Linking Building Energy Codes With Benchmarking and Disclosure Policies

Key synergies that drive building energy performance

March 2014

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Building energy efficiency is widely recognized as the most cost-effective way to reduce reliance on non-renewable fuel sources and avoid the costly development of more power plants. Two key policy mechanisms available to assist with reducing building energy consumption are energy codes and benchmarking and disclosure policies.

While building energy codes have been around since the 1970s, benchmarking and disclosure policies have only gained prominence in the last decade. Important links between these two policies can help drive energy efficiency throughout the life cycle of a building.

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Building Energy Codes

Building energy codes establish minimum requirements for the physical elements within a building that impact energy consumption. These include insulation, windows, doors, heating, ventilation and air conditioning equipment, service water heating, and lighting. When adopted by a state or local government, codes are considered law, impacting new construction as well as additions and alterations to existing buildings. Model energy codes[1] are developed by national code development organizations for review and adoption by state and local governments. Nearly all cities and counties in the United States have adopted some version of a building energy code.

From 2006 to 2012, the national model codes increased efficiency levels by nearly 30 percent. However, these efficiency levels are not achieved simply by adopting the current codes. They need to be effectively enforced for their energy-saving potential to be realized. Benchmarking and disclosure policies can help ensure compliance with an adopted energy code.

1 International Energy Conservation Code and ASHRAE/IESNA Standard 90.1

Energy Benchmarking and Disclosure Policies

Benchmarking is the process of assessing the energy performance of a property and establishing a baseline from which efficiency improvements can be made. Energy performance figures are generated in one of two ways: they can be calculated through modeling software, using inputs for the physical and operational characteristics of the buildings to simulate energy consumption ("asset rating"), or recorded from actual utility bills and building operating characteristics ("operational rating").[2] Operational ratings are exemplified by the U.S. Environmental Protection Agency's (EPA's) ENERGY STAR Portfolio Manager, one of the tools most commonly used for benchmarking buildings in the United States.

Did you know?

A U.S. Department of Energy study shows that every $1 spent on energy efficiency or energy conservation has an economic multiplier of $2.24 for the local economy. When compared to $1 spent elsewhere, the energy efficiency and energy conservation multiplier is $0.18 more than consumer goods, $0.49 more than electricity and $0.76 more than petroleum products or natural gas.

The Jobs Connection: Energy Use and Local Economic Development, U.S. Department of Energy, 1996

Benchmarking is used by many real estate operators to understand how their buildings are performing, enabling them to establish an energy performance baseline, monitor ongoing performance, set energy performance goals, and prioritize energy efficiency investments. These actions are critical for building operators to effectively manage energy usage and increase energy efficiency.

Because benchmarking is a key to energy-efficient building operations, U.S. policymakers are now mandating benchmarking for many properties and creating new requirements for the public disclosure of building energy performance information. The goal of these policies is twofold: to ensure that building operators continually assess the energy performance of their buildings, and to ensure that building energy performance information is transparent and accessible in the real estate marketplace. The premise mirrors transparency rules in other market sectors, such as nutritional labels on food and fuel economy ratings on vehicles.

2 Leipziger, David. *Comparing Building Energy Performance Measurement: A framework for energy efficiency assessment systems.* April 2013. Available at http://www.imt.org/uploads/resources/files/ComparingBuildingEnergyPerformanceMeasurementFINAL.pdf

To date, the states of California and Washington and the cities of Austin, Boston, Chicago, Minneapolis, New York, Philadelphia, San Francisco, Seattle, and the District of Columbia have adopted benchmarking and disclosure policies. Collectively, these policies will impact approximately 51,000 nonresidential and multifamily buildings totaling more than 5.8 billion square feet of floor space as they are implemented over the next few years.[3]

Harmonies Between Policies

Although building energy codes and benchmarking and disclosure policies have traditionally been viewed as separate policy instruments, many harmonies exist between them that need to be explored. Recognizing these will allow the policies to be most effectively implemented and allow jurisdictions to realize the maximum benefits from these policies.

Best practices can reduce energy consumption by 25 percent to 45 percent and worst practices can increase energy consumption by up to 140 percent.

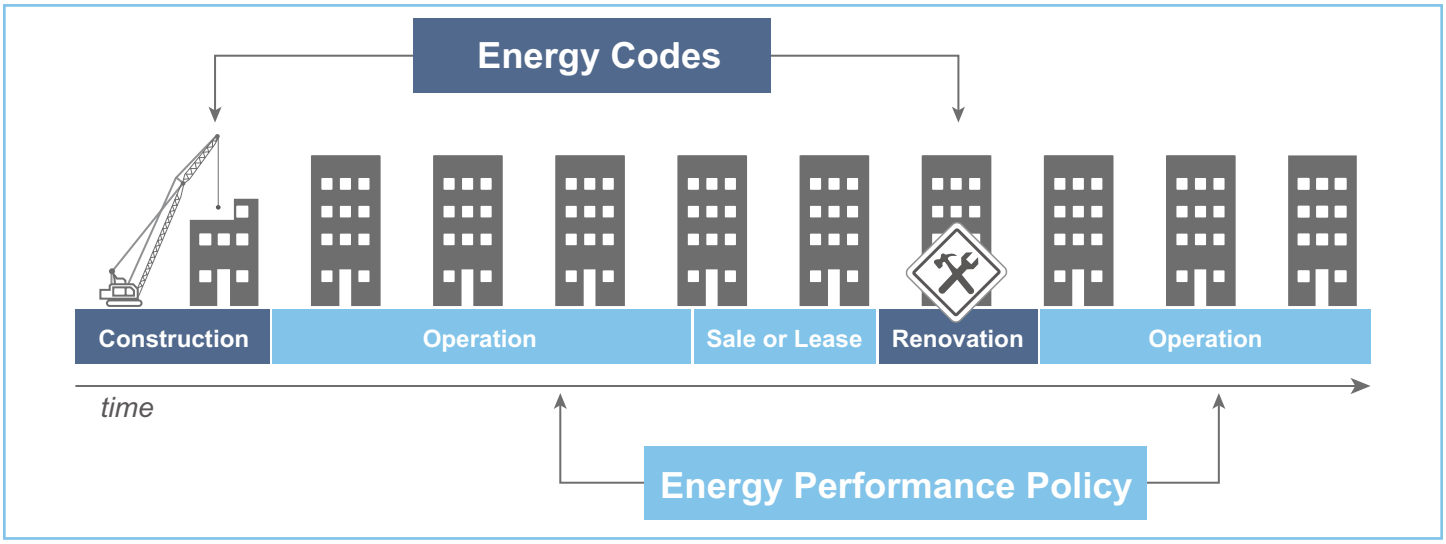
Policy Scope

One synergy pertains to where each policy impacts a building in its life cycle, as shown in Figure 1. Building energy codes apply to new buildings being constructed and, with the exception of alterations/renovations, generally have little application after the certificate of occupancy has been issued by the local government. Benchmarking and disclosure policies pick up nicely where energy codes leave off. After a building is constructed and enters into operation, a typical[4] benchmarking and disclosure policy requires that the energy consumption of that building be disclosed on an annual basis, or at the time of a real estate transaction, such as selling or leasing the property. In doing so, this policy encourages energy efficiency improvements where the energy code no longer applies.

3 Institute for Market Transformation, "Building Energy Transparency: A Framework for Implementing U.S. Commercial Energy Rating and Disclosure Policies." July 2011. Available at http://www.buildingrating.org/Building_Energy_Transparency_Implementation_Report

4 Benchmarking and disclosure policies have varying scopes; this paper is simply referring to model policies.

Figure 1. Energy codes and benchmarking (on energy performance) policy impact a building over its life cycle.



Eventually, the line between energy codes, which regulate physical attributes, and building performance policies, which regulate operating characteristics, may have to be eliminated.

As mentioned above, energy codes set minimum requirements for the elements within a building that impact energy consumption. However, the operation of a building has a tremendous impact on energy consumption, and energy codes currently don't regulate building operations. A study[5] by the New Buildings Institute found that "the combined impacts of operation, maintenance and tenant behavior practices represent the potential for a substantial impact on overall building energy use." The study showed that best practices can reduce energy consumption by 25 percent to 45 percent and worst practices can increase energy consumption by up to 140 percent. Eventually, the line between energy codes, which regulate physical attributes, and building performance policies, which help regulate operating characteristics, may have to be eliminated. This could lead to the development of a true "energy performance" code, which would consider not just building design and construction quality but how well the completed and occupied building actually performs.[6]

5 Heller, Jonathan, Morgan Heater, and Mark Frankel. *Sensitivity Analysis: Comparing the Impact of Design, Operation, and Tenant Behavior on Building Energy Performance.* July 2011. Available at http://newbuildings.org/sites/default/files/NBISensitivityReport.pdf.

6 Harris, Jeffrey, Lowell Ungar, Bill Fay, Aleisha Khan, Harvey Sachs, and Garrett Stone. *Re-Inventing Building Energy Codes as Technology and Market Drivers.* August 2010. Available at http://newbuildings.org/sites/default/files/Codes_as_Drivers.pdf

In addition, most buildings are sold or re-leased many times during their lifespan. These events are the most opportune times for a building owner or tenant to make physical improvements that can increase energy efficiency and performance. Since benchmarking and transparency policies raise awareness of a building's performance in the marketplace, they can lead to several positive and likely outcomes:

- A building owner will be motivated to make investments before a future sale or lease, making their building more competitive.
- A new tenant can request changes that will improve the efficiency of a leased space as part of negotiated tenant improvements.
- The new purchaser of a building can choose to renovate it, including making improvements that will increase energy performance.

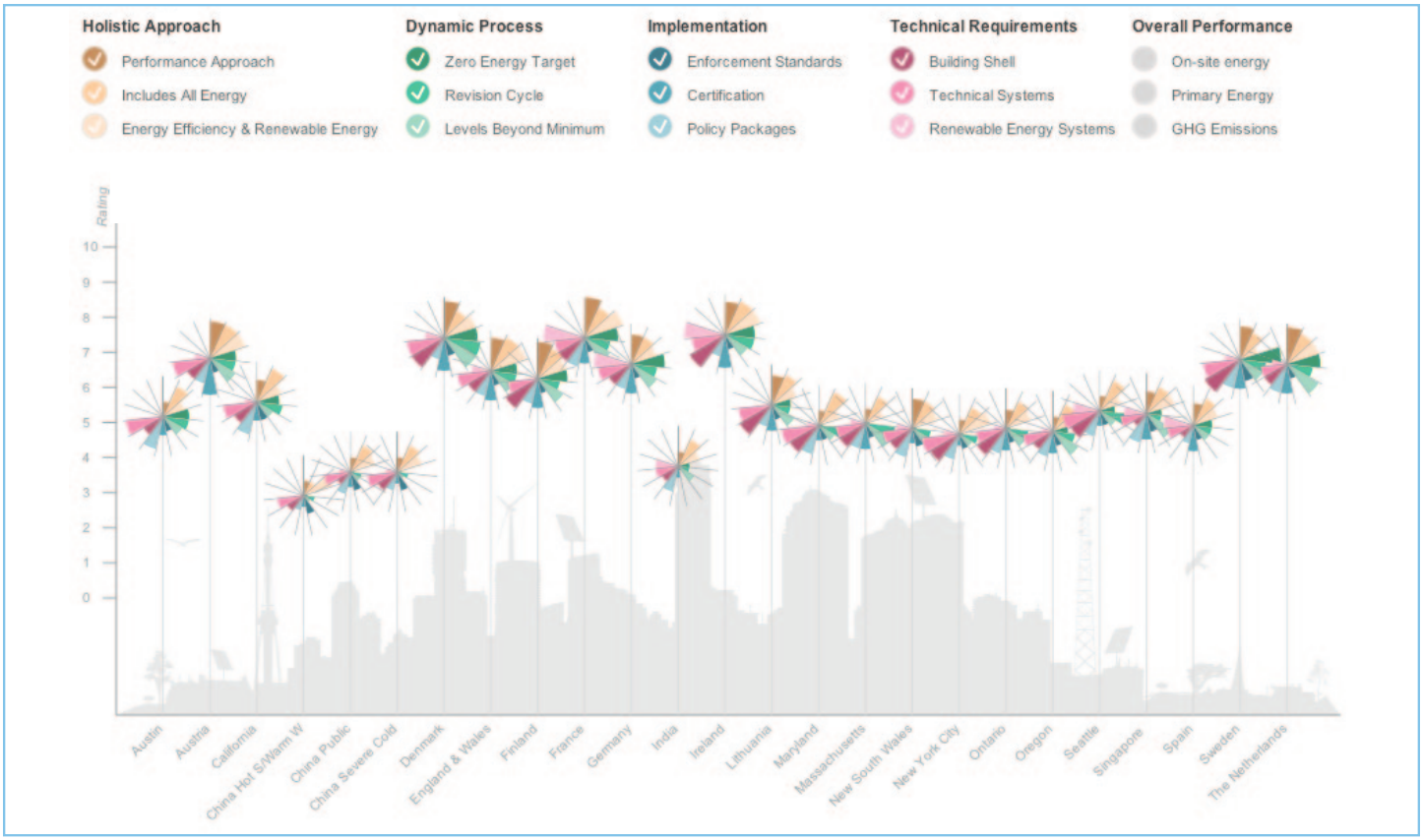
In each of these cases, the information from a benchmarking and transparency policy can be instrumental in encouraging investments in energy efficiency improvements. Without this information, there could be a missed opportunity. After the decision to make improvements has been made, the energy code requirements will kick in to ensure that all design and construction will be at least compliant with current minimum energy codes. Thus, rating and transparency policies and the energy code ideally work hand in hand at the point of a real estate transaction.

Moving Toward Modeled and Measured Performance

Another area of combined effort involves the evolution of energy codes toward modeled and measured performance and the role benchmarking and disclosure policies can play in that process.

National model energy codes, which serve as the basis for nearly all state and local codes, have seen a theoretical 30 percent increase in efficiency levels from 2006 through 2012. Most of these changes have come through improved efficiency levels in the prescriptive path. The prescriptive path sets minimum values for various building components that must be met in order to be in compliance. Unfortunately, achieving

Figure 2. GBPN Building Code Comparative Tool



significantly higher energy savings through the prescriptive path has been recognized as difficult and often not cost effective. In addition, even though the prescriptive requirements for the loads regulated by energy codes have continued to become stricter, the energy consumption of non-regulated loads, such as computers and other plug loads, is rising, threatening to negate the gains made by energy codes. With that in mind, many believe that it is necessary for energy codes to evolve toward performance requirements. If they do so, builders and designers can maintain flexibility while meeting more stringent energy efficiency targets.

In a 2013 study by the Global Buildings Performance Network,[7] a group of more than 50 global experts provided input on the key attributes for an energy code regime that could successfully move to a net-zero-energy building standard (see Figure 2). One of the critical criteria identified was

7 McDonald, Niamh, and Laustsen Jens. *A Comparative Analysis of Building Energy Efficiency Policies for New Buildings.* February 2013. http://www.gbpn.org/sites/default/files/08.Final%20BC%20Report_Reduced%20File%20Size.pdf.

the need to employ a holistic or systematic approach to the design and construction process. While the initial steps toward zero energy can be taken by improving individual parts of buildings, it will not be possible to design a zero-energy building by addressing individual components in isolation. The conclusion was that the main requirements of the energy code should be focused on achieving total energy performance targets, based on either a modeled performance calculation or a figure derived from measured consumption.

Benchmarking and disclosure policies play a crucial role in enabling the market to recognize and value energy consumption.

These concerns were highlighted by the latest report of benchmarking results for buildings in New York City. The report shows that the median energy-use intensity (EUI) for office buildings has risen steadily by almost 40 percent from a median EUI of 188.3 for offices built before 1930 to 262.1 for offices built since 1990. EUI is a key benchmarking metric – the higher the EUI, the worse the energy performance. The report found that the median EUI for the buildings of each 20-year period was higher than the preceding one, with a noticeable worsening of energy performance for buildings built after 1990 despite energy code requirements increasing during the same period.[8] Some of this increase can no doubt be attributed to newer buildings offering more energy intangible services – better illumination, increased comfort levels, and higher concentrations of computers and other equipment. However, this illustrates that energy codes alone, particularly in the absence of total energy performance targets, are clearly not sufficient.

Performance-based energy code requirements also work hand in hand with benchmarking and disclosure policies because they make building owners and their design and construction teams consider the energy consumption of a building before it is built. After the building enters into operation, a benchmarking and disclosure requirement lets them know whether they met the energy targets they aimed for. Therefore, the

8 "The New York City Local Law 84 Benchmarking Report." September 2013.

benchmarking and disclosure policy creates an ongoing feedback loop to evaluate modeled energy performance.

In Washington, DC, this approach has already been incorporated into the building permitting process. Under DC's Clean and Affordable Energy Act of 2008, all new construction or substantial improvements greater than 50,000 square feet must use the EPA's ENERGY STAR Target Finder to establish expected building performance. Target Finder uses the same underlying methodology for normalizing input parameters and calculating building performance as ENERGY STAR Portfolio Manager. Since DC also has mandatory annual benchmarking requirements based on Portfolio Manager, the value determined by Target Finder during project design can be directly compared to the value determined from actual measurements after the building is occupied to assess how well the building is performing compared to the design expectations. Once a local jurisdiction has actual data on the size and frequency of any differences between actual and projected performance, they can more effectively determine if and how best to address that gap. For example, targeted incentives and education programs, improved code compliance or even mandatory upgrades for underperforming buildings may be worth considering.

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Benchmarking and Disclosure Policies Encourage Code Compliance

In jurisdictions where benchmarking and disclosure policies are enacted, they can act as a driver for energy code compliance and even encourage performance levels beyond the code minimum.

When design teams know the building they are designing will be required to disclose its energy consumption, they are more likely to conduct a thorough analysis of the building's potential energy use. While energy codes are still necessary to establish the minimum requirements, a benchmarking and disclosure policy can motivate owners and their design teams to strive for above-code performance. Similarly, benchmarking and disclosure policies

can encourage more thorough attention to the building's adherence to the design specifications and energy code requirements during construction.

As described above, a performance-based energy code requires a building to be designed and built to meet a pre-defined energy efficiency target value. Though this has some advantages over a prescriptive-based code, compliance with a performance-based energy code still only requires a building owner to demonstrate that they met the energy consumption target once, at the time of construction. By combining a performance-based energy code with benchmarking and disclosure requirements, the building owner is incentivized to maintain compliance with the target value continuously, relying on measures such as retrocommissioning and ongoing maintenance and operational improvements to ensure that their building continues to perform at least as well as when it was first completed and occupied.

By recognizing the synergies that exist between each policy mechanism, governments can effectively implement them for the greatest impact.

Compliance with a performance-based energy code can rely on either a modeled performance calculation – using energy modeling software to estimate a building's energy consumption – or measured consumption – evaluating the actual energy use of a building after it's been constructed and occupied. Regardless of whether compliance with targets is based on a modeled performance calculation or on measured consumption, one of the challenges is determining what that target should be. It must be ambitious enough to prevent the construction of buildings with unacceptably poor performance, while not imposing demands that are beyond the ability of the local market to meet cost-effectively. Here, too, the relationship between energy codes and benchmarking and disclosure can play a key role. The data generated by benchmarking programs can provide jurisdictions with highly detailed and granular data to help determine appropriate performance targets for different building types and uses, taking climatic conditions and other highly localized factors into consideration.

Ultimately, a compliance approach based on measured performance, verifiable through benchmarking and reporting, has the potential to simplify enforcement demands for responsible jurisdictions. Though some level of plan review and on-site inspection still will be needed, relying on measured performance as one key aspect of the compliance process may allow greater flexibility of code interpretation and enforcement, and help minimize the staff resources that must be dedicated to these labor-intensive activities.

Recommendations for Implementation

While nearly all local governments have adopted an energy code as part of their building, fire, and life safety codes, benchmarking and disclosure policies have only been adopted by a handful of states and cities. Since both policies impact buildings, it is critical that they be properly integrated within a local jurisdiction's administrative structure.

Energy codes are typically implemented by a jurisdiction's building department and are a part of the plan review, permitting, and inspection process that occurs during the construction or renovation of a building. Benchmarking and disclosure programs, on the other hand, are still considered to be more innovative and, when mandated by a city, typically are implemented within the mayor's office or under an office of sustainability. However, given the many synergies between energy codes and benchmarking and disclosure policies, it makes sense to oversee benchmarking and disclosure requirements within the building department.

Some of the potential advantages include:

- Placing the responsibility for improving the energy performance of all buildings within a jurisdiction's building stock – over their entire life cycle – in a single place, making it easier to drive and monitor progress toward any citywide energy efficiency goals.
- Reducing overhead and builds a "center of excellence" by consolidating staff expertise in building energy efficiency.

- Increasing the emphasis on energy-related issues within the building department, potentially improving the attention placed on other related areas such as energy code compliance.
- Improving ability to feed information from benchmarking results directly to code officials, who can use it to refine future code requirements and compliance practices.

In some jurisdictions, initial design and development of a benchmarking and disclosure program may best be handled outside of the building department. However, to ensure smooth implementation, it is recommended that a member of the building department be involved with the drafting of the ordinance and that the building department ultimately be responsible for program enforcement and collection of benchmarking data.[9]

Conclusion

As state and local governments strive to reduce energy consumption in buildings, building energy codes and benchmarking and disclosure policies play critical roles. The adoption and enforcement of energy codes ensure that new buildings and renovations to existing buildings use less energy. A benchmarking and disclosure ordinance fills the vital function of enabling the market to recognize and value energy consumption, thereby addressing the gap that energy codes leave in regulating building operations.

By recognizing the synergies between these two policy mechanisms, governments can effectively implement them to achieve the greatest impact on reducing building energy consumption.

9 The New York City example included in the initial release of this report has been removed following this clarification. Although the Department of Buildings is responsible for compliance and enforcement of the city's benchmarking requirements, the Mayor's Office of Long Term Planning and Sustainability retains the responsibility for overall program oversight.

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About the Institute for Market Transformation

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.

About the Global Buildings Performance Network

The Global Buildings Performance Network (GBPN) is a globally organized and regionally focused nonprofit network advancing building energy performance best practice policies to help decision-makers develop and implement policy packages that can deliver a Deep Path of energy consumption reductions and associated carbon dioxide emissions mitigation from buildings. It operates a Global Centre in Paris and is officially represented by Hubs in China, Europe, India and the United States. For more information, visit gbpn.org.

Acknowledgements

This paper was developed by IMT, with support from the Global Buildings Performance Network. Many thanks to Cody Taylor (U.S. Department of Energy), David Cohan (Northwest Energy Efficiency Alliance), and Jim Edelson and Sean Denniston (New Buildings Institute) for their generous donations of time and expertise.

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