U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Energy Codes and Building Performance Standards

Why Align Energy Codes and Building Performance Standards?

Unlike building energy codes, which set minimum requirements for energy-efficient construction at the time of construction and major renovation, a Building Performance Standard (BPS) is designed to ensure existing buildings meet specific levels of performance over their lifetime. Given the different goals of codes and BPS it is possible that buildings constructed and occupied within the years preceding, during, or immediately following the adoption of a BPS may be compliant with the applicable energy code but unable to meet the BPS targets, potentially requiring further interventions to bring the building into compliance with the BPS. To reduce confusion in the marketplace and enable new buildings to be capable of meeting a performance standard, it's imperative to align the requirements of the applicable energy code and the BPS where possible during the BPS development process.

How Does the Code Compliance Path Affect Future BPS Compliance?

The prescriptive pathway is a frequently used compliance path for commercial buildings, but it can result in a wide range of performance outcomes, making it a poor predictor of actual operational energy use.[1] Figure 1 highlights this variation by showing the range of performance outcomes that result when simulating over 100,000 combinations of prescriptive building parameters (none exceeding minimum requirements) for a medium office building in Reno, Nevada.

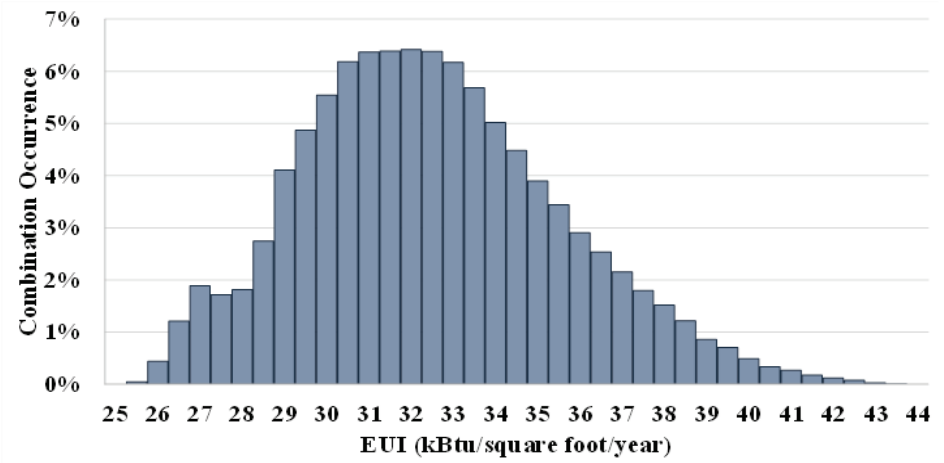

Figure 1. Distribution of EUI for IECC 2018 Prescriptive Options for Medium Office Building in Reno, NV.

In contrast, the performance pathway uses building simulation analysis to demonstrate that the proposed building energy use exceeds the minimum standard, which is set based on a reference building with specific characteristics. Although the performance pathway allows designers more flexibility in complying with the code, it is possible that the energy use estimated by the building models developed during the code compliance process may not align with actual building operational energy use if variables like occupancy, operation, maintenance, and weather are different than predicted.

What Strategies Can Be Used to Align Energy Codes with BPS?

The first step in aligning the energy code with BPS is to understand the typical code outcomes for the jurisdiction. This can be achieved by 1) reviewing recent code compliance applications to understand the most common types of compliance pathways, building designs, and modeled outcomes, and 2) reviewing building energy benchmarking data (where available) to understand the performance of recently constructed buildings and assess how they compare with proposed BPS targets. With a better understanding of potential performance discrepancies between code and BPS, jurisdictions can look to strategies such as code updates or changes to the BPS targets and compliance pathways that

Options for Jurisdictions: Aligning a Building Performance Standard with Energy Codes

There are a few key actions jurisdictions can take to align their proposed BPS with codes:

Know

Evaluate whether recently-built buildings will be able to comply with the BPS by comparing recent outcomes with BPS targets.

Update

Where possible, consider updating the applicable code to align with the BPS by increasing code stringency, aligning the code and BPS compliance metrics (or providing clear methodologies for conversions between the different metrics), or adding a parallel requirement for demonstrating the building's ability to comply with the BPS during the new construction process.

Bridge

Create alternative compliance pathways for new buildings in the transition period between construction and BPS implementation.

Streamline

Encourage collaboration between BPS and code compliance officials to streamline the compliance process.

Educate

Develop training programs to educate building developers and designers on the requirements of the BPS.

could improve outcomes for newer buildings complying with the BPS. Examples of code updates can include:

- Enhancing certain code requirements such as metering, commissioning, and operations and maintenance that can help isolate the energy uses of the building subject to BPS and ensure building systems realize their energy efficiency potential.
- Aligning the energy code and BPS metrics so buildings can be evaluated on similar terms.
- Updating the performance targets required for code compliance to align with the BPS targets (or vice versa).
- Adding a requirement for new buildings to demonstrate not only compliance with the energy code, but also with the BPS. This approach could leverage predictive modeling to better understand future building performance.

Other approaches may be possible depending on the needs of each jurisdiction.

Why Is It Valuable to Align the Code and BPS Metrics?

The performance pathway in national model energy codes (i.e., ASHRAE Standard 90.1 and IECC) uses energy cost as the metric to determine compliance. To date, BPS policies established at the state or local level have used a site energy, source energy, or emissions intensity metric to demonstrate compliance. Adopting a BPS compliance metric that differs from energy code compliance can make it challenging for building owners and designers to understand how a building's code compliance performance compares to the BPS requirement. Aligning the two metrics where possible can reduce confusion for building owners and designers and ease new buildings into BPS compliance. As an alternative to aligning the metrics, jurisdictions could provide building owners a clear methodology for converting cost to other metrics.

How Can the Gap Between New Buildings and BPS Be Bridged?

A gap in code vs. BPS compliance for newer buildings may exist depending on factors like code stringency, how well the BPS targets align with code, or how the new building is operated. An initial step a jurisdiction can take to help address any potential discrepancies between their energy code and a BPS is to evaluate recently constructed buildings (potentially through benchmarking data, if available) to assess how their performance compares with proposed BPS targets. This can help inform additional actions such as code updates that provide feedback loops between projected and actual building performance. For example, jurisdictions could consider including a parallel requirement in the code demonstrating that new construction will be capable of meeting the BPS target using either simulation or a code compliance approach tied to actual energy use.

Jurisdictions could also evaluate providing alternative compliance options for buildings constructed during transitional periods between construction and BPS compliance, such as allowing non-compliant buildings to apply for an extension, or to retro-commission the building to try to bring it into compliance.

Streamlining Code and BPS Compliance

With the addition of a BPS policy, an entirely new process and potentially a different agency may be designed to ensure compliance with a BPS compared to the energy code. Encouraging collaboration between inspectors enforcing both policies or, where feasible, placing them in the same agency, may create greater opportunities for collaboration and resource-sharing (e.g., help desk, tracking and reporting, etc.), increasing the efficiency of the compliance process for both jurisdiction staff and building owners and operators.

Available Resources

The U.S. Department of Energy offers existing resources and funding to provide technical assistance to support jurisdictions with the adoption and implementation of BPS and advanced energy codes:

- BPS Help Desk
- BPS Resources
- Energy Codes Help Desk

References

[1] Rosenberg, M., Zhang, J., Hart, R., & Athalye, R. 2015. *Roadmap for the Future of Commercial Energy Codes*. Richland, WA: Pacific Northwest National Laboratory.

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For more information, visit: energycodes.gov/BPS

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