

**nbi** new buildings  
institute

# Building Decarbonization Code

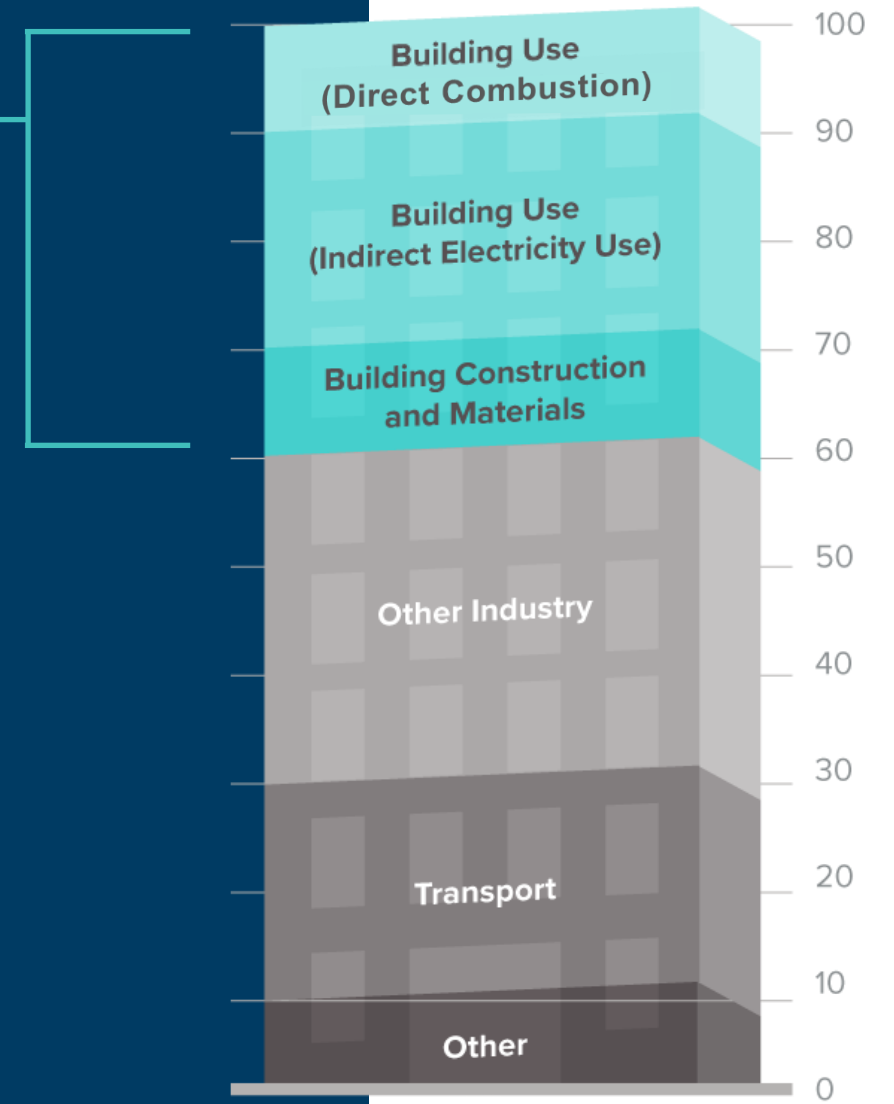
An overlay to the International Energy Conservation Code



Building Use and Operations account for

# 39% of CO<sub>2</sub> Emissions in the US

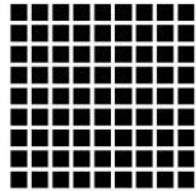
Source: IEA, 2019. % shares.



# The Five Foundations of Zero Carbon Building Policies



Energy Efficiency



Renewable Energy



Grid Integration + Storage



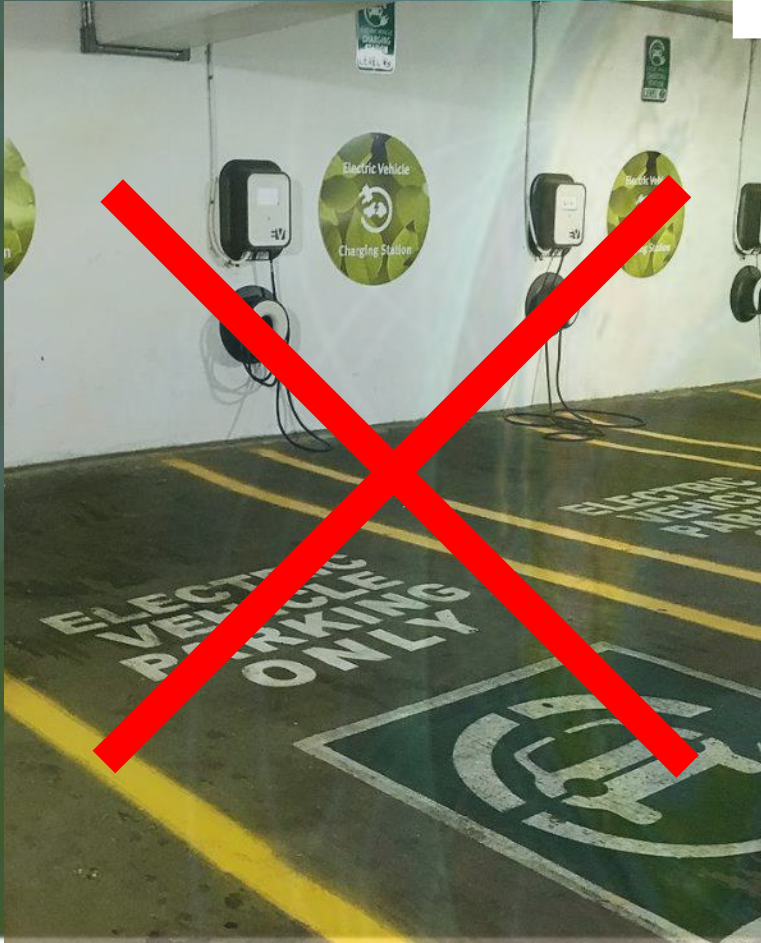
Building Electrification



Life-Cycle Impacts



# The Opportunity



[https://commons.wikimedia.org/wiki/File:EV\\_charging\\_stations\\_Arlington\\_08\\_2013.jpg](https://commons.wikimedia.org/wiki/File:EV_charging_stations_Arlington_08_2013.jpg)

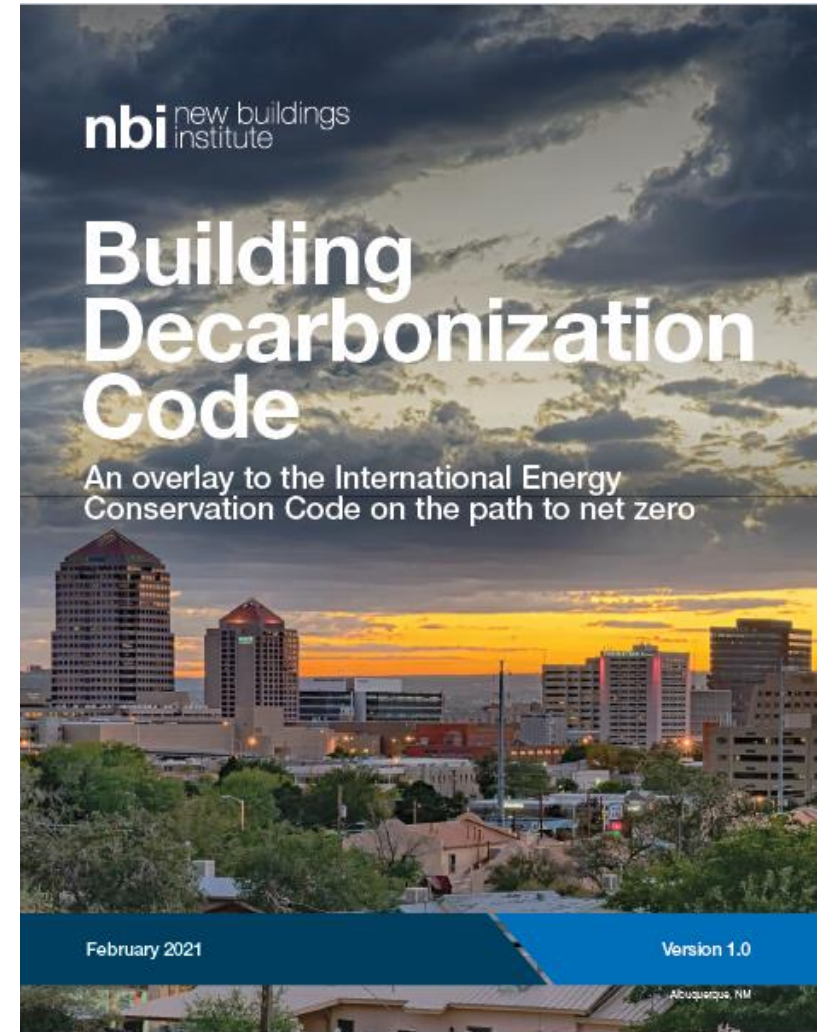


<http://www.flickr.com/photos/63483222@N03/14423707856/>

2021

# Decarbonization Toolkit

- Partnership with NRDC
- Part of a toolkit with three major pieces:
  - Actionable Code Language
  - Advocacy Framework
  - Outreach and Adoption Toolkit



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# Adoptable Code Language

## C403 BUILDING MECHANICAL SYSTEMS

**Add new text as follows:**

**C403.4.1.6 Demand responsive thermostats.** All thermostats shall be provided with demand responsive controls capable of increasing the cooling setpoint by no less than 4°F (2.2°C) and decreasing the heating setpoint by no less than 4°F (2.2°C).

**Exception:** Health care and assisted living facilities.

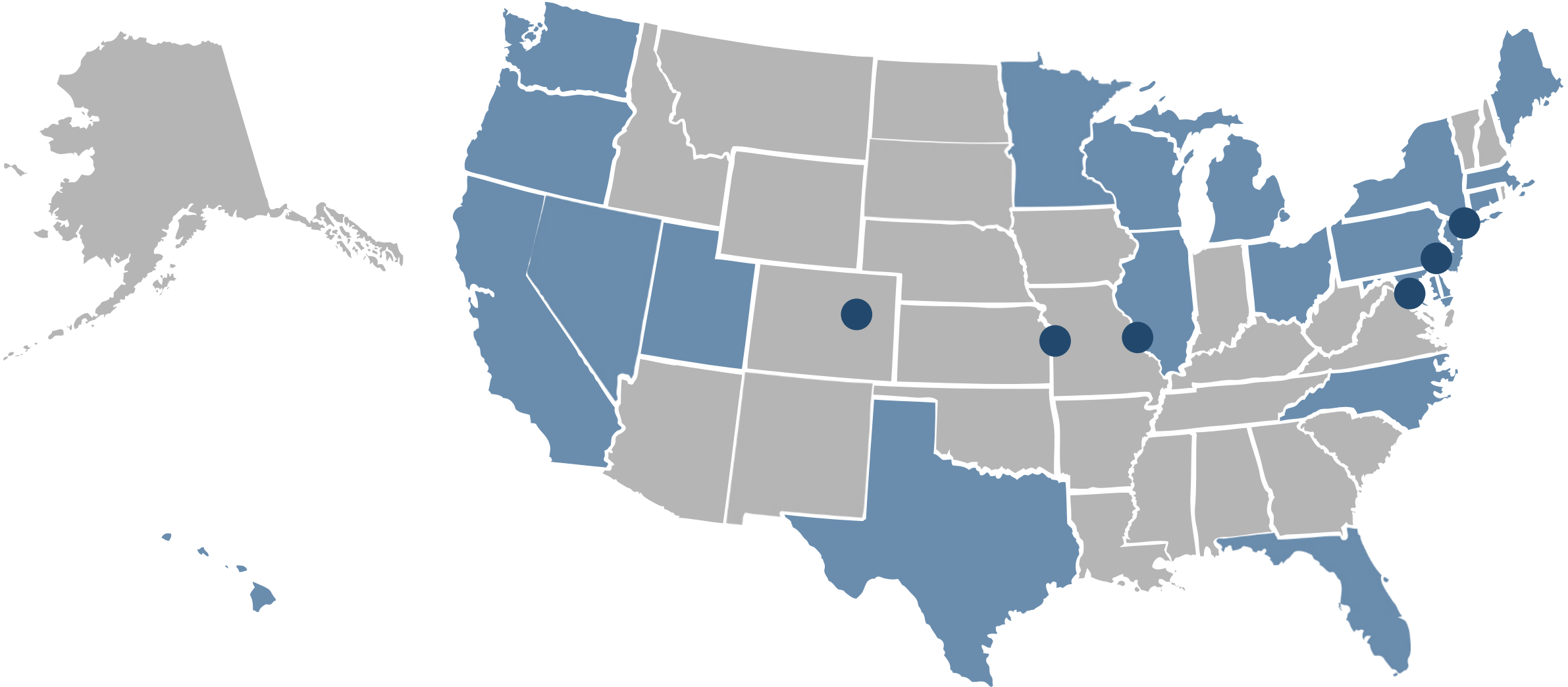
*Demand responsive controls for thermostats are added based on language from California Title 24. In health care and assisted living facilities, thermostat setpoints can impact more than just thermal comfort, and temperature can be part of the health care being provided. To ensure that this requirement cannot have an adverse impact on those services, these facilities have been exempted from this requirement.*

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# Revised Intent

**C101.3/R101.3 Intent.** This code shall regulate the design, and construction of buildings for the ~~effective use and conservation~~ reduction of greenhouse gas emissions and for the efficient production, use and storage of energy over the useful life of each building. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

# Codes Developing through 2023







# Codes for Climate™

Building Today for a Zero-Carbon Future

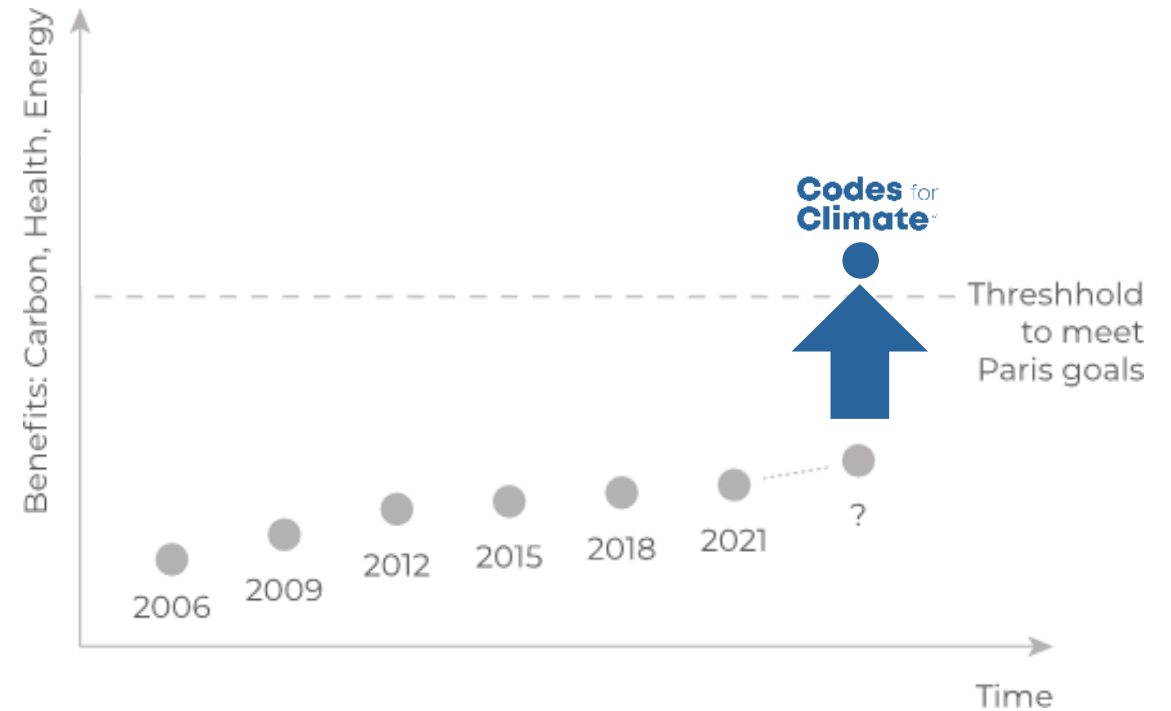
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**ARMI**  
ENERGY. TRANSFORMED.

## The Strategy:

# Codes for Climate™

We are creating **Codes for Climate™** to work with state and municipal governments to deliver the codes and standards needed to achieve 1.5°C climate goals.



# Tactical Actions



## **Support Policy-makers.**

Align around a Code for Climate, and provide technical and policy support

## **Use what works.**

Continue to engage and advance IECC and ASHRAE model codes and standards to meet climate needs

## **Disrupt what does not.**

Create alternate and actionable code and policy language that provides states and cities the code they need.

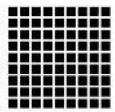
# Code Scope and Goals



**Efficiency**

Base Codes / Building Systems

Highly Efficient / Passive Resilience



**Electrification**

Building Systems + Vehicles

Prohibit all on-site combustion



**Renewables**

Onsite, Offsite + Procurement

Onsite resilience, Support RPS and additive procurement



**Grid Integration**

Controls, Storage

TOU Carbon reduction and Grid-sensitive



**Lifecycle Impact**

Embodied Carbon, Refrigerants + Deconstruction

Lifecycle GHG reductions

**Equity**

IAQ, Materials + More

Just transition, Improve health, Local Jobs, Affordability

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# Questions?

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Director of Codes

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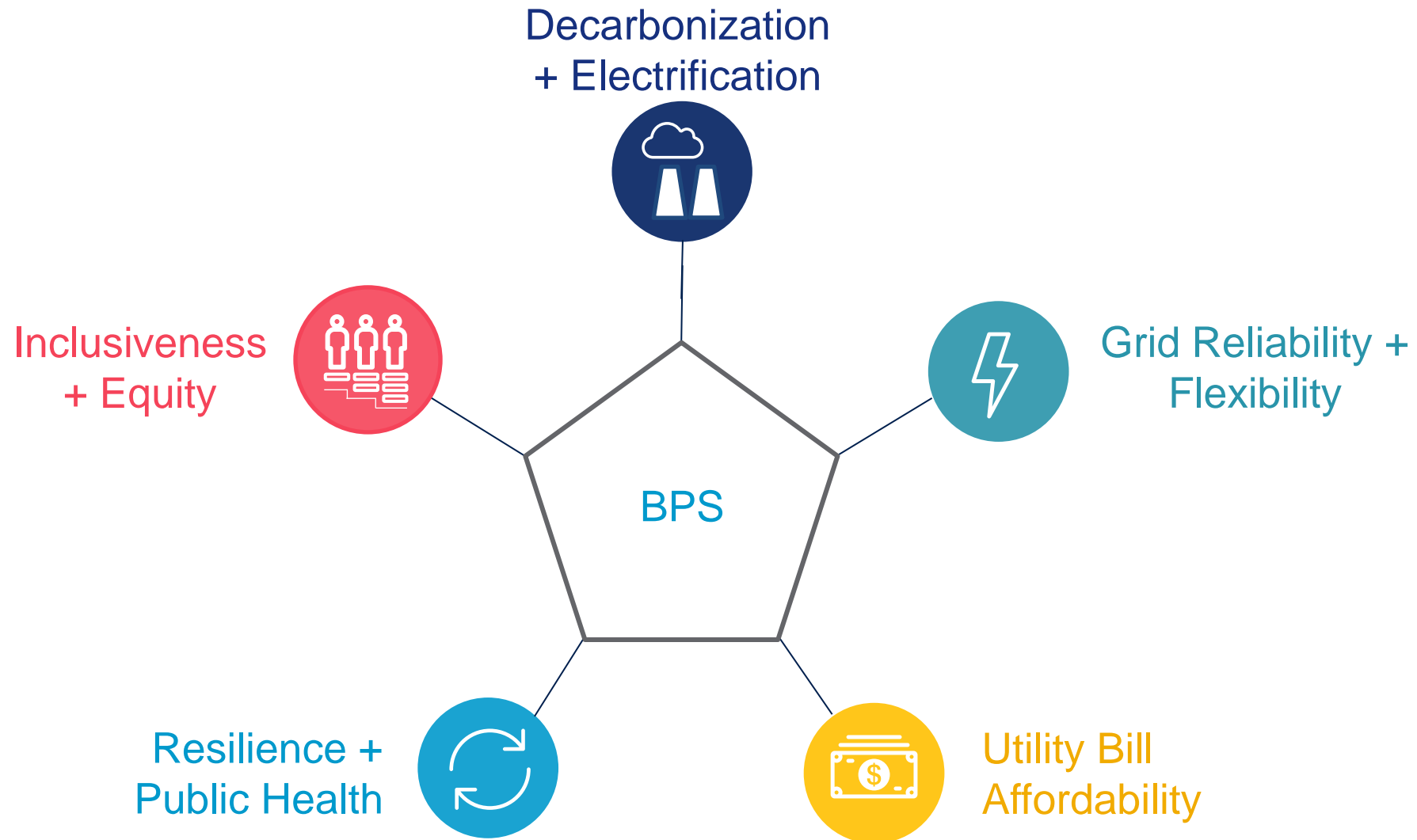
# Building Performance Standards



**Future of Codes Workshop**

**June 24, 2021**

# Building Performance Standards: A Platform for Building Regulation



# BPS Around the United States

	Washington, DC	New York City	WA State	St. Louis, MO	Montgomery County
Year Adopted	2019	2019	2019	2020	Pending
First Compliance Deadline	2026	2024	2026	2025	~2026
Minimum Threshold Performance	Standards set no lower than median <b>ENERGY STAR score</b>	<b>CO<sub>2</sub>e</b> emissions limits on a sq. ft. basis	<b>Site EUI</b> targets are 15% less than 2009-2018 averages	Standards set no higher than 35 <sup>th</sup> percentile <b>site EUI</b>	In development to be set in regulation, based on <b>site EUI</b>
Covered Buildings	Commercial and multifamily > 10K sf	Commercial and multifamily > 25K sf	Commercial > 50K sf	Commercial and multifamily > 50K sf	Commercial and multifamily > 25K sf
Compliance Cycle	5 years	Buildings must comply annually; limits get stricter every ~5 years	5 years	4 years (6 years for affordable housing and houses of worship)	Long-term target with 4 year interim check ins



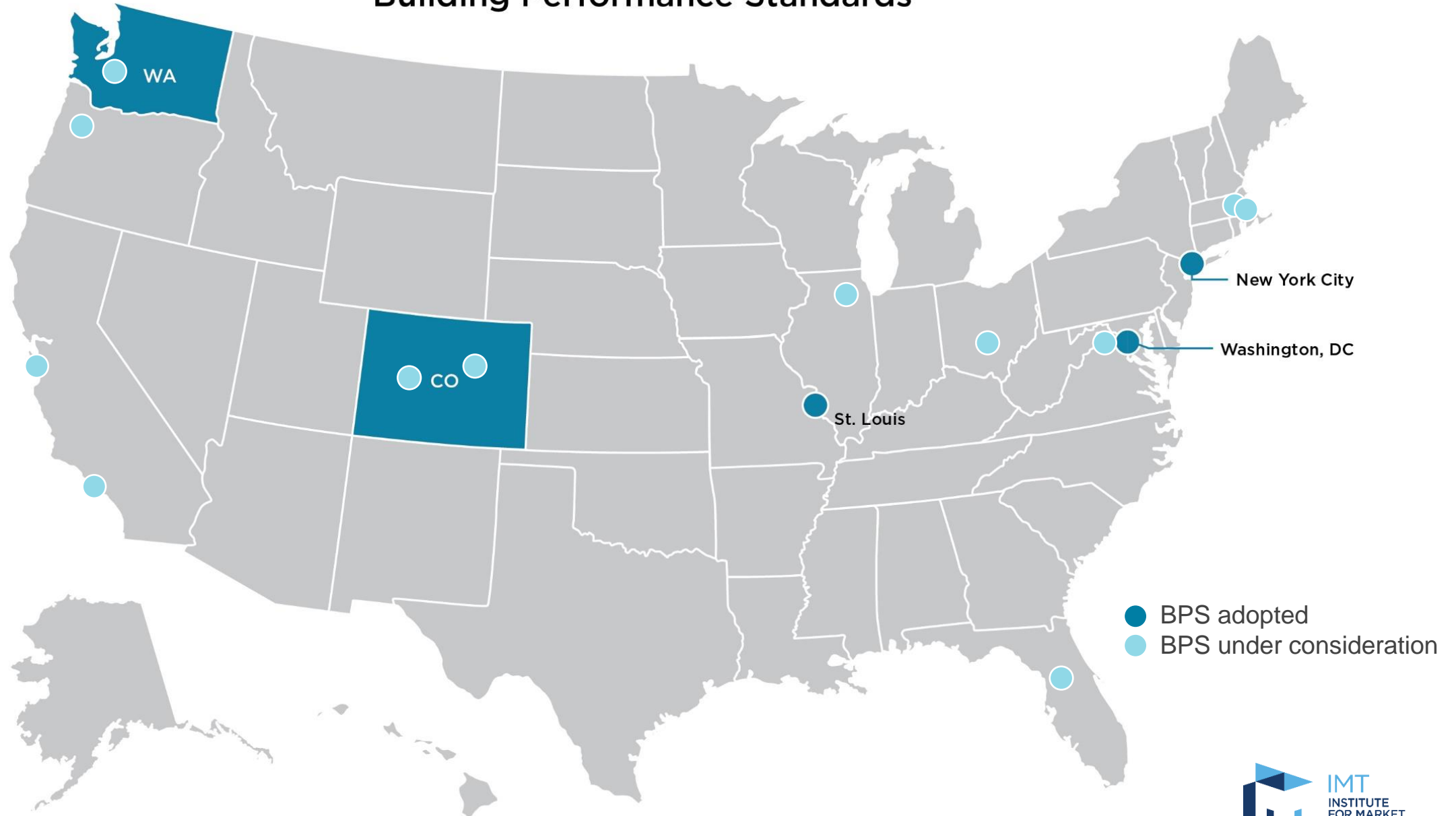
# Metric Comparison

Energy and Emissions Metrics	ENERGY STAR Score	Site EUI	Source EUI	GHGI	
Compatible with Long-Term Standards?	✗	✓	✓	✓	✳️ Site-to-Source multiplier is calculated as a national average. Does not reflect local conditions
Fully Within Control of Owner and Occupants	✗	✓	✗	✗	
ESPM Normalizes for Weather	✓	✓	✓	✗	✳️ Available for ENERGY STAR 1-100 Score-eligible buildings
ESPM Normalizes for Business Characteristics (e.g. Density, Schedule)	✓ ✳️	✗	✗	✗	
Generation and Distribution Losses	✓ ✳️	✗	✓ ✳️	✓	

# Trajectory Approach: Planning Ahead



# U.S. City and State Policies for Existing Buildings: Building Performance Standards





# California Energy Commission

**Flexible Demand Appliance Standards**

Pierre H. duVair, Ph.D.

June 24, 2021



# SB 49 on Appliance Standards

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## Promote Flexible Demand Technologies in Appliances

- Cost-Effective, GHG Reductions, Grid Benefits
- Consumer Consent
- Open Source & User-Friendly
- Cybersecurity & Communications
- Interface with Load Management / DR Programs
- Labeling and Certification



# Evaluating Appliances

## Initial Assessment


- Load Shift Potential (MWh)
- Flexible Capacity (MW)
- Cost-Effective (\$)
- GHG Emission Reductions (mmtCO<sub>2</sub>e)

## Important Factors

- Technically Feasible
- Equity & Disadvantaged Communities
- Innovation & Market Growth
- Synergies with Policies
- Challenges and Risks



# Load Shape of Appliances



U.S. DEPARTMENT OF  
**ENERGY**

Prepared for the U.S. Department of Energy  
under Contract DE AC05 76RL01830

PNNL-20110


## Use of Residential Smart Appliances for Peak-Load Shifting and Spinning Reserves

### Cost/Benefit Analysis

Chellury (Ram) Sastry  
Rob Pratt

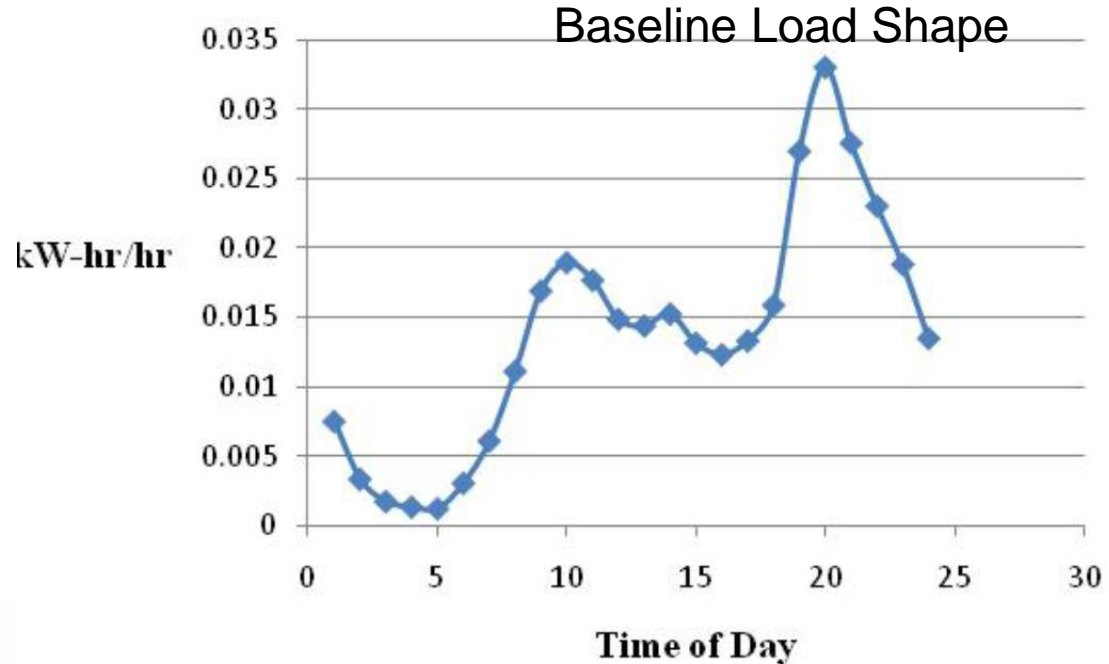
Viraj Srivastava  
Shun Li

December 2010



**Pacific Northwest**  
NATIONAL LABORATORY

Proudly Operated by **Battelle** Since 1965



**Figure 3.2.** ELCAP Dishwasher Load Shape for an Average Annual Day

**Table 3-11.** ELCAP Dishwasher Hourly Consumption on an Average Annual Day

Hour	1	2	3	4	5	6	7	8	9	10	11	12
kW-hr/hr	0.0075	0.0034	0.0017	0.0014	0.0012	0.0031	0.0061	0.0111	0.0169	0.0190	0.0177	0.0149
Hour	13	14	15	16	17	18	19	20	21	22	23	24
kW-hr/hr	0.0144	0.0153	0.0132	0.0123	0.0133	0.0159	0.0270	0.0330	0.0276	0.0230	0.0188	0.0135

The dishwasher load shape based on the data shown in Table 3.11 is shown in Figure 3.2 below.



# Building Standards & Flexible Demand

## Existing Title 24 Standards

- **Appendix JA5** - Specifications for Occupant Controlled Smart Thermostats
- **Appendix JA13** - Requirements for Heat Pump Water Heater Demand Management
- **Section 110.12** - Mandatory Requirements for Demand Management
- Building Codes and Reach Codes Adoption for **EV Charging**

## Proposed Standards for 2022

- **Section 140.10** - Requirements for **Photovoltaic** and **Battery Storage** Systems
- Sizing requirements based on building space type and climate zone





# Load Management Standards (LMS)

## LMS Supports Customer Access to Lower Rates

- **MIDAS** (Market Influenced Demand Automation Server) electricity rate database – **2021**
- Customer education and outreach – **2022**
- Rate **access tool** to support third-party providers – **2023**
- Develop locational electricity rates – **2024**



# Contact Information

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CEC Flexible Demand Standards Webpage:

<https://www.energy.ca.gov/proceedings/energy-commission-proceedings/flexible-demand-appliances>

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