, the best policies are the ones that have the largest impact on emissions at the least cost, so assessing the policies' cost is also important.

The relationship between energy savings and CO_2 emissions reductions is not a matter of simple multiplication by a single emissions factor, although this approach is a typical one in many evaluations. Emissions reductions from benchmarking and disclosure programs are likely to differ across cities, as the mix of fuels used for heating and the demand for heating vary across regions of the country, as does the mix of fuels used to produce electricity, which can even vary by time of day and year within a particular region. This suggests that the effectiveness as well as the cost-effectiveness of energy efficiency as an emissions reduction strategy—whether through benchmarking and disclosure programs or a host of other efficiency policies—will vary across cities and states that rely on these policies for emissions reductions.

The cities adopting the ordinances and many analysts suggest that benchmarking programs are relatively low cost in comparison with other policies, especially those that try to reduce energy use and emissions in older buildings (Cox et al. 2013). Whether this is indeed the case is difficult to assess. To our knowledge, no estimates of the costs of benchmarking and disclosure programs exist. This is understandable, as the programs are just getting started, but it will be important for the cities implementing the laws to assess their costs. And the appropriate measure of costs is the full welfare costs—that is, an estimate of the value of the resources diverted from other uses. It is also important to incorporate the costs of monitoring and enforcing compliance with the laws.

Based on his evaluation of the New York program, Kontokosta (2013) claims that it is costly and time-consuming for building owners to assemble the correct data, enter them into the Portfolio Manager program, and report the required information to the government. Collecting energy data from tenants can be particularly time-consuming and difficult. Kontokosta argues for a move toward more standardization and automation of the process.[21] As the market evolves, this is likely to happen. Even now, there are firms that will contract with building owners to provide data collection and reporting services, along with advice for energy efficiency improvements. And a group of organizations, including the Building Owners and Managers Association (BOMA), Real Estate Roundtable, US Green Building Council, and Institute for Market Transformation, has formed an independent alliance to push for electronic access to whole building energy data.[22] These efforts should bring down compliance costs over time.

Conclusions

Many energy efficiency improvements have been identified as "low-hanging fruit" to reduce US energy use and CO_2 emissions (McKinsey & Co. 2009). Several of these options have to do with improvements and retrofits to buildings, which account for approximately 40 percent of US energy use. Finding effective and low-cost ways to spur building owners to make these improvements, however, is an ongoing challenge for policymakers. Eleven local jurisdictions have stepped up and met this challenge by passing new energy benchmarking and disclosure ordinances, and several other localities are considering following their lead. In this paper, we have described how these policies work and how it is hoped that they will move the commercial and multifamily building markets toward improved efficiency.

In our view, the new policies have some decided strengths. They provide some much-needed energy information to the marketplace. Buildings are complex; prospective tenants and buyers consider a variety of attributes when making lease and purchase decisions, and energy attributes may be low on the list simply because of the difficulty in obtaining the relevant information. Disclosure laws should make at least some of this information easier to get. They also could ease some problems that building owners face in making retrofit and improvement decisions. Building owners may want to reduce energy use so as to lower their buildings' operating costs, but often these owners are "rationally inattentive," will not be able to recoup investment costs in rents, or cannot persuade creditors to make loans to cover the costs. Mandating disclosure and benchmarking of energy use may help overcome these problems.

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[21] The cost reduction from automation may remove some of the benefits reaped from making energy use more salient to building owners, however.

[22] See www.energydataalliance.org for more information.

The laws also may bring about some ancillary benefits. For one, they may spur innovations in how building energy systems are managed. Already we see new businesses entering the marketplace to streamline the sharing of data between utilities and building owners and to manage building energy systems and meet the laws' requirements. These businesses are shining a spotlight on energy for building owners, and that could lead to improvements and retrofits to bring down energy use. Additionally, the data the laws generate could help with new policy design. We might be able to learn from the data where the big problems lie and eventually how to tackle them with more targeted and cost-effective programs.

As currently designed, the laws do have some potential shortcomings. The heavy reliance on Portfolio Manager and the limitations of that software—namely, calibration to the 2003 CBECS data, which include limited numbers of some types of buildings and are more than a decade old—is a concern. More problematic, perhaps, than PM itself is the reporting, in most cities, of only EUIs and Energy Star scores. These pieces of information might not be all that useful for prospective tenants and buyers. A survey of real estate agents could shed some light on the extent of this problem: Are prospective tenants and buyers using the EUI and Energy Star scores in making their decisions, and if not, why not? Our concern is that the actual energy costs for leased space that a prospective tenant is considering may be only weakly correlated with the building's EUI and Energy Star score.

Perhaps our largest concern is in the evaluation of these programs as they move forward. Measurement and verification of energy savings from energy efficiency programs in general are fraught with problems. Access to the requisite utility billing data is difficult to obtain, and simple comparisons of energy use by program participants before and after the program intervention generally is not sufficient to identify the effects of a policy for a variety of reasons. In the case of disclosure programs, we are concerned that cities will report average Energy Star scores or summary EUI statistics over time and draw conclusions about the efficacy of the programs. It is essential that independent researchers conduct careful and systematic evaluations that rely on data for both affected and nonaffected buildings from time periods before and after the program takes effect. This type of evaluation will be necessary to understand how effective benchmarking and disclosure programs are in narrowing the energy efficiency gap.

Appendix. Other Benchmarking and Disclosure Provisions

In the table below, we provide some additional information on benchmarking and disclosure programs in the 11 jurisdictions beyond the basic information provided in Table 1. We also list the benchmarking tool the cities require or allow and the precise information disclosed.

City or county	Benchmarking tool	Information disclosed	Other key provisions
Austin	PM or other approved	No public disclosure required. Energy rating calculation disclosed to relevant parties in real estate transactions. The owner of a residential facility must provide the energy audit report to the purchaser or prospective purchaser of the building.	Multifamily units are required to have an energy audit, and results must be posted in the building and provided to prospective tenants; buildings that exceed 150% of the average multifamily EUI in the city must improve efficiency by 20% and notify current tenants that the building experiences higher-than-average energy use.
Boston	PM	At a minimum, building identification, energy intensity, GHG emissions intensity, Energy Star rating, and water use intensity. Information regarding program compliance may also be reported. Building owners have the opportunity to review the accuracy of information to be disclosed.	Covered buildings are required to undertake energy audits every five years; exemptions apply to buildings that are already efficient or are making significant progress on energy efficiency. No requirement to act on the results of an audit. Building owners may authorize an energy or water utility or qualified third party to report building-specific data on their behalf.
Cambridge, MA	PM	Property address, primary use type, gross floor area, site EUI, weather normalized source EUI, annual GHG emissions, water use intensity, the energy performance score that compares the energy use of the building to that of similar buildings where available (Energy Star rating), and compliance status.	The department may establish certification or licensing requirements for users of benchmarking tools. By December 31, 2018, if the energy performance for covered buildings has not improved significantly, amendments to the ordinance or other measures necessary to improve the energy performance of covered buildings may be considered. Building owners are required to maintain all records related to water and energy use for three years.
Chicago	PM	Only aggregated city-level data reported in the first year. Statistics for individual buildings, such as energy consumption and performance scores, will be publicly disclosed starting in the second year of reporting.	Every third year of reporting (including the first year), the owner of a covered building must have the reported benchmarking information verified by a licensed professional.
Minneapolis	PM or an equivalent tool adopted by the director	Building compliance status, address, EUI, annual GHG emissions, water use intensity, energy performance score, and a comparison of data across all of the years that a building was benchmarked.	Tenants are required to report energy use data to building owners.
Montgomery County, MD	PM	The director issues an annual report to the county executive and the county council that includes summary statistics on the most recently reported energy benchmarking information. The report will not publicly disclose any individually attributable reported benchmarking information for the first year of reporting. Starting in the second year, reported benchmarking information is made available to the public on an open data website.	Every third year of reporting (including the first year), the owner of a covered building must have the reported benchmarking information verified by a licensed professional.
New York	PM	Building identifier code, address, property type, site EUI, weather	LL87 mandates that covered buildings undergo periodic energy efficiency auditing

		normalized source EUI, indoor water intensity, Energy Star score, annual GHG emissions from energy use, floor area, and a comparison of data across all of the years that a building was benchmarked (*based on actual data available on NYC website*).	and retrocommissioning. Every 10 years, building owners are required to submit an EER and corresponding retrocommissioning information to the city. Building owners must keep all energy and water use information required for reporting for three years.
Philadelphia	PM	Benchmarking results are disclosed online and include building address, EUI, water use intensity, annual GHG emissions, PM Energy Star rating, and building type.	Every third year of reporting (including the first year), the owner of a covered building must have the reported benchmarking information verified by a licensed professional.
San Francisco	PM	Public disclosure of aggregate statistics from AEBS reports and aggregate compliance information; for each covered building, disclosed information includes status of compliance with the ordinance, the minimum required ASHRAE level for an energy efficiency audit, date of most recent audit that meets ASHRAE level, EUI, Energy Star rating, California nonresidential energy performance rating, and annual average GHG emissions.	Energy audits required every three years. These audits must follow the ASHRAE procedures.
Seattle	PM or other approved	No public disclosure required. Building owners must disclose copies of the most recent Statement of Energy Performance from PM (EUIs and Energy Star scores) to a current or potential buyer or lender in response to an authorized request.	Automated uploading of energy consumption data is required unless a building owner has been granted permission to manually input utility meter data into PM. Utilities are responsible for uploading energy consumption data for all buildings for which they have been authorized as service providers. In addition, utilities must maintain energy consumption data for all buildings for which they are authorized as service providers for two years.
Washington, DC	PM, TF	Property ID, address, owner, property type, year built, site EUI, weather normalized source EUI, indoor water intensity, Energy Star score, GHG emissions, floor area, electricity use, natural gas use, district steam use, other fuel use (*based on actual data available on WDC website*).	No disclosure for the first year of reported data from a building. New provisions require utilities to automatically upload energy use data to PM on a monthly basis for each covered building for which they provide service. Also, building owners are required to transfer energy use records when a building changes ownership.

Notes: TF = Energy Star Target Finder Program; EUI = energy use intensity; GHG = greenhouse gas; EER = Energy Efficiency Report; AEBS = Annual Energy Benchmark Summary; ASHRAE = American Society of Heating, Refrigerating, and Air-Conditioning Engineers; LL87 = Local Law 87.

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