Pacific Northwest
NATIONAL LABORATORY

Strategic/Policy View Panel

Overview of BPS and Energy Codes

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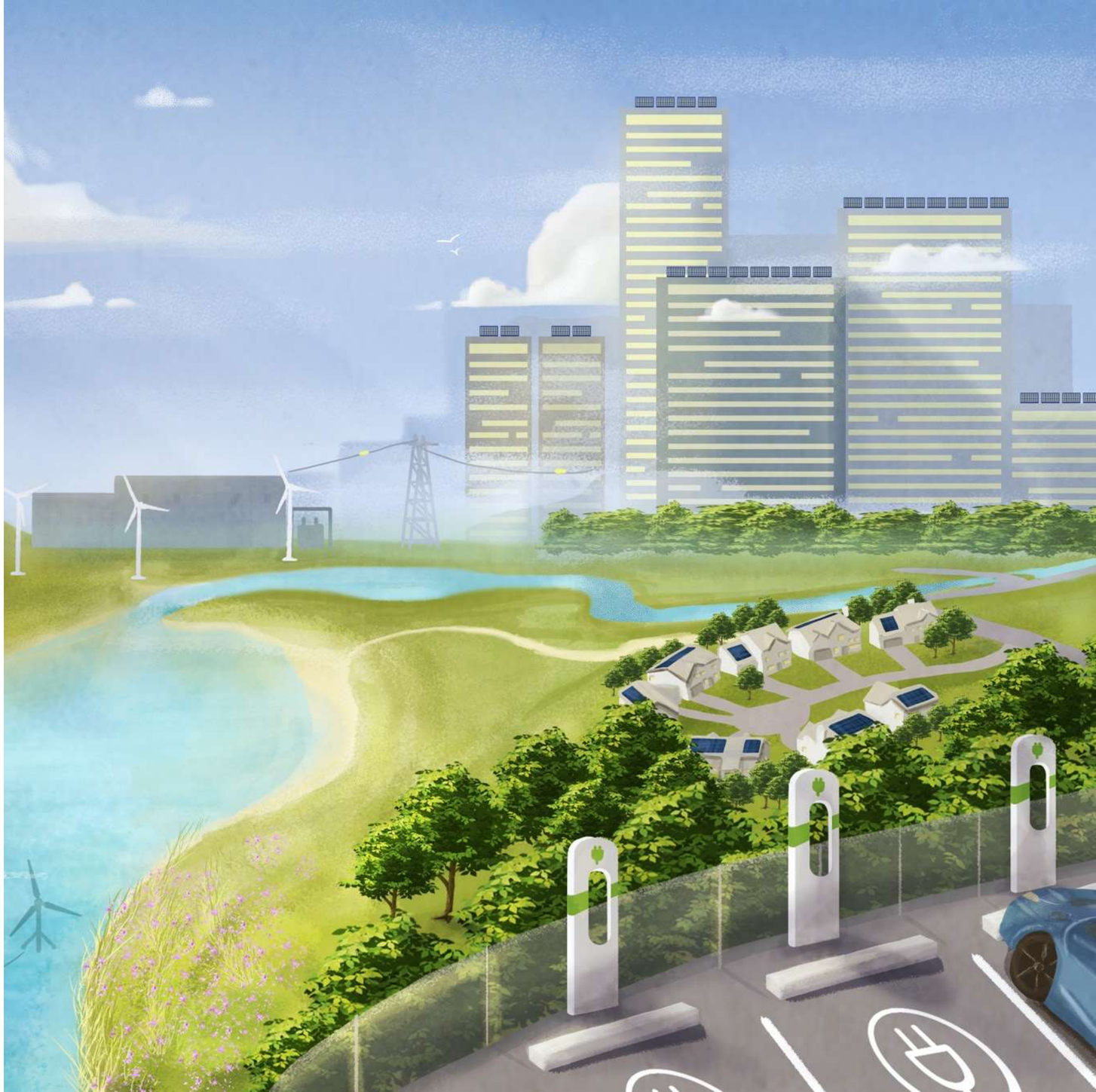

U.S. DEPARTMENT OF ENERGY BATTELLE

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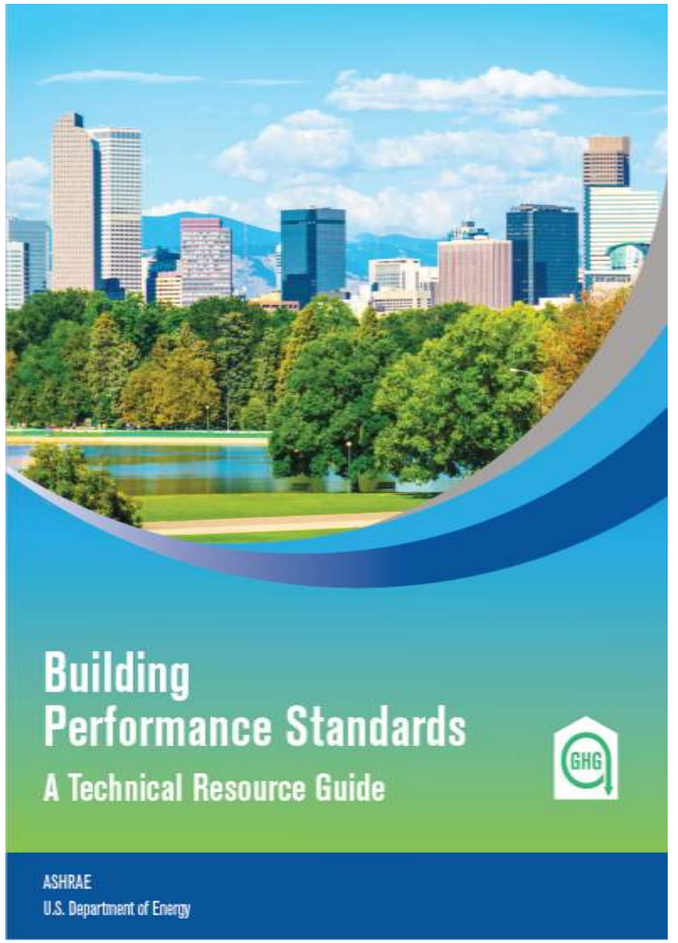
Policy Drivers in Building Performance

- **Building Energy Codes**, including Zero Energy Codes
- **Building Performance Standards**
- Support DOE's historic expansion of the codes
  Technical Assistance

PNNL partnered with New York City and completed the pilot on **performance-based codes**.



PNNL helped lead the ASHRAE/**DOE BPS Technical Resource Guide** development

Publication date: Feb 2023. Free Download.

What is a Building Energy Code?

- A holistic set of requirements outlining the minimum levels of efficiency by which a building can legally be constructed

- Addresses all aspects of a **building**:
  - Building Envelope
  - Mechanical
  - Service Water Heating
  - Lighting
  - Electrical Power
- There are two sets of national model energy codes:
  - 2021 International Energy Conservation Code (IECC) – Residential Model Code
  - ASHRAE Standard 90.1 - 2019

Levels of Building Energy Codes

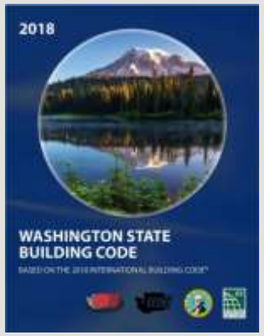
National Model Code

State Code

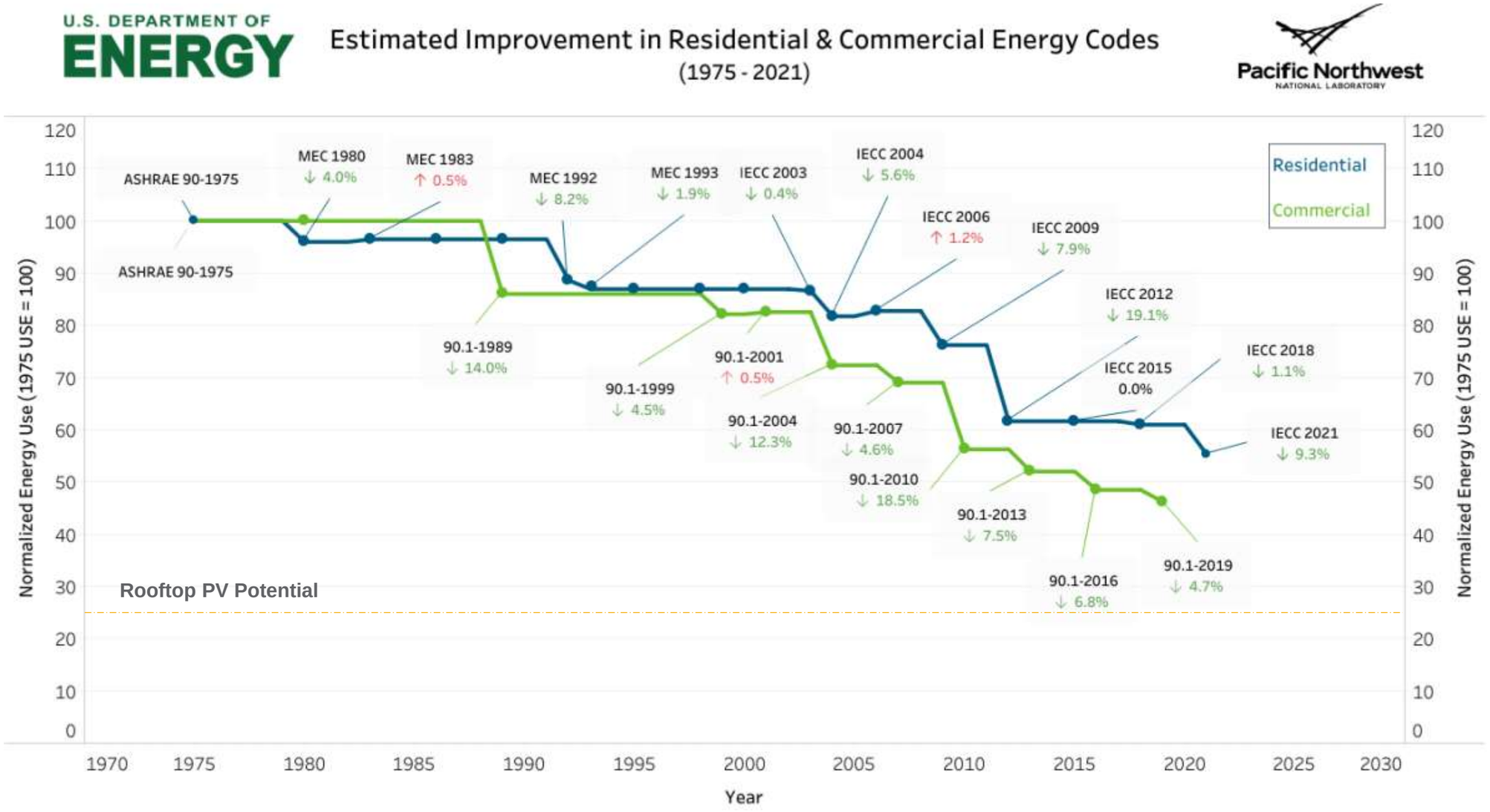
City of Seattle

Local Code

Code

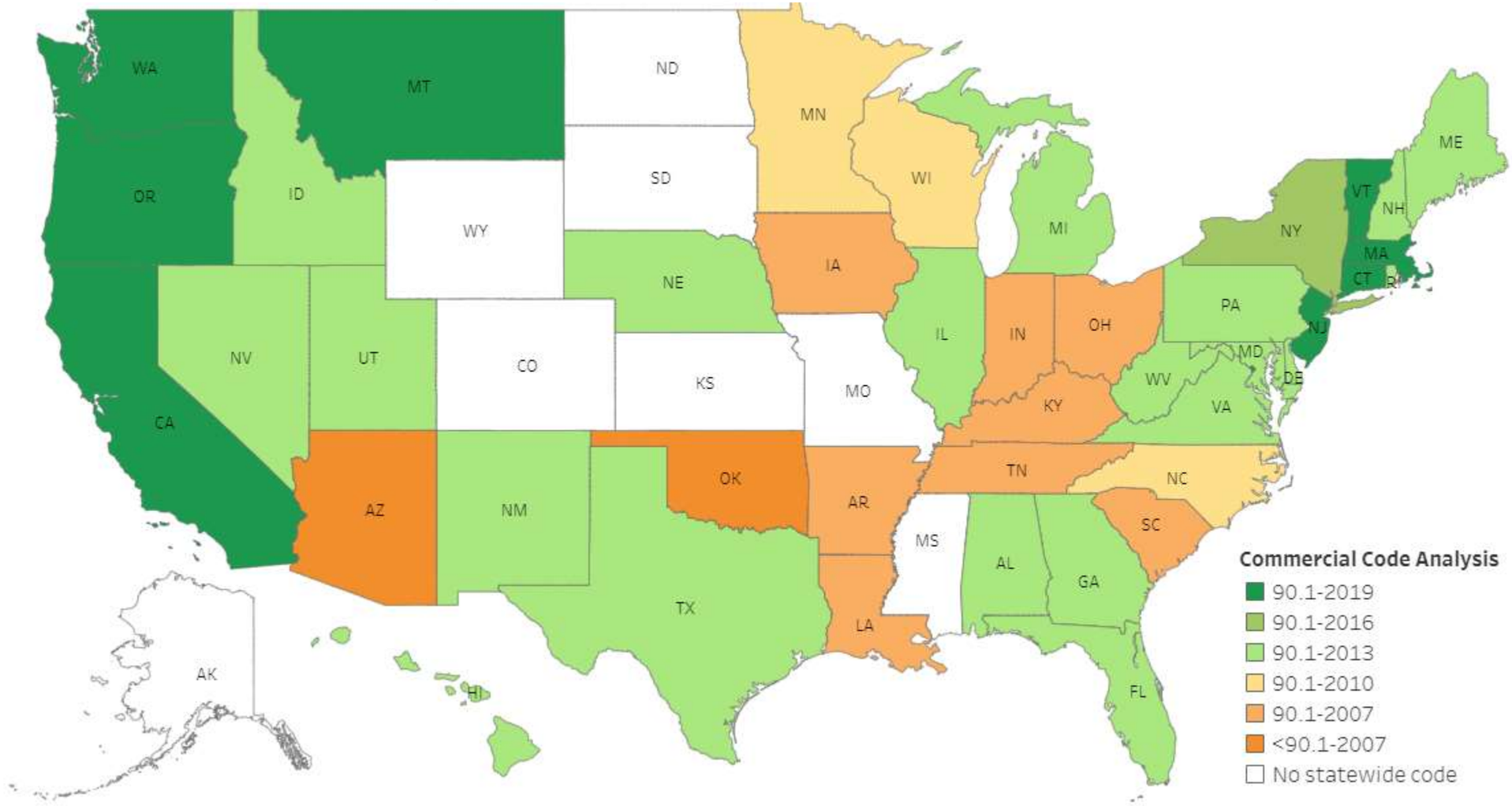


Historical Context of Codes



Status of Energy Code Adoption

State Commercial Energy Code Efficiency



Code Compliance Pathways

PRESCRIPTIVE

Code prescribes the performance of specific building elements: envelope, mechanical systems, etc.

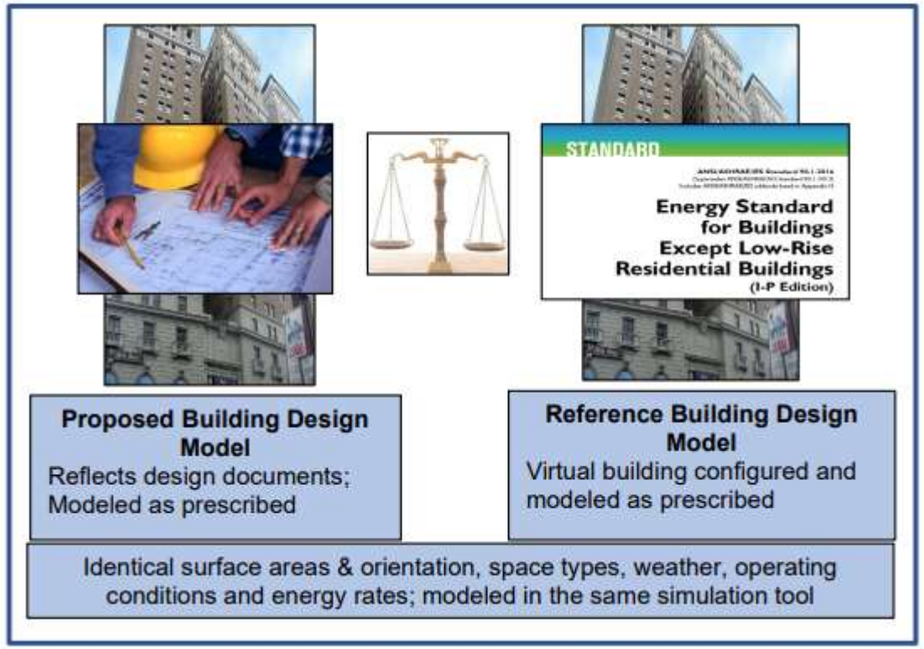
TABLE C402.4
BUILDING ENVELOPE FENESTRATION MAXIMUM *U*-FACTOR AND SHGC REQUIREMENTS

CLIMATE ZONE	0 AND 1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
Vertical fenestration																
U-factor																
Fixed fenestration	0.50		0.45		0.42		0.36		0.36		0.34		0.29		0.26	
Operable fenestration	0.62		0.60		0.54		0.45		0.45		0.42		0.36		0.32	
Entrance doors	0.83		0.77		0.68		0.63		0.63		0.63		0.63		0.63	
SHGC																
	Fixed	Operable	Fixed	Operable	Fixed	Operable	Fixed	Operable	Fixed	Operable	Fixed	Operable	Fixed	Operable	Fixed	Operable
PF < 0.2	0.23	0.21	0.25	0.23	0.25	0.23	0.36	0.33	0.38	0.33	0.38	0.34	0.40	0.36	0.40	0.36
0.2 ≤ PF < 0.5	0.28	0.25	0.30	0.28	0.30	0.28	0.43	0.40	0.46	0.40	0.46	0.41	0.48	0.43	0.48	0.43
PF ≥ 0.5	0.37	0.34	0.40	0.37	0.40	0.37	0.58	0.53	0.61	0.53	0.61	0.54	0.64	0.58	0.64	0.58
Skylights																
U-factor	0.70		0.65		0.55		0.50		0.50		0.50		0.44		0.41	
SHGC	0.30		0.30		0.30		0.40		0.40		0.40		NR		NR	

NR = No Requirement, PF = Projection Factor.

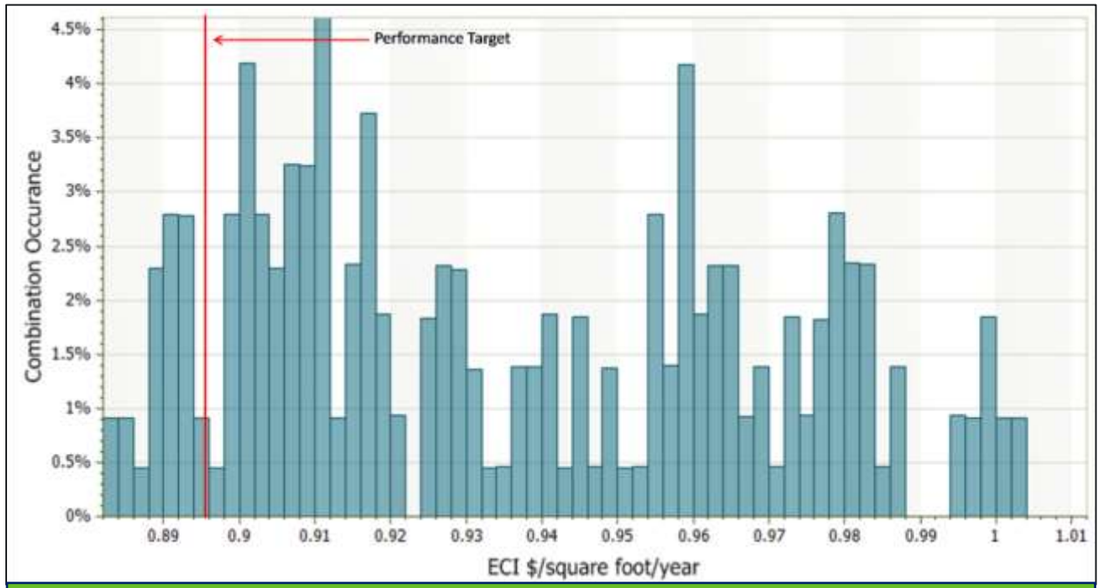
PERFORMANCE

Proposed building design demonstrates better performance than a reference design through simulation and other tools



Variability in Code Outcomes

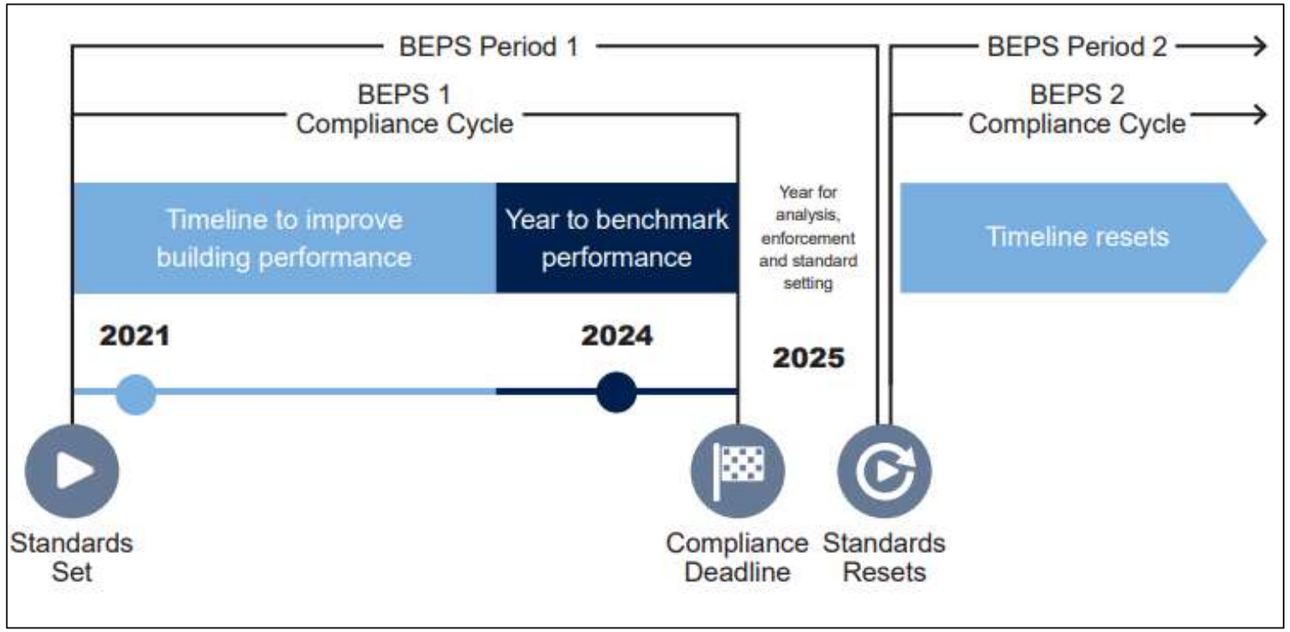
- Both the prescriptive and performance compliance pathways can result in a broad range of performance outcomes for a given building type
- One study showed significant variability in energy cost index (ECI) outcomes for an office building in Chicago from varying five (5) prescriptive parameters
- Codes typically use energy cost as the compliance metric



Distribution of Energy Costs for Prescriptive Options for Medium Office Building in Climate Zone 5A (Rosenberg et. al, 2015)

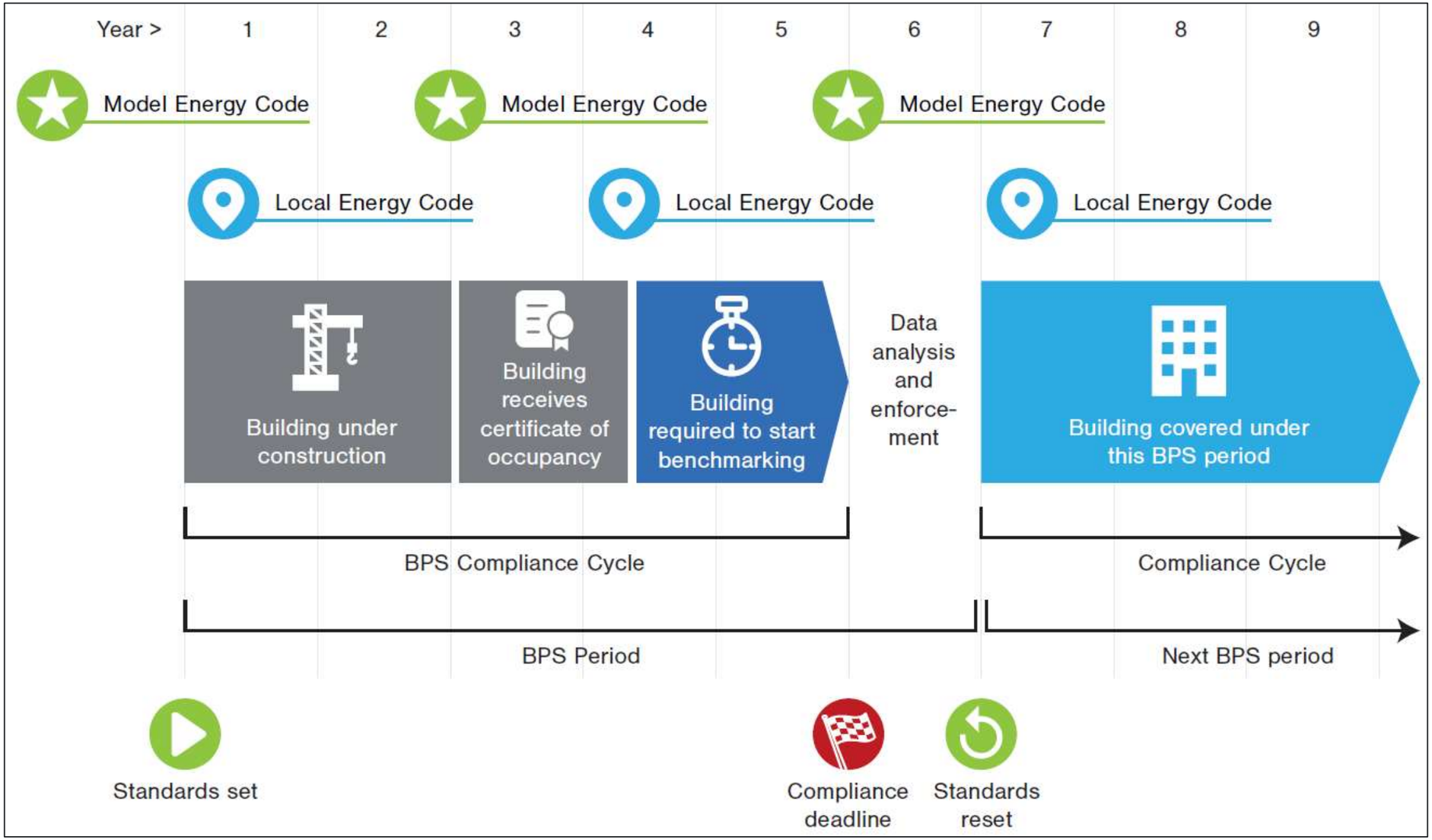
What is a Building Performance Standard?

- Outcome-based policy that requires buildings to meet energy or carbon-based performance targets
- Long-term policies with increasing stringency over time (targets vary over compliance periods)
- Align with jurisdiction's energy and climate goals for the building sector

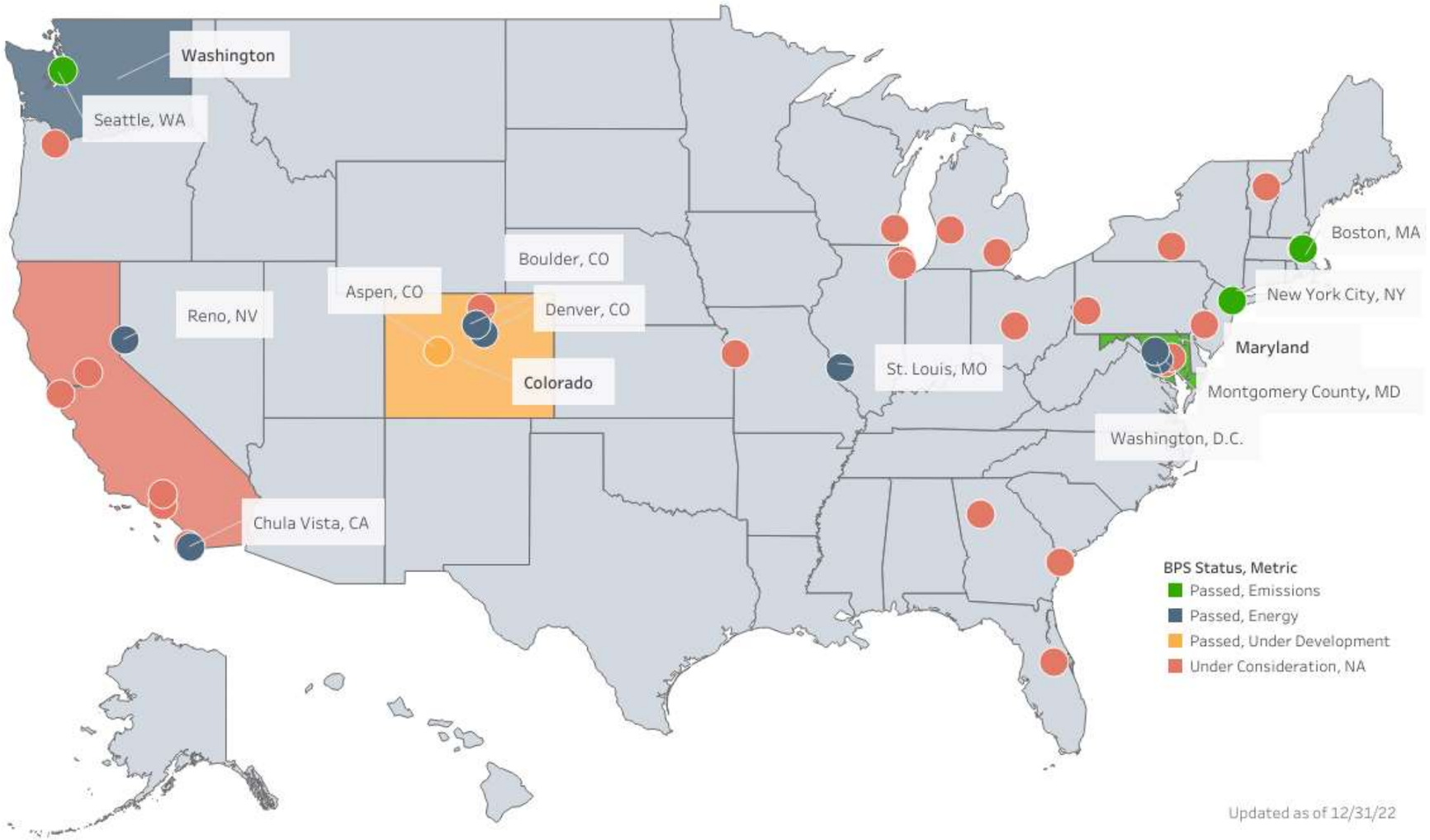


Source: St. Louis Building Energy Performance Standard (BEPS): BEPS Compliance Pathways Fact Sheet

BPS and Code Alignment



BPS Adoption: Current and Future



10+ state and local policies passed to date

Federal BPS passed in December 2022

20+ additional state and local govts. commit to passing BPS policy by Earth Day 2024

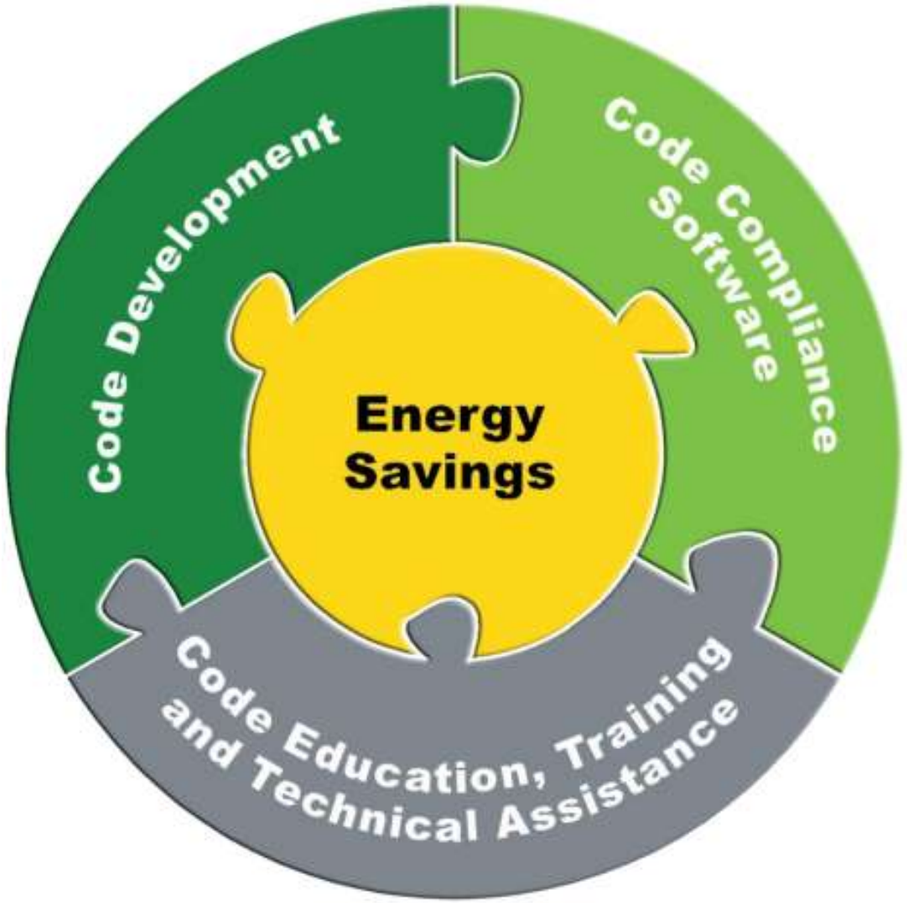
Covering nearly **25%** of the nation's building footprint

Opportunities for Utilities

- Codes and BPS stand to change building load profiles moving forward. Utilities may be able to support by:
  - Providing Data Access
    - ✓Building owners will need access to their building's energy consumption data
  - Supporting Energy Savings Programs
    - ✓Both for new construction and existing building retrofits
    - ✓Can new construction programs be adapted for BPS?

DOE's Support

- DOE is directed by statute to participate in industry processes to
  - Develop model building energy codes
  - Issue determinations as to whether updated codes result in energy savings
  - Provide technical assistance to states to implement and comply with the codes
- Code development and adoption
- Implementation
  - Customized technical analyses
  - Software tools
  - Education and training materials
  - Technical support through a help desk



Resources

ASHRAE Building Performance Standards: A Technical Resource Guide

https://forms.ashrae.org/forms/PDFdownload_BuildingPerformanceStandards

ASHRAE BPS Resources and Publications

https://www.ashrae.org/file%20library/about/bps-resources-and-publications-for-web-posting---final.pdf

ACEEE Building Performance Standards Whitepaper

https://www.aceee.org/sites/default/files/pdfs/buildings_standards_6.22.2020_0.pdf

DOE Building Energy Codes

https://www.energycodes.gov/status

DOE Building Performance Standards

https://www.energycodes.gov/BPS

EPA Benchmarking and Building Performance Standards Policy Toolkit

https://www.epa.gov/statelocalenergy/benchmarking-and-building-performance-standards-policy-toolkit

USDN Building Performance Standards Framework

https://www.usdn.org/uploads/cms/documents/bps-framework_july-2021_final.pdf

Thank you

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