



The Nexus of Energy Codes and Building Performance Standards

Introduction

Cities and states across the country have made commitments to reduce greenhouse gas (GHG) emissions according to stated timelines. The approach to reducing emissions, energy, and water use in new buildings is very different than the approach to do so in existing buildings. There are two separate but very related ways to approach these challenges: energy codes and building performance standards.

Energy codes apply to new buildings and major renovations. They are typically based on a national model code, and they are one of many building codes, such as fire codes, structural codes, plumbing and electrical codes. Building performance standards (BPS) apply to existing buildings that meet certain parameters, such as exceeding a specific square footage. Unlike energy codes, BPS are developed on a state or municipality level, and not by a national organization. BPS are standards designed to reduce energy and water use, and to reduce GHG emissions over time.

As soon as new buildings are built, they become existing buildings. While there may be a grace period, those buildings are soon subject to BPS. A building can be built to meet its jurisdiction's energy code, but might not be in a good position to meet BPS requirements. At the very least, there may be misalignments in metrics and unnecessary retrofits down the line. Considering energy codes and building performance standards together can avoid the missed opportunity to build more energy efficient buildings from the outset.



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Energy Codes

Overview

Energy codes apply to new buildings and major renovations, and regulate lighting, HVAC (heating, ventilation, air-conditioning), and building envelopes. They are typically based on a nationally recognized model code like the International Energy Conservation Code (IECC) and/or ANSI/ASHRAE/IES. Energy codes are set by each state, and sometimes by individual municipalities. The model IECC is released every three years, and different states may utilize different release years.

Depending on the jurisdiction, states may have two or more levels of codes. The first is the base energy code, which is the minimum code requirement all new buildings must meet. The second is the stretch energy code, which is usually an optional, stricter opt-in code that local governments may adopt and implement. There may be a yet more stringent opt-in code, or a step code, as is found in British Columbia. This means, that like BPS, energy codes are constantly updated every few years. Depending on local statutes, however, a jurisdiction may reference outdated model codes and miss out on energy savings.

ZONING ORDINANCES

There are other ways besides energy codes to address energy, water usage, and GHG emissions in new construction. Boston's use of zoning ordinances to address these issues dates back to 2007, when the city's zoning code required high performance, sustainable building practices according to the US Green Building Council's Leadership in Environmental and Energy Design (LEED) Rating System. A zoning ordinance is a local law enacted to regulate the use and development of land. Particulars can range from building types and heights, to placements on lots, to sustainability objectives. Boston recently adopted the Zero Net Carbon Building Zoning Initiative. This initiative will evaluate strategies to use green building zoning requirements to reach a zero net carbon standard. Priorities include: low carbon building, onsite renewable energy, renewable energy procurement and embodied carbon.

Building Performance Standards

Overview

BPS are relatively new and, as mentioned above, apply to existing buildings that fall within certain parameters, such as size and building type. BPS are developed on a state or municipality level. Each jurisdiction establishes building types that are covered by BPS, typically commercial and multi-family. BPS are policies that require



building owners to meet city or state mandated targets by improving the performance (such as energy use, water use, emissions) of their buildings within the timeline specified. Usually a series of milestones will need to be met over several years. For instance, a compliance cycle might be every five years, with each new cycle featuring improved performance targets.

Benchmarking is a process that measures building energy usage and compares it to a reference such as the energy usage of comparable buildings, or a defined performance level. Some cities have had benchmarking programs already in place, and now they are upgrading those policies to BPS. For other cities, starting a benchmarking program is the first step in developing BPS.

Equity

In the past, existing building owners were typically exempt from catching up with new energy codes. Building performance standards have changed that by putting a new obligation on owners whose existing buildings meet the stated parameters. These owners are obligated to benchmark and report their annual energy use and implement measures to improve performance such as upgrading mechanical systems, improving thermal efficiency through insulation, and/or installing on-site renewable energy.

In implementing BPS, equity and affordability are important. This is especially true for building owners of affordable multi-family buildings. These building owners and managers should receive education, technical assistance, and financial assistance. Utility programs and state funding mechanisms can help building owners access incentives to make building retrofits more affordable. Retrofitting existing buildings will create new jobs, and training should be provided to students and contractors to create a diverse workforce to tackle new opportunities and challenges. Additional consideration should be given to maintain transparency in the process and information for building occupants. Jurisdictions must listen to the groups directly affected by BPS, and understand the needs of underserved groups. Efforts must be made to ensure that the cost of compliance with BPS are not passed on to building occupants in the form of higher rent and commercial leases.

U.S. jurisdictions where BPS legislation has been enacted include Washington, D.C.; New York City; Washington State; Colorado State; St. Louis, Missouri; Boston, Massachusetts; and Reno, Nevada.

The Nexus

Energy codes and BPS are usually developed and managed independently of each other, and therefore are often not aligned. This is because while energy codes are typically based on the IECC, BPS are developed independently by each jurisdiction based on specific needs, metrics and other variations. Additionally, energy codes and BPS are typically developed and managed by completely different departments. Energy codes are typically managed by building departments of a given jurisdiction while building performance standards are handled by a Department of Energy, or similar office.



However, jurisdictions are finding ways to better align energy codes and BPS. In Washington D.C., BPS and energy codes have been designed to build off each other. Staff have concluded that without both, carbon neutrality by 2050 per their climate plan would be out of reach.

METRICS

There are different metrics used to measure building energy performance that are commonly used in both energy codes and BPS, including:

- Energy use intensity (EUI), which measures the energy consumption per unit of conditioned floor area (kBtu/sf).
- Emissions intensity limits, which measure GHG emissions, are measured in metric tons of carbon dioxide emissions per square foot.

The U.S. Environmental Protection Agency (EPA)'s ENERGY STAR Score, which is a 0 - 100 score that adjusts for key drivers of energy use by property type

The Future

For building owners, developers, architects and engineers, the time to consider the long-term performance of a new building is during its design. There is a real opportunity to align building energy codes and building performance standards for greater impact in reaching climate goals and ensuring an equitable energy future. This includes anticipating future upgrades to BPS within a given jurisdiction. For example, in the long-term, the minimum square footage of buildings subject to BPS typically drops, so while a new building today is not yet subject to BPS, it may become subject to BPS in five or 10 years.

For jurisdictions yet to adopt BPS, they have an opportunity to enhance their existing or future energy codes with BPS informed by lessons learned from other jurisdictions.

For jurisdictions that have already enacted BPS, now is the time to facilitate inter-departmental collaboration. This will not only avoid misalignment of building energy codes and BPS, but also actively use them together to accelerate progress in the quest to mitigate climate change, create local jobs, and provide affordable, healthy homes for everyone.



Codes and BPS Alignment in Action: An interview with Aykut Yilmaz, Energy Program Analyst, and Casey Studhalter, Green Building Program Analyst, from the Washington D.C. Department of Energy and Environment

Q: How are your current codes and standards aligned? How are they misaligned?

A: The DC Energy Conservation Code and Building Energy Performance Standards (BEPS) were developed independently, using different metrics and focused on different outcomes. The Commercial Energy Conservation Code, under the performance pathway, measures modeled energy cost of new construction, compared to BEPS which uses EPA's ENERGY STAR Portfolio Manager to compare source energy, property use, and a variety of other factors in existing buildings. The challenge lies in ensuring that the energy code doesn't allow a new project to be delivered that doesn't meet BEPS in that building's first compliance cycle. While they are not directly coordinated, both the codes and BEPS development processes have been acutely aware of this concern and are continually working to address any misalignment.

Q: Why is it important for energy codes and BEPS to be aligned?

A: The energy code governs construction standards and ideally should produce a high-performing building that performs above the local median ENERGY STAR Score so it isn't subject to performance requirements in the near term. The best and most economical time to complete energy conservation measures is during new construction, and owners and developers of new buildings are interested in avoiding additional regulations as long as they maintain their buildings properly. Ensuring new buildings meet the BEPS will enable the program to focus its resources on improving the efficiency of buildings built to older energy codes.

Q: Is there any concern that a building that has been designed to the current energy code will not meet the BEPS by the time it is completed?

A: There are too many variables to say for certain, but it is possible that a newly constructed, code-compliant building could end up not meeting the BEPS in its first compliance cycle. Particularly given the variability that comes from operations, maintenance and occupant behavior, it is difficult to ensure that won't occur. We do want project teams to know of this potential outcome and encourage all projects to consider exceeding code requirements in their construction and alteration projects to future-proof their buildings to the extent practicable.



Q: How will the District’s energy code change over time? Will this bring the two polices closer or farther away? Is the natural progression of energy codes enough or will more need to happen?

A: We anticipate the energy codes to progress more quickly than the natural evolution of the BEPS, and given this, the first BEPS cycle has the greatest risk of newly constructed buildings failing to meet compliance with the BEPS energy efficiency requirements. However, the codes will outpace the BEPS and this will not be an issue in future cycles.

The Clean Energy DC plan calls for an energy code that requires net-zero energy (NZE) by 2026. In order to meet that goal, the energy codes are on a trajectory of reducing energy consumption to meet that goal. As the energy code ramps down energy consumption, there should be less chance of a code compliant building running afoul of BEPS.

Q: How will BPS evolve? Can the city encourage decarbonization when the BPS is based on Energy Star Scores instead of carbon metrics? Why is it important for energy codes and BEPS to be aligned?

A: The Department of Energy and Environment (DOEE) is required to investigate how the BEPS program can address greenhouse gas emissions more directly and publish a report by the beginning of next year.

While the EPA has found that [electric heat pumps generally lead to lower source energy use](#) than fossil fuel heating technology, we are investigating possible changes to the program including using different or additional metrics that send clear signals towards electrification. We would like to maintain energy efficiency as a program goal but add clear, long-term signals to ultimately move all BEPS-covered buildings toward electrification.

In the meantime, there are ongoing efforts to encourage decarbonization, such as BEPS Prescriptive Pathway rules that discourage continued investment in fossil-fuel technology, alternative compliance options for buildings transitioning to low Global Warming Potential (GWP) refrigerants, and moving the District’s energy efficiency programs toward funding electrification measures instead of gas replacements.



Q: We understand that the BPS and energy codes are based on two different legislative vehicles. Who designed the BPS and who updates the building codes? Was there any collaboration? If not is there a plan to collaborate in the future?

A: BEPS is a statutory program that is implemented by the Department of Energy and Environment within the legal framework. The law specifies, and therefore the DC Council ultimately controls, important BEPS program parameters such as the scope of covered buildings, evaluation metric and minimum efficiency threshold, the compliance cycle period, and the energy savings requirements.

The DC Energy Conservation Code, part of the DC Construction Codes, is overseen by the Construction Codes Coordinating Board. This mayor-appointed board includes both public and private members who work to adopt and amend the national model codes on a semi-regular cycle.

There were minimal opportunities for collaboration in the development of these two regulations, however the staff leading development of both are very aware of the potential conflict and have coordinated as much as possible. If either, or both, regulations were to switch to a different metric, it could be easier to align targets but the unknown factors of operations and real-world performance are inherent challenges in aligning these two programs.

Q: Is there anything else you'd like to share?

A: The thing that I didn't appreciate at the outset of the BEPS development was the positive feedback loop between codes and BEPS. In order to ensure that new construction projects are meeting the BEPS we've heard some surprising support from stakeholders toward increasing the stringency of codes in a way that we previously had not. The energy code has also seen a new emphasis placed on commissioning and air tightness testing, recognizing that these have huge impacts on a building's performance but haven't traditionally been as closely enforced. We've also seen public agencies, like the Department of Housing and Community Development, voluntarily increase the minimum energy efficiency standards for all affordable housing funding sources to ensure that projects aren't liabilities a few years later.

Similarly, building owners have expressed interest in using certification to advanced green building standards as an alternative compliance pathway for the BEPS program. There is a real interest in giving building owners a "one-stop shop" type of solution to addressing building energy use and carbon emissions, and the new BEPS program has fed into interest to aligning codes and BPS significantly