Creating Value from Benchmarking:
A Utility Perspective

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Introduction

Building benchmarking—the act of measuring the energy performance or water consumption of a building, so that its performance can be compared to itself over time, to a norm, or to a group of peers—is the foundation of a successful energy and water management plan. While an increasing number of building owners have integrated it into their energy management strategies and more jurisdictions now require benchmarking, it has been underutilized by utilities and energy efficiency program administrators as a tool to drive cost-effective energy savings.

Several utilities have incorporated benchmarking in energy efficiency programs, and innovative utilities have also been leveraging city efforts. In the last five years, local governments have begun unlocking vast amounts of data on the energy performance of buildings by requiring large building owners to report the energy usage of their buildings. These city benchmarking datasets provide utilities with new insights, which can generate breakthrough advancements in energy efficiency program planning and implementation, help utilities comply with state requirements, and inform infrastructure investments.

These early experiences of cities and utilities exemplify models for creating value from benchmarking.

The Opportunity

The benefits and challenges of obtaining smart-grid and real-time data have received a lot of attention from utilities, the private sector, and state regulators. However, the potential of whole-building data and the simple act of monthly benchmarking are often overlooked.

Benchmarking and other energy-performance policies are on the books in 10 cities, two states, and one county in the U.S.[1] These cities collect data on the energy usage intensity (EUI), carbon emissions, and physical and operational characteristics for large commercial and multifamily buildings. More than a dozen other North American jurisdictions are considering similar policies, and policy adoption is likely to accelerate in the coming years. With all of this new data on the verge of entering the market, utilities should be poised to capture this information and transform it into useful intelligence.

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[1] "Jurisdictions," BuildingRating, accessed July 28, 2014, http://buildingrating.org/jurisdictions
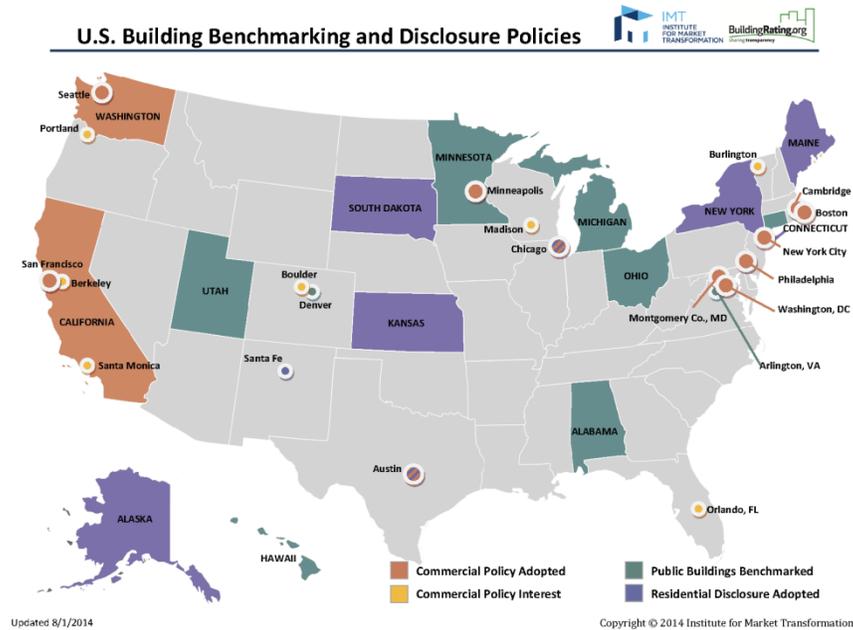
Pioneering utilities and states are exploring new energy efficiency strategies, including market transformation initiatives and programs that consider energy usage more holistically. This trend can be expected to accelerate as the "low-hanging fruit" of efficiency opportunities gets picked, new energy codes and appliance standards saturate the market, and more utilities and states consider efficiency strategies to comply with EPA's new Clean Air Act regulations.[2] Benchmarking and resulting datasets can play a significant role in evaluating and designing these new strategies, as described below, and should be considered a critical tool for moving towards market transformation programs.

How Utilities Support Benchmarking

A diverse mix of municipal and investor-owned utilities across the country support benchmarking. One of the key ways to do so is by facilitating a building owner's access to whole-building data, one of the greatest hurdles to effective energy management. Benchmarking in ENERGY STAR Portfolio Manager, the most commonly used tool in the industry, requires 12 consecutive months of whole-building data—information that many building owners, especially those of separately metered buildings, cannot easily retrieve. Many building

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[2] "Clean Power Plan Proposed Rule," U.S. Environmental Protection Agency, accessed July 28, 2014, http://www2.epa.gov/carbon-pollution-standards/clean-power-plan-proposed-rule

owners cannot obtain whole-building energy usage information without the consent of individual tenants, which is time-consuming and difficult to get. Proactive utilities have minimized this barrier by setting up simple procedures for building owners to request whole-building data through the utility. Some utilities have also developed automated benchmarking services that automatically upload energy usage data to benchmarking tools such as Portfolio Manager, so that owners do not have to manually input energy usage information. A few utilities have also bolstered benchmarking efforts by providing technical assistance, such as training workshops.

In 2011, the National Association of Regulatory Utility Commissioners (NARUC) adopted a resolution that affirmed the need for better access to whole-building energy consumption data to enable energy-efficient operations, and encouraged state public utility commissions and utilities to support benchmarking and data access programs.[3] The National Association of State Utility Consumer Advocates (NASUCA) passed a similar resolution in the context of the multifamily sector in November 2013.[4]

Creating Value from Benchmarking

1. Helping a building owner benchmark can motivate customers to enroll in energy efficiency programs.

Recent studies have shown that benchmarking leads to energy savings. In 2012, the U.S. Environmental Protection Agency (EPA) analyzed the energy performance of more than 35,000 buildings that received ENERGY STAR performance scores for 2008 through 2011 and found that these buildings attained average annual energy savings of 2.4 percent.[5]

Supporting benchmarking represents an opportunity for utilities to educate and engage building owners on energy efficiency. A 2012 report by the NMR Group for the California Public Utilities Commission concluded that when building owners are aware of the energy performance of their building, they are spurred to pursue

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[3] "Resolution on Access to Whole-Building Energy Data and Automated Benchmarking," National Association of Regulatory Utility Commissioners, accessed July 28, 2014, http://www.naruc.org/Resolutions/Resolution on Access to Whole-Building Energy Data and automated Benchmarking.pdf

[4] "2013-05 Supporting Automated Benchmarking of MultiFamily Buildings for Energy Efficiency Purposes," National Association of State Utility Consumer Advocates, accessed July 28, 2014, http://nasuca.org/2013-05-supporting-automated-benchmarking-of-multifamily-buildings-for-energy-efficiency-purposes/

[5] "Benchmarking and Energy Savings" U.S Environmental Protection Agency, accessed July 28, 2014, http://www.energystar.gov/ia/business/downloads/datatrends/ DataTrends_Savings_20121002.pdf?3d9b-91a5

other energy efficiency improvements. A survey of participants and non-participants of the California investor-owned utilities' benchmarking workshops found that, of those who benchmarked their buildings, 84 percent planned or implemented energy linked improvements to utility energy efficiency programs. Survey responses also indicated that benchmarking motivates more comprehensive retrofits: 90 percent of participants agreed with the statement "You implement more comprehensive energy efficiency measures in the buildings you benchmark."[6]

> Supporting benchmarking represents an opportunity for utilities to educate and engage building owners on energy efficiency.

Recognizing these benefits, some utilities have funded benchmarking programs through their energy efficiency portfolios. Commonwealth Edison (ComEd), an investor-owned electric utility serving 3.8 million electric customers in the greater Chicago and northern Illinois regions,[7] has provided automated upload of whole-building energy usage data to Portfolio Manager through its Energy Usage Data System (EUDS) since 2008. The program is funded by all commercial customers as a part of the "Market Transformation and Education" section of ComEd's energy efficiency plan. EUDS empowers customers with data, and Kevin Bricknell, ComEd's Program Manager of Marketing and Environmental Programs, calls EUDS "a gateway" to other energy efficiency programs.[8]

Puget Sound Energy (PSE), an investor-owned utility serving the Western Washington region, considers its automated energy usage data tool, MyData,[9] similarly. MyData users can directly access links to energy efficiency programs from the tool, and PSE hopes to individualize these links over time. The system is a marketing tool for these programs, and reflecting this objective, the development of MyData was 50 percent funded by PSE's energy efficiency portfolio.[10]

Not only can benchmarking create a pipeline of customers for energy efficiency programs, but by streamlining access to data and helping customers save time and money, utilities also can improve their customer service. ENERGY STAR awarded ComEd a Special Recognition Award for Innovation in Customer Service in 2009 for its initiative. With the internet and copious amounts of data at their fingertips, customers expect easy access to data. Moreover, studies have shown that customer who are aware of energy efficiency

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[6] NMR Group, *Statewide Benchmarking Process Report*. Submitted to California Public Utilities Commission, April 2012.
[7] "A Company Shaped by Customers and Employees," ComEd, accessed July 28, 2014, https://www.comed.com/about-us/company-information/Pages/profile.aspx
[8] Personal communication with Kevin Bricknell, ComEd, September 20, 2012.
[9] MyData, Puget Sound Energy, accessed July 28, 2014, https://pse.com/accountsandservices/YourProperty/Pages/Automated-Benchmarking.aspx
[10] Puget Sound Energy, Filing to Washington Utilities and Transportation Commission, Docket No. UE-132043, December 18, 2013.

programs are more likely to rate their utility higher on customer service surveys.[11]

2. Analyzing aggregated benchmarking data can make utilities smarter.

There is mounting evidence that benchmarking leads to energy savings at the individual building level—which can add up for an efficiency program administrator—but innovative projects demonstrate how analyzing aggregated benchmarking datasets of hundreds or even thousands of buildings can drive cost-effective energy-saving actions. Supporting benchmarking can connect utilities to a wealth of information on building stocks that they currently lack. With this new insight, utilities can improve energy efficiency and infrastructure planning and implementation.

Integrating benchmarking data with existing datasets can help a utility set energy efficiency targets.

Understanding where and how energy is used is fundamental for assessing the market and designing effective energy efficiency programs, but utilities typically do not have insight past the meter. Meters and account numbers may not be mapped to service addresses, so information is not organized by building; furthermore, fragments of information attached to an account may be spread throughout disparate pieces of a utility's billing and customer information system. Utilities generally do not have information on building operating or basic physical characteristics, including square footage information. Utilities may buy aggregate datasets to obtain these characteristics, but these datasets are expensive, often inaccurate, or based on regional samples.

Cities, however, have been on the forefront of collecting and analyzing building performance data. Their investigations provide a model for types of analyses utilities can do and create a foundation for the private sector to build upon.

In 2013, Seattle released an analysis of the benchmarking dataset that it collected for compliance with its energy benchmarking and reporting ordinance—in Seattle, all commercial and multifamily buildings over 20,000 square feet must benchmark their energy performance and report it annually to the city, as well as disclose it to tenants and buyers at the time of a transaction. Seattle discovered that if the lowest quartile of buildings were to improve their performance to meet those of the most efficient quartile, total energy

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[11] J.D. Power, "J.D. Power and Associates 2013 Power Electric Utility Residential Customer Study," July 17, 2013, and "J.D. Power and Associates 2013 Electric Utility Business Customer Satisfaction Study," February 13, 2013.

usage within the buildings subject to benchmarking would be reduced by 42 percent, saving $90 million per year.[12]

This initial analysis begs the question of how these results compare to more traditional utility conservation potential assessments (CPAs) and how CPAs can be improved with benchmarking data. CPAs are used to inform energy efficiency targets and program planning by categorizing achievable conversation potential by market sector, segment, and building type. Data describing the building stock drives the results of a CPA, so accuracy and completeness of the datasets constrains the quality of the results.

To inform its next CPA and energy efficiency program planning, Seattle City Light, the city's municipal utility, assessed the accuracy of its building dataset by merging the city's benchmarking dataset with its internal dataset, which is a compilation of data from Seattle's Department of Planning, county tax assessor office, the U.S. Census, and purchased datasets. With the help of EMI Consulting, a Seattle-based firm that provides energy industry research to utilities, SCL compared its listed building categories to the benchmarking dataset's building and space types, which were input by individual building owners into Portfolio Manager and reported to the city. The study found that SCL's building categories matched the benchmarking building types for 72 percent of data points considered, with a match rate of 96 percent for multifamily housing but only 45 percent for commercial buildings.[13] More specifically, while SCL's existing dataset correctly identified multifamily housing, warehouses, offices, and hotels, it did not capture distribution centers, non-refrigerated warehouses, medical offices, retail stores, and schools.

The city's benchmarking dataset represents a near-complete census of large buildings in Seattle as the city reached compliance rates of 97 percent with the ordinance for the year 2012. While Seattle is now tackling verification of data quality and accuracy, Brendan O'Donnell, Energy Planning Analyst in SCL's Conservation Resources Division, calls the benchmarking dataset "the gold standard" as an inventory of building data for its completeness and accuracy and a great improvement over SCL's existing data sources.[14]

> By streamlining access to data and helping customers save time and money, utilities also can improve their customer service.

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[12] "Solving Seattle's Energy Puzzle," accessed July 28, 2014, http://www.seattle.gov/Documents/Departments/OSE/ Seattle_Benchmarking_2012.pdf

[13] EMI Consulting to Seattle City Light, "Memorandum Re: QA/QC Analysis Results for Seattle City Light BCD Commercial Buildings Database," April 15, 2014.

[14] Personal communication with Brendan O'Donnell, Seattle City Light, May 8, 2014.

Benchmarking can illuminate energy trends that can guide energy efficiency program development.

In 2013, New York City released its analysis of two years of data for over 13,000 properties and more than two billion square feet of real estate that it collected for compliance with Local Law 84 (LL84). Requiring all commercial and multifamily buildings over 50,000 square feet to benchmark and disclose their energy performance publicly, LL84 is the foundational piece of the city's Greater, Greener Buildings Plan, which also mandates large buildings to either perform an energy audit or retro-commission once every 10 years.

NYC's analysis, done with its academic partner New York University's Center for Urban Science and Progress, revealed previously undocumented patterns, including[15]:

- Energy use varies by a factor of about three to six among properties with similar uses. The largest variation occurs in the office and retail sectors, exposing potential for sector-specific improvement and saving opportunities.

- There is significant fluctuation in median EUI when looking at property age in the office sector—despite commonly held preconceptions, EUI has generally increased in recent decades.

These types of observations can steer development of energy efficiency programs by helping identify sectors with maximum potential. These trends also guide and prioritize future research questions. For example, investigating factors that influence energy usage can help energy efficiency program administrators better understand construction methodologies and behavioral strategies that lead to energy efficiency.

Benchmarking data can improve outreach efforts and program administrators' abilities to target buildings to maximize cost-effective savings.

Up to this point, program development and outreach has not been data-driven. Energy efficiency programs are typically first-come, first-serve, partially because program administrators do not have the ability to hone in on low-performing buildings. Programs could improve cost-effectiveness by using benchmarking data to identify the worst-performing buildings, allowing utilities to construct a more direct approach and decrease costs of engaging customers at scale.

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[15] "New York City Local Law 84 Benchmarking Report," New York City, September 2013, accessed August 1, 2014, http://nytelecom.vo.llnwd.net/o15/agencies/planyc2030/ pdf/ll84_year_two_report.pdf

Programs can only achieve true energy savings potential if customers who could benefit most from programs know that they exist. Typically, program engagement is relationship-based—but many utilities do not have contact information for a building's energy efficiency decision-maker, a hurdle for effective outreach that utilities can mitigate with data from benchmarking programs. For example, Pacific Gas and Electric Company (PG&E), has provided automated upload of whole-building usage data into Portfolio Manager for close to 10,000 properties since 2011, helping many buildings voluntary benchmark as well as comply with San Francisco's and California state's benchmarking requirements. The energy efficiency team collects building information through the tool and shares it internally with account representatives serving the benchmarked buildings[16]—the data affords account representatives a holistic view of buildings, allowing them to reach out to building owners about specific energy efficiency programs, and strengthens their relationships.

Supporting benchmarking can connect utilities to a wealth of information on building stocks that they currently lack.

The data illuminated by benchmarking can especially benefit sectors that have traditionally been hard to break into. For example, SCL cross-referenced Seattle's benchmarking dataset with energy efficiency program participation to observe penetration rates, existing opportunities, and program participant characteristics. SCL discovered program penetration appeared to be lower for smaller and low-rise buildings than for larger buildings; previously, SCL did not have accurate square footage information and building characteristics to do this breakdown.[17] Larger buildings have historically been primary targets for energy efficiency programs, as recruitment costs for programs are typically high, so achieving more savings from individual participants is more cost-effective. More complete datasets and contact information may allow programs to expand to new participants and more fragmented markets, which will be necessary for utilities to keep meeting saving targets.

Benchmarking also can be used as a cost-effective filtering tool to target and prioritize buildings. A collaboration between the Low-income Energy Affordability Network (LEAN), Massachusetts utilities, and WegoWise, which has a multifamily benchmarking tool, demonstrated how benchmarking information can be used to accomplish these tasks in the multifamily sector. While the multifamily sector has great potential for energy savings, the lack of data on building energy performance has undermined multifamily efficiency programs. With LEAN, WegoWise benchmarked 75 percent of affordable housing buildings in the state of Massachusetts.

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[16] Personal communication with Laura Mogilner, Pacific Gas & Electric, July 17, 2014.
[17] EMI Consulting to Seattle City Light, "Memorandum Re: BCD Program Data Analysis Results," June 17, 2014.

The utilities then targeted the low-performing buildings for energy efficiency improvements and cost-effectively reached savings targets. By benchmarking instead of performing more costly audits as a preliminary step, the utilities were able to save $2.2 million; the project could potentially save 1,800 GBTU of gas and electric energy per year if all buildings became as efficient as the top quartile.[18] Benchmarking cannot replace an audit, but it is an efficient screening tool.

Utilities can also achieve parallel benefits at a smaller scale, as well. Technology companies such as WegoWise or FirstFuel are now offering analytics based on monthly energy usage data and preliminary benchmarks that aim to engage customers. Several utilities, including Pepco, PG&E, ComEd, and Connecticut Light and Power, require commercial buildings to benchmark their performance in order to qualify for incentives and rebates through energy efficiency programs, and some of these utilities only provide incentives if buildings have higher than average energy intensities.[19]

Benchmarking can inform infrastructure investments.

As a part of their benchmarking analyses, New York City and Seattle mapped the median EUI for different building types by zip code. Mapping can identify neighborhoods with high saving potential and focus marketing strategies. Recognizing spatial patterns of energy consumption can also guide infrastructure investment. For example, by identifying clusters of low-performing and high-energy consuming buildings, utilities can target those buildings with energy efficiency programs to avoid upgrading or increasing the capacity of surrounding infrastructure. Energy efficiency can be a tool for managing load growth cost-effectively, without significant capital investment.

3. Benchmarking can unlock the potential in innovative, whole-building efficiency programs.

Studies have shown that there is significant potential for savings from operational measures, which energy efficiency program administrators have traditionally underutilized. A FirstFuel analysis of representative medium- and large-scale commercial buildings in FirstFuel's Remote Building Analytics platform concluded that half of

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[18] "The spread of a utility program," WegoWise, accessed July 28, 2014, http://data.wegowise.com/leanmap

[19] "Directory of Energy Efficiency Programs Leveraging Energy Star, Updated January 20, 2012," U.S. EPA, accessed July 28, 2014, http://www.energystar.gov/ia/business/downloads/Directory_of_Energy_ Efficiency_Programs_Leveraging_ENERGY_STAR.pdf

all energy efficiency savings can be achieved through operational improvements at little or no cost to building owners.[20]

With "low-hanging fruit" picked, some utilities are piloting programs that veer away from traditional direct-install or measure-by-measure programs by considering a whole-building approach and incorporating operational or behavioral strategies. For example, Pay for Performance models[21] link energy savings directly to incentives. Participation is contingent on a benchmark to set a baseline, and financial incentives are then paid out at set milestones that require buildings to meet certain energy targets. Critical to this process is the regular tracking of energy usage—benchmarking—to plan, target energy performance, verify performance, refine management strategies, and quantify savings.

Xcel Energy, a utility that serves eight states across the country, is currently developing a comprehensive whole-facility energy efficiency program that will allow customers to access data more easily and that includes a portal for building owners to get data for benchmarking. According to Drew Quirk, Product Developer at Xcel, "benchmarking will allow us to unlock potential we know exists in behavioral and commissioning programs."[22]

4. Benchmarking can be used as a low-cost method to supplement traditional evaluation, measurement, and verification methods.

EPA's National Action Plan for Energy Efficiency report, "Utility Best Practices Guidance for Providing Business Customers with Energy Use and Cost Data," asserts that benchmarking scores can be used as a "simplified, lower-cost basis for evaluation, measurement, and verification." [23]

Savings for typical energy efficiency programs, including direct-install programs, are typically calculated with complex yet widely accepted algorithms no more frequently than once per year, and often only once every two or three years. More frequent data

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[20] Mazmanian, Erik. "The Hidden Opportunity in Commercial Energy Efficiency," FirstFuel, February 6, 2013, accessed July 28, 2014, http://firstfuel.com/blog/The-Hidden-Opportunity-in-Commercial-Energy-Efficiency

[21] For example, Lorentzen, Mark, Tom Rooney, Michael Colgrove, and Patrick Fitzgerald, "NYSERDA's Multifamily Performance Program: Rounding the First Turn," 2008 ACEEE Summer Study on Energy Efficiency in Buildings, available via the American Council for an Energy-Efficient Economy, accessed July 28, 2014, https://www.aceee.org/files/proceedings/2008/data/papers/2_735.pdf

[22] Personal Communication with Drew Quirk, Xcel Energy, June 12, 2014.

[23] National Action Plan for Energy Efficiency (2008), *Utility Best Practices Guidance for Providing Business Customers with Energy Use and Cost Data,* ICF International, 2008, www.epa.gov/eeactionplan

tracking can help refine and improve program implementation. Benchmarking before and after an energy efficiency upgrade is performed may be a low-cost method for comparing actual savings to projections. However, a program administrator may need to normalize data and be cognizant of other uncontrolled variables.

Leveraging Building Energy Performance Policies at the City and State Level

Utilities can attain the benefits described above at massive scale in cities or metropolitan areas that have building energy performance policies. By enabling benchmarking for building owners that need to comply with requirements, utilities can get energy performance and building data for the majority of commercial and multifamily floor space in a city. These policies will unlock vast amounts of data and represent a significant opportunity to engage owners and drive energy savings. The resulting datasets are particularly useful, as there is otherwise a tendency for the data to be biased towards overrepresentation of the better-performing buildings.

In Washington, DC, the Sustainable Energy Utility (SEU), a ratepayer-funded efficiency utility, is working with the District to help owners comply with its benchmarking requirement.[24] The SEU hosts a benchmarking help center, providing technical assistance to owners and thereby building relationships with customers. It is also using benchmarking data to identify trends and customer segments with the greatest potential for cost-effective energy savings.

The City of San Francisco also requires large commercial buildings to benchmark annually and either perform an audit or retro-commission once every five years.[25] After the city collected the first round of audit information in 2014, it was able to pinpoint buildings that had yet to upgrade their lighting systems. The city then used this data to reach out to the identified buildings with targeted information about a lighting upgrade rebate program that was about to expire.[26] The lighting program team recruited more participants and buildings were able to cost-effectively achieve energy savings.

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[24] "Benchmarking Help Center," DC Sustainable Energy Utility, accessed July 28, 2014, https://www.dcseu.com/for-my-business/benchmarking-help-center
[25] "San Francisco," BuildingRating, accessed July 28, 2014, http://buildingrating.org/jurisdiction/San%20Francisco
[26] Personal communication with Barry Hooper, San Francisco Department of the Environment, May 20, 2014.

Challenges and Recommendations

Benchmarking relies on monthly energy usage information at the building level. Utilities have been billing for monthly energy usage for generations: Why have they not previously capitalized on this information and the act of benchmarking? Although several challenges can explain this inaction, utilities have come up with solutions.

Utility customer information systems and billing infrastructure may not be set up to store relevant information organized in terms of buildings. As utilities are developing benchmarking programs, they need to prudently consider which data points should be collected—both from a technical and legal perspective—so that systems can capture relevant information and utilities are allowed to obtain benchmarking information from a building owner.

Most states have strict criteria for allowing utilities to attribute savings from energy efficiency programs, and it is inherently more difficult to calculate savings from market transformation and whole-building strategies such as benchmarking than from more traditional energy efficiency incentive and rebate programs, as these types of programs may not pass strict cost-recovery tests. However, some states have encouraged utilities to pilot innovative programs and have allowed utilities to use "market transformation" or "innovation" funding to support benchmarking initiatives. Utilities may also be able to include benchmarking support under marketing costs for other efficiency programs.

For utilities to be able to leverage city and state energy performance policies, jurisdictions should aim to make benchmarking data as transparent and easily accessible as possible. Currently, some cities only require disclosure at the time of a transaction, making it harder to obtain the information. Annual public disclosure is ideal.

For benchmarking information to be useful and influential, it needs to be accurate. Utilities and cities with benchmarking and disclosure programs should think through quality assurance mechanisms and work with building owners to help them benchmark correctly. By uploading energy consumption data directly to a building owner's records, utilities can help ensure that the benchmarking data they receive back will be more reliable.

Lastly, benchmarking is a valuable tool and benchmarking data can be a vital resource. However, benchmarking data on its own is not information and cannot lead us to intelligent efficiency. Data has to be analyzed to release useful trends and observations. Data trends

Half of all energy efficiency savings can be achieved through operational improvements at little or no cost to building owners.

and benchmarking information also must be carefully messaged to be a powerful influence for the real estate industry.

Acknowledgments

About the Institute for Market Transformation (IMT)

The Institute for Market Transformation (IMT) is a Washington, DC-based nonprofit organization promoting energy efficiency, green building, and environmental protection in the United States and abroad. IMT's work addresses market failures that inhibit investment in energy efficiency and sustainability in the building sector. For more information, visit imt.org.

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