Piloting the Use of Energy Policy Data to Drive Market Action

Erin Beddingfield, Institute for Market Transformation
Joe Hudak, District of Columbia Sustainable Energy Utility
Ali Levine, New York City Mayor's Office of Sustainability

ABSTRACT

Data is only useful when put to use. Across the U.S., an ever-growing number of state and local jurisdictions are implementing building performance reporting laws regarding building energy and water use in the commercial and multifamily sectors. This wealth of performance information is not yet being deployed to its full potential to drive smarter business decisions and increase energy savings.

Recognizing that this information can help advance energy efficiency in cities, in 2015 the Institute for Market Transformation (IMT) partnered with New York City and the District of Columbia and local groups, NYCEEC and the District of Columbia Sustainable Energy Utility, on a three-year project to understand and document how, exactly, this data can and should be integrated to reap an array of benefits for cities, energy efficiency service providers, utilities, and building owners.

This paper examines how local governments, utilities, and program implementers can replicate the success of DC and NYC. It summarizes the findings from the Cities' and their partners' efforts to fully understand the datasets, overcome integration challenges, and apply the data to visual engagement, strategic outreach, evidence-based policymaking, and retrofit project identification and deployment. The paper goes beyond theoretical discussion by outlining practical application of data using specific examples from NYC and DC, summarizing challenges and findings, and highlighting next steps for other jurisdictions to learn from and build off the work done in those jurisdictions.

Background

In the United States, cities are leading the charge to mitigate the causes of climate change, as they are often on the front lines in experiencing its impacts. Recognizing the connection between greenhouse gas (GHG) emissions levels and climate change, many are setting ambitious emission reduction targets, and exercising the authority of local leadership to implement real, impactful solutions. In most urban areas, the highest GHG-emitting sector is the energy produced for and used in buildings, often making programs that target energy efficiency in buildings a high priority. To more effectively shape these programs by understanding where and how energy is being used in their jurisdictions, many local governments are implementing benchmarking and transparency policies to collect and publish whole-building energy performance information about their largest buildings.

To date, 24 cities, two states, and one county have benchmarking policies in place for their commercial and multifamily sectors, and many of these jurisdictions are beginning to adopt audit and retrocomissioning policies. These policies generate rich datasets on the building stock within a jurisdiction, but the wealth of data cities are gathering through these programs is not yet being used to its full potential to drive robust retrofit markets sustained by private sector demand for energy efficiency. In addition to energy and climate-related initiatives, other data, like

permitting, housing assistance or economic data, can be layered on top of building energy performance information to advance efficiency in parallel to other city interests like equity and economic development.

Realizing the significant potential these datasets hold, the Institute for Market Transformation (IMT), along with partners in District of Columbia and New York City, launched the *Putting Data to Work* project in 2015. *Putting Data to Work* was a three-year pilot project, partially funded by the U.S. Department of Energy (DOE), aimed at using building performance data and asset information to help efficiency program implementers better target their outreach to building owners and increase the number of projects executed within these programs. The project used building performance data collected through city energy policies to improve energy efficiency program design and delivery in the District of Columbia and New York City, and developed a toolkit of resources to enable local governments, utilities, and program implementers to learn from activities to replicate successes.

Building energy performance data have applications for many real estate market actors, but the target audiences for the toolkit developed under the *Putting Data to Work* project were City sustainability leaders (including sustainability directors and their staff) and efficiency program implementers (including utility efficiency program staff or third party implementers). As such, resources and lessons learned were shaped around the topics most of interest to these stakeholders, and the market decision points that these audiences can most effectively influence to affect energy efficient choices.

This paper pulls from many of the lessons learned through the *Putting Data to Work* effort and builds off of the lessons outlined in a paper written about this project for the 2016 ACEEE Summer Study on Energy Efficiency in Buildings (Beddingfield, et. al. 2016). We begin with a discussion of the practical applications for building energy policy data for these audiences; outlining ways that city sustainability leaders and energy efficiency program implementers can use these data to move their real estate markets toward more energy efficient decisions. Then, we detail two specific examples of this - the first is the Retrofit Accelerator out of the Mayor's Office of Sustainability in New York (NYMoS), which offers building owners and decision makers free, personalized advisory services that streamline the process of making energy efficiency improvements to buildings. The second is the District of Columbia's Sustainable Energy Utility (DCSEU), which is a third-party, demand-side management program administrator that services electric and natural gas customers in the District of Columbia. Both of these sections provide a background on the work, including the types of data used, challenges encountered, quantifiable successes, and a discussion of where each effort is headed.

Uses of Building Energy Performance Data for Cities and Efficiency Implementers

While publishing the benchmarking data in a spreadsheet, as many cities do, accomplishes the goal of releasing the information publicly, it may not accomplish the underlying objective of having the information be incorporated into market decisions. This is because large, data-heavy spreadsheets are often complex and not easily understood, city governments websites are not the most commonly accessed or easily navigated, and the data is often not of interest to those outside the building energy efficiency community.

Building energy performance data are foundational to overcoming information barriers related to building performance in the real estate market, but a real estate market that fully values energy efficiency requires that all participants are aware of the existence and value of the data.

This also requires that all market participants integrate energy performance into their decision-making process at key leverage points: at the time of lease for tenants, at the time of purchase for owners, and as a factor for lending or investment decisions for lenders and investors. Cities and efficiency implementers play different, but complementary roles in ensuring that these data are known, understood, valued and used by the market. These key roles are detailed below.

Provide clean, reliable data to the real estate market. Whole building energy performance data, being made available to the market through benchmarking and transparency policies, overcomes a market asymmetry by allowing energy performance to be known to all market actors and factored into transactional decisions. The availability of complete and accurate datasets is crucially important for the real estate market to properly value energy efficiency. Just as important as the data *being* complete and accurate, market actors need to *have faith* that the data are complete and accurate. Cities collecting and publishing these data play a key role in ensuring this; there are actions that cities can take leading up to their policy compliance deadline to prepare reporters to submit their data (such as through a help center), during submission to reject clearly incorrect or incomplete values, and after submission to clean outlying and clearly incorrect values out of the dataset before using it for analysis.

Motivate action on efficiency. Cities can act as the conduit for energy policy data, publishing it in easily understandable formats through public websites and visualization platforms, and directing building owners to clear next steps to efficiency improvements through energy scorecards. Many cities provide map-based visualizations, and several—including Chicago, Denver, Minneapolis, Philadelphia and Seattle—provide scorecards to individual building decision makers that show a building's relative performance and outline next steps to improve efficiency. These formats for communicating the building performance data allow building owners to understand how their performance compares with that of peer buildings (by size, age, neighborhood, or other comparative statistics), and when paired with actionable next steps (for example, direction to reach out to the utility's efficiency program), moves the building owner toward efficiency improvements in their assets.

Refine marketing and outreach strategies. Using building energy performance data, cities and efficiency implementers can proactively identify buildings that may have significant opportunities for efficiency improvements. Depending on the nature of the engagement, a city might act as an objective adviser to identify project ideas and connect building owners with vetted contractors and financers, or an efficiency implementer might use this information as a pipeline for new projects. New York City's Retrofit Accelerator, administered through the Mayor's Office of Sustainability, is an example of a city taking the lead on pushing energy efficiency retrofits forward. The Accelerator's "Efficiency Advisers" work directly with building owners, managers, and other decision makers to provide free guidance throughout the entire building retrofit process, which includes selecting projects, accessing available financing and incentives, selecting contractors, and ongoing support through project completion. The DCSEU, meanwhile, is an example of an efficiency implementer using benchmarking data to identify opportunities and customers.

Better deploy data in city-level planning. Cities can use benchmarking data to more accurately model energy use of buildings in their jurisdiction, rather than relying on national averages, which grounds the modeling in the reality of circumstances within the city. An example of this is

the Clean Energy DC plan in the District of Columbia, where the project team used the District's energy benchmarking data to develop the model and analysis for the buildings-related recommendations and estimated savings in the Plan. The Plan, which was among the District's initiatives to reduce GHG emissions, identified actions that can reduce emissions by close to 40 percent by 2032 (compared with a business-as-usual baseline), if fully implemented. The availability of this information allowed the modeling to directly reflect actual, current, building characteristics and energy consumption within the District, rather than relying on assumptions or national-level data, creating a more accurate representation of the expected energy and GHG impact of various actions (District of Columbia 2016).

Evidence-based policymaking. Finally, as shown in NYC, as these datasets provide more clear understanding of building energy performance over time, the information can be used to inform evidence-based policymaking. When coupled with audit data, building energy performance information can illuminate energy-using systems that are responsible for the most emissions from buildings, and which buildings to target for energy conservation measures. In New York, this deep technical analysis has underpinned new legislation and programming, like the Retrofit Accelerator.

The following sections provide examples of a city (NYC) and an efficiency program implementer (DCSEU) using building energy performance data to move their respective jurisdictions to more energy efficient real estate marketplaces. In undertaking these efforts, NYC and DCSEU used a combination of publicly available and non-public datasets to identify priority buildings for assistance as shown in Table 1, below. Jurisdictions looking to replicate these efforts should identify comparable datasets for their local building stock. For reference, the *Putting Data to Work* toolkit also includes additional example case studies, guidance and reports on the practical application of building energy performance data (IMT 2018).

Table 1. Summary of data sources used in pilot efforts

Program	Data sources and use	Building types
NYC Retrofit Accelerator	*NYC LL84 Benchmarking Data*: Since 2010, the City has required all owners of buildings over 50,000 square feet to annually benchmark their energy and water use and submit this information to the City. The Retrofit Accelerator uses this dataset to identify high energy and water consumers as an indicator of high savings potential. *NYC LL87 Audit Data*: Since 2013, the City has required owners of all buildings over 50,000 square feet to conduct energy audits once every 10 years and submit this information to the City, which includes an inventory of physical building systems and attributes, as well as recommendations of energy conservation measures. The Retrofit Accelerator uses both the inventory and the recommended measures to identify potential project opportunities.	All privately owned buildings in NYC can receive assistance from the Retrofit Accelerator, but the program is currently geared toward those owners who own or manage buildings 50,000 square feet and larger that must comply with LL84 benchmarking and LL87 energy audits and retrocommissioning requirements

	Other City Datasets: Other datasets include the NYC Department of Housing Preservation and Development and the NYC Housing Development Corporation program data on affordable housing; neighborhood resiliency data on flood, heat, and wind risk; and neighborhood health vulnerability data related to pollution and health risks.	
DCSEU Outreach	*District of Columbia Energy and Water Benchmarking Data*: The most recent publicly available dataset of buildings 50,000 square feet and above that are covered by the District's benchmarking law was used to compare peer buildings in the DCSEU's visualizations. *DCSEU Proprietary Customer Data*: The DCSEU tracks customer information internally at the project level, including customer points of contact and relevant information to past interactions or incentives. The DCSEU worked to map this customer data (not always at the building level) to the building-level benchmarking data.	Buildings subject to the District's benchmarking law, which include commercial and multifamily buildings 50,000 square feet and larger

The New York City Retrofit Accelerator

In September of 2014, Mayor Bill de Blasio committed the City of New York to reducing its GHG emissions by 80 percent by 2050 (80 x 50), compared to 2005 levels. The NYC Mayor's Office of Sustainability relies on building energy data collected as a result of a suite of legislation passed on 2009, called the "Greener, Greater Buildings Plan (GGBP)" in order to develop policies and initiatives and to implement programs to help reach that goal.

The GGBP included legislation requiring all buildings over 50,000 square feet to annually benchmark and disclose their energy and water use to the City. This legislation was then expanded to include all buildings over 25,000 square feet in 2016. The GGBP also included a requirement for all large buildings to perform level II ASHRAE energy audits and retro-commissioning every 10 years. The equipment inventory and recommendations resulting from that audit are submitted to the City each year.

Motivating Action

The GGBP was devised to provide the owners and stakeholders in buildings with information with which they could take action to reduce their energy use. The whole building benchmarking lets these decision-makers compare their building's performance to their peers and the energy audits provide clear steps that they can take to improve the performance of their building. Due of a range of factors, including varying quality of audits in the initial years, competing building priorities in a highly competitive real estate market, and a confusing landscape for energy efficiency, the City did not see the desired uptake in energy efficiency retrofits.

As a result, the City launched the NYC Retrofit Accelerator in September 2015, which provides one-on-one assistance for decision-makers in privately owned buildings to make the process of energy efficiency easier. This program was devised as a data-driven program that would use the plethora of data collected by the City to identify and target buildings with a high potential for savings and a high need for assistance. Through the development of this targeting strategy, the program found that this data was also useful in identifying specific project opportunities for participants and helping decision-makers with portfolios of buildings prioritize specific properties for upgrades.

Data-driven Targeting Strategy

Shortly after the program launched in September 2015, the project team developed a data-driven targeting strategy to identify buildings that were highest priority for outreach based on three primary indicators: high energy consumption compared to peers, high opportunity for project implementation, and high need for assistance. Explanation of this strategy can be found in more detail in the 2016 ACEEE Summer Study paper on this topic (Beddingfield, et. al. 2016). In summary, the project team developed indicators for each property covered by the Retrofit Accelerator using a number of data flags from the benchmarking and auditing data in addition to other publicly available data sources available in New York City. Those properties that have the most data flags and indicators were ranked as the highest priority for outreach and assistance. The NYC Retrofit Accelerator uses this targeting strategy primarily to prioritize the program staff's (called Efficiency Advisors) direct outreach and allocation of resources and time spent with each property in the pipeline. In addition to these indicators that assist with prioritization, the team developed a number of "outreach initiatives," which identified specific high-impact measures or packages of measures that resonate with decision-makers and are easier to digest than the recommendations that come out of an audit.

Since that paper was published, a few chances have been made to this strategy to better identify properties that not only are high impact properties, but are in greatest need for assistance and align with other City priorities, such as affordable housing and resiliency. In the first year of the program, the team recognized that the City has multiple priorities when it comes to its buildings, and other agencies and offices were doing a significant amount of work to identify priority buildings for their respective issue areas. As a result, the project team sought to leverage those analyses to add them to the program's targeting strategy.

The project team used available data create a "high financial need" indicator that identified properties that had some financial needs that would restrict their operating expenses and as a result, could use improvements that would reduce utility expenses and help New York City's affordable housing remain viable. Some examples of these data flags are: the presence of an affordable housing regulatory agreement, existing tax and water arrears on the property, location in census tracts with certain characteristics such as high poverty levels, high rent burden, and/or low rents. In addition, the project team added two more indicators: "Resiliency Need" and "Vulnerability." The resiliency indicator is focused primarily on flood risk, and identifies buildings in the flood zones that could benefit from both energy efficiency and resiliency upgrades. The vulnerability indicator utilized work done by the City's Department of Health and Mental Hygiene in partnership with the Mayor's Office of Resiliency and Recovery to categorize buildings and neighborhoods into a Heat Vulnerability Index. The vulnerability indicator brought this index, in addition to other indicators, such as senior housing into the Retrofit Accelerator's targeting strategy.

Findings and Challenges

While the data targeting strategy has been useful to prioritize how resources are allocated within the program, the project team has found that cold calling decision-makers, regardless of how much energy they used or the opportunities they have, is not the most effective way to recruit them into the program. Rather, the data targeting strategy has been used primarily in three ways:

- **Measuring how the program is reaching its non-energy goals**, such as assisting "high-need" buildings;
- **helping decision-makers with portfolios of buildings prioritize which buildings to implement upgrades**;
- **engaging participants around specific measures** as identified through outreach initiatives.

Although using the data targeting strategy for its intended purpose has been a challenge, it also presented an opportunity. The project team found that many decision-makers, particularly those that have never done an energy efficiency retrofit, were more likely to implement a project when presented with just one to three options for upgrades than when presented with an entire suite of upgrades. The data analysis, in particular the identification and packaging of high-impact measures, is extremely useful in quickly identifying those opportunities without having to dig into a physical audit.

In addition, in New York City, there are many property owners and managers that own or are responsible for well over 20 buildings, and often do not understand how their portfolio uses energy, which buildings are the highest consumers, and what opportunities those properties have. The data targeting strategy allows the Retrofit Accelerator's Efficiency Advisors to assist those portfolio managers in prioritizing for quicker decision-making.

Results and Next Steps

To date, the NYC Retrofit Accelerator is working with decision-makers for over 4,500 buildings, with over 1,500 buildings starting construction or completing retrofit projects. If all of the projects in the pipeline are completed, the program expects to reduce well over 150,000 metric tons of carbon dioxide equivalent, or the equivalent of taking over 32,000 cars off the road for a year. In addition, the program is working with over 350 properties to implement steam heating measures, which is one of the measures identified through and "Outreach Initiative" in the data targeting strategy.

Evidence-based Policymaking

The benchmarking and audit data collected by the City of New York has made it possible for the Mayor's Office of Sustainability to perform comprehensive analysis to inform policies to help the City meet 80 x 50. In February of 2015, Mayor Bill de Blasio convened a Buildings Technical Working Group (TWG) to come up with long-term strategies to reduce energy use in existing buildings. That working group discussed measures and pathways that would help the City's buildings reach its portion of the GHG reduction goal. The working group was paired with a technical study of the city's one million buildings to look at the technical feasibility of those upgrades. The energy audit data was invaluable in conducting this analysis, as it provided an unprecedented look into which energy-using systems were most responsible for the emissions

from buildings, and which buildings could implement the measures or deep energy retrofit pathways discussed and developed by the working group. These pathways have set the basis for legislation as well as for the future of the Retrofit Accelerator. As the program grows and begins to push for deeper upgrades, it will rely on this deep technical analysis to make recommendations and assist participants.

Since that working group was convened, the City has continued to use benchmarking and auditing data to develop policies, such as one introduced in the New York City Council in November 2017, which, if passed, prescribed minimum fossil fuel performance standards that existing buildings must meet by 2030 (or 2035 for affordable housing), or face a significant fine. The bill also states that the City must determine whole-building performance standards (including electricity) at a future date. Without the benchmarking or end use energy breakdowns collected, such performance standards would not be able to be set. In addition, the City was able to use the analysis performed through the TWG to understand what is reasonable to require for all buildings, both with regard to energy performance and the upgrades that may be implemented to meet that performance.

District of Columbia Sustainable Energy Utility Outreach Strategy

Under its 2012 Sustainable DC plan, the District of Columbia established targets that include reducing GHG emissions by 50 percent by 2032 and by at least 80 percent by 2050, including a citywide energy-use reduction target of 50 percent by 2032. The Clean Energy DC plan, discussed above, then laid out a data-driven strategy for how to achieve the 2032 GHG reduction goal. In December of 2017, Mayor Muriel Bowser furthered that commitment by pledging that the District will be a carbon- neutral and climate-resilient city by 2050.

Recognizing the amount of energy that buildings use in the District (accounting for over 70 percent of the District's GHG emissions), the City has targeted the built environment as a key part of its climate action. In 2008, the Council of the District of Columbia passed the Clean and Affordable Energy Act (CAEA), which requires commercial and multifamily buildings over 50,000 square feet to annually benchmark their energy consumption and report it to the City. The District gathers one of the most descriptive benchmarking datasets among cities in the United States; currently, more than 250 data fields are captured through this benchmarking data reporting process. This and other initiatives have quickly transformed the District into a 'data-driven city' and the resulting performance has been recognized; the District's ACEEE City Energy Efficiency Scorecard ranking rose from 30th in 2008 to 8th position in 2017 among the largest cities in the U.S.

The District of Columbia Sustainable Energy Utility (DCSEU) is a third-party, demand-side management program administrator that services electric and natural gas customers in the District. The DCSEU is operated by the Vermont Energy Investment Corporation under contract to the District of Columbia Department of Energy and Environment (DOEE). Since 2011, the DCSEU has delivered financial incentives, technical assistance, and information to tens of thousands of District residents and businesses, helping them to save millions of dollars on their energy costs. DCSEU is an integral partner in the District's success in improving the energy performance of its buildings, and has made great strides in leveraging the City's data collection efforts. The DCSEU has tightly integrated the publicly available benchmarking datasets into its day-to-day operational and planning activities. To date, this has resulted in much more accurate data modeling and targeting of energy efficiency efforts from an operational standpoint, and has enabled the DCSEU to improve its educational resources for customers. DCSEU does not yet

have access to the meter data that most utilities and efficiency implementers have, which makes access to the District's benchmarking data even more valuable. This integration also allows DCSEU to enhance planning and execution of program delivery strategies.

Data Cleansing and Analysis

DCSEU uses a combination of publicly available data collected through the City's benchmarking ordinance and internal, proprietary customer data to identify customers for outreach and create visualizations to engage those customers. The DCSEU previously conveyed energy-saving opportunities and demonstrated its successful track record on a project level—often with a specific tenant or in pursuit of a single efficiency project within a building. However, it lacked data to communicate at the whole-building level when speaking with building owners and property managers, or to easily connect single efficiency projects with a specific building. In addition, as is often the case, the practice of storing data in multiple places introduced opportunities for inaccuracy and inefficiency. It also required account managers to reference information in more than one place—a particularly problematic challenge given that the DCSEU is striving to reach customers and secure their program participation as quickly and efficiently as possible.

A key mechanism to ensure that DCSEU has the most current, centralized data from the benchmarking ordinance has been the use of the Standard Energy Efficiency Data Platform™ (SEED Platform). Developed by the U.S. Department of Energy, the SEED Platform allows public agencies and other organizations to manage portfolio-scale building performance data from a variety of sources. DCSEU connects to the SEED account maintained by DOEE to pull the most up-to-date ordinance data into its system.

The initial effort to connect to SEED was a significant undertaking - the DCSEU needed to understand the District's data collection process, data "cleaning" protocols and upload process. As part of this effort, DCSEU analyzed structures of the data, and evaluated the outliers and anomalies to determine whether the data provided demonstrated existing situations or variances in entry practices. The DCSEU also evaluated internal data structures elements, which allowed them to identify a preliminary list of augmentations required to blend the two datasets in ways useful to the DCSEU and its customers. The resulting data model makes the DCSEU process much more efficient in finding new savings opportunities, vastly improves business intelligence around how corporate entities and properties are related, and demonstrates more concrete examples of pre- and post-engagement savings. In addition, DCSEU has linked to DC's SEED instance via Application Programming Interface (API), a key feature that allows DCSEU to pull in the most current District benchmarking data without the need to exchange spreadsheets, increasing security and timeliness, and decreasing the risk for issues with version control.

Visualization and Engagement

Based upon the initial data analysis, DCSEU developed some basic proof-of-concept tools for initial outreach with customers. Using a combination of Excel and Power BI to illustrate gas, electric, and water use at a collection of properties for a select group of clients, DCSEU created visualizations and analytics that compare energy use with peer buildings (those that have similar variables such as size, use type, or neighborhood). DCSEU Account Management staff determined what data points were most resonant with customers, and developed visualizations

and engagement scripting to take advantage of the field findings. Key data points include the following comparisons:

- **ENERGY STAR score relative to national or local average of peer buildings.** If the building has an average ENERGY STAR score lower than the national or local average of similar buildings (by age, size, and type), it may be underperforming, which could be an opportunity for improvement.
- **Energy Use Intensity (EUI) relative to national or local average of peer buildings.** If the building has an average energy use per square foot higher than peer buildings, there may be opportunities to improve.
- If multiple years of data are available, note any **significant changes in performance over time** (accounting for weather or other events that may affect energy performance). If the energy performance of a building is worsening over time, it may indicate that equipment is in need of upgrade, or that there are other opportunities for improvement.

During the engagement process with the pilot group of companies, DCSEU discovered a broad spectrum of comprehension around the benchmarking data. This identified gaps that the DCSEU can assist with in the future through education initiatives and improved engagement. Though the DCSEU's operational change and strategies surrounding the benchmarking data is at an early stage, the data has already borne fruit for the DCSEU and the District of Columbia. Out of an initial 23 corporate engagements, DCSEU has identified 14 active savings opportunities, and of those, 10 have already converted to actual energy saving projects, resulting in 11,466 MWh in electric savings and 19,084 MMBTU gas savings, or the equivalent of taking almost 2,000 cars off the road for a year. It was also determined that the "technical potential" - meaning the number of benchmark participants who could participate in similar analysis and engagement - would be near 100 percent. This means that the groundwork being laid through developing these data cleansing, linking, and application processes can scale up beyond this initial pilot group to include all DCSEU customers who submit benchmarking data to the District, which is over 2,000 buildings.

Findings and Challenges

Based on this initial work, DCSEU developed an additional data cleanup process that includes over 200 steps, and an entirely new internal data structure that needed to be built to import the SEED data. This process of linking the records to relevant people, companies, and work sites allows the DCSEU to report against whole building benchmarking data while blending existing customer and project records. DCSEU's internal Business Services Group and software developers are designing and implementing the changes into internal systems. Through the process of understanding the available benchmarking data, and its limitations, and tying these data in with internal datasets for outreach and engagement, the DCSEU has learned that:

Whole-building data can be used to analyze trends. The building-level analytics previously unavailable to the DCSEU enabled implementers to evaluate trends in whole-building energy usage over time and to identify buildings and neighborhoods with high savings potential.

Data can be used to engage customers. Direct customer engagement using data visualizations to show relative performance of buildings when compared with their peers can be a valuable tool for relationship cultivation, with the end goal of enabling building owners and property managers to understand and improve the energy efficiency of their buildings— and, as a result, increase participation in incentive programs.

Benchmarking data can be a valuable addition to existing customer datasets. Mapping efficiency project information to the building level allows for the tracking of building performance over time, enabling implementers to understand the impact of project implementation on building performance. It also allows for disparate points of contact to be rolled up to the building level to streamline communication with the building.

The linking of DCSEU's internal records and incoming SEED data has, and will continue to, require a significant amount of research and manual work to initialize and maintain. DCSEU has identified the pain points in this process, developed reporting strategies to address issues, and identified personnel to handle the maintenance. The initial process of connecting SEED data will continue to require a significant amount of labor resources to validate and will be implemented in stages over time, beginning with the most active customers.

Future Opportunities

As the District continues to gather benchmarking data year over year, the DCSEU has the opportunity to model the energy use of the City over time while improving strategic analysis of the markets it serves. The DCSEU now has access to a vastly expanded, annually refreshed data snapshot of a large portion of the city, which will improve engagement protocols with customers. This data integration project bears indirect opportunities for education and awareness around energy use, which will bolster the DCSEU brand and market presence, improving its ability to serve all customers across the City. The DCSEU has the opportunity to leverage this extensive data set, along with the findings of its outreach and engagement, to provide support to all benchmarking reporters in the District.

Conclusions

City governments play an important role in cultivating local real estate markets that incorporate energy efficiency in transactional decisions to realize a variety of economic, environmental, and social benefits. Efficiency program implementers can dig even deeper into energy savings opportunities by using building energy performance data to identify projects with high potential energy savings, and shepherding building owners through the process of undertaking efficiency improvements.

For jurisdictions that have, or are considering, building energy performance policies (including benchmarking and transparency policies and audit policies) the applied examples in NYC and the District provide a blueprint for the types of programs and initiatives that can be undertaken when these data are widely available in a real estate market. Still relatively new even in NYC and the District, the availability of these data in ever-more jurisdictions nationwide provides and exciting opportunity to advance energy efficiency and reap the associated benefits of climate change mitigation and economic growth, leading the country's efforts on these fronts from the bottom-up.

Acknowledgements/References

This material is based partially upon work supported by the Department of Energy, Office of Energy Efficiency and Renewable Energy (EERE), Building Technologies Office (BTO) under Award Number DE-EE0007063. The authors would also like to acknowledge input

from the following individuals in the development of this paper: Marshall Duer-Balkind (DC DOEE), Julie Hughes (IMT), Katie Weeks (IMT).

Beddingfield, Erin, Marshall Duer-Balkind, Ali Levine, Elena Alschuler and Rich Brown. "Putting Data to Work: Using Building Energy Performance Data to Expand the Market for Energy Efficiency in Buildings." Proceedings of the 2016 ACEEE Summer Study on Energy Efficiency in Asilomar, CA. Washington, DC: American Council for an Energy Efficient Economy. http://aceee.org/files/proceedings/2016/data/papers/7_324.pdf.

City of New York. 2009. "Greener, Greater Buildings Plan." http://www.nyc.gov/html/gbee/html/plan/plan.shtml (Accessed May 30, 2018).

City of New York. 2016 "One City Built to Last Technical Working Group Report: Transforming New York City Buildings for a Low-Carbon Future." http://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/TWGreport_042120 16.pdf

District of Columbia. 2016. "Clean Energy DC: The District of Columbia Climate and Energy Plan." http://doee.dc.gov/cleanenergydc/ (Accessed May 30, 2018).

District of Columbia, Department of Energy & Environment. "Energy Benchmarking" http://doee.dc.gov/energybenchmarking/ (Accessed May 30, 2018).

Institute for Market Transformation. "Comparison of U.S. Commercial Building Energy Benchmarking and Transparency Policies." http://buildingrating.org/graphic/uscommercial-building-policy-comparison-matrix (Accessed May 30, 2018).

Institute for Market Transformation. 2018. "Putting Data to Work." www.imt.org/PuttingDatatoWork. (Accessed May 30, 2018).

