Testimony submitted to Members of the House Select Committee on the Climate Crisis

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Thank you for recognizing the important role our built environment has to play in meeting our climate goals and providing a safe, resilient future for our country.

Why Buildings?

Buildings and construction account for approximately 40% of global CO_2 emissions[1]. In order to leverage the opportunity we have in the building sector to meet the targets of the Paris Agreement, we need to reduce emissions from the built environment by *at least* 50% by 2030, optimally 65% by 2030, and completely eliminate emissions from the built environment by 2050.

We do this by addressing the operational efficiency in new and existing building stock – targeting net zero or net positive performance, electrification, grid harmonization, renewable energy generation onsite and offsite, land use and development policies, as well as the embodied carbon in our building materials.

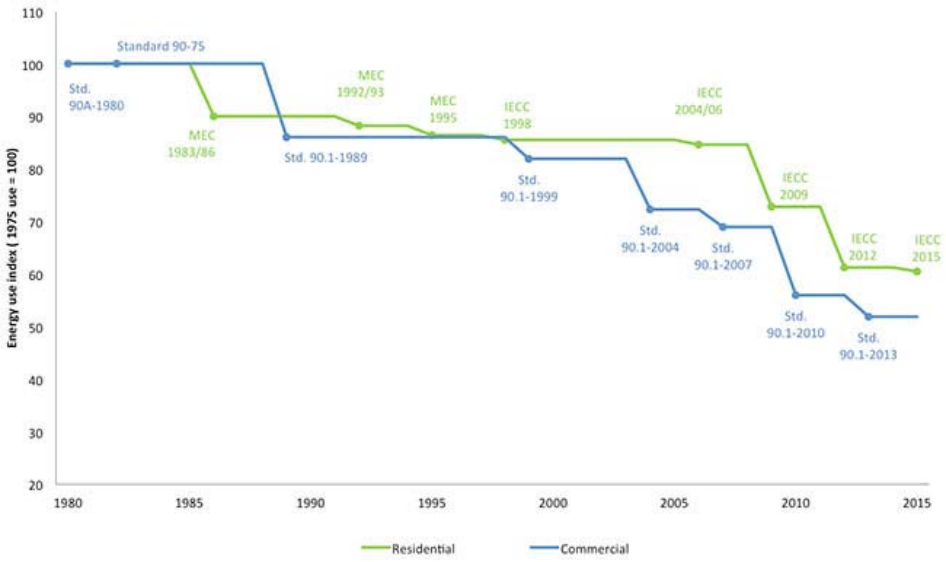
Energy Performance in New Buildings and Alterations

New buildings and alterations to existing buildings are subject to building codes through a permitting and inspections process. Building codes are regulations for issues such as fire and life safety that have been developed since the 1800s to protect people and communities.

In order to stay current and relevant, model building codes are updated in 3-year cycles by volunteer code committees comprised of members of the building industry, such as architects, engineers, manufacturers, building industry associations and building code officials. Anyone can submit code change proposals, code hearings are public and live webcast, draft code changes are subject to public comment and each new edition of the model code is ultimately voted on by members of the codes council after a lengthy stakeholder engagement process.

[1] UN Environment Annual Report (2017)

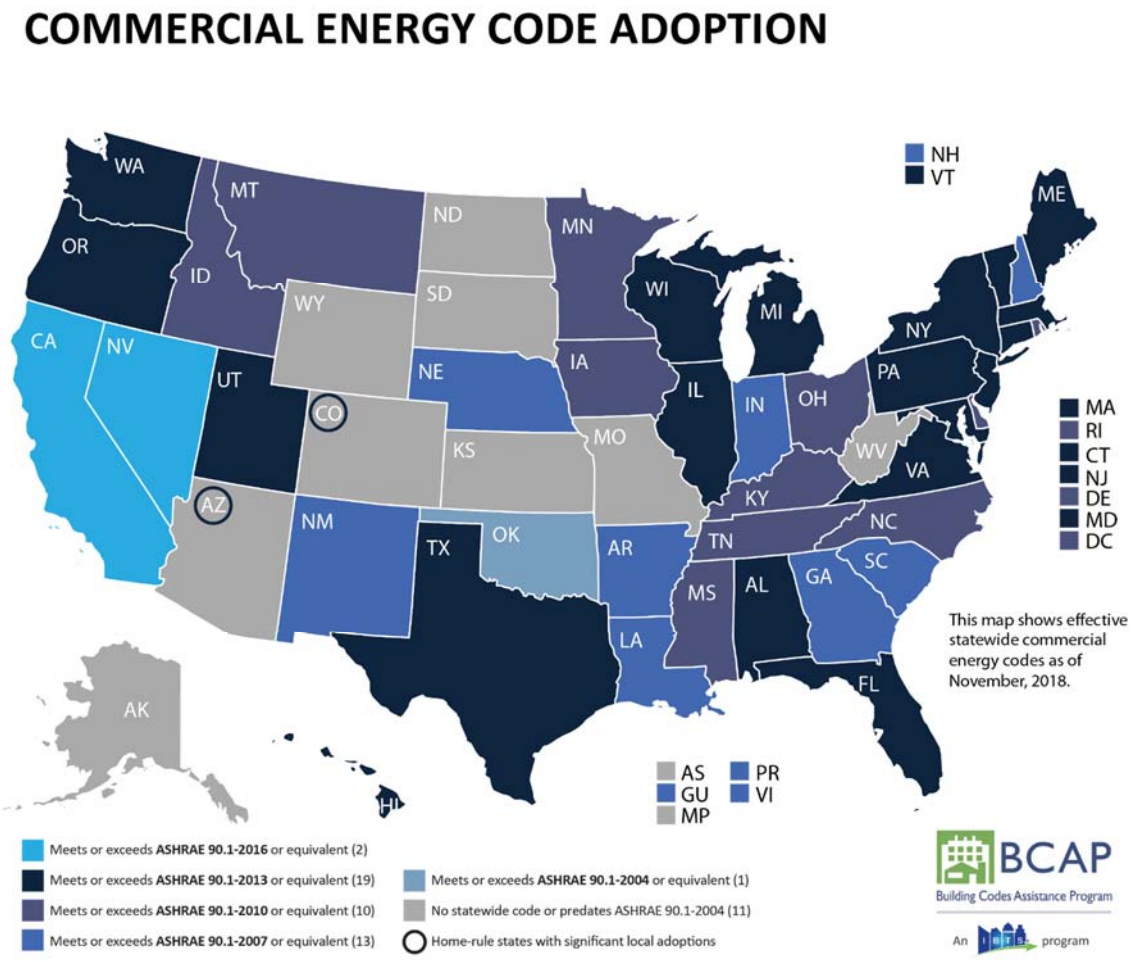
Relative Energy Use under Model Building Energy Codes 1980-2015[2]



From 2006 to 2012, model energy codes increased energy savings potential by nearly 30%[3]. While model codes are updated every three years, they are not adopted uniformly across the US. There are 11 states with no statewide adoption or codes that predate the 2006 International Energy Conservation Code (IECC). In fact, nearly half the country is still on the 2009 or an older energy code at the state level[4].

Half the country is constructing buildings that will consume energy for 60 or more years on decade-old energy codes. Fortunately, cities (or counties) are able to adopt more stringent energy codes than the state level, and there are many instances where local code adoption has significantly outpaced the state.

[2] https://aceee.org/blog/2016/02/take-ride-energy-slide-building-codes
[3] Assessment Methodology for Code Compliance in Medium to Large Cities (NRDC, IMT; 2018)
[4] http://bcapcodes.org/code-status/commercial/



Standard/Code Cycle Equivalency

ASHRAE 90.1-2004	IECC 2006
ASHRAE 90.1-2007	IECC 2009
ASHRAE 90.1-2010	IECC 2012
ASHRAE 90.1-2013	IECC 2015
ASHRAE 90.1-2016	IECC 2018
ASHRAE 90.1-2018	IECC 2021*

** Final vote November 2019, publication 2020*

The U.S. is projected to construct 45 billion square feet over the next decade[5]. One of the biggest opportunities and one of the simplest solutions is to simply bring all of our states and cities up to the most current energy codes so that this new building stock is as efficient as possible for the next few generations.

Why don't jurisdictions adopt the newest codes more regularly? Many jurisdictions do not advance the code more consistently because they are increasingly challenged to maintain sufficient code enforcement staff to

[5] U.S. Energy Information Administration Annual Energy Outlook 2019

effectively provide services and to fund the training, tools, and resources necessary to maintain skills let alone the capacity to address new codes every three years.[6]

How much does it cost to enforce the energy code?

A study conducted by the Lawrence Berkley National Laboratory found the average cost of enforcing the energy code to be $139 per commercial building and $49 per single-family home. These figures are based on a survey of 23 local building departments with an average time to conduct plan review and on-site inspections of five hours for commercial projects and 1.9 hours for residential projects. The authors of the study acknowledge that the cost estimates are only representative of personnel time and are exclusive of overhead, benefits, or travel cost (for on-site inspection), which could triple or quadruple the figures. Larger cities with higher overhead and labor costs may need to spend $400–$500 per new commercial building and $150–$200 per new single-family residential home as the full cost of enforcing the energy code.

How much does it cost *not* to enforce the energy code?

The direct result for building owners of legacy energy codes or a lack of code enforcement is higher utility bills. Analysis indicates for every dollar invested in energy code compliance six dollars are saved[7]. That is six dollars lost for every dollar we *don't* spend on code compliance. In addition to monetary savings, adoption of and compliance with current energy code has many non-energy related benefits such as improved occupant comfort, better indoor air quality, and a more resilient building stock.

What can Congress do?

Congress can provide resources to state and local governments in many ways. Congress can provide assistance to jurisdictions who wish to convert to an **e-plan review** process or to leverage **integrated technology solutions** that work with Building Information Modeling (BIM) design tools to facilitate virtual inspections through Augmented Reality (AR), Virtual Reality (VR) or drone site visits, all of which can streamline the permitting and inspection process and creates more efficient use of staff resources, enabling better code enforcement procedures and more consistent code updates.[8]

Congress can also incentivize jurisdictions to adopt the latest codes by offering to co-fund staff or provide training for code officials using the existing U.S. Department of Energy (DOE) energy code training modules. There was a highly successful Federal program in the wake of the last recession with the **2009 American Recovery and Reinvestment Act** that provided free training and 2009 IECC code books and workbooks along with strong incentives for all jurisdictions to adopt the 2009 IECC[9]. This incentive program is likely a major factor leading 88% of the U.S. to *at least* be on the 2009 energy code or a later edition now.

What are Outcome-Based Codes and why do they matter?

Ultimately if we want to meet our climate goals and advance our buildings to zero carbon, our codes need to move away from component-based prescriptive manuals and predictive energy models to **outcome-based codes**.

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[6] The Future of Code Officials: *Results and Recommendations from a Demographic Survey (NIBS, ICC; 2014)*
[7] Assessment Methodology for Code Compliance in Medium to Large Cities (NRDC, IMT; 2018)
[8] Disruption, Evolution, and Change: AIA's vision for the future of design and construction (AIA, 2019)
[9] http://bcapcodes.org/topics/federal-funding/

Our current model code structure has limited potential impact on overall energy use because it applies only to new construction, major renovations, and **installed building features**. The efficiency of many of these installed features is actually limited by Federal law[10]. In 1975 Congress enacted the National Appliance Energy Conservation Act (NAECA) to set national standards for equipment like heaters, boilers and rooftop air conditioners, but this legislation also disallows states and other jurisdictions from setting more stringent local standards on these products. The International Code Council (ICC), the states, and or cities that adopt stretch energy codes, are still strictly limited in how much efficiency they can achieve in the products covered by NAECA.

In addition, because of the robust (and lengthy) stakeholder engagement process, codes are also slow to embrace new technologies or materials, or innovative methods. A **prescriptive code** therefore by definition isn't always keeping up with the latest available technology, material or methods. A code enforcement official has some leeway to interpret the code but may feel restricted by code language and err on the side of excluding new means or methods.

More importantly, the energy code doesn't address operations, maintenance, or occupant behavior that occurs after the issuance of a certificate of occupancy and that will impact performance over the lifecycle of a building[11]. While a predicted **performance compliance path** does exist in the current code structure, and energy simulation tools and processes have become more seamlessly integrated into project design and delivery, and the cost of energy modeling pays for itself in well under a year of operational savings[12], simulation tools often don't account for the wide variation in **operations and maintenance, occupant behavior or plug-loads**.

Outcome-based codes establish a target energy use level or energy allowance, then require measured and reported actual energy use in relation to that target once the building is completed and occupied. At a minimum, an outcome-based energy code requires 12 consecutive months of post-occupancy performance within the allowed energy or carbon budget, typically within the first 18-36 months of use to normalize for weather and allow for commissioning. If the building doesn't meet performance requirements, the builder or owner forfeits a financial penalty.

Many jurisdictions do not have the personnel or fiscal resources to adequately ensure compliance with energy requirements. By focusing on the outcome, code officials and communities can be assured that requirements are being met while not incurring additional enforcement burdens. Outcome-based codes mean that there would be less reliance on design documentation to obtain a permit, alleviating the pressure on a diminishing code enforcement workforce and freeing that workforce up to focus on building lifecycle performance policies such as transparency (annual benchmarking) and building performance standards. Typically, communities that are prepared for an outcome-based code already have adopted public and commercial building benchmarking policies, thus establishing an annual communication channel between building owner and building performance oversight agency[13].

This simplification of the energy code would allow for more rapid escalation of performance expectations without the burden of retraining the entire code enforcement workforce every code cycle. It will also link escalation design expectations to more rigorous oversight of **construction quality** and **ongoing performance**

[10] Federal Preemption as a Barrier to Cost Savings and High-Performance in Local Codes (NBI, 2017)
[11] Implementing an Outcome-Based Compliance Path in Energy Codes (NIBS, 2017)
[12] Architect's Guide to Building Performance: Integrating performance simulation in the design process (AIA, 2019)
[13] Implementing an Outcome-Based Compliance Path in Energy Codes (NIBS, NBI; 2017)

optimization as an integral part of operations and maintenance activities. The National Institute of Building Sciences (NIBS) and New Building Institute NBI) have provided energy code appendix language in the guide *Implementing an Outcome-Based Compliance Path in Energy Codes* to help jurisdictions interested in moving towards an outcome-based code.

What can Congress do?

Congress can incentivize states and cities to be early adopters of outcome-based codes by supporting the transition of staff and permitting infrastructure, public education and engagement programs, annual benchmarking and reporting infrastructure and the development of shared tools and lessons learned.

Congress can also link existing **Federal tax incentives** to outcomes, such as target Energy Use Intensity (EUI) metrics or **Zero Energy** and **Zero Carbon** goals. By leveraging existing financial incentives but tying them to outcome-based requirements, Congress not only uses its buying power to reduce carbon emissions in the built environment but also creates a replicable framework that smaller jurisdictions can emulate and normalizes the expectation of performance outcomes.

Where is the model Energy Code now?

The proposed International Energy Conservation Code (IECC) 2021 has concluded public comments and is up for final hearings in October and final vote in November 2019. It is estimated the proposed model code is approximately 10%-15% more efficient that the 2018 IECC. It includes cost effective advances in enclosure efficiencies, lighting, building commissioning and smart building operation infrastructure.

The 2021 model energy code includes a **Zero Code appendix**, a platform that jurisdictions can opt into to incentivize or make mandatory for certain building types or sizes to help them meet their climate goals. As an appendix it is built into the code enforcement framework of the IECC but is voluntarily adopted by jurisdictions and could be adjusted locally to align with a step code or other local programs. The provisions contained in this appendix will become mandatory when specified as such in the jurisdiction's adopting ordinance.

The Zero Code appendix to the 2021 IECC is constructed to require that new commercial, institutional, and mid- to high-rise residential buildings install or procure enough renewable energy to achieve zero net carbon annually[14]. The appendix encourages on-site renewable energy systems when feasible but also supports off-site procurement of renewable energy through a variety of methods. This appendix does not allow renewable energy to be traded off against the energy efficiency required by the 2021 IECC. Buildings are required to comply with the 2021 IECC using either the prescriptive or performance approach. When the prescriptive approach is used, the renewable energy that must be installed or procured is specified based on building type and climate zone.

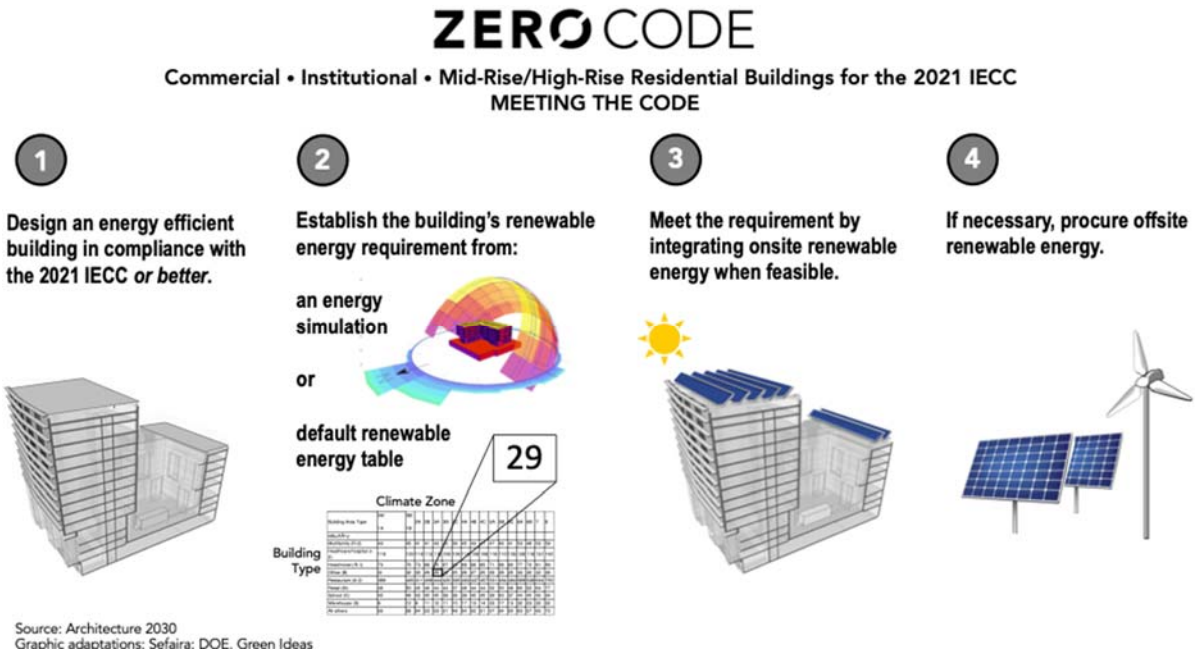
[14] Understanding Code Change Proposal CE264-19 Zero Code Renewable Energy Appendix (AIA, 2019)

The ZERO Code Renewable Energy Appendix is unique because of its:

1. Incorporation into the 2021 IECC, a highly efficient national building energy code;
2. Availability of sophisticated easy-to-use code compliance tools and software (developed by the U.S. Department of Energy) such as **COMcheck**, **EnergyPlus**, and a multitude of private sector energy performance programs;
3. Renewable energy default table and calculator for all US locations that determines the renewable energy required and estimates the potential on-site renewable energy production and off-site renewable energy procurement needed to achieve zero net carbon; and
4. Recognition of off-site renewable energy options that result in renewable energy generation that exceeds what utilities are already required to provide by their mandated RPS.

Once the IECC 2021 model code is published Congress can offer incentives to state and local governments to increase speed of adoption and encourage use of the **Zero Code appendix[15].**

The entire draft 2021 energy code has been endorsed by the U.S. Conference of Mayors[16] as a key part of getting to net zero building construction by 2050.



[15] https://architecture2030.org/wp-content/uploads/ZERO-Code-RE-Appendix-Fact-Sheet.pdf
[16] July 1, 2019 USCM Resolution 59

Why do we need a Zero Code?

Zero Net Energy (ZNE) buildings are picking up momentum in the market and the early adopters have shown that our industry has the materials and technology available to complete 67 NZE buildings and have another 415 on the way[17]. These projects are located in every climate zone in the U.S. The majority of completed and verified ZNE buildings (roughly 80%) are smaller than 25,000 square feet. However, there are signs the market is ready to take on larger projects with than 40% of projects registered as 'emerging zero energy' at 50,000 sf or larger. Advancing to a zero energy or zero carbon code, particularly in jurisdictions with advanced climate policies who are ready to take on the challenge, will move the market faster than waiting for voluntary market adoption.

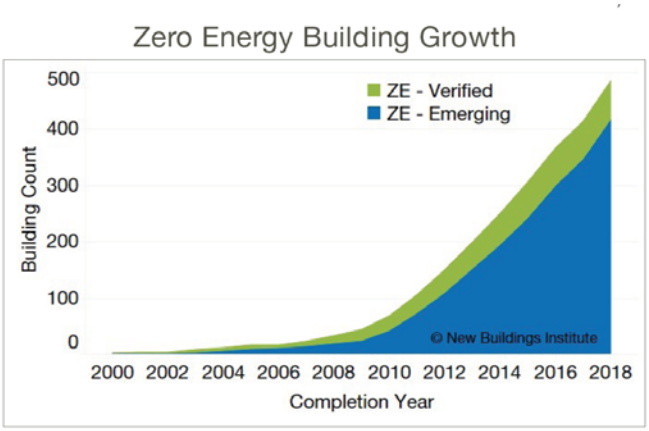


Fig 1. The Buildings List includes nearly 500 projects and is on a steep curve upward, having increased over 700% since 2012.

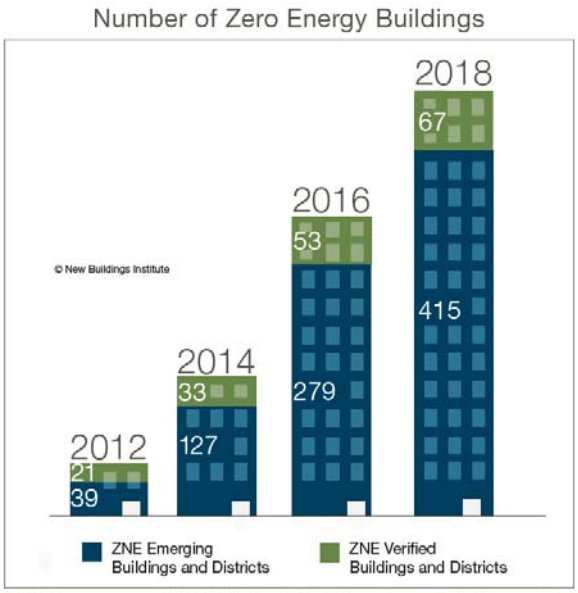


Fig 2. There are now 67 ZE Verified and 415 ZE Emerging projects documented by NBI.

[17] Getting to Zero Status Update and List of Zero Energy Projects (NBI, 2018)

Who is adopting Zero Codes and policies?

Many cities and a few states are already phasing in zero energy and zero carbon building codes. For example (see timeline, following page):

- The city of **Santa Monica, CA** started enforcing a Zero Net Energy (ZNE) Code for single family and low-rise residential buildings in 2017[18].

- The **State of California**[19] requires all new residential construction to be ZNE by 2030, all new commercial construction to be ZNE by 2030. California also addresses existing buildings, requiring 50% of commercial buildings to be retrofitted to ZNE by 2030, and 50% of renovations to state-owned buildings to be ZNE by 2025%. 100% of state-owned buildings by 2030.

- The **State of Oregon**[20] requires state-owned buildings to achieve carbon neutral operations starting in 2022. The residential code must be solar-ready starting in 2020 and Zero-Energy ready in 2023. In 2022, the commercial code must be solar-ready, and parking structures, commercial or residential, are required to install a minimum of 2 Electric Vehicle (EV) charging stations. All new commercial and state-owned buildings must be Net Zero by 2030.

- In **Washington, DC**[21] the Clean Energy DC Omnibus Act requires a Net Zero building code by 2026 and a net-zero retrofit to at least 12.5% of its building stock by 2032. DC currently has a voluntary "Appendix Z" to its proposed Energy Code update awaiting final approval to go into effect in 2020.

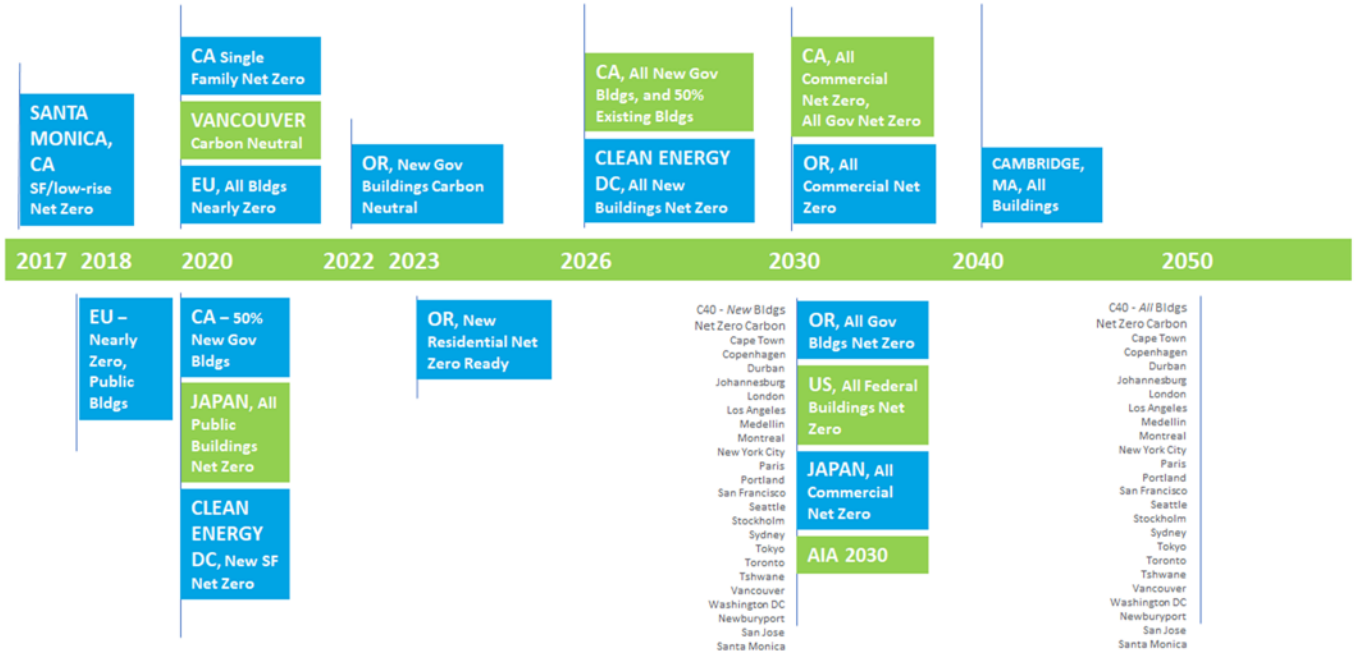
- **Cambridge, MA**[22] has committed to be a Net Zero community, requires all new buildings to be Net Zero by 2040.

- Other cities that have signed on as part of a global C40 Cities Net Zero Carbon Buildings Declaration[23] to net zero carbon new construction by 2030 and existing buildings by 2050 include **Los Angeles, New York City, Portland, San Francisco, Seattle, San Jose**.

- The Energy Independence and Security Act of 2007 [EISA §433] requires New Federal buildings and Federal buildings undergoing major renovations to reduce fossil fuel-generated energy consumption (baseline 2003) by 80% (2020), 90% (2025), and 100% (2030).

[18] https://www.smgov.net/Departments/OSE/Categories/Green_Building/Energy_Reach_Code_and_ZNE.aspx
[19] https://www.cpuc.ca.gov/ZNE/
[20] Oregon State Climate Action EO No. 17-20
[21] https://code.dccouncil.us/dc/council/laws/22-257.html
[22] https://www.cambridgema.gov/~/media/Images/CDD/Climate/NetZero/netzero_20150408_infographic.jpg
[23] https://www.c40.org/other/net-zero-carbon-buildings-declaration

City & State: Mandatory Net Zero Energy/Carbon Building Codes



What can Congress do?

Congress can incentivize states and cities to be early adopters of **Zero Energy** and **Zero Carbon codes** by supporting the staff and permitting infrastructure, public education and engagement programs, annual benchmarking and reporting infrastructure and the development of shared tools and lessons learned.

Congress can also link existing **Federal tax incentives** to Zero Energy and Zero Carbon goals. By leveraging existing financial incentives but tying them to Zero Energy or Zero Carbon, Congress not only uses its buying power to reduce carbon emissions in the built environment but also creates a replicable framework that smaller jurisdictions can emulate and normalizes the expectation of performance outcomes.

Congress can maintain and increase Federal tax incentives for Renewable Energy technologies, including storage. As more production comes online, the ability to store energy and control how and when it flows onto the grid will be critical to maintaining our infrastructure and energy autonomy.

What do we need beyond Energy Efficiency and Renewable Energy to achieve Zero Carbon buildings?

Energy efficiency and renewable energy are key components to achieving a low carbon built environment. Another critical element is the **electrification of buildings**. While Renewable Portfolio Standards are addressing the combustion of fossil fuels at the utility level, we must also address the consumption of fossil fuels on site at the building and central plant. This means replacing fossil fuel-based cooking, water heating, space heating and cooling equipment with electric equipment in our codes for new construction and alterations, as well as in our existing buildings through retrofits.

What can Congress do?

Congress can offer incentives for the replacement of fossil fuel-based equipment, particularly water heaters, furnaces, boilers and space heating/cooling equipment (i.e. heat pumps), or rebates to buy down the cost premium for first-time installation of electric equipment. Studies indicate regional state-led incentive programs[24] have been successful to date.

Eliminating onsite combustion of fossil fuels can have co-benefits such as improved safety, indoor air quality and grid flexibility.

In many cases natural gas or coal is used in large central plant facilities serving multiple buildings, particularly at hospitals, airports, universities and other campuses or networks that serve our communities. Providing resources to help these facilities convert to electric districts, renewable-ready districts and zero energy-ready districts can help them to be more resilient and prepared for the future.

[24] http://www.aceee.org/sites/default/files/publications/researchreports/a1803.pdf

What is the role of Existing Buildings and how do we get to them?

Building codes in many states don't address existing buildings. The International Existing Building Code (IEBC) was created in 2003 and is adopted in approximately half of the Unites States[25].

The model energy code addresses new construction and planned alterations projects that require a permit. The construction activity triggers the code. Buildings with no planned construction activity are not typically addressed by energy codes.

In most established U.S. cities, 80-90% of the buildings that will be consuming energy in 2050 already exist. U.S. cities only see 1-2% turnover (renovation or replacement) of building stock every year on average. Even cities with a lot of construction activity, like Washington, DC, still turn over less than 3% of building stock per year. And yet, in cities, buildings represent on average 50-70% of GHG emissions inventory. Buildings are the single largest opportunity to meet climate goals. For example:

- **Boston, MA:** buildings generate 75% of emissions[26]
- **Cambridge, MA:** buildings generate 65.8% of emissions[27]
- **Chicago, IL**: buildings generate 53.7% of emissions[28]
- **Minneapolis, MN:** buildings generate 63% of emissions[29]
- **New York City, NY:** buildings generate 71% of emissions[30]
- **Washington, DC:** buildings generate 75% of emissions[31]

Therefore, building codes alone won't address the issue of emissions in the built environment. Other complementary policy solutions, such as energy transparency and benchmarking, as well as building performance standards are required.

Transparency and Benchmarking Policies

Energy benchmarking and transparency ordinances are being adopted by cities and states across the country, making publicly and privately-owned building annual performance data available to jurisdictions and the public. The performance of *all* buildings, whether newly constructed or existing in place for decades, is the focus of the transparency movement, as cities create data-driven market mechanisms and public policies to support their climate commitments[32].

[25] The Role of Existing Building Codes in Safely, Cost-Effectively Transforming the Nation's Building Stock (NIBS, 2017)
[26] https://www.boston.gov/sites/default/files/boston_ghg_inventory_2005-2015.pdf
[27] https://www.cambridgema.gov/CDD/climateandenergy/greenhousegasemissions/communityemissions
[28] https://www.chicago.gov/content/dam/city/progs/env/GHG_Inventory/CityofChicago_2015_GHG_Emissions_Inventory_Report.pdf
[29] https://lims.minneapolismn.gov/Download/PriorFileDocument/-63089/WCMSP-178225.PDF
[30] http://www.nyc.gov/html/builttolast/assets/downloads/pdf/OneCity.pdf
[31] https://doee.dc.gov/service/greenhouse-gas-inventories
[32] Leveraging Energy Transparency (AIA)

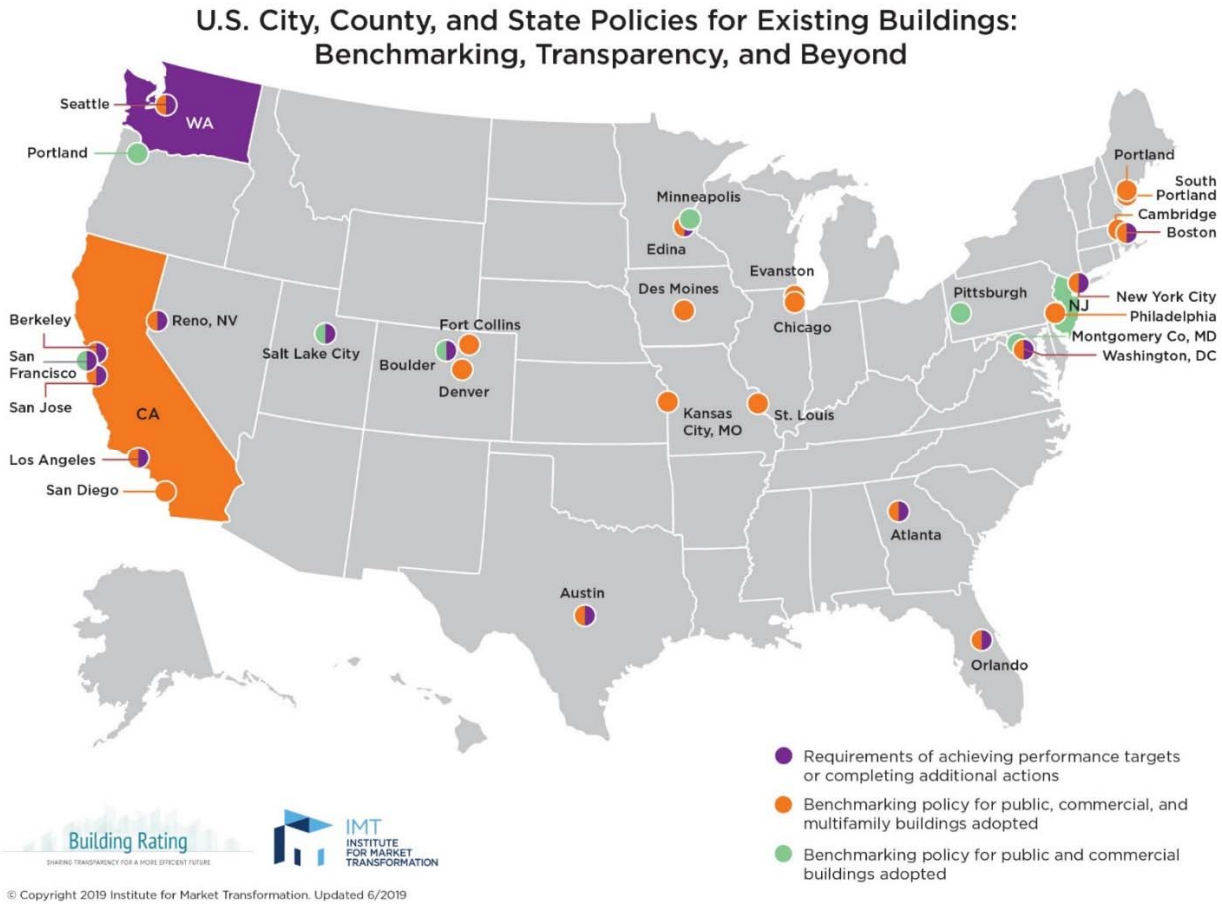
Transparency and benchmarking policies have been implemented in over two dozen jurisdictions[33], including cities, counties and states, such as[34]:

• Atlanta, GA	• Evanston, IL	• Portland, ME
• Austin, TX	• Fort Collins, CO	• Portland, OR
• Berkeley, CA	• Kansas City, MO	• Reno, NV
• Boston, MA	• Los Angeles, CA	• Salt Lake City, UT
• Boulder, CO	• Minneapolis, MN	• Saint Louis, MO
• California	• Montgomery County, MD	• San Diego, CA
• Cambridge, MA	• New Jersey	• San Francisco, CA
• Chicago, IL	• New York City, NY	• San Jose, CA
• Denver, CO	• Orlando, FL	• Seattle, WA
• Des Moines, IA	• Philadelphia, PA	• Washington
• Edlina, MN	• Pittsburgh, PA	• Washington, DC

40% of the United States are represented with benchmarking and transparency policies at city, county or state level, indicating the widespread appeal.

These policies encompass nearly 92,000 properties[35] at 11 billion square feet of floor area[36] reported every year. Through transparency alone these cities are seeing an average of 4-13% energy improvement in their existing building stock. Just starting to use the benchmarking and reporting tools, such as EnergyStar Portfolio Manager, shining a light on building performance, and introducing a comparative metric has already inspired improved operations and maintenance as well as investment in energy efficiency.

[33] https://www.imt.org/wp-content/uploads/2019/06/IMT-Benchmarking-Map-CityCountyState-CURRENT-062019.jpg
[34] https://www.buildingrating.org/graphic/us-commercial-building-policy-comparison-matrix
[35] https://www.buildingrating.org/graphic/us-number-properties-covered-annually
[36] https://www.buildingrating.org/graphic/us-building-area-covered-annually


U.S. City, County, and State Policies for Existing Buildings:
Benchmarking, Transparency, and Beyond
Seattle
WA
Portland
Berkeley
Reno, NV
San
Francisco
San Jose
CA
Los Angeles
San Diego
Salt Lake City
Fort Collins
Boulder
Denver
Minneapolis
Edina
Des Moines
Evanston
Chicago
Kansas
City, MO
St. Louis
Austin
Atlanta
Orlando
Pittsburgh
Portland
South
Portland
Cambridge
Boston
NJ
New York City
Philadelphia
Montgomery Co, MD
Washington, DC
Requirements of achieving performance targets or completing additional actions
Benchmarking policy for public, commercial, and multifamily buildings adopted
Benchmarking policy for public and commercial buildings adopted
Building Rating
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Comparison of U.S. Commercial Building Energy Benchmarking and Transparency Policies

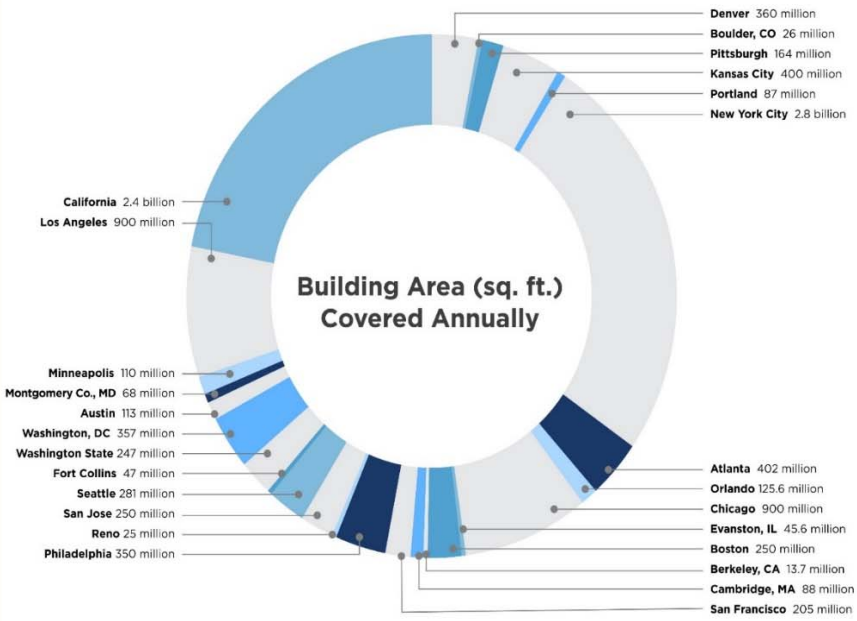
	Legislation	Public Data Available	Policy Impact			Buildings Included	Policy Schedule		Compliance		Additional Elements	
	Jurisdiction	Released	Number of Bldgs	Square Footage	Energy Savings	Types & Sizes	Reporting to Gov't	Transparency	By # of Buildings	By % of Sq. Ft.	Water Tracking	Other Requirements
Cities/Counties	Atlanta	-	2,900	402 million	-	Comm & MF ≥ 25K	Jun 1, Annual	(if Energy Star >55) Sept 2018	-	-	✓	Audits every 10 years
	Austin	-	2,800	113 million	-	Comm ≥ 10K MF ≥ 5 units	Jun 1, Annual	Time of transaction	-	-	-	Audits & mandatory upgrades for high energy use MF buildings
	Berkeley	-	257	13.7 million	-	Comm & MF ≥ 50K Comm & MF ≥ 25K	July 1, Annual July 1, 2019	TBD TBD	-	-	✓	Periodic/time of sale energy reports for all buildings (timing based on size)
	Boston	Yes	1,600	250 million	-	Comm ≥ 35K MF ≥ 35K/35 units	May 15, Annual	Oct 1, Annual	-	84% (2014)	✓	Periodic energy assessments and/or actions
	Boulder	-	475	26 million	-	Comm ≥ 50K New Comm ≥ 10K Comm ≥ 30K Comm ≥ 20K	Aug 1, Annual Aug 1, Annual Jun 1, Annual Jun 1, 2020	>Jun 1, 2019 >Jun 1, 2019 >Jun 1, 2021 >Jun 1, 2023	100% (2016)	100% (2016)	✓	Lighting upgrade; audits & RCx every 10 yrs (must invest in RCx measures w/ ≤2yr payback)
	Cambridge	Yes	1,100	78 million	-	Comm ≥ 50K MF ≥ 50 units	May 1, Annual	Sept 1, Annual	95% (2015)	93.5% (2014)	✓	-
	Chicago	Yes	3,500	900 million	2.9% (2014-17)	Comm ≥ 50K MF ≥ 50K	Jun 1, Annual	>Jun 1, Annual	85% (2017)	92% (2017)	-	Data verification by licensed professional 1st year & every 3 years
	Denver	-	3,000	360 million	4.5% (2017)	Comm & MF ≥ 25K	Jun 1, Annual	TBD	90% (2017)	-	-	-
	District of Columbia	Yes	2,000	357 million	9% (2010-13)	Comm ≥ 50K MF ≥ 50K	Apr 1, Annual	>Apr 1, Annual	83% (2013)	-	✓	-
	Evanston, IL	-	557	45.6 million	-	Comm & MF ≥100K Comm & MF ≥ 50K Comm & MF ≥ 20K	Jun 30, Annual Jun 30, Annual Jun 30, 2019	TBD	-	-	✓	Data verification by a certified professional 1st year and every 3 years
	Fort Collins, CO		2,250	47 million		Comm ≥20K Comm ≥ 10K MF ≥ 20K Comm ≥ 5K MF ≥ 10K MF ≥ 5K	Mar 1, 2020 Mar 1, 2021 Mar 1, 2021 Mar 1, 2022 Mar 1, 2022 Mar 1, 2023	Annual	-	-	✓	-
	Kansas City	Yes	~1,500	~400 million	-	Comm & MF ≥100K Comm & MF ≥ 50K	May 1, Annual	Sept 1, 2018 Sept 1, 2019	61.8% (2017)	-	✓	-
	Los Angeles	-	14,000	900 million	-	Comm & MF ≥100K Comm & MF ≥ 50K Comm & MF ≥ 20K	Dec 1, Annual Jun 1, Annual Jun 1, 2019	Annual	82% (2016)	-	✓	ASHRAE level II audit and RCx every 5 years
	Minneapolis	Yes	625	110 million	3.4% (2014-16)	Comm ≥ 50K	Jun 1, Annual	Aug 31, Annual	-	80% (2016)	✓	-
	Montgomery Co., MD	Yes	~1,000	~110 million	-	Comm ≥ 50K	June 1, Annual	Oct, Annual	77% (2016)	-	-	Data verification by licensed professional 1st year & every 3 years
	New York City	Yes	33,417	2.8 billion	6-14% (2010-14)	Comm & MF ≥ 50K Comm & MF ≥ 25K	May 1, Annual	Sept 1, Annual Anticipated >2018	90% (2015)	90% (2015)	✓	Audits & RCx (LL 87), lighting upgrades & submetering (LL 88)
	Orlando	-	826	125.6 million	-	Comm & MF ≥ 50K	May 1, Annual	Sep 1, 2019	-	-	-	Energy audit or RCx every five years if ENERGY STAR <50. Benchmarking by qualified benchmarker
	Philadelphia	Yes	2,900	390 million	-	Comm ≥ 50K MF ≥ 50K	Jun 30, Annual	>Jun 30, Annual >Jun 30, 2017	91% (2014)	91% (2014)	✓	-
	Pittsburgh	-	861	164 million	-	Comm ≥ 50K	June 1, Annual	>Jun 1, Annual	-	-	✓	-
	Portland, ME	-	284	-	-	Comm ≥ 20K MF ≥ 50 units	May 1, Annual	Sept 1, 2019	-	-	✓	-
	Portland, OR	Yes	1,024	87 million	-	Comm ≥ 20K	Apr 22, Annual	Oct 1, Annual	-	91% (2017)	-	-
	Reno	-	500	25 million		Comm & MF ≥100K Comm & MF ≥ 50K Comm & MF ≥ 20K	Apr 1, 2020 Apr 1, 2021 Apr 1, 2022	Annual	-	-	✓	Bldgs not meeting performance target must do audit or retuning every 7 years
	Salt Lake City	-	1,211	124 million	-	Comm ≥ 50K Comm ≥ 25K	May 1, 2019 May 1, 2020	Sept 1, 2019 Sept 1, 2020	-	-	-	Tune-ups every 5 years
	San Francisco	Commercial Municipal	2,312	203 million	7.9% (2010-14)	Comm ≥ 10K	Apr 1, Annual	>Apr 1, Annual	-	82% (2013)	-	ASHRAE level I/II audits or RCx every 5 years
	San Jose	-	2,500	250 million		Comm & MF ≥ 50K Comm & MF ≥ 20K	May 1, 2019 May 1, 2020	Annual	-	-	✓	Bldgs not up to performance std. must do audit, RCx or improvement measures

Each year, existing policies will impact more than **91,800 properties**

Impact of U.S. City, County, and State Benchmarking and Transparency Policies for Existing Buildings

Totaling approximately **11 billion** SF of floor space in major real estate markets

Impact of U.S. City, County, and State Benchmarking and Transparency Policies for Existing Buildings



The economic impact of investments in Energy Efficiency

Investment in Energy Efficiency is investment in local jobs and the local economy. Building improvements focused on improved energy efficiency in existing building stock cannot be shipped overseas. They are labor intensive and site-specific projects, driving the creation of local jobs in construction, renovation, installation, operations and maintenance[37]. According to the *2019 U.S. Energy and Employment Report,* Energy Efficiency produced more new jobs in the United States in 2018 than any other energy sector, and accounted for more than **2.3 million jobs** overall, as compared with about 534,000 in renewable energy and about 200,000 in coal.

Transparency and benchmarking policies encourage the private sector to invest in energy efficiency projects. Building owners want to maintain Class ratings for their portfolio and remain competitive in the real estate market. In order to get to 100% clean energy by 2035, the **City of Atlanta** determined that an approach including investment in energy efficiency would return $41 in local benefits for every $1 invested[38]. The City of Atlanta now requires commercial buildings 25,000 square feet and larger to report annual EnergyStar scores and perform energy audits every 10 years[39].

What can Congress do?

Congress can incentivize states and cities to adopt transparency and benchmarking policies, by co-funding staff or providing resources and tools, particularly when policies are linked to a national benchmarking platform such as the U.S. Environmental Protection Agency (EPA) **EnergyStar Portfolio Manager** tool. Congress can ensure EnergyStar Portfolio Manager remains relevant by maintaining funding for the **Commercial Building Energy Consumption Survey** which populates the database on the backend.

Congress can leverage the National Laboratories and the U.S. Department of Energy Building Technologies Office (BTO) to provide demonstration and field validation of advanced technologies so that American businesses may foster innovative solutions to our building energy challenges, these technologies may become shelf-ready and cost-competitive, and building owners may confidently employ these technologies in existing buildings to improve their performance.

Congress can also incentivize building owners by providing financial incentives (tax incentives or rebates) for energy audits, retro-commissioning, deep green retrofits, systems or component replacement, and building operator training programs.

Building Performance Standards

Once jurisdictions have established transparency and benchmarking infrastructure with its annual communication channels between building owners and a building performance oversight agency, it is easier to put a building performance standard into place. Cities may want to require building owners to take additional steps beyond just reporting performance such as improving buildings that exceed energy- or water-consumption thresholds or fall below peer building EnergyStar scores.

There are a small number of jurisdictions that have already passed building performance standards, but many more are looking at similar policies to address their existing building stock. The next most likely jurisdictions to pass similar policies will be those with existing transparency and benchmarking policies already in effect.

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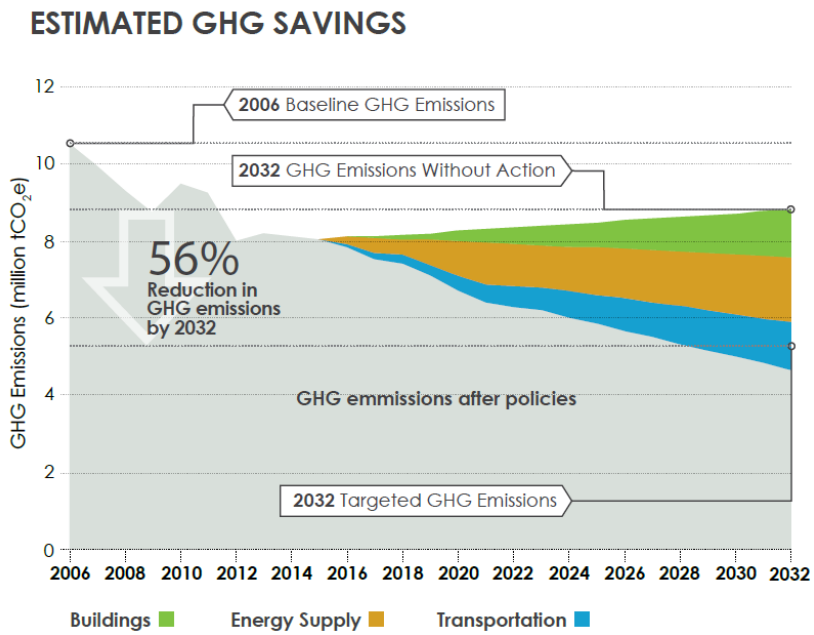
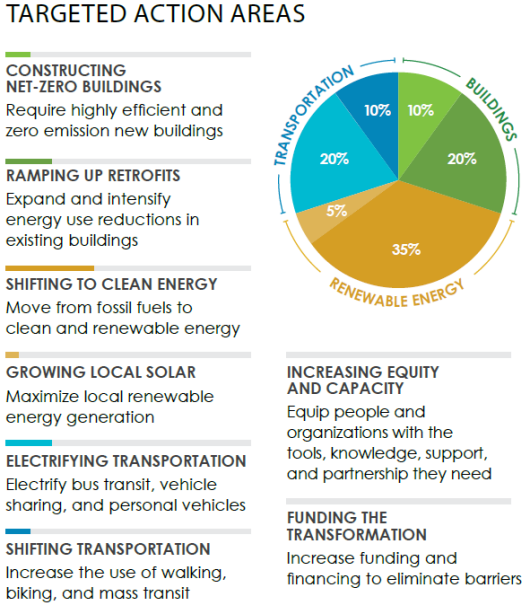
[37] Energy Efficiency in Buildings: the key to Effective and Equitable Clean Energy Action for Cities (IMT)
[38] Clean Energy Atlanta, Resolution No. 17-R-3510 (2017)
[39] https://atlantabuildingbenchmarking.files.wordpress.com/2019/02/nrdc_100ce_plan_021319_v8_low-res.pdf

Summary of existing Building Performance Standards in effect today:

Jurisdiction	Min. bldg. size	Performance metric	Year
Washington, DC	10,000 sf	Local median EnergyStar score per bldg. type	2021
Washington State	50,000 sf	Average EUI per bldg. type, Lower EUI for new construction	2026
New York City	25,000 sf	Max GHG emissions per bldg. type	2024



The **Clean Energy DC Plan**[40] establishes a clear path to achieve over 50% reduction in GHG emissions by 2032. Savings from new Net Zero buildings are estimated to comprise 10% of the District's GHG emissions reduction plan and savings from existing building retrofits are estimated to comprise 20% of the District's GHG emissions reduction plan (see Targeted Action Areas).



In order to realize the GHG emissions reduction articulated in the Clean Energy DC Plan, in 2018 **Washington, DC** passed the **Clean Energy DC Omnibus Amendment Act**[41] reducing benchmarking requirements to all buildings 10,000 square feet or larger (public and private owned) and creating a **Building Energy Performance Standard (BEPS)** to address the ongoing lifecycle performance of its existing building stock. Starting in 2021, buildings must meet the BEPS (which can be no lower than the *local* median EnergyStar score for each building type), or owners will have five years to bring the building into compliance through:

[40] https://doee.dc.gov/sites/default/files/dc/sites/ddoe/page_content/attachments/Clean%20Energy%20DC%20-%20Full%20Report_0.pdf
[41] https://code.dccouncil.us/dc/council/laws/22-257.html

a) **Prescriptive Compliance Path**: a set of previously identified measures, such as commissioning, energy audits, boiler replacement, lighting retrofits, roof replacement, building operator training, calculated to approximate 20% performance improvement. These prescriptive measures will vary by building type, as the measures will have varying levels of impact based on the load profiles of each building type. This option leaves nothing to chance – if the owner is able to document in year five proof that the required activities were conducted, and that equipment or systems were purchased and installed, the building will be deemed in compliance for that BEPS cycle. However if the building's EnergyStar score is still below the local median for its building type in year five (baseline year for the next BEPS cycle), it will be required to repeat the prescriptive compliance path or to look at another compliance path for the next BEPS cycle.

b) **Performance Compliance Path**: a 20% improvement in building performance calculated by evaluating performance in year five against performance in the baseline year. This path allows building owners to work with their consultants to evaluate different options and identify the best path forward for that building. Owners may choose to leverage **energy modeling** tools to evaluate different design options and quantify their potential impact on building energy savings as well as project simple payback. This option may work well for owners already considering or planning to undertake building renovation or repositioning projects, into which energy efficiency upgrades can be folded in. It also gives the owner more flexibility and choice. It is less predictable and requires the projects to be undertaken and completed sufficiently early in the cycle for the savings to be realized by the completion of year five so that the 20% performance improvement can be documented. If the owner is able to document in year five proof that the building has improved by at least 20% from its baseline year, the building will be deemed in compliance for that BEPS cycle. However if the building's EnergyStar score is still below the local median for its building type in year five (baseline year for the next BEPS cycle), it will be required to repeat the performance compliance path or to look at another compliance path for the next BEPS cycle.

c) **Alternative Compliance Path:** the DC Department of Energy and Environment (DOEE) is tasked by the Act to develop alternative compliance pathways. These may include third party green building certifications or ratings, such as BREEAM In-Use, LEED for Existing Buildings: Operations and Maintenance, EnergyStar, WELL or others. The alternative compliance path may allow for some combination of portfolio trade-offs for multiple building or large real estate portfolio owners, or even tradeable credits between building owners, with a combination of on-site and offsite efficiency improvements or on-site and offsite renewable energy generation. A similar construct exists now with tradeable stormwater credits, requiring buildings to meet at least 50% of their stormwater obligations onsite but allowing the remainder to be treated offsite so long as that treatment remains within the District. This alternative pathway has not yet been defined but will be developed in further detail by the DOEE and the BEPS Task Force, comprised of local building industry stakeholders.

The distinguishing characteristic of Washington, DC's building performance standard is that it is on a five-year cycle, and benchmarked against a **local median EnergyStar score**, which by definition will rise over time as new high performance and net zero buildings come on line (Net Zero Building Code required for new construction in 2026) and the existing building stock improves in its energy performance. Building owners can be impacted in consecutive BEPS cycles, so careful consideration will need to be taken into determining whether incremental building performance improvement is the right path, or deep green retrofits that position a building well ahead of the median to leapfrog over the next few BEPS cycles is the better way to go. This decision may depend on existing tenant lease agreements, financing options and how recently the building has undergone renovation.

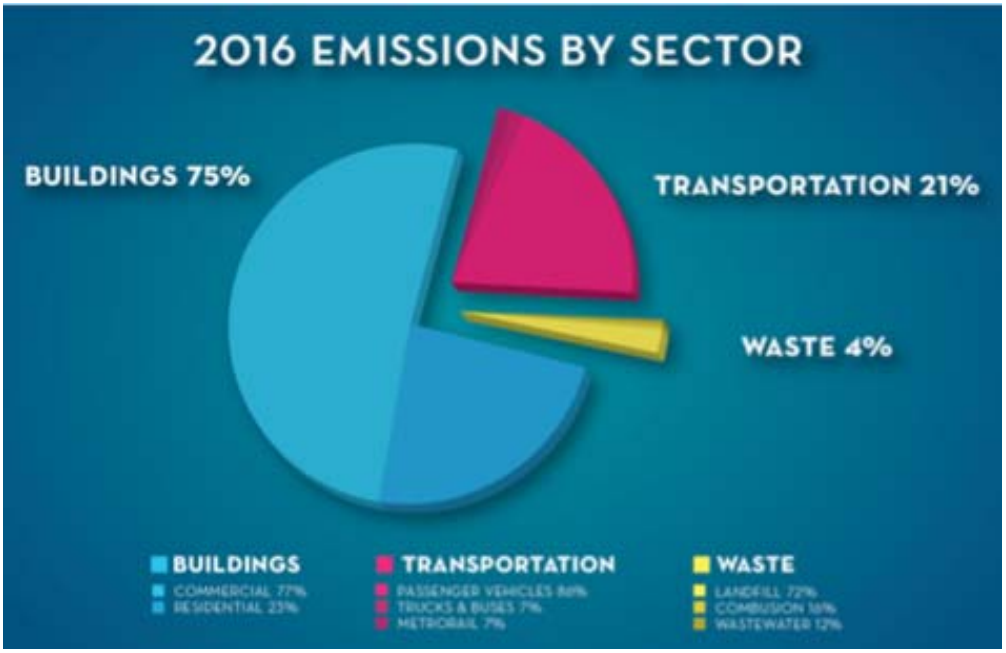
With EnergyStar scores, based on a percentile, higher is better. Therefore, the standard is in and of itself a self-improving threshold or benchmark. It will automatically rise over time, and the five-year cycle will generate economic activity in the construction industry, as well as investment in buildings, neighborhoods, communities and infrastructure that improve quality of life for all residents, and encourage infill development and growth in the District as the built environment and services improve.
The Act provides other pathways for addressing the improvement in performance of **Affordable Housing** stock and allows for flexibility in compliance with the BEPS in order to avoid unintended consequences with displacement of low-income residents.

The Act provides funding for the newly establish **Green Bank**, a revolving green fund intended to help finance energy efficiency projects in the District, complementing **DC Pace Bonds**, the **DC Sustainable Energy Utility** and **DC Solar for All** programs that provide alternative financing for energy efficiency and renewable energy projects (in addition to private capital). If buildings failing to comply with the building energy performance requirements at the end of the 5-year compliance period shall pay an alternative compliance penalty established by DOEE.

The Act additionally calls for a **100% Renewable Portfolio Standard** by 2032 and an electrification of fleet vehicles, integral parts of decarbonizing the grid and bringing additional storage capacity to improve building and grid flexibility.

The Act also establishes **a Sustainable Energy Infrastructure Capacity Building and Pipeline Program** with the purpose of increasing the participation and capacity of certified business enterprises, directing the Office of Contracting and Procurement to includes Certified Business Enterprise utilization as an evaluation factor when shortlisting and selecting businesses for professional services and when selecting contractors in best value procurements with a contract value of more than $250,000.

In Washington, DC, buildings represent 75% of Greenhouse Gas Emissions (2016)[42]:



[42] https://doee.dc.gov/service/greenhouse-gas-inventories

Washington State determined efficiency to be the 'largest, cheapest, lowest risk energy resource' and that 'with an aggressive new energy efficiency policy the region can potentially meet 100 percent of its electricity load growth over the next twenty years with energy efficiency.' A 2017 report documented that energy efficiency programs in the state had created **65,000 jobs**, primarily in the construction sector, and that the number is continuing to grow. In 2019, Washington State passed House Bill 1257[43] that requires a building performance standard go into effect between 2026 and 2029, affecting buildings 50,000 square feet and larger.

The standard shall establish **Energy Use Intensity (EUI) targets by building type**, require energy management plans, operations and maintenance programs, energy efficiency audits, investment in energy efficiency measures and shall be developed based on **ANSI/ASHRAE/IES standard 100-2018**. The standard must be updated every five years. In contrast to EnergyStar scores which are based on a percentile, Energy Use Intensity is a measurement of total annual energy use over the course of a year, divided by building area. It is often depicted in British thermal units per square foot per year (kBtu/sf/yr) or kilowatt hours per square foot per year (kWh/sf/yr). Therefore, **when it comes to EUI, lower is better.**

The EUI targets can be **no greater than the average EUI for building occupancy type**, and may implement lower EUI targets for more recently built commercial buildings based on the state energy code in place when the buildings were constructed. Therefore, older building stock must be brought up to at least average performance and newer building stock may be held to a higher performance standard. The standard may become higher more stringent over time, assuming the average EUI improves (lowers) with the addition of new building stock and the improvement of energy performance in existing building stock. The standard for more recently constructed buildings is not necessarily self-improving, as it requires consideration and manual calibration, but it is clear the legislative intent is that this standard keep pace ahead of the building code as well.

Buildings falling short of the performance standard must implement energy efficiency measures identified by energy audits to achieve its energy use intensity target. The bill requires investment criteria be developed that requires a building owner to adopt an implementation plan to either:

a) Meet the energy intensity target
b) Implement an optimized bundle of energy efficiency measures that provides maximum energy savings without resulting in a savings-to-investment ratio of less than 1.0

Administrative penalties may be imposed upon a building owner for failing to submit documentation demonstrating compliance. The penalty may not exceed an amount equal to five thousand dollars plus an amount based on the duration of any continuing violation (may not exceed one dollar per year per gross square foot of floor area). Administrative penalties collected must be deposited into the **low-income weatherization and structural rehabilitation assistance account**.

The state is required to develop an incentive program for early adoption and for buildings whose baseline EUI exceeds its target by at least fifteen EUI units (i.e. it is 15 units lower than the target EUI). The incentive is eighty-five cents per gross square foot of floor area, excluding parking, unconditioned, or semi-conditioned spaces (such as mechanical rooms or penthouses).

The bill also requires that the building code council adopt rules for vehicle charging capability at all new buildings that provide on-site parking. Where parking is provided, the greater of one parking space or ten percent of parking spaces, rounded to the next whole number, must be provided. Electric vehicles are

[43] http://lawfilesext.leg.wa.gov/biennium/2019-20/Pdf/Bills/House%20Passed%20Legislature/1257-S3.PL.pdf

integral parts of decarbonizing the grid and bringing additional storage capacity to improve building and grid flexibility.

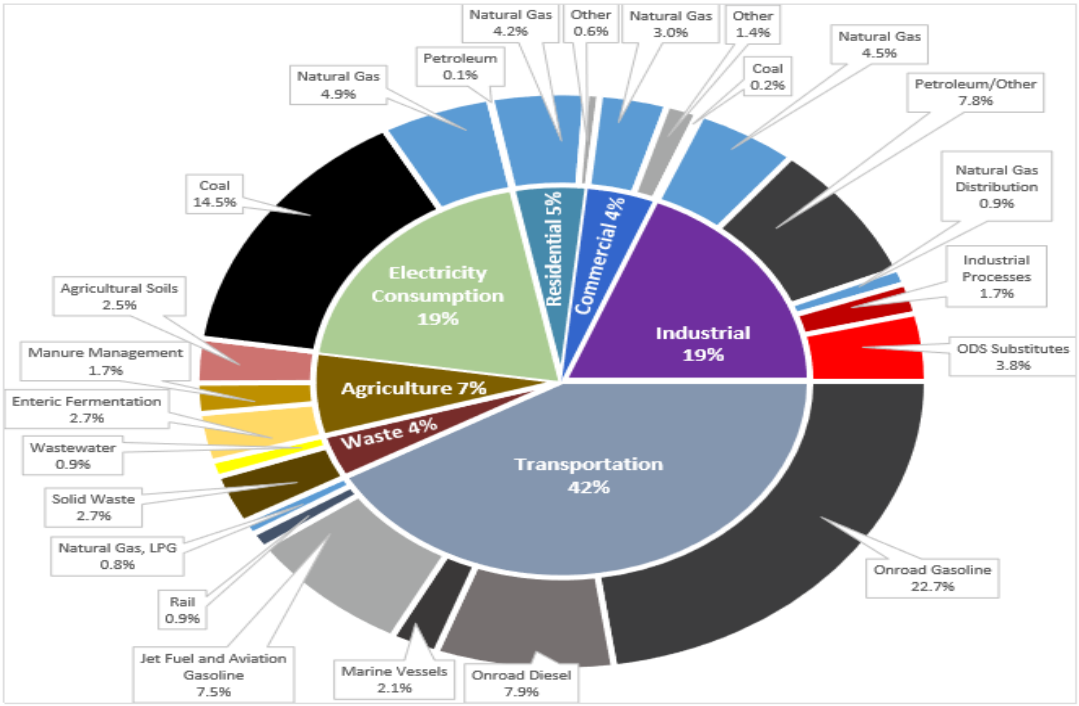


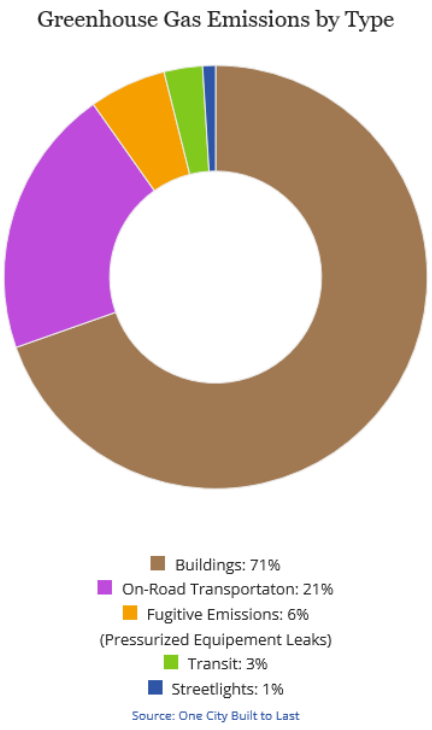
Figure 7: Washington Greenhouse Gas Emissions, 3 year average (2013-2015)

In 2015, Washington's largest contributors of greenhouse gases were[44]:

- Transportation sector at 42.5%
- **Residential, commercial, and industrial sector at 21.3%**
- Electricity sector at 19.5%

[44] https://fortress.wa.gov/ecy/publications/documents/1802043.pdf

Buildings make up 71% of GHG emissions in **New York City**[45]. Energy consumption from electricity use, heating, and cooling all contribute. Building owners and managers can improve energy efficiency of building systems and operations and invest in cleaner on-site power generation. They can also support market growth for renewables through power purchase agreements and other mechanisms to procure cleaner energy that is generated off-site. Building tenants and occupants can reduce their energy consumption, which accounts for 40-60% of a building's energy use. Emissions from the city's power supply can be reduced by power suppliers switching to cleaner energy sources, and by fuel distributors offering low-carbon fuels.



In 2019, New York City **passed the Climate Mobilization Act**, including Bill 1253 which sets emissions caps on buildings over 25,000 square feet and establishes an Office of Building Energy and Emissions Performance. The bill sets one standard to go into effect between 2024-2029 and a more stringent standard to go into effect in 2030.

The limits are calculated to require emissions reductions from the highest emitting 20% of buildings in each occupancy group for the first compliance date beginning in 2024, and the highest emitting 75% of buildings in each occupancy group for the second compliance date beginning in 2030.

The Bill includes prescriptive performance improvement requirements for rent-controlled/rent-regulated housing units in order to prevent the legislation from displacing low- residents or increasing the cost of their housing.

The Bill establishes a Property Assessed Clean Energy (PACE) program in the City. PACE is a voluntary financing mechanism that enables energy efficiency and renewable energy projects to receive long-term financing for little or no money down. Further, debt service is generally limited to the amount of money saved through the resulting reductions in energy use. Typically PACE financing is tied to property title rather than individual or company so that if a building transfers ownership before the completion of the payback period of an energy efficiency project, the new owner of the building continues to pay off the PACE bond.

Specific emissions limits for each building occupancy type in calendar years 2035-2050 have yet to be established, but the end goal by 2050 has been defined: annual building emissions limits and building emissions intensity limits applicable for calendar years 2035 through 2039 and building emissions limits and building emissions intensity limits applicable for calendar years 2040 through 2049 shall be set to achieve an average building emissions intensity for all covered buildings of no more than 0.0014 $tCO_2e/sf/yr$ by 2050.

On and after January 1, 2050 building emissions limits and building emissions intensity limits shall achieve an average building emissions intensity for all covered buildings of no more than 0.0014 $tCO_2e/sf/yr$.

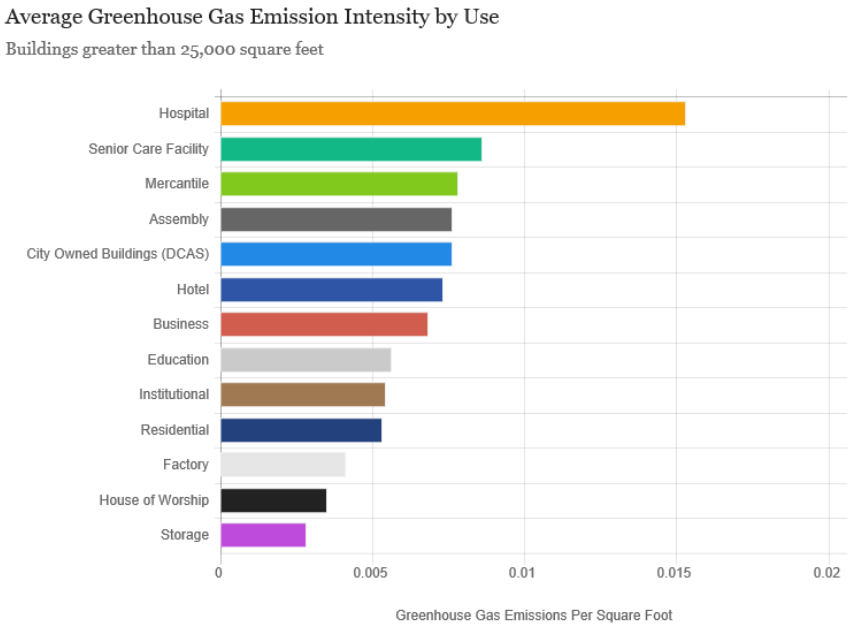
[45] http://www.nyc.gov/html/builttolast/assets/downloads/pdf/OneCity.pdf

Calendar year 2024-2029	
Occupancy Type	**Emissions Intensity Limit (per square foot)**
Group A	0.01074 tCO_2e
Group B (other than Group B exceptions noted below)	0.00846 tCO_2e
Groups E and I-4	0.00758 tCO_2e
Group I-1	0.01138 tCO_2e
Group F	0.00574 tCO_2e
Group B civic administrative facility for emergency response services, Group B non-production laboratory, Group B ambulatory health care facility, H, I-2, I-3	0.02381 tCO_2e
Group M	0.01181 tCO_2e
Group R-1	0.00987 tCO_2e
Group R-2	0.00675 tCO_2e
Groups S and U	0.00426 tCO_2e
Calendar year 2030-2034	
Occupancy Type	**Emissions Intensity Limit (per square foot)**
Group A	0.00420 tCO_2e
Group B (other than Group B exceptions noted below)	0.00453 tCO_2e
Groups E and I-4	0.00344 tCO_2e
Group I-1	0.00598 tCO_2e
Group F	0.00167 tCO_2e
Group B civic administrative facility for emergency response services, Group B non-production laboratory, Group B ambulatory health care facility, H, I-2, I-3	0.01193 tCO_2e
Group M	0.00403 tCO_2e
Group R-1	0.00526 tCO_2e
Group R-2	0.00407 tCO_2e
Groups S and U	0.00110 tCO_2e

What distinguishes this legislation is that is does explicitly allow for **renewable energy credits** (RECs), **greenhouse gas offsets**, or **clean distributed energy resources**. To be eligible, the source of the renewable energy credits must be considered by the New York independent system operator to be a capacity resource located in or directly deliverable into zone J load zone for the reporting calendar year. For calendar years 2024-2029, a greenhouse gas offset can only be authorized for up to 10 percent of the annual building emissions limit. For calendar years 2024-2029, a greenhouse gas deduction can only be authorized based upon the calculated output of a clean distributed energy resource located at, on, in, or directly connected to the building.

The Act also included Bill 1318, which requires a feasibility assessment of replacing the City's gas-fired power plants with battery storage powered by renewable energy sources, as well as Bills 276 and 1032 which equip the roofs of smaller new residential buildings and non-residential buildings with solar photovoltaic systems or green roofs.

The bill acknowledges that of these use groups, hospitals have the highest GHG emissions per square foot in New York City, but that by law hospitals are required to maintain certain ventilation and exhaust rates, which is energy intensive. In addition, plug loads for mission-specific equipment such as MRIs also contribute to high energy demand. Therefore, the bill includes provisions to ensure hospitals reduce emissions without impeding their mission.



New York City's average GHG emissions intensity by building use type

What can Congress do?

Congress can incentivize states and cities to adopt Building Performance Standards, particularly when policies are linked to a national benchmarking platform such as the U.S. Environmental Protection Agency (EPA) **EnergyStar Portfolio Manager** tool. Support may include co-funding staff or providing resources, tools and training for jurisdictions.

Congress can continue to support the development and improvement of energy simulation tools that aid building owners in making financial investment decisions, as well as EPA EnergyStar Portfolio Manager platform, and ensure it remains relevant by maintaining funding for the **Commercial Building Energy Consumption Survey** which populates the database on the backend.

Congress can leverage the National Laboratories and the U.S. Department of Energy Building Technologies Office (BTO) to provide demonstration and field validation of advanced technologies so that American businesses may foster innovative solutions to our building energy challenges, these technologies may become shelf-ready and cost-competitive, and building owners may confidently employ these technologies in existing buildings to improve their performance.

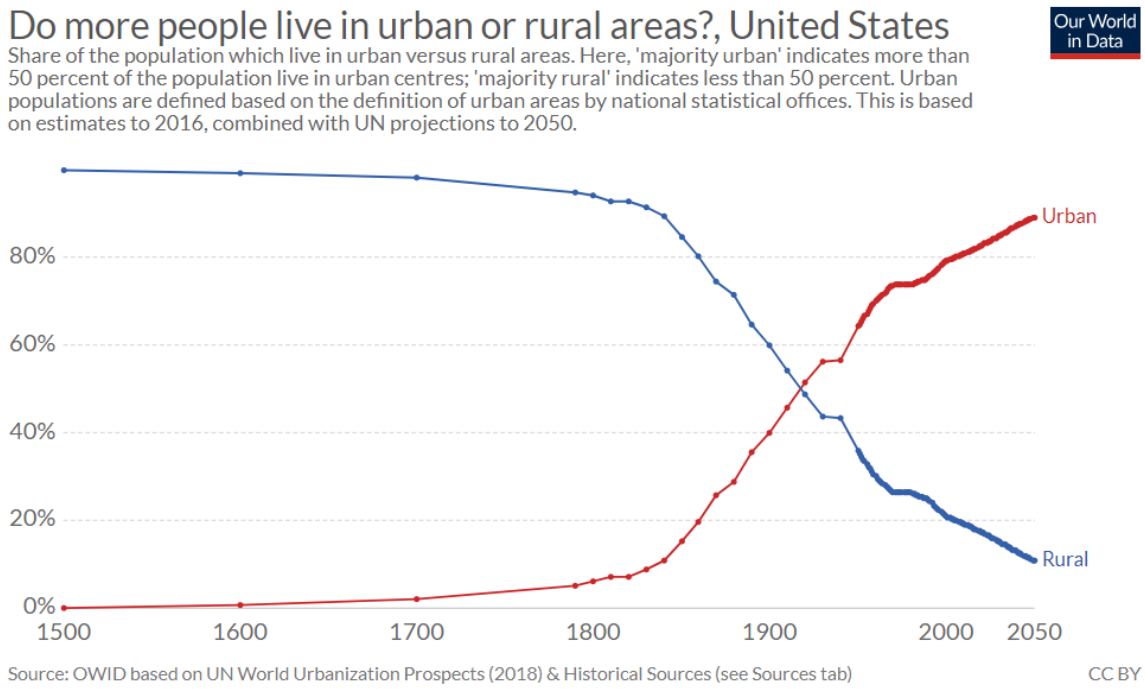
Congress can also incentivize building owners by providing financial incentives (tax incentives or rebates) for energy audits, retro-commissioning, deep green retrofits, systems or component replacement, and building operator training programs.

Why should Congress Incentivize Local Policy?

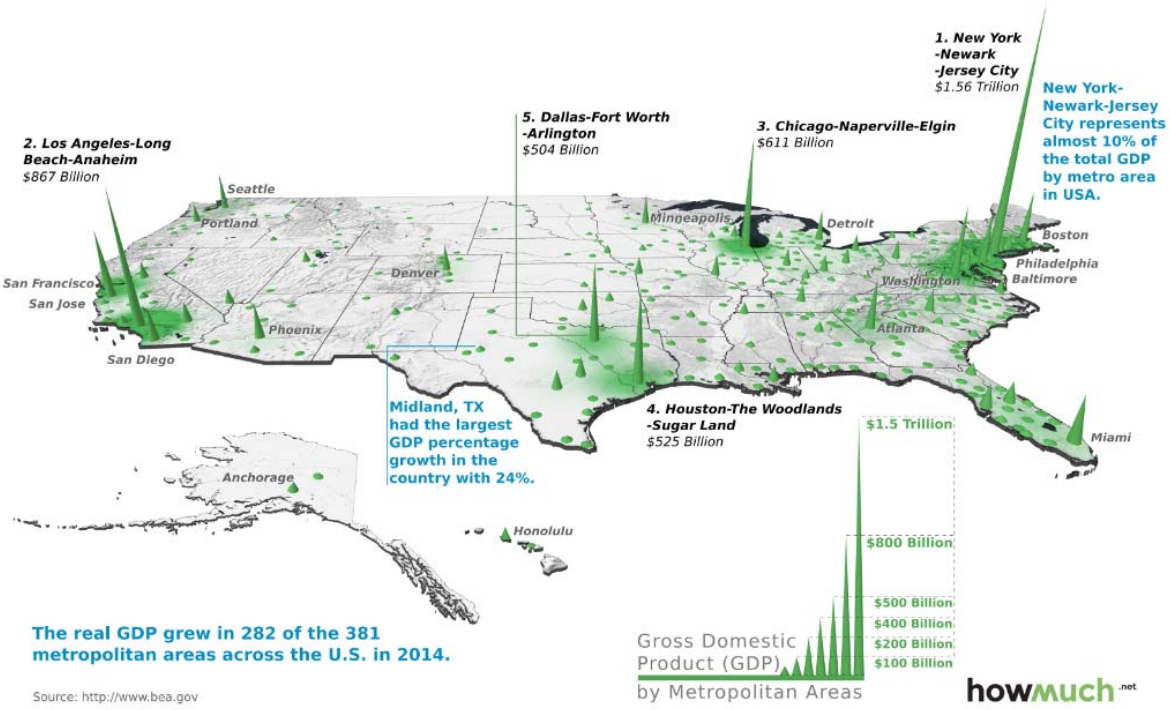
Why is there such an emphasis on local policies and programs? Local policy can often be the most nimble and serve as a laboratory for innovative ideas that – once tested and proven at the local level, can be leveled up to state and eventually Federal policy. Local leadership is also where we see the most ambitious and *sustained* commitment to climate policy.

82% of the U.S. population lives in urban areas[46] – and the number is growing. This growth and migration to cities means we will see investment in new construction as well as reinvestment in our existing neighborhoods and communities. More buildings could potentially mean more demand for energy but also more opportunity for density, transit-oriented development, as well as healthy, walkable and resilient cities, and transformation of our existing building stock and infrastructure.

Cities and urban counties are the loci for 85% of our Gross Domestic Product[47]. This means they are the center of economic activity and commerce. Catalyzing local policies with Federal incentives and resources can normalize low- and zero-carbon development patterns, reducing market barriers and establishing a template for any city, town, county or state that wants to focus on resource efficiency, mitigation, resiliency, economic revitalization, jobs, equity and community redevelopment.



[46] UN World Urbanization prospects (2018)
[47] www.bea.gov



What can the Federal Government do with its own portfolio?

Some Federal projects are procured through a **Design-Bid-Build process**. In this process, the Federal government describes the program (scope of work) and hires an architect (and its team of consultants) to design a building or project, and the design is ultimately translated into construction documents and issued for bid so that it can be awarded to a contractor for construction. The architect is typically contracted through a qualifications-based selection process, and performance metrics can be integrated into the contract documents to ensure the contractors are bidding on **minimum performance requirements**.

Starting in 2006, the U.S. General Services Administration (GSA) started requiring a minimum level of LEED Silver certification for Federally owned buildings. In 2010 this was increased to a minimum level of LEED Gold. Request for Proposal (RFP) documents or contracts do not typically reference project-specific performance metrics such as energy use intensity (EUI), water consumption or greenhouse gas (GHG) emissions. The default is usually to rely on Executive Orders and the Energy Independence and Security Act (2007) to define those targets generally, however these performance expectations are not contractually binding if they are determined not to be 'cost effective' and energy efficiency, water efficiency, reduced carbon emissions or renewable energy generation can be excluded from a project with the intent of managing project costs.

Some Federal projects are procured through a **lease-back** process where the Federal government issues a Request for Lease Proposals, issues its requirements relative to location, tenant area, amenities, rental rates, and other selection criteria. The private sector competes in a design competition to win and build a project that will be leased back to a government tenant. This allows the Federal government to move into new buildings that are 'built to suit' without having to provide the capital for construction. The lease agreements are usually for 10-year increments and can be renewed at the end of the agreement. These buildings are often good investment vehicles for real estate investment trusts. Historically, a **Request for Lease Proposals**

(formerly Solicitation for Offers) will include requirements that the base building be certified LEED Silver or EnergyStar rated and that the tenant fitout be consistent with LEED Silver as well as specific LEED credit criteria. Under the current Executive Order 13834[48] base building requirements for sustainability criteria or certifications have been omitted from solicitations for lease proposals as these requirements have been deemed unnecessary for lease agreements.

Other Federal projects are procured through a **Design-Build** contracting method, where the project will be directly awarded to a general contractor with a proposed design, and the Federal government is seeking a **Guaranteed Maximum Price (GMP)**. This is usually precipitated by the Federal government hiring a design firm to create a set of Bridging Documents, or a preliminary design, in order to get funding approval from Congress. This preliminary design defines the criteria of the Design-Build contract. But not all Design-Build contracts begin with Bridging documents. Contractors partner with a design team to develop the design enough to put together a cost estimate and submit a GMP. Although Design-Build contracts are evaluated and weighted based on many factors, including design and sustainability, the most heavily weighted factor is always price. The proposal with the lowest price is most likely to win. This encourages teams to propose a design that meets the minimum performance requirements rather than a design that meets the Federal government's climate goals.

What can Congress do to improve its procurement process?

Congress can direct the Federal government to explicitly include project-specific and binding **performance metrics in design and construction contracts**, such as Energy Use Intensity (EUI) targets, reduction in water use (from EPAct 1992 baseline), reduction in fossil fuel consumption, reduction in GHG emissions, onsite renewable energy generation, Lighting Power Density (LPD), spatial daylight autonomy (sDA), or embodied carbon (GWP). These should be benchmarked at each stage of the design, included in the construction bid and any changes in the Value Engineering process should have to be cross checked against these metrics. Contractors already forfeit penalties for projects that are delivered over schedule. Performance metrics will continue to be eroded in the Value Engineering process unless they are tied to end of project contract expectations.

Congress can direct the Federal government to explicitly include **performance metrics in solicitation for lease proposals**, such as **Zero Energy** buildings, **Zero Carbon** buildings, Energy Use Intensity (EUI) targets, reduction in water use (from EPAct 1992 baseline), reduction in fossil fuel consumption, reduction in GHG emissions, onsite renewable energy generation, Lighting Power Density (LPD), spatial daylight autonomy (sDA), or **low embodied carbon** (GWP). If these characteristics are prioritized in the selection process, it will incentivize the private sector to invest in advanced building technology. When the Federal government required LEED Silver in its lease agreements, it became the new default for commercial office buildings seeking Federal tenants. Furthermore, most developers went beyond LEED Silver to achieve LEED Gold or Platinum certification for their buildings. Expressing a preference or placing value on a characteristic sends a signal to the market.

Congress can direct the Federal government to solicit **stepped design options and fees** in Design-Build proposals. For example, the Energy Independence and Security Act (2007) section 433 requires a reduction in fossil fuel consumption in buildings by 80% in 2020, 90% in 2025 and 100% in 2030[49]. A project team might be able to show a pathway to zero fossil fuels and zero carbon emissions by 2030, but if the team can only submit a single project price and feels it would not win the project unless it submits the lowest price, then it

[48] https://www.federalregister.gov/documents/2018/05/22/2018-11101/efficient-federal-operations

[49] [EISA §433]: New Federal buildings and Federal buildings undergoing major renovations shall reduce their fossil fuel-generated energy consumption (baseline 2003) by 55% (2010), 65% (2015), 80% (2020), 90% (2025), and 100% (2030).

will not be incentivized to show the lowest carbon solution. It is possible to design a project so efficiently that the design becomes reductive rather than additive. Peak loads are reduced through orientation, massing, a high-performance envelope and the result is a reduction in HVAC system sizing. A low carbon or zero carbon design might not carry as high of a cost premium or as long of a payback timeframe as anticipated. Solicitations should provide bidders with an opportunity to demonstrate a lowest price option (often the least performance option as well) as well as stepped packages that offer progress towards the Federal carbon reduction goals and the pricing of those packages. If a Zero Carbon design could be offered at a very nominal premium and with <10 year payback, procurement officers should have an opportunity to evaluate that option in concert with the lowest cost/lowest performance options.

Investment in high performance buildings has proven to have payback that benefits American taxpayers. GSA inventoried its portfolio and determined[50] that **operating expenses** in high performance buildings cost 10% less per square foot to operate than industry benchmarks and 23% less per square foot to operate than other Federal buildings (legacy stock).

Congress makes decisions about the priorities for buildings it constructs, leases or retrofits. Expressing a preference or placing value on a characteristic sends a signal to the market. If the investments Congress makes with tax dollars prioritize **low carbon** and **carbon neutral** projects, then Congress has established value and created demand. The economy is a social construct that we create through policy and priorities; matter and energy, carbon and currency exist within the larger ecosystem and are subject to its constraints.

Figure 2 - The Traditional Economic Paradigm

Figure 4 - The New Ecological Economic Paradigm

"The Government's economic decision-making tools should be used in a manner that supports environmentally and socially responsible operations in programs and major acquisitions extending into the future… Tools and policies must support sustainable government operations, so that we can make the most preferable environmental and social choice when purchasing goods and services."

"The traditional economic paradigm upon which our financial decision-making is based... assumes that the economy functions independent of the natural world, with the environment as a subset of no value except as a source of resources and a "sink" for wastes (Figure 2). Social inputs beyond labor costs are not considered at all."

[50] The Impact of High-Performance Buildings (GSA, 2018)

"The new *ecological* economic paradigm nests the economy within the environment, rather than independent of it. And, rather than shortchanging the role of society, as in the traditional economic model, this paradigm defines the economy as a construct of society that moves goods and services (matter and energy) through it while determining what has value and is economically viable (Figure 4). In this paradigm, solar energy sustains the ecosystem, whose products are used as factors of economic production. The economy then sends its wastes back into the ecosystem, to be broken down by natural processes. The economy can only be sustained if there are healthy societies, living in healthy ecosystems that furnish renewable resources and assimilate wastes[51]."

Examples of High-Performance Federal Projects in HOK's Portfolio
HOK has designed tens of millions of square feet of building space for the Federal government, including New Construction projects, Adaptive Reuse, and Deep Green Retrofits.

NASA Building 20 in Clear Lake, TX (LEED Platinum) 83,205 sq. feet. Primarily open office environment with access to daylight and views. Measures include a highly efficient building envelope, underfloor air distribution, a total energy recovery wheel and solar hot water harvesting supplying 18% of the building's domestic hot water consumption. The project was designed to be 57% more energy efficient than a similar office building, with gross square footage 6% below program.

[51] www.gsa.gov/cdnstatic/2009_New_Sustainable_Frontier_Complete_Guide.pdf

NOAA Daniel K. Inouye Regional Center at Pearl Harbor, HI (LEED Gold, AIA COTE Top 10) 350,000 sq. feet. Located on a national historic landmark site on Oahu's Ford Island, NOAA's Inouye Regional Center features the adaptive reuse of two World War II-era airplane hangars linked by a new steel and glass building. The new complex houses a diverse range of critical programs, functions and Federal departments, including the Pacific Tsunami Warning Center. The facility has a comprehensive skylight diffuser system that virtually eliminates the need for artificial light during the day and Hawaii's first hydronic passive cooling unit (PCU) system which uses cold water drawn from a deep sea well to cool air before it is distributed through an underfloor air system. Combined these systems contribute to 42% energy use savings compared to a similarly programmed facility. A graywater system irrigates the native landscaping.

U.S. Coast Guard Headquarters at St. Elizabeths West Campus in Washington, DC (LEED Gold) 1.2 million sq. feet. HOK provided landscape architecture, sustainable design and interior design services for the Coast Guard. HOK's design for the step-down courtyards, edges and green roofs provides continuity between the surrounding woodlands and an adjacent historic government campus. Rainwater that falls onto the green roofs permeates through the plant roots and soil and into a drainage system that leads to a stormwater pond for reuse in irrigation. Advanced HVAC system, lighting controls and high-performance enclosure contributed to 33% energy use savings compared to a typical office building.

Byron Rogers Federal Building and Courthouse in Denver, CO (LEED Gold) 494,156 sq. feet. Due to its age and condition, the 18-story project was selected to receive funding for a complete remodel through the 2009 American Reinvestment and Recovery Act (ARRA). GSA received additional ARRA funding to incorporate then emerging energy-efficiency technologies such as LED lighting into the design. The building underwent deep green retrofits to enclosure, HVAC, lighting and plumbing systems. GSA articulated a **performance requirement** in the contract (Target: 39.1 kBtu/sf/yr). The Federal building renovation contributed to the combined 46% EUI reduction of the Federal building and courthouse (former combined site EUI 79.1 kBtu/sf/yr, post-renovation EUI 42.5 kBtu/sf/yr)