Lessons from the Ground: Implementing Building Performance Standards

Marshall Duer-Balkind, Amy Boyce, Rajiv Ravulapati, and Louise Sharrow,
Institute for Market Transformation
Sharon Jaye, City and County of Denver
Patti Boyd, VEIC (District of Columbia Sustainable Energy Utility)

ABSTRACT

Building Performance Standards (BPS) have now been adopted in more than a dozen jurisdictions in the U.S., with policy commitments from many more. With implementation now in full swing, the next critical questions are how are these policies working, and how can we make them work better?

This paper provides a survey of BPS compliance progress in the U.S., focusing on the five jurisdictions furthest along in their initial implementation cycle–New York City, St. Louis, Denver, Boston, and Washington, DC. Using results from a survey of service providers and consulting engineers, interviews with city staff, and independent quantitative analysis, we paint a picture of how the programs are faring on the ground. We see that the percentage of buildings on track to meet the first BPS targets ranges from 30-80%, depending on location, and no more than a quarter of buildings are on track to meet 2030 targets anywhere. We then take a deeper dive into key implementation challenges and demonstrate varied ways these can be overcome, focusing on the development of alternative compliance plan strategies, from prescriptive approaches to customized action plans to target adjustments. We find that the costs of BPS compliance are in line with the social cost of carbon, with non-compliance often higher—but that this alone may not be sufficient to motivate unplanned work. In this context, we review the critical role of utility efficiency programs in BPS implementation, and consider how the next phase of BPS policies can accelerate an equitable, low-carbon future.

Introduction

Over the last five years, Building Performance Standards (BPS) have gone from a theoretical concept to one of the most important and powerful tools available to reduce energy use and greenhouse gas emissions from large existing commercial buildings.[1] To put it simply, if commercial buildings continue to be retrofitted at current rates of around 1-2% annually, it will take over 50 years to reach all commercial buildings, and per-building savings would also be insufficiently modest. This has created a growing consensus that meeting the climate challenge requires more direct regulation of existing buildings (IEA 2022, Nadel and Hinge 2023).

While BPS policies have been categorized as an innovative code approach by the U.S. Department of Energy, this policy tool is fundamentally distinct from more traditional approaches to regulating building energy through building codes and appliance standards. The Institute for Market Transformation (IMT) defines BPS as outcome-based policies that apply to a specific subset of existing commercial, institutional, and multifamily buildings within a certain

[1] Some jurisdictions use related terms, including Building Energy Performance Standards, Building Emissions Performance Standards, Minimum Energy Performance Standards, Mandatory Energy Performance Standards, or Existing Building GHG Limits. For the purpose of this paper, all policies using this model will be called Building Performance Standards (BPS).

jurisdiction, by date-certain deadlines that ramp up with each cycle, with compliance based on measured and verified whole-building energy use, and where there are clear negative financial consequences for non-compliance (IMT 2024b).

BPS policies have the ability to provide significant benefits to communities, such as easing energy burden for residents, improving indoor and outdoor air quality, and spurring job creation in the building retrofit industry (Hart, Majersik, and Eagles 2022). To ensure these benefits are able to be enjoyed by everyone and do not inadvertently lead to increased rents or displacement, it is crucial that policies and supporting programs are developed in close collaboration with community members and entities, including local residents, business owners, and advocacy groups (Di Lauro et al. 2024).

There are now 13 BPS policies in place in the U.S., with final regulations issued and implementation underway in seven of them: Washington, D.C.; New York City; Boston; Denver; St. Louis; the State of Colorado; and the State of Washington. Over 30 additional jurisdictions have committed to adopting a BPS through the National BPS Coalition (IMT 2024a). Similar policies have been adopted in Vancouver, Tokyo, and the European Union, but are not in scope of this paper (see Nadel and Hinge 2023).

While no energy or emissions performance standard has yet to be *enforced*, the innovative approach is being implemented in seven jurisdictions, with the first deadlines coming up in 2024-2026. These BPS policies build on benchmarking laws already in existence. Yet while most benchmarking laws are broadly similar, the greater complexity of a BPS has resulted in varied policy designs and implementation details. IMT published a model BPS law in 2021 to capture best practices in BPS design–and while all BPS policies with analyzable progress predate the model BPS law, they share best practices (IMT 2021; Hart, Majersik, and Eagles 2022).

This paper assesses progress to date and identifies key challenges to getting across the finish line. This paper uses a mix of quantitative analysis, qualitative surveys, and our own experience to attempt to answer five key questions:

- To what extent are buildings on track to meet the first BPS targets—as well as subsequent targets, where those have been determined?
- What lessons are service providers learning as they try to help building owners comply with a BPS?
- What lessons have been learned from the process of creating and implementing regulations? How have these needed to be adapted for real world circumstances?
- What might it cost building owners to meet the standards?
- What demand-side management program support is needed to support BPS compliance, and what lessons have been learned from “accelerator” programs for driving early action?

Cities at the Front of the Pack

To understand how BPS programs are performing, we selected five jurisdictions to focus on: Washington DC, New York City, St. Louis, Boston, and Denver. These five were among the earliest BPS policies passed, and have established final regulations and standards—which means it is reasonable to expect building owners to understand what they need to do to meet the BPS and to be taking actions accordingly. Equally importantly, all have benchmarking data for a baseline period or earlier. Colorado and Washington State are excluded because they established their benchmarking requirements at the same time as their BPS requirements, and so don’t have

sufficient baseline data for evaluation. Major elements of each of the five cities are listed in Table 1. All policies apply to commercial, multifamily, institutional, and government buildings (Denver uniquely also includes manufacturing, but this is not further discussed in this paper). We assessed progress through three activities: (1) surveys of key implementation staff in Washington, DC, New York City, St. Louis, Boston, and Denver; (2) a survey of service providers who are helping building owners comply with BPS policies in these markets; and, (3) quantitative analysis on progress in percent of buildings on track for BPS compliance

Table 1. Key Details on the five BPS policies focused on in this paper

Location	**Washington, DC**	**New York City, NY**	**St. Louis, MO**	**Boston, MA**	**Denver, CO**
Benchmarking established	2008	2009	2017	2014	2017
BPS est.	2018	2019	2020	2021	2021
Buildings covered	Comm, Res. $\geq$ 50,000 ft^2	Comm, Res. $\geq$ 25,000 ft^2	Comm, Res. $\geq$ 25,000 ft^2	Comm, Res. $\geq$ 25,000 ft^2	Comm, Res. $\geq$ 25,000 ft^2
BPS Metric	ENERGY STAR Score / Source Energy Use Intensity (EUI)	GHG Intensity (GHGI)	Site EUI	GHGI	Site EUI
Baseline Period	2018-2019	N/A	2018	N/A	2019
First BPS Deadline	2026 data, due 2027	2024 data, due 2025	2024 data, due 2025 / 2026 data, due 2027 for affordable housing	2025 data, due 2026	2024 data, due 2025
Final BPS Deadline	N/A - new cycle every 6 years	2050	N/A - new cycle every 4-6 years	2050	2030
Main Compliance Pathway	20% reduction in Site EUI	Meet standard for property type	Meet standard for property type	Meet standard for property type	"Trajectory Approach" (see IMT 2021)
Alternative Compliance Pathways	Meet standard; "prescriptive pathway"	Prescriptive pathway for affordable housing only	"Narrow the Gap"; Custom pathway	Portfolio-level pathway; Custom Trajectory	Building Performance Action Plan
Treatment of Renewable Energy	On-Site renewable energy reduces Source EUI & improves ENERGY STAR Score	GHGI credit for 100% of renewable electricity purchase, if generated in NYC grid zone	No credit for renewable electricity	GHGI credit for 100% of in-state renewable electricity purchase	Site EUI credit for 100% of in-state renewable electricity purchase

Are Buildings on Track?

While no BPS policy has been enforced yet, in these leading cities, buildings are taking action to come into compliance. But how much? Initially, we aimed to apply a methodology from DC to other cities to determine the percentage of buildings "on track" for compliance. However, challenges such as varying target stringencies, inconsistent baseline data, and limited insights into effectiveness made direct comparisons difficult.

It is more useful to look at how many buildings are already in compliance, and how that has changed since the programs began. All BPS programs in this study used a dataset of actual reported benchmarking data for their jurisdiction to set targets, and established a percentile to peg the targets to. New York City and Boston both used modeling to set targets based on a philosophy of starting with the worst buildings first and then expanding to cover most large buildings. DC and St. Louis both use a cyclical structure that resets the standards based on a target percentile (50th and 65th, respectively) specified in the statute e. Denver set its EUI targets based on what it would take to achieve certain predetermined energy savings.

To calculate progress, we used publicly available benchmarking data from the year that the BPS standards were set to calculate the percentage of buildings meeting the first compliance target and the 2030 target at the time that those targets were set. This is a simple calculation of assigning the property type target to each individual building and measuring the gap between the EUI or GHG metric in the benchmarking data and the required target. We then completed those same calculations using the most recently available benchmarking data compared to the same targets. For our purposes, this method did not strenuously clean the data of exempt buildings or assign standards to non-listed property types. For several cities this calculation had already been completed by the government or an associated group and in that case, we used those numbers rather than duplicating the analysis (Urban Green Council 2023; A. Held, pers. comm., February 27, 2024; A. Callan, pers. comm., March 7, 2024).

Table 2. Initial Progress based on percentage of eligible buildings meeting standards

Location	**Washington, DC**	**New York City, NY**	**St. Louis, MO**	**Boston, MA**	**Denver, CO**
Percentile for target setting	50th each cycle	~75th initially ~25th by 2030	65th each cycle	~75th initially ~25th by 2030	15th by 2030
Percentile selected via	Statute	Modeling	Statute	Modeling	Statute + Modeling
% Meeting first standards when set	50%	75%	35%	54%	15%
% That meet first standard in latest data	53%	80%	30%	76%	36%
% Meeting 2030 standards when set	N/A	13%	N/A	24%	15%
% That meet 2030 standard in latest data	N/A	24%	N/A	25%	24%

As shown in Table 2, the initial and 2030 targets were designed to capture a specified portion of the building stock. Denver, NYC, and DC have made some improvements since then. The two outliers are St. Louis and Boston. Unfortunately, the Boston data is confounded by the fact that the initial targets were set based on parcel data, whereas Boston now collects and publishes data per building, making a direct comparison difficult. St. Louis is unique in having fewer buildings meeting the standards now than when they were set. This discrepancy is likewise due to a dataset discrepancy–in this case, the dataset now includes many buildings that were not in the original 2018 reference dataset, since the benchmarking reporting compliance rate in St. Louis increased from 45% to 91% between 2018 and 2022. The fact that buildings that only recently started benchmarking are performing worse is consistent with trends we see in other cities, where the buildings that report first were often *already* benchmarking their energy use and managing it, while poor performance is unwelcome news to newer-reporting buildings. In other cases where cities have benchmarking data for a minority of the covered buildings when setting standards, supplemental data has been used, including audit data, energy modeling, and reference datasets from other jurisdictions (Duer-Balkind Et al. 2022).

In general, buildings will fall into one of four categories when it comes to BPS compliance: (1) those that are high performing and meet the standard already; (2) those close to the standards who can often comply with low-or-no-cost measures, (3) those that will need upgrades, but where the upgrades are both technically and financially feasible, and (4) those that are much further away from their targets and face significant internal and/or external challenges to compliance. The remainder of this paper focuses on the latter two groups, where there is a lot of work to be done.

Voices from the Ground

Survey Methodology

In order to understand more about the current status of both benchmarking compliance and preparation for BPS implementation, we wanted to hear from two groups of people working in cities with upcoming deadlines: government staff administering the policies, and service providers doing the work in buildings. We developed two sets of questions: an email questionnaire for government employees asking about benchmarking and early BPS compliance to-date, and a Google Forms survey for service providers asking about their interactions with owners around energy and BPS work. We communicated directly with government personnel via email and phone, and asked partners in the relevant local "hubs" in each of the five cities (such as the DC-based Building Innovation Hub) to distribute the survey link to their service provider contacts. We acknowledge this approach has a self-selection bias as it reaches only providers already engaged in some way with BPS or policy work. However, as our goal was to understand more about what these providers are experiencing as they actively try to incorporate BPS, we felt this bias was acceptable for our purposes.

We were able to connect with government representatives in all five cities (including a co-author on this paper), and their responses were used to determine what sort of data analysis could be done and how to handle differences in each city's data and processes. For the service provider survey, the link was emailed to around 1,000 individuals working in the five markets. 60 responses were received (5% response rate). 45% of respondents worked in just one market, the rest worked in multiple locations, with a median of 3. Over 20 respondents reported working in each of DC, NYC, Denver, and Boston, though only 3 worked in St. Louis. The respondents

represent a range of service provider types, the most common being energy consultants (52%) followed by energy auditors, contractors, and architects (10 % each), but also including engineers, sustainability consultants, property staff, and others.

Because of the low response rate and selection bias, the survey results are not statistically significant, but they are interesting. Quotes and data from this survey are spread throughout the paper as illustrative examples. In addition, a few overall points jump out from the results:

- Service providers who responded to our survey are twice as likely as clients to bring up BPS compliance.
- The top three goals prioritized by clients of the respondents are energy cost savings, meeting BPS targets, and needed equipment replacements.
- Most projects focus only on the most immediate deadline; less than 20% of respondents said their clients were trying to prioritize long-term planning.
- In all five markets, the top concern of all service providers involves workforce constraints, such as the ability to hire enough staff to meet anticipated demand. Liability concerns were the second highest concern in all markets.
- Clients, unsurprisingly, are most concerned about costs: project costs, BPS penalties, and availability of incentives and financing.

Common Challenges, Uncommon Solutions

For BPS programs, the real work of bringing underperforming buildings into compliance is just getting started. This work starts with raising awareness among owners and industry professionals. While those working in the fields of building energy efficiency and public policy might be very familiar with the concept of building performance standards and their associated structures and requirements, respondents to our service provider survey suggest that building owners are often less informed. An energy consultant working in New York City reported that "Clients are still unclear about LL97 PECMs and requirements after 2030", and another based in D.C. stated that "ownership seems largely unaware of the requirements". An energy consultant in Denver shared that "Everyone wants cheaper services, but clients need so much help." Multiple respondents shared a need for more education, both from them to the client but also overall education in the market about the policies.

Furthermore, terminology can be confusing, even for technical experts. As noted above, "performance" for building codes usually means modeled performance, and for energy audits, current and projected performance estimates, particularly where metered data is limited, may vary substantially from reality. The realization that building owners will be held accountable for *actual, verified* energy performance outcomes is proving to be a paradigm shift for building owners, facility managers, engineers and other service providers.

Many buildings will face significant technical challenges when trying to reduce their energy or carbon use, and every inefficient building often proves to be inefficient in its own unique way. Some owners have asserted that the cost of upgrades may be so high that they outweigh the value of the asset, though in practice this tends to reflect a low asset value more than high upgrade costs. Service providers shared multiple concerns, including "How to achieve BPS target within a limited budget" and the belief that "many buildings don't have the ability to meet targets given their 'bones'". Where the building cannot meet the prescribed target for its size and type, it may be necessary to adjust the target to one that is more realistic for the

circumstances, at least in the short term. In other cases, it is more a matter of timing, where planned capital replacements do not align with compliance deadlines.

While both technical feasibility and timing are not unrelated to cost, sometimes financial constraints are much more directly tied to the inability to meet the requirements of a BPS. Many owners, particularly those of Class B and C buildings or affordable housing buildings, may simply not have the funds to conduct the work necessary to bring their buildings or units into compliance. In our survey, the service providers indicated that the cost of projects/ROI was the most common concern cited by their clients, and that they sometimes did encounter buildings that would struggle to meet the BPS standards without significant assistance and investment. While the goal of BPS is to decrease the use of energy or carbon output per building, they are not intended to do so at the expense of an individual's well-being or the financial stability of a business. Additional financial and technical support becomes important in these situations.

Innovative Compliance Pathways

While BPS policies have a lot in common with one another, they also differ, as cities experiment with different approaches adapted to local conditions. One key place where we see differences is in alternative compliance options; most jurisdictions offer multiple alternative pathways. In order to keep the focus on building upgrades, we put aside accounting-based compliance options such as portfolio-level compliance, renewable energy purchase, offsets, and trading programs. This leaves three key alternative compliance pathway concepts that have been iterated on in more than one jurisdiction and show significant lessons: (1) a 'prescriptive' pathway, (2) a Building Performance Action Plan, and (3) standardized target adjustments.

Can a prescriptive pathway for BPS work?

While outcome-based programs can yield more predictable progress in aggregate, they introduce uncertainty and risk for building owners and service providers, since they rely on the fulfillment of energy models and efficiency calculations, all of which are subject to variances in real world applications, actual building use, and unforeseen events (Boyce, Cheslak, and Edelson 2022). To allay industry concerns and provide paths to assured compliance, the first two BPS laws, in DC and NYC, included a prescriptive pathway. But the building owners aren't the only ones who want certainty; policy-makers need certainty too, and prescriptive measures have a range of real-world savings outcomes. Balancing these needs has been a challenge.

New York City's Local Law 97 provides a prescriptive pathway only available to affordable housing buildings with more than 35% rent-stabilized units. The prescriptive pathway requires completion of certain measures specified in the law itself, and further defined in regulations, but neither requires nor provides any assurance of energy savings, and which prioritizes avoiding rent impacts over achieving any given level of energy savings (Nadel and Hinge 2023; NYC 2023).,

In DC, the Clean Energy DC Act that created the BPS charged the District of Columbia Department of Energy & Environment (DOEE) with creating a "prescriptive pathway for buildings to achieve compliance by implementing cost-effective energy efficiency measures with savings comparable to the performance pathway" (District of Columbia 2019). In Building Energy Performance Standard Task Force meetings, building owner stakeholders strongly argued for the simplicity of a "menu" of options, each with a median savings percentage, that would add

up to the 20% site energy savings required by the performance pathway. Unfortunately, in practice, the amount of energy a given measure will save varies widely among buildings–and especially so for poor-performing buildings. Retrocommissioning is the most extreme example; one meta-analysis by PNNL found that savings ranged from 0.25% to 52%, with a median value of 12% (Katipamula and Fernandez 2020). Even more classic measures like space heating and domestic hot water upgrades have large ranges in savings. Add up all the ranges across all the measures, and one can quickly see that no menu-based approach can actually work if the goal is to meet a given performance target for an individual building.

As a result, DC adopted a path wherein a building owner conducts an energy audit and selects measures that add up to 25% savings, and where compliance is then measured based on completing those measures. To provide headroom for variances between models and reality, the proposed measures must add up to 25% savings even though the performance path requires 20% savings (DOEE 2013). In practice, this isn't really a "prescriptive path" in the conventional understanding of such a term, and bears more resemblance to a measure-based action plan approach, as discussed below.

Revisiting Building Performance Action Plans

One of the most promising solutions for buildings facing real challenges in meeting the targets is a Building Performance Action Plan, or BPAP. Per IMT's BPS Implementation Guide, BPAPs provide flexibility to owners facing challenges in meeting their designated interim or final performance standards, enabling owners to submit customized improvement plans for their buildings for consideration by the department overseeing BPS enforcement (IMT 2022).

BPAPs are intended to only be permitted in extenuating circumstances, and constitute a binding agreement between the owner and jurisdiction. BPAPs provide a better option than exemptions or fixed extensions by offering owners flexibility, while still advancing emissions and equity goals (Hart, Majersik, and Eagles 2022). BPAPs must include an energy audit report and proposed energy conservation measures or capital improvements along with a detailed implementation timeline. BPAPs can provide flexibility by extending compliance deadlines and/or adjusting the building's performance requirements. In exchange for these accommodations, the enforcement department may request that the owner commit to actions deemed beneficial to the community, such as using high-road contracting principles when procuring professional services for the work proposed in the BPAP. An owner is deemed compliant with the BPS as long as they abide by the terms of the plan (IMT 2022).

BPAPs design and application can vary in several ways: (1) adjusting compliance for an interim target or the final standard, (2) adjusting the timeline for compliance, (3) adjusting what has to be done for the final target, and (4) how it is enforced.

Denver was among the first jurisdictions to put the BPAP model into its BPS regulations. In the original version of Denver's rules, the city had a function similar to the BPAP that allowed for the adjustment of the building's final target, in which a professional engineer would determine the maximally technically achievable target for the building (the draft regulations did not define cost conditions for determination). Through stakeholder engagement, however, the city received feedback from service providers that basing a building's compliance determination on a professional engineer's educated opinion of what was achievable creates a liability issue for the provider. You could send five different providers into the same buildings and get different opinions on what the maximum achievable target of the building should be. It is also possible

that the owners and installers could follow the engineer's recommendations to the letter, but issues could arise with the specific equipment installed, the building operator might make adjustments post-installation, or the building had abnormal operational circumstances that year. If the building does not achieve the final target that the PE set, the building owner could potentially sue the PE for an amount equal to the penalties assessed. For any service provider, the results of the audit or plans for retrofitting are estimates governed by best engineering practices, but the ultimate outcome of the operations of the building is out of their control. As a result of that stakeholder engagement, Denver decided to remove any compliance functions where the final target of a building or a compliance decision was based on a service provider's recommendation. Liability concerns with the owner meeting the BPS targets showed up in the top three service provider concerns in all cities we surveyed.

Under Denver's final rules, building owners who believe their building cannot meet the interim or final target by the deadline can still apply for a BPAP—but the program is now focused only on adjusting timelines, not targets. The process continues to include completing an audit and recommending a series of measures as well as projecting the anticipated performance in order to justify the proposed alternate timeline. Denver also increased the number of reasons for timeline adjustments from six to 11, and added "reasons considered on a case-by-case basis" to provide more flexibility (Denver 2023).

Another key lesson learned with the BPAPs and other custom compliance pathways relates to the concept that it constitutes a "binding agreement." While calling it a binding agreement is clear messaging, in Denver, DC, and St. Louis, agency lawyers concluded that an alternative compliance selection could not be documented in anything called a "binding agreement," as that represented a contract and could trigger city contracting rules. Instead, Denver simply issues a new "notice letter" that is as binding as the original "notice to comply" letter that documents the adjusted terms. Similarly, in DC, the agreement for any alternative compliance pathway is documented in an "Alternative Compliance Pathway Decision Letter" that lists the requirements and represents the new regulatory requirement (DOEE 2023).

Standardizing Approaches to Target Adjustments

Shifting timelines can be important for aligning with capital plans, but a more difficult challenge comes when a building owner seeks a BPAP because they believe the final standard is itself technically or economically infeasible. The question then becomes how to fairly select a reasonable target for that building.

One solution is for the government to set an adjusted target for the building, but not one directly based on a service provider's analysis, but rather based on standardized EUI adjustments or buckets. With this model, the service provider's report would likely *inform* a building owner's decision to ask for and agree to an alternate target, but would not be the legal basis for the target. Denver worked with the EPA to design standardized target adjustments for specialized use cases like swimming pools and data centers, as well as non-standard occupancy hours, based on factors derived from the ENERGY STAR Score models (Denver 2023). Washington State also allows buildings with non-standard operating hours to adjust their BPS EUI target based on standard multipliers per ASHRAE 100-2018. However, due to the structure of ASHRAE 100, this approach primarily helps buildings that operate 24/7, which are eligible for a 30% to 110% increase in EUI targets, depending on building type (ASHRAE 2024). DC provides buildings with even greater flexibility for operating characteristics through its use of the ENERGY STAR score for BPS targets, though this flexibility comes at the cost of long-term certainty, since EPA

regularly updates the ENERGY STAR score models. (ASHRAE 100-2024 also includes requirements that buildings that do not meet the target must undertake an energy audit and decarbonization assessment, and identify measures that can meet a given target–very similar, conceptually, to DC's "prescriptive pathway" discussed above.)

Another emerging option is for an engineer to propose an alternative target, but for compliance to be measured according to completion of the measures outlined in the BPAP, rather than achievement of the target. This is how Montgomery County, Maryland is proposing to implement their alternative compliance option. Like Denver, the County got pushback from stakeholders on engineers proposing alternative EUI targets. In order to provide greater flexibility and certainty, the County instead decided to take an approach similar to DC's prescriptive path, or ASHRAE 100. In its proposed rules, the department reviews the plan, and may require additional measures be included or other changes be made. Once the plan is approved, the building is deemed in compliance with the BPS as long as they implement the measures when specified, with annual reporting. So long as the work is done, the building is still in compliance so long as it undertakes selected measures, regardless of whether the actual savings are similar to what was predicted in the engineer's study (Montgomery County 2023).

Estimating and Establishing Appropriate Consequences

Traditionally, the motivation for major building improvements has been based on anticipated cost savings in the form of reduced energy bills, or on the need for equipment replacement due to failure or excessive repair costs. With this reasoning, energy conservation measures face a high burden of return, needing to eclipse that of other potential non-energy investments; major system overhauls are often dismissed in favor of like-kind replacements. While the pursuit of above-code certifications, like LEED, provide marketing and leasing advantages, cost barriers are still hard to overcome. Most owners do not change large equipment for energy reduction reasons, like central HVAC systems, but instead wait until the system is at the end of its useful service life. The noncompliance costs associated with BPS changes the calculation; upgrades that may not have previously penciled out could now do so. One NYC provider stated that "in general most owners I work with are experienced and know the long-term matters, but impending fines of BPS are a strong driver - and draw a lot of attention."

To understand what sorts of costs the BPS could impose, we reviewed cost-benefit analysis (CBA) and/or life cycle cost analysis (LCCA) studies from select jurisdictions that aim to estimate what it may cost building owners to actually retrofit buildings that don't meet the performance thresholds, and compared that to the payments or penalties buildings are liable for if they do not comply with the BPS.[2] As shown in Table 3, we used studies for four of the five cities focused on in this paper, adding Vancouver, Canada to provide an additional reference point since there was no sufficient study for St. Louis. For the DC and Denver studies, we used the published data to estimate carbon abatement costs over a 25-year lifetime, based on energy savings and projected GHG intensities from NREL's Cambium 2023 model (mid-case scenario). While the costs for improvements sufficient to meet the local BPS can vary significantly based on the measures being considered, the building types being affected, and the stringency of the

[2] Different jurisdictions use different terms for the monies owners of buildings that do not comply with a BPS are liable for: alternative compliance penalties, alternative compliance payments, fines, and carbon pollution fees. IMT generally recommends BPS laws use "payments," rather than penalties/fines, as this allows sharing of responsibility between owners and commercial tenants; this paper often uses "penalties" for clarity (IMT 2021).

BPS targets, we see capital costs generally in the range of $10-$20 per sq. ft., and carbon abatement costs roughly in line with EPA's latest estimates for the social cost of carbon in 2030, which ranges from $170 to $380 per tCO_2e, depending on discount rate (EPA 2023). In all five examples, non-compliance payments/penalties are set higher than the first cost or abatement cost.

Table 3: Compliance and Non-Compliance Costs, in U.S. Dollars

Location	**Average capital costs**	**Energy / carbon abatement costs**	**Non-compliance payment[3]**	**Source**
Washington, DC	$9/ft^2 (for 20% savings)	$0.46 per kBtu of annual energy savings $264-323/$tCO_2e$ lifetime cost[4]	up to $10/ ft^2/cycle	DOEE 2022
New York City, NY	$2/ft^2 (for <20% savings) to $22/ft^2 (for >50% savings)	Not published	$268/ tCO_2e/year	NYC 2023
Boston, MA	Not published	$211-234/$tCO_2e$ levelized cost	$234/ tCO_2e/year	Eash-Gates Et al. 2021
Denver, CO	$11/ft^2 (to reach median) to $17/ft^2 (to reach 2030 target)	$0.63 per kBtu of annual energy savings $168-497/$tCO_2e$ lifetime cost[5]	up to $0.70/ kBtu/year	Dyas 2022
Vancouver, BC, Canada	$15/ft^2 (mechanical upgrades only) to $55/ft^2 (with envelope upgrades)	$213/$tCO_2e$ lifecycle cost	$256/ tCO_2e/year	Duer-Balkind Et al. 2022

A key driver of differences in BPS penalties is whether the goal is to drive building owners to make a more energy-efficient/low-carbon retrofit than they would otherwise, or to drive them to make faster changes. Typical energy efficiency incentives have been based on covering differential incremental costs. The BPS non-compliance payments in NYC and Boston are similar, in so far as they are set at a level sufficient to make a low-carbon/energy-efficient project more cost-effective than a conventional business-as-usual project. This also makes philosophical and macroeconomic sense: if costs are close to the social cost of carbon, and that cost makes a lower-carbon project pencil out, then the externality may have been internalized.

But what if a building owner would otherwise not retrofit the building in the first place? A BPS policy, fundamentally, aims to *accelerate the rate* of building retrofits dramatically. We will never actually decarbonize our built environment if we do not begin retrofitting buildings faster than the industry norms of 1-2% per year. In this context, a non-compliance penalty can't

[3] The amounts listed here are maximum rates established in statute or final regulations; actual liability may be reduced through regulatory guidance or enforcement discretion.

[4] Annual energy and 25-year carbon abatement costs calculated by authors based on DC CBA report and interviews (DOEE 2022; A. Held, pers. comm., June 18, 2024).

[5] Annual energy abatement costs are as published; 25-year carbon abatement costs calculated by authors based on Denver report. The wide range reflects the range of potential fuel mixes and GHG intensities (Dyas 2022).

just be high enough to outweigh the *incremental* costs of more efficient and low-carbon building technologies; it needs to be high enough to make doing *nothing* the more expensive option. Unfortunately, fees based on the social cost of carbon or other incremental costs are insufficient here, as shown by a City of New York study where the total net present value of penalties across office and residential buildings is projected to be substantially lower than the projected cost of compliance, especially for the building cohorts far from the 2030 targets (NYC 2023). Using 'cost of compliance' studies to set penalties is important, but cannot capture these edge cases.

In some jurisdictions, existing legal limitations (often imposed by the state government) limit the quantity of fee or fine that can be collected. St. Louis is limited to setting fines to $500/day, which for a large real estate company is quite low. However, in accordance with its City Charter, the Building Commissioner has the authority to deny an occupancy or building permit for buildings that do not comply with Department regulations—including blocking new work associated with buildings not in compliance with BPS. This stick is potentially more impactful than any fine, though the political will to carry this out remains uncertain.

At the end of the day, though, penalties are a last resort and paying them does not produce energy or emissions savings–and while in most cases, the revenue is designated to go to other building decarbonization efforts, safeguarding such funds can be challenging. In our survey, service providers reported that they believe energy cost savings was the client's main goal in their work together, but potential penalties were their second highest concern, outranked only by the cost of the project itself. To quote a common sentiment, one Denver provider noted that "many of the buildings will not be able to meet BPS targets with the money currently available to them" and many respondents stated the need for more incentives and low-cost financing. To achieve lower energy use and carbon emissions, more support will be needed.

BPS Support through Utility Efficiency Programs

Federal funding, utility programs, and innovative financing models can all play a role in supporting change, but we will focus here on demand-side utility energy efficiency programs. These have a long history, and can be restructured to play a major supportive role for BPS.

Because buildings may struggle with BPS requirements, financial incentives are both politically and economically critical–the importance of aligning the utility-based energy audit or strategic energy management program cannot be understated. One challenge is that traditional evaluation, measurement, and verification rules prevent providing additional incentives for work already required by legal requirements like energy codes (though they can and do support above-code work). This approach makes sense in a building code context, as the owner has ample reasons to build the building, and is legally required to comply with the applicable code during construction. However, a BPS is *not* an energy code–many retrofits associated with a BPS would not happen *at that time* or perhaps *at all* without the BPS requirements, and so the appropriate comparison is the preexisting building, not the energy code.

In Washington, D.C, the BPS was specifically designed to function in parallel with its demand-side management program, through two key support mechanisms. The first was that the DC Sustainable Energy Utility (DCSEU, which runs all energy efficiency and DSM programs in DC, and is operated by VEIC) was legally authorized to support BPS compliance through funding associated efficiency upgrades, under the same law that created the BPS. The second was mandating the creation of the country's first Affordable Housing Retrofit Accelerator (AHRA), also implemented by DCSEU (District of Columbia 2019). The AHRA's goal is to

help qualified affordable multifamily and other under-resourced buildings meet DC's BPS while preserving affordability. DOEE also added a performance benchmark to DCSEU's contract, requiring the DCSEU to design and implement a deeper energy retrofit program that provides technical and financial assistance to commercial and multifamily residential building owners subject to the BPS and assist in meeting the standards. Since 2022, the AHRA has offered about 100 affordable multifamily housing building participants benchmarking data verification, a Level 2 audit, BPS compliance plan development, financial support for selected projects, approved contractor support, and electrification education (DCSEU 2024).

BPS requirements are fundamentally changing the conversation that energy efficiency program administrators and resource hubs are having. In DC, due to a lack of access to direct utility data, the DCSEU has used benchmarking reports as a means to identify and reach large energy users. BPS data further changed project pipeline development and targeting approaches by allowing the DCSEU to narrow its outreach focus to buildings that were likely to fall short of the requirements. Targeted outreach efforts started to include high level guidance to building owners on BEPS requirements, deadlines and penalties. Despite setback associated with the pandemic, the DCSEU continues to provide additional aid to building owners including market specific "roundtable" sessions to share BPS specific updates, resources available from the DCSEU and the Building Innovation Hub, connections to the DC Green Bank, and breakout sessions for peer-to-peer sharing of information.

Conversations with service providers are just as important–no matter how skilled they might be in their field of expertise, if service providers do not know the intimate details of the policy and its requirements, they will not be able to help the building owner come into compliance. Since energy audits are often the starting point—whether through free or reduced-price utility programs or an owner-selected consultant—it is critical that those performing energy audits are also fully aware of the policy requirements.

To facilitate this education, Denver has created a robust vendor training series, broken up into four types of training for different parts of the policies. The service provider must demonstrate proficiency with the content in order to be listed in a Trained Service Provider Directory. In DC, NYC, and St. Louis, local 'high-performance building hubs'—the Building Innovation Hub, Building Energy Exchange, and Building Energy Exchange St. Louis, respectively—maintain regional vendor directories of service providers. As independent entities, these hubs are better able to offer targeted advice and recommendations than the government can, including offering training series, links to financing resources and incentives, and even sample contracts and scopes of work. One key early learning in DC was that despite the job creation potential of BPS, more needed to be done to improve equity and provide benefits to local residents. As a result, the Building Innovation Hub, DOEE, and Emerald Cities Collaborative developed toolkits for high-road contracting and green building career maps (Building Innovation Hub 2024). More work can always be done in this area - workforce constraints were the top concern of service providers who responded to our survey.

Another benefit of training is that it builds up networks of accessible providers along with increasing market knowledge. On the other hand, some owners are still not aware of BPS or dismiss the possibility of investing in efficiency projects. Unfortunately, ongoing uncertainty in the real estate market and decreasing property values leave many owners uncertain of whether they will keep or sell the building. Service providers surveyed stated that most clients were focused solely on the first compliance deadline, and few were taking this opportunity for longer-term planning—regardless of whether the BPS program sets long term targets or not.

Conclusions

Building Performance Standards continue to be one of the most promising policies to drive rapid improvement across the existing building stock, while also providing sufficient flexibility to meet buildings where they are. Even though no BPS deadlines have occurred, we see the policies motivating both market actions and real-world energy/emissions savings. We find that ~25% of buildings are on track to meet the 2030 targets, with a wide divergence in shorter-term compliance outlooks, but lagging and varied data makes it hard to determine how concerning this trend is. Unfortunately, long-term planning still seems uncommon, despite BPS structures that should incentivize it. We can assume, however, that buildings that have moved towards compliance since these policies were enacted are likely those for which compliance did not impose an extreme burden. As more deadlines loom, the challenges towards compliance will become more apparent, and the need for both incentives and penalties will grow. The realization that building owners will be held accountable for actual, verified energy performance outcomes is proving to be a paradigm shift for owners, managers, engineers and service providers.

Of the alternative compliance options, a model for strategic decarbonization planning such as a BPAP remains promising, but does face challenges–some unique, and some in common with outcome-based codes. Partially as a result of the research in this paper, IMT has identified developing a more robust and standardized approach for alternative compliance pathways as a key next step for BPS development–and one that needs more research, testing, and funding.

The fundamental goal of a BPS is to motivate action that would not otherwise happen. Yet not all BPS programs have negative consequences sufficient to motivate change. For both carrots and sticks, we need to move away from models that focus only on incremental costs and simple payback based on energy savings alone—and to models that match the scale of the climate challenge. Upgrading a building yields additional benefits beyond energy savings, and that should be recognized too. Enabling utilities to support BPS compliance is key, but traditional models of providing for the incremental costs for new higher performing pieces of equipment are likely insufficient to the scale and complexity of the need.

As we look to the next generation of building performance standards, we are seeing increasing focus on balancing multiple metrics, better aligning with building codes, and better incorporating community voices and priorities. Equitable design and implementation are of particular importance for ensuring that BPS policies deliver benefits not just for the climate, building owners, or service providers, but for the greater good.

Acknowledgements

The authors would like to thank the following individuals for contributing data and insights to this report: Theresa Backhus (Building Innovation Hub), Katie Bergfeld (District of Columbia), Aidan Callan (City of Boston), Meredith Elbaum (Built Environment Plus), Andrew Held (District of Columbia), Katarina Michalova (City of St. Louis), Malachi Rein (Building Energy Exchange St. Louis), and Katie Schwamb (Building Energy Exchange New York).

References

ASHRAE. 2024. *Washington State Clean Buildings Performance Standard.* Peachtree Corners, GA: ASHRAE. https://www.commerce.wa.gov/growing-the-economy/energy/buildings/

Building Innovation Hub. 2021. *High Road Contracting.* Washington, DC: IMT. https://buildinginnovationhub.org/resource/find-a-qualified-vendor/high-road-contracting/

Boyce, A., K. Cheslak, and J. Edelson. "The New Challenge for New Construction: The Intersection of Energy Codes and Building Performance Standards." *Proceedings of the 2022 ACEEE Summer Study on Energy Efficiency in Buildings.* 9: 347-355. Washington, DC: ACEEE.

District of Columbia. 2019. *D.C. Law 22-257, Clean Energy DC Omnibus Amendment Act of 2018, Title III.* D.C. Official Code § 8-1772.21.

DCSEU (DC Sustainable Energy Utility). 2024. *Affordable Housing Retrofit Accelerator.* Washington, DC: VEIC. https://www.dcseu.com/retrofitaccelerator

DOEE (District of Columbia Department of Energy and Environment). 2022. *Cost and Benefit Impact Study of the Building Energy Performance Standards Program.* Washington, DC: Government of the District of Columbia. https://dc.beam-portal.org/helpdesk/kb/BEPS/79/

—. 2023. *Building Energy Performance Standards (BEPS) Compliance and Enforcement Guidebook for Compliance Cycle 1.* Version 1.1. Washington, DC: Government of the District of Columbia. https://dc.beam-portal.org/helpdesk/kb/BEPS_Guidebook/

Denver, City and County of. 2023. *Energize Denver Benchmarking and Energy Performance Requirements - Buildings 25,000 Square Feet and Larger - Technical Guidance.* Denver, CO: City and County of Denver. https://www.denvergov.org/files/assets/public/v/1/climate-action/documents/energize-denver-hub/ed-technical-guidance-buildings-25000-sq-ft-and-larger-v2_june-2023_clean.pdf

Duer-Balkind, M., A. Palesi, R. Desai, K. Leung, L. Westerhoff, and M. Lang. 2022. "Setting Building Performance Standards with Limited Local Data." *Proceedings of the 2022 ACEEE Summer Study on Energy Efficiency in Buildings.* 9: 264-279. Washington, DC: ACEEE.

Di Lauro, G., R. Ravulapati, A. H. Juárez, and J. Burton. 2024. *Transforming Climate Governance with Community Accountability Boards*. Washington, DC: IMT. https://imt.org/resources/community-accountability-board-toolkit/

Dyas, L. 2022. *Penalty Cost Analysis.* Denver, CO: Group 14 Engineering. https://www.denvergov.org/files/assets/public/v/1/climate-action/documents/energize-denver-hub/cost-of-compliance-analysis-for-penalty-level-setting-june-2022.pdf

Eash-Gates, P., K. Takahashi, D. Goldberg, A. Hopkins, and S. Kwok. 2021. *Boston Building Performance Standards: Technical Methods.* Cambridge, MA: Synapse Energy Economics. https://www.boston.gov/sites/default/files/file/2021/02/Boston_Performance_Standard_Technical_Methods_2021-02-18_20-013_0.pdf

EPA (U.S. Environmental Protection Agency). 2023. *Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances.* Washington, DC: EPA. https://www.epa.gov/system/files/documents/2023-12/epa_scghg_2023_report_final.pdf

Hart, Z., C. Majersik, and J. Eagles. "Leveling Up Building Performance Regulations: How Governments Can Craft Equitable, Effective Building Performance Standards to Drive Widespread Market Transformation" *Proceedings of the 2022 ACEEE Summer Study on Energy Efficiency in Buildings.* 5: 297-310. Washington, DC: ACEEE.

IMT (Institute for Market Transformation). 2021. *Model Law for Building Performance Standards.* Washington, DC: IMT. https://imt.org/resources/model-ordinance-for-building-performance-standards/

__. 2022. *Putting Policy in Action: Building Performance Standard Implementation Guide.* Washington, DC: IMT. http://www.imt.org/resources/building-performance-standard-implementation-guide

—. 2024a. *National BPS Coalition.* Washington, DC: IMT. www.nationalbpscoalition.org

__. 2024b. *What Defines a Building Performance Standard (BPS)?* Washington, DC: IMT. https://imt.org/resources/what-defines-a-building-performance-standard-bps/

IEA (International Energy Agency). 2022. *Technology and Innovation Pathways for Zero-carbon-ready Buildings by 2030.* Paris: International Energy Agency. https://www.iea.org/reports/technology-and-innovation-pathways-for-zero-carbon-ready-buildings-by-2030

Katipamula, S. and N. Fernandez. 2020. *Improving Commercial Building Operations through Building Re-Tuning: Meta-Analysis.* Richland, WA: Pacific Northwest National Laboratory. https://buildingretuning.pnnl.gov/documents/PNNL-SA-156277_Re-tuningMeta-Analysis_2020-09-05.pdf

Montgomery County. 2024. *Building Energy Performance Standard.* Wheaton, MD: Montgomery County Department of Environmental Protection. https://www.montgomerycountymd.gov/DEP/Resources/Files/energy/commercial/BEPS%20Exec%20Reg_Cln%201_8.pdf

Nadel, S. and A. Hinge. 2023. *Mandatory Building Performance Standards: A Key Policy for Achieving Climate Goals.* Washington, DC: ACEEE. https://www.aceee.org/sites/default/files/pdfs/B2303.pdf

NYC (City of New York). 2023. *Getting 97 Done: A Plan to Mobilize New York City's Large Buildings to Fight Climate Change.* New York: City of New York. https://climate.cityofnewyork.us/wp-content/uploads/2023/09/Getting-_LL97Done.pdf

Urban Green Council. 2023. *Local Law 97 Progress.* https://www.urbangreencouncil.org/what-we-do/explore-nyc-building-data-hub/local-law-97-progress/