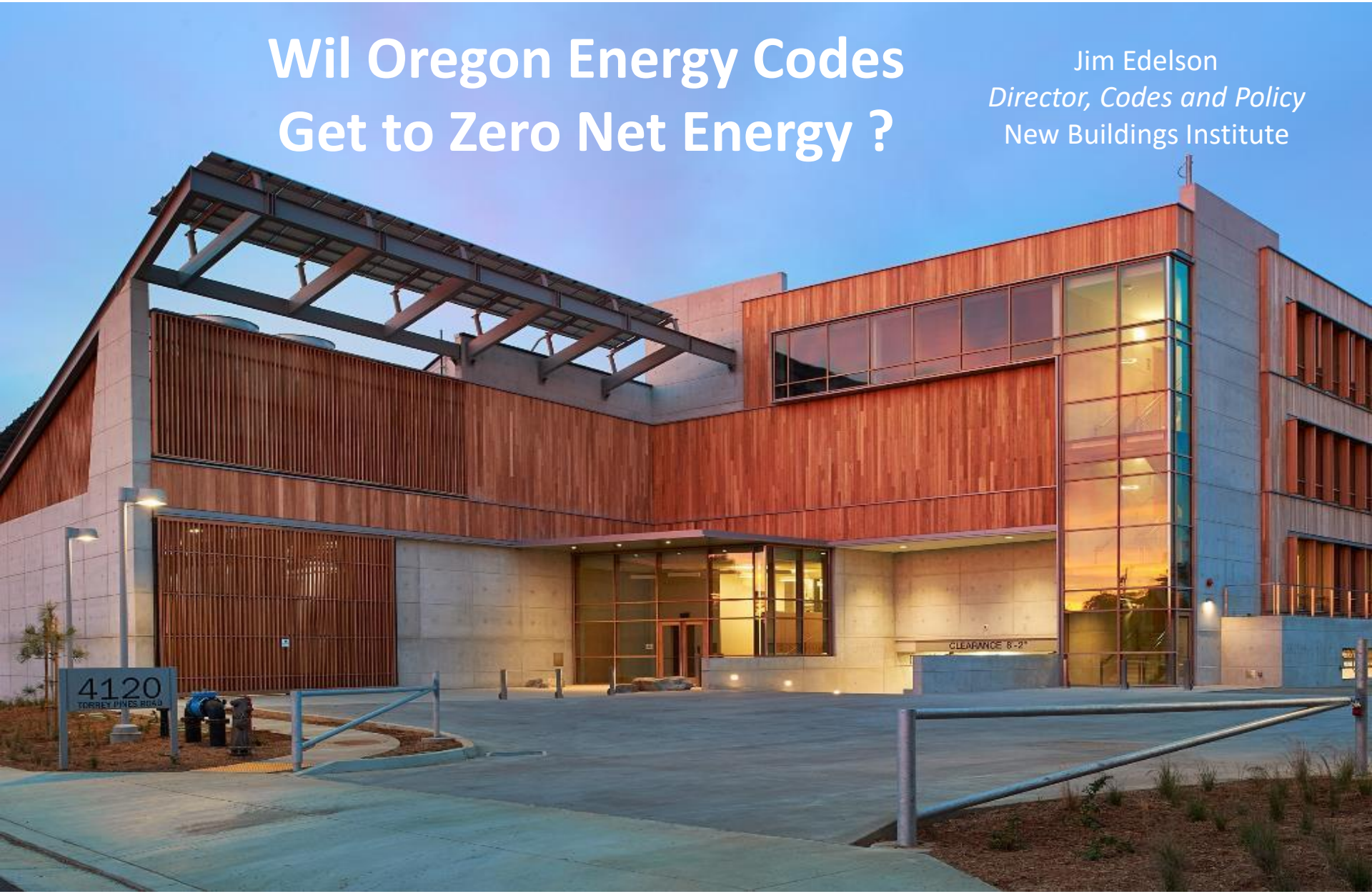
Wil Oregon Energy Codes Get to Zero Net Energy ?

Jim Edelson
Director, Codes and Policy
New Buildings Institute



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New Buildings Institute

NBI is redefining energy efficiency in the built environment

- Programs areas:
  - Zero energy leadership and market development
  - Best practices in new and existing buildings
  - Continuous code and policy innovation

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Agenda

1. Policy Background
2. Energy Codes in Oregon
3. Codes and Zero Energy Buildings
4. Challenges and Opportunities

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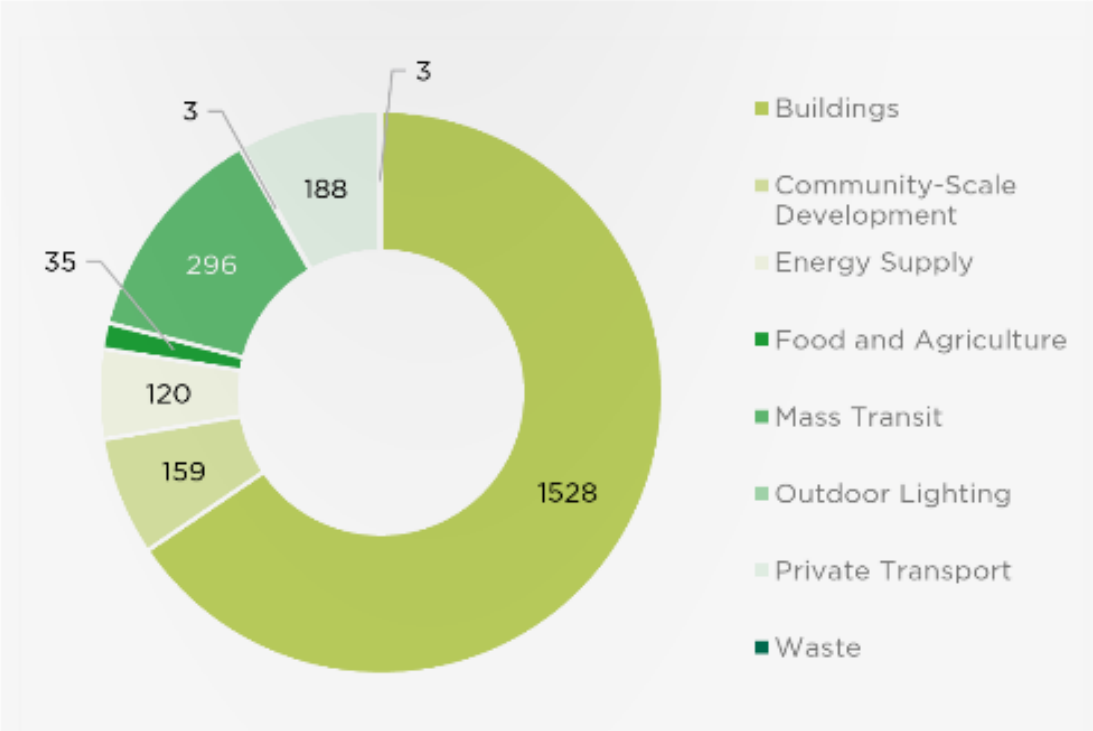
Arup: Potential for Climate Action

450 $MtCO_2e$

could be saved by 2020 if the highest priority actions were implemented.

Figure 2.04. Sector breakdown of first priority actions.



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Investment Shift

Barclays (2016) - "Paris" effect over 25 years

Fossil Fuels	- $34 trillion (revenues)
Energy Efficiency	+ $21.5 trillion (investments)

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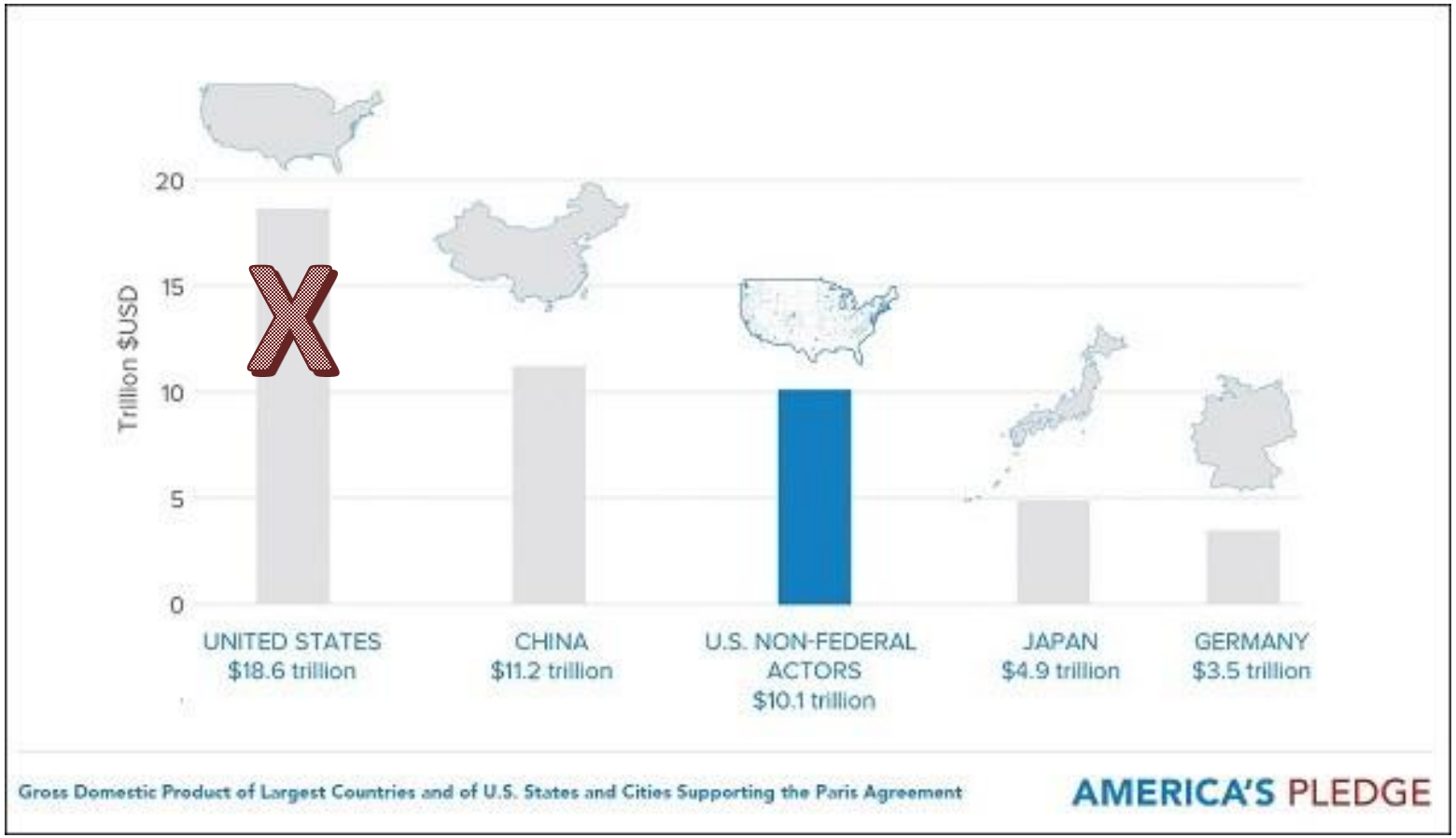
Paris, 2016

Bonn, 2017



Oregon Senate Bill 79 - 2009

In reviewing the energy conservation standards, the director shall consider the target standards described in the Architecture 2030 organization's 2030 Challenge and may consider other available nationally recognized energy conservation standards.

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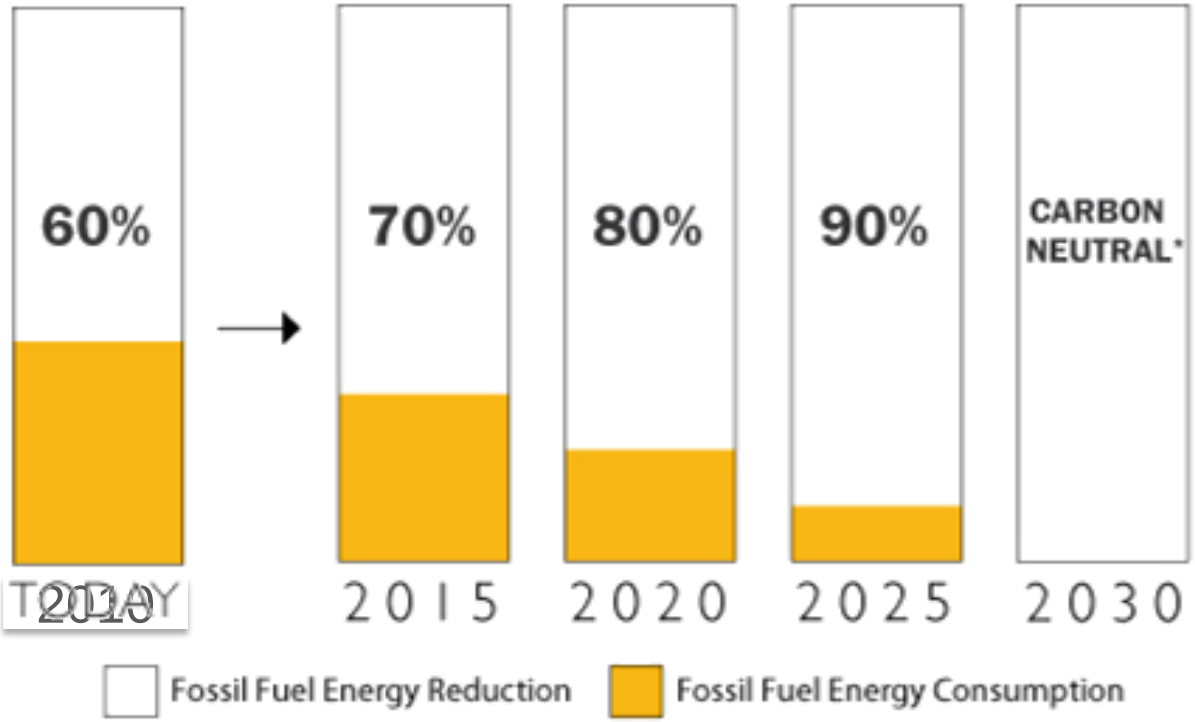
Pathway to 2030



The 2030 Challenge

Source: ©2010 2030, Inc. / Architecture 2030. All Rights Reserved.
*Using no fossil fuel GHG-emitting energy to operate

Adopted by:

- US Conference of Mayors
- AIA
- ASHRAE
- Royal Architectural Institute of Canada
- U.S. Green Building Council
- Congress for the New Urbanism

http://architecture2030.org/

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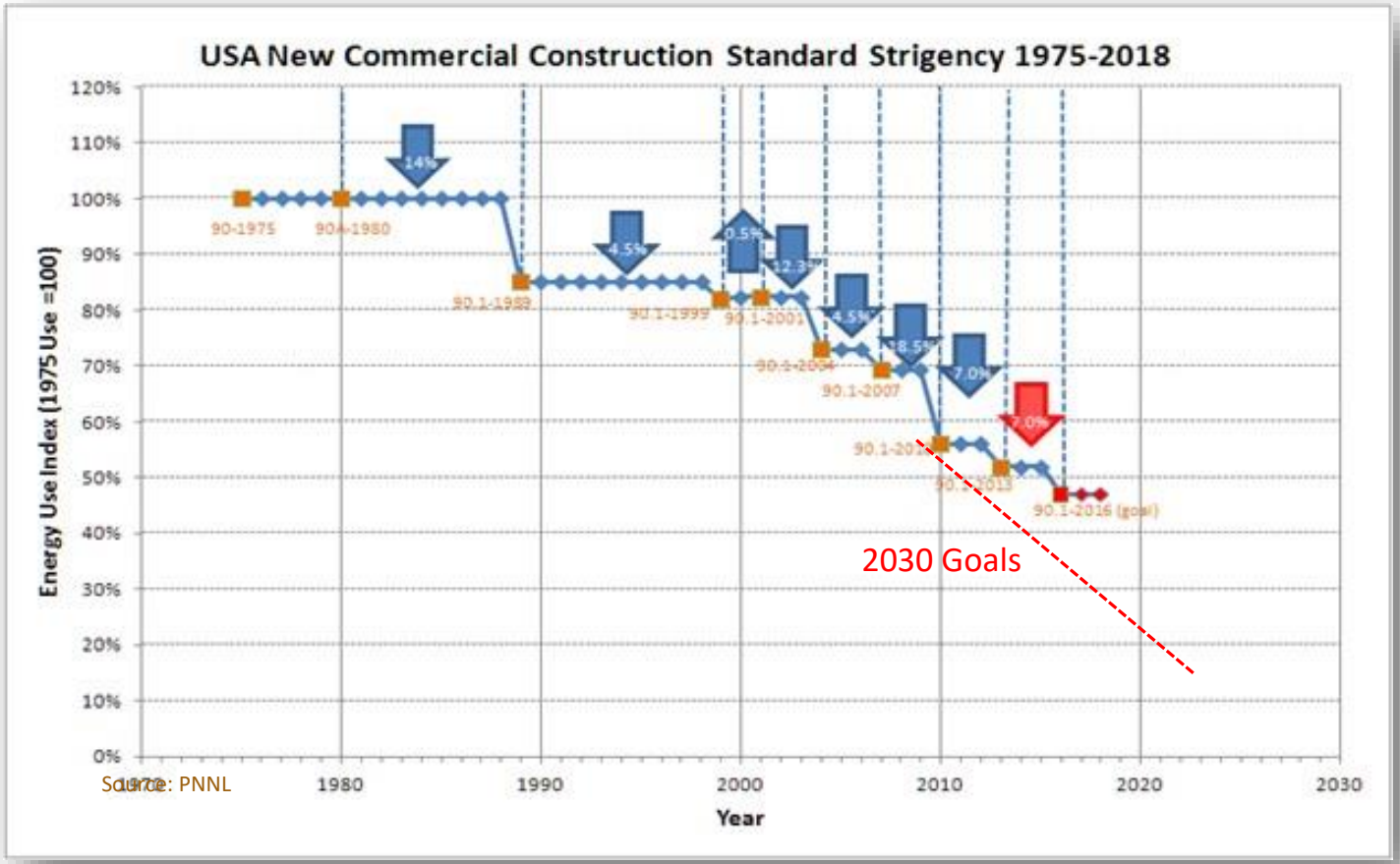
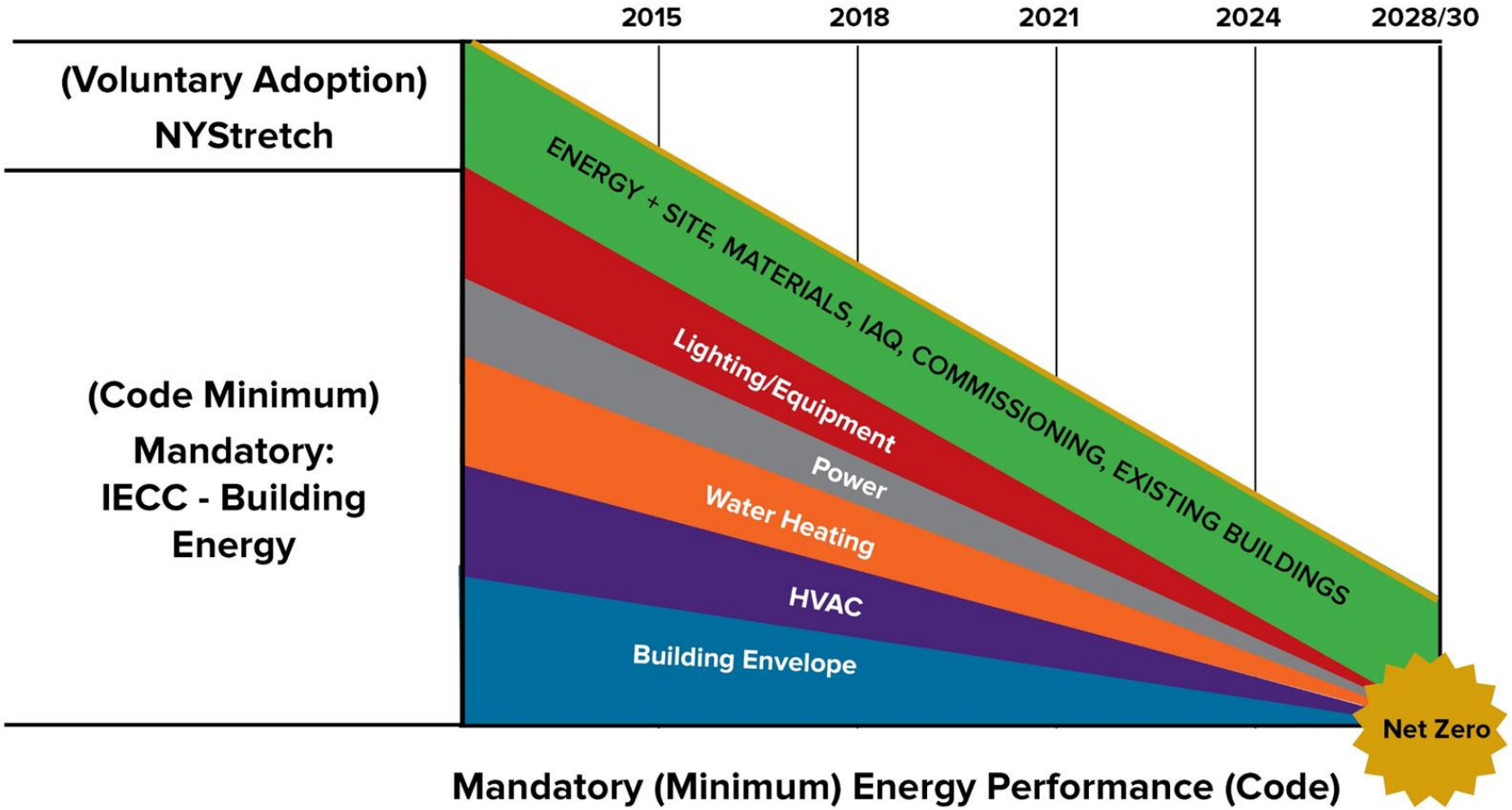
Status of Model Codes



Source: PNNL

NYStretch and Code Minimum



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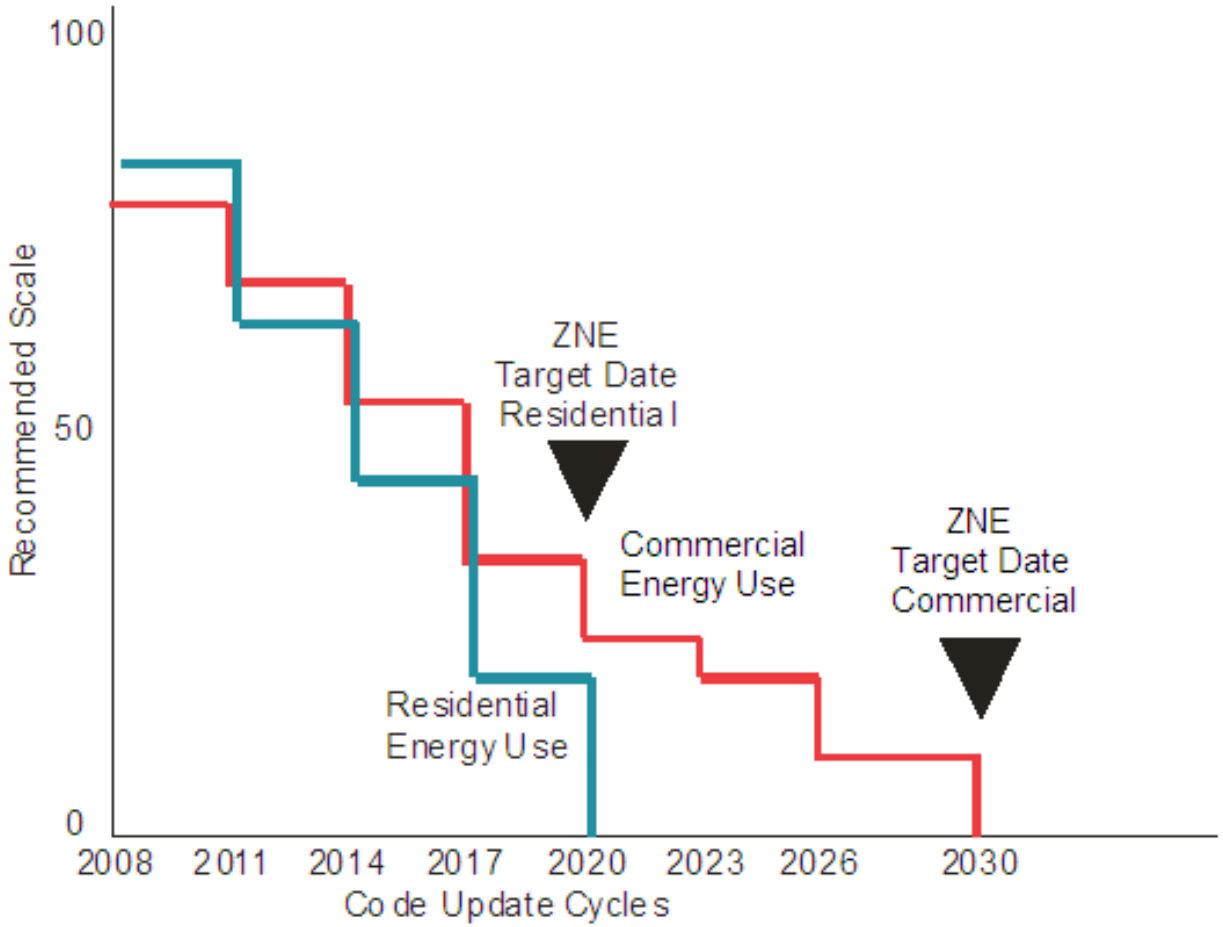
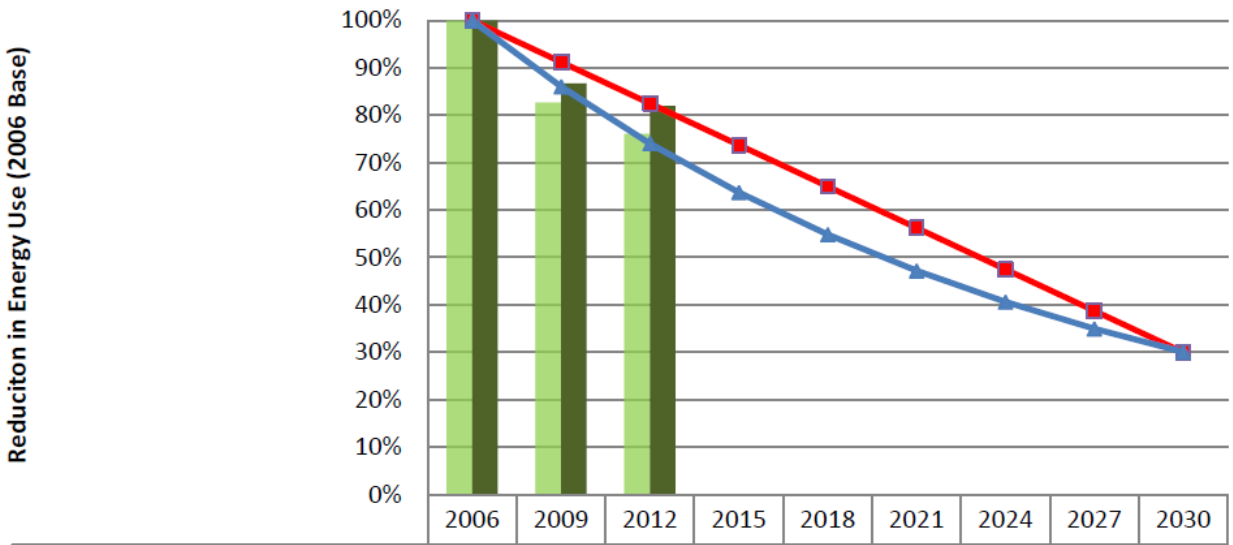
Code Cycles to Net Zero in CA



Code Cycles to ZNE, Source: SCE & AEC, 2009

Washington Required Code Cycles



	2006	2009	2012	2015	2018	2021	2024	2027	2030
Residential	100%	82.7%	76.1%						
Commercial	100%	86.8%	82.0%						
Target: 8.75 % savings compared to the 2006 WSEC	100%	91%	83%	74%	65%	56%	48%	39%	30%
Target: 14% savings compared to each previous code	100%	86%	74%	64%	55%	47%	41%	35%	30%

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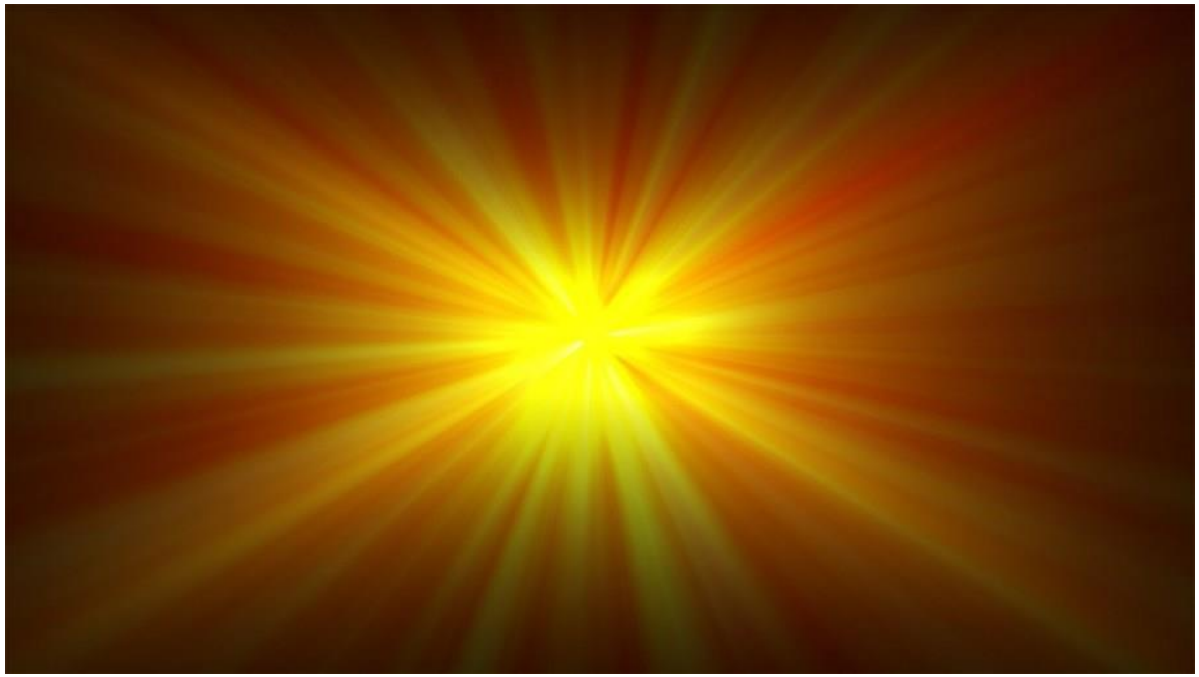
ZNE is the North Star in Building Energy Policy



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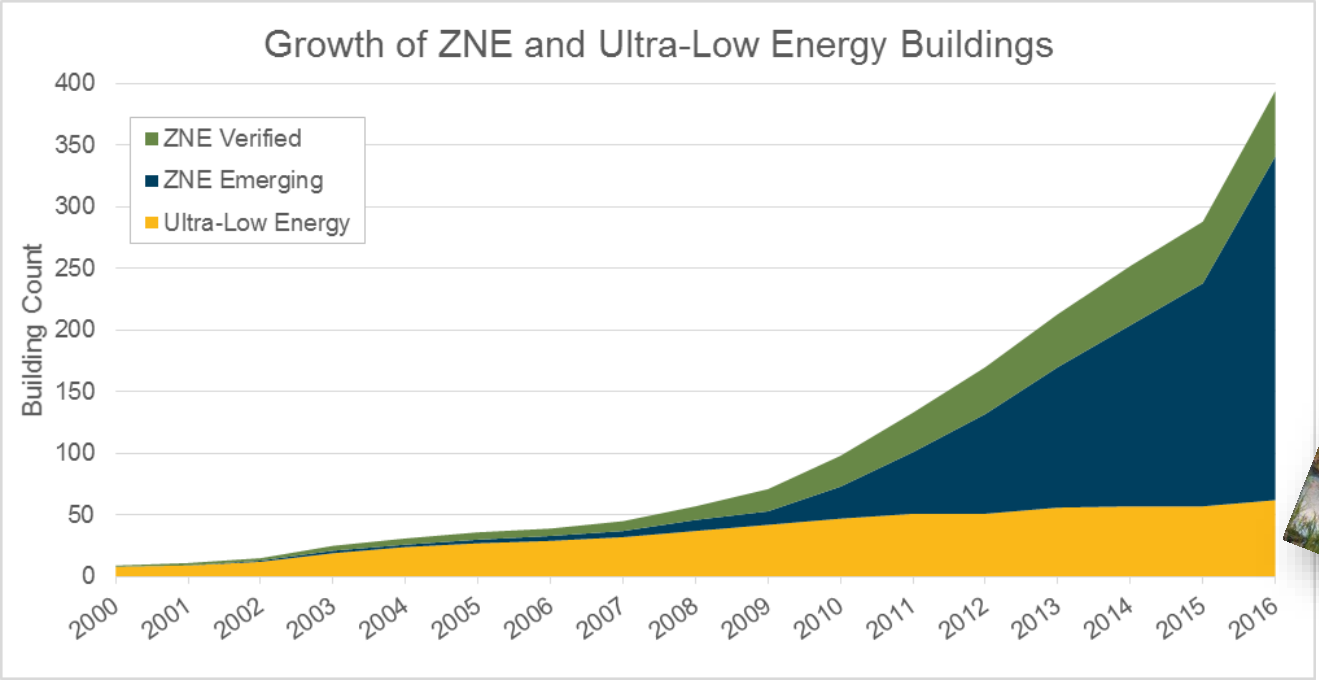
Growth of ZNE and Ultra-Low Energy Buildings



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Oregon Senate Bill 79 - 2009

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>>>> The state's first Reach Code

>>>> Buildings Codes Division started measuring progress against 2030 Challenge

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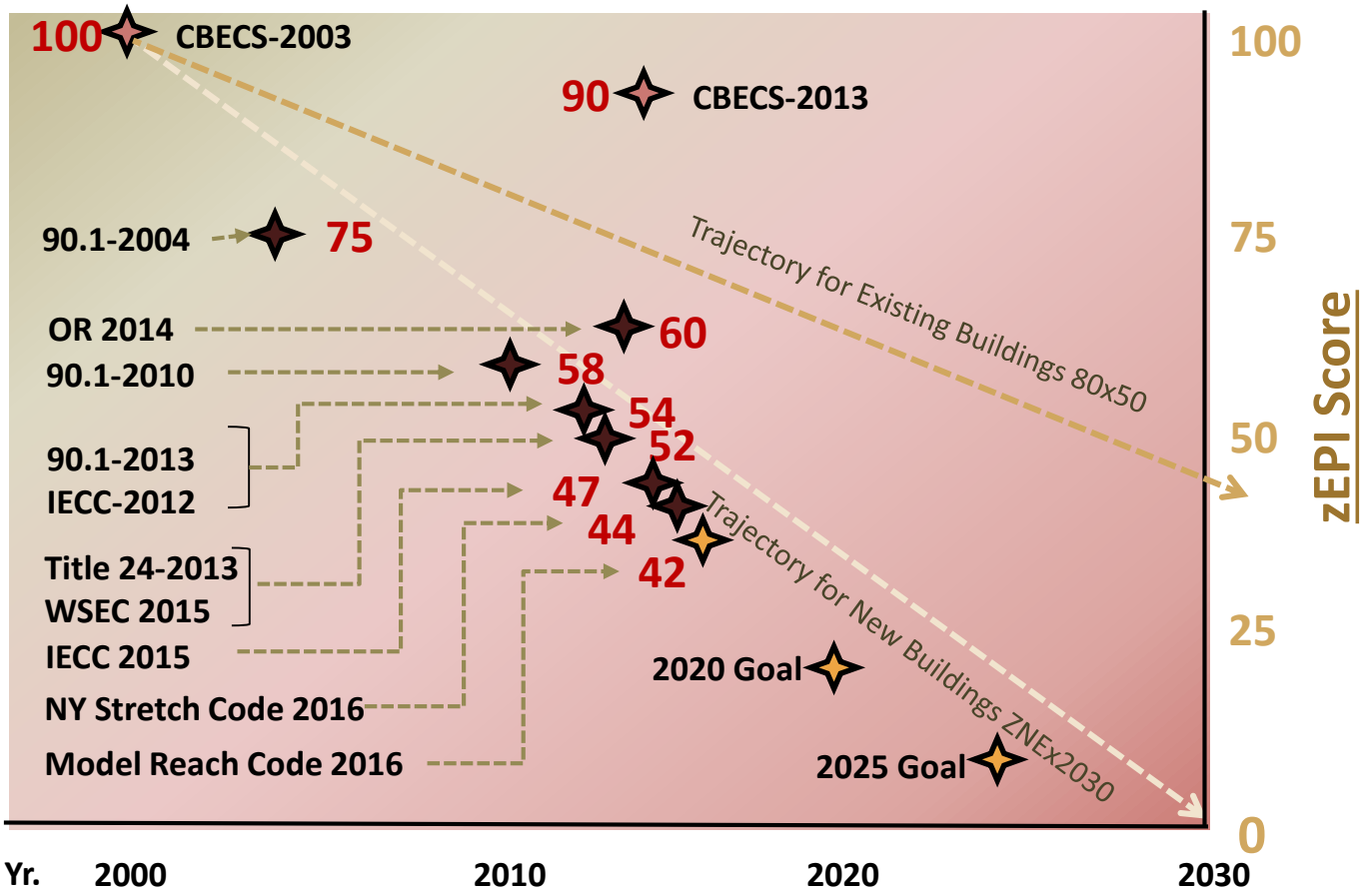
OR Energy Codes are Lagging

Zero Energy Performance Index (zEPI)



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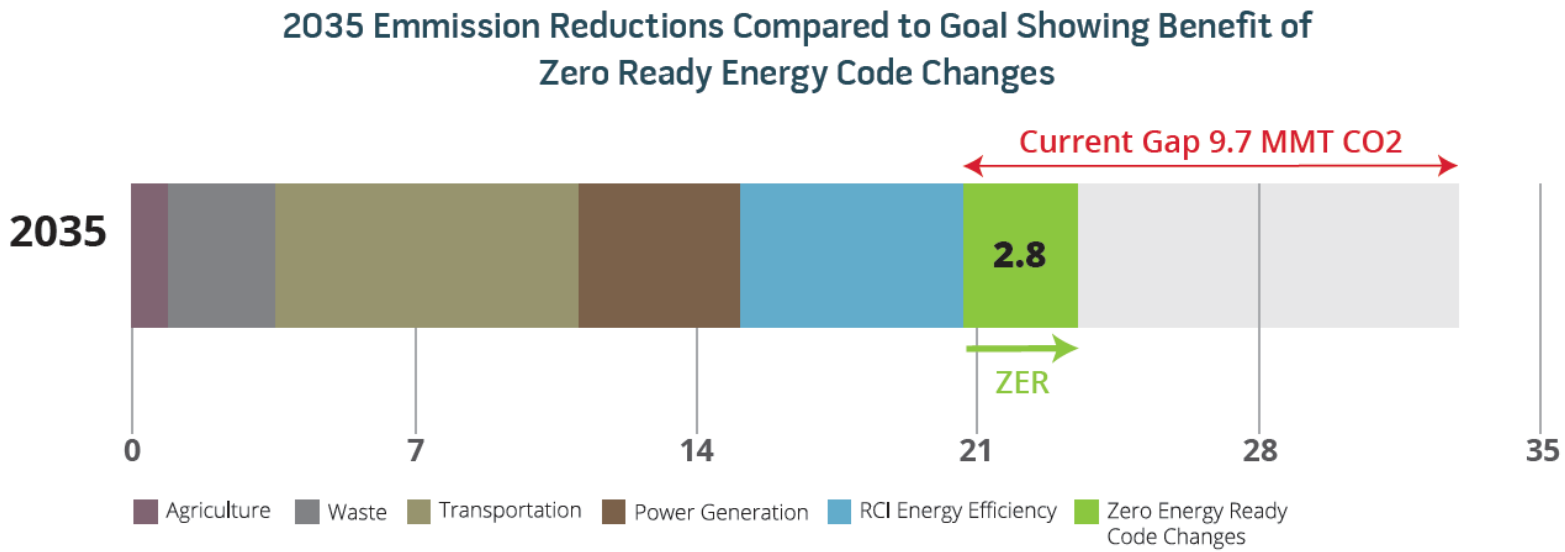
Steadily Advancing Codes Will Impact GHGs



ORS 455.040 - “Max-min”

The state building code shall be applicable and uniform throughout this state and in all municipalities, and no municipality shall enact or enforce any ordinance, rule or regulation relating to the same matters encompassed by the state building code but which provides different requirements unless authorized by the Director of the Department of Consumer and Business Services.

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Building Codes are Key Part of Local Climate Plans

BUILDINGS AND ENERGY

2030 OBJECTIVE 2 **Achieve zero net carbon emissions in all new buildings and homes.**

The best time to begin addressing building efficiency is in the initial building design stage. Buildings that have been designed and built with performance as a primary goal are capable of significantly outperforming similar, previously built buildings that have been retrofitted for efficiency. Because total emissions from buildings must be reduced by much more than can be accomplished with retrofits alone, it is critical that buildings built after 2030 generate more energy from clean sources than they consume, resulting in a net emissions reduction.

In the last three years, several homebuilders and developers have pioneered the design of net-zero energy projects in the Portland area, and even more have adopted the Architecture 2030 targets into their projects.

Still, few new building construction projects are seeking this high level of performance. The actions below are intended to move new development toward nearly-zero energy building design and ensure that more efficient standards result in actual energy savings.

ACTIONS TO BE COMPLETED BY 2020		Impact	Lead agency	Timeframe
2A	**Oregon Building Code** — Continue participating actively in the process to revise the Oregon building code to incorporate performance that targets net-zero energy by 2030.	C C C C $ E	City: BPS	Existing and/or ongoing
2B	**Minimum Performance** — Establish minimum energy performance targets for new construction and major renovations.	C C C C $ E	City: BPS	Mid-term
2C	**Net-Zero Energy Projects** — Build market demand for net-zero energy buildings through incentives, education, demonstration projects, partnerships and recognition.	C C C C $ E	City: BPS	Near-term
2D	**System Development Charges** — As part of upcoming renewal of systems development charge methodologies, evaluate options that could promote housing affordability, reduce environmental impacts and fund capital projects that meet climate action objectives.	C C C C $ E	City: BPS, PBOT, Water, BES, PP&R, BDS	Long-term

Barrier to Climate Action Plans in Portland, and Eugene, etc.

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Good News for Oregon – Executive Order

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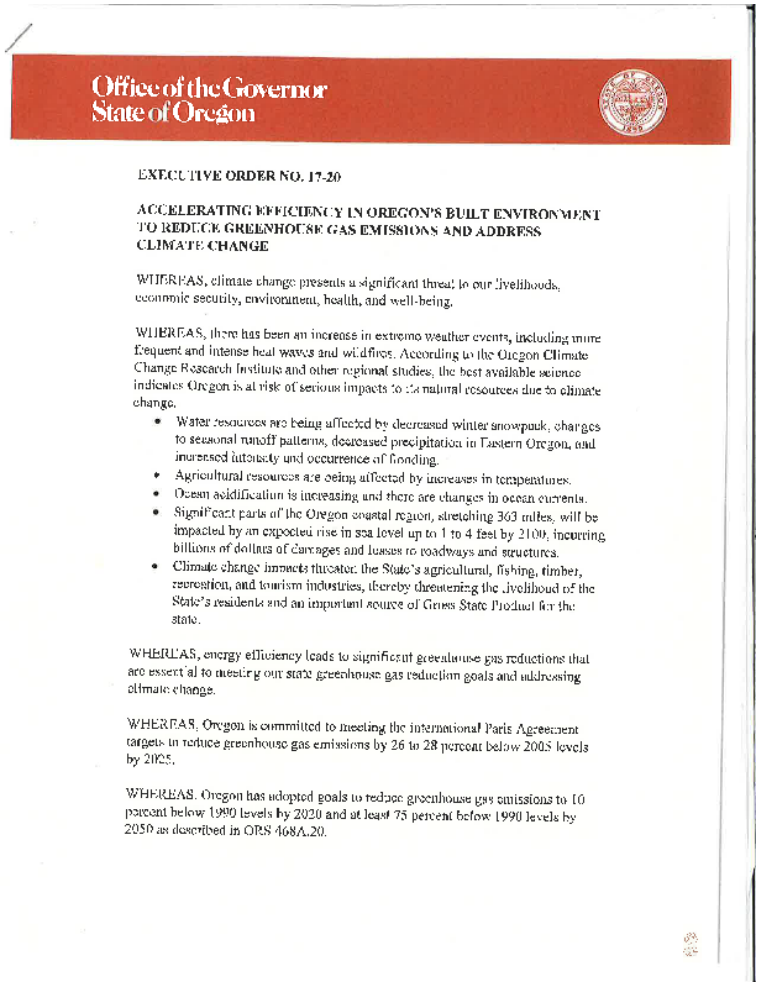
Comprehensive Energy Policy



Office of the Governor
State of Oregon

EXECUTIVE ORDER NO. 17-20

ACCELERATING EFFICIENCY IN OREGON'S BUILT ENVIRONMENT TO REDUCE GREENHOUSE GAS EMISSIONS AND ADDRESS CLIMATE CHANGE

WHEREAS, climate change presents a significant threat to our livelihoods, economic security, environment, health, and well-being.

WHEREAS, there has been an increase in extreme weather events, including more frequent and intense heat waves and wildfires. According to the Oregon Climate Change Research Institute and other regional studies, the best available science indicates Oregon is at risk of serious impacts to its natural resources due to climate change.

- Water resources are being affected by decreased winter snowpack, changes to seasonal runoff patterns, decreased precipitation in Eastern Oregon, and increased intensity and occurrence of flooding.
- Agricultural resources are being affected by increases in temperatures.
- Ocean acidification is increasing and there are changes in ocean currents.
- Significant parts of the Oregon coastal region, stretching 363 miles, will be impacted by an expected rise in sea level up to 1 to 4 feet by 2100, incurring billions of dollars of damages and losses to roadways and structures.
- Climate change impacts threaten the State's agricultural, fishing, timber, recreation, and tourism industries, thereby threatening the livelihood of the State's residents and an important source of Gross State Product for the state.

WHEREAS, energy efficiency leads to significant greenhouse gas reductions that are essential to meeting our state greenhouse gas reduction goals and addressing climate change.

WHEREAS, Oregon is committed to meeting the international Paris Agreement targets to reduce greenhouse gas emissions by 26 to 28 percent below 2005 levels by 2025.

WHEREAS, Oregon has adopted goals to reduce greenhouse gas emissions to 10 percent below 1990 levels by 2020 and at least 75 percent below 1990 levels by 2050 as described in ORS 468A.20.

- Energy Efficiency in State Buildings (set Energy Targets for existing /remodels)
- Energy Efficiency in New Construction
- Water Efficiency in New Construction
- Retrofits of Existing Buildings
- Cost Analysis
- 50000 Evs by 2020 Statewide
- Electric Vehicles in State Agencies
- EV Chargers for State Agencies
- West Coast Electric Fleet Bulk Purchase
- DEQ EV RebateProgram
- Consistency with CA on auto mfr. EV rate
- Greater access to EV charging throughout Oregon

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Commercial Energy Code

- Equivalent to ASHRAE 189.1 by 10/1/2022
- Solar Ready construction by 10/1/2022
- EV-Ready (level 2) in all parking structures
- High Efficiency Water fixtures by 1/1/2020
- Water capture and reuse by 1/1/2025
- Approximate 12% savings each for 2 cycles

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Residential Energy Code

- Equivalent to Zero Energy Ready (2017) by 10/1/2023
- Solar Ready construction by 10/1/2020
- EV-Ready (level 2) in all parking structures
- High Efficiency Water fixtures by 1/1/2020
- ODOE report on appliance standards (2018)
- Approximate 10% savings each for 2 cycles

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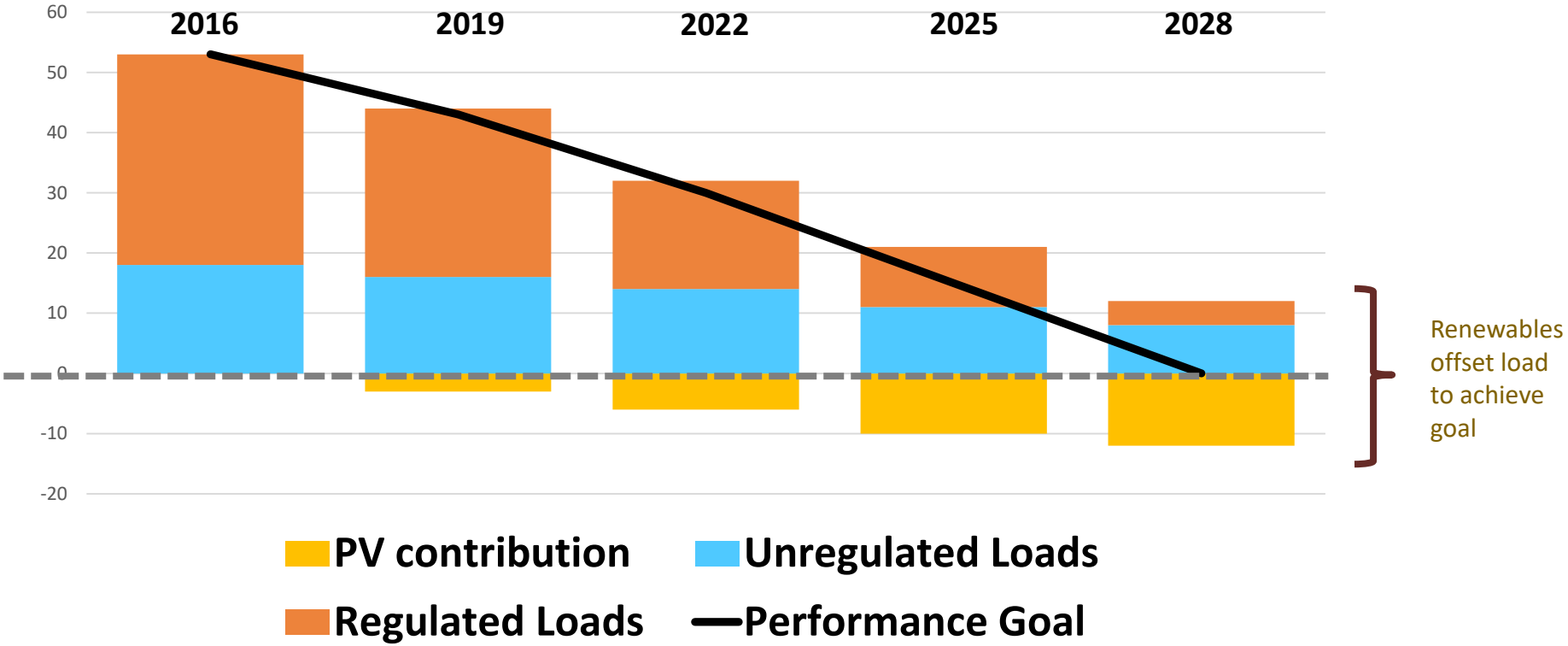
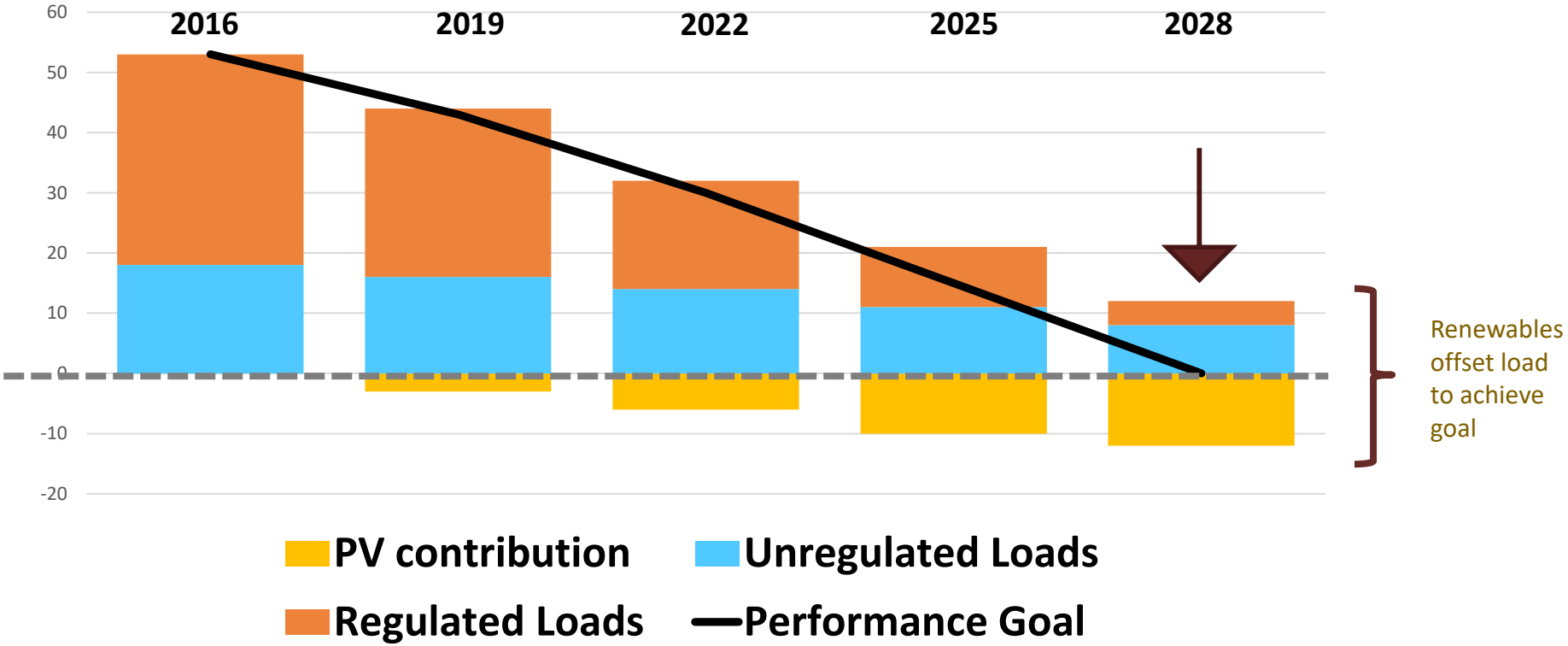
Code Progression Schematic



At ZNE – All energy is renewable



Solar-Ready Residential – IECC appendix

- 300 sf of roof area if 600 sf has S or SW orientation
- less setback areas, etc……
- roof dead and live load calculations on documents
- Interconnection pathways on documents
- Reserved space on electrical panel

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Solar-Ready Commercial – IECC appendix

- Solar-ready zone of 40% of roof area, less setbacks, etc…
- Applies to 5 stories or less, with workable orientation
- Dead load of 5psf or more - calculations on documents
- Interconnection pathways on documents
- Reserved space on electrical panel

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EV-Ready - Commercial

- California, NYStretch, etc……

Commercial Provisions (optional)

C409.4 Electrical vehicle service equipment capable. Parking garages and open parking lots shall provide either:
•208/240V 40 amp outlets for 5 percent of the total parking spaces; or
•Panel capacity and conduit for the future installation of such outlets for 5 percent of the total parking spaces.

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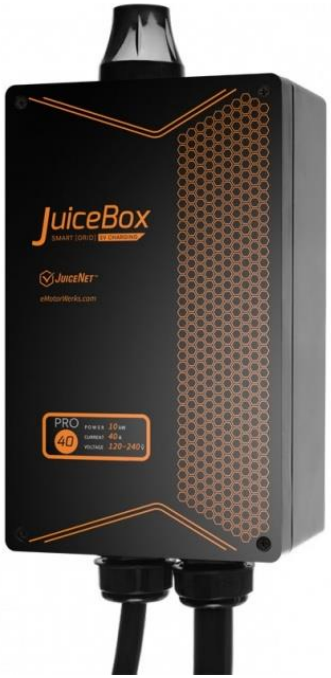
EV-Ready - Residential

Residential Provisions (mandatory)

Detached one or two family dwellings and townhouses with onsite parking shall provide a 208/240V 40-amp outlet for each dwelling unit or panel capacity and conduit for the future installation of such an outlet. Outlet or conduit termination shall be adjacent to the parking area.

For residential occupancies where there is a common parking area, provide either:

- 208/240V 40-amp outlets for 5 percent of the total parking spaces; or
- Panel capacity and conduit for the future installation of 208/240V 40-amp outlets for 5 percent of the total parking spaces.



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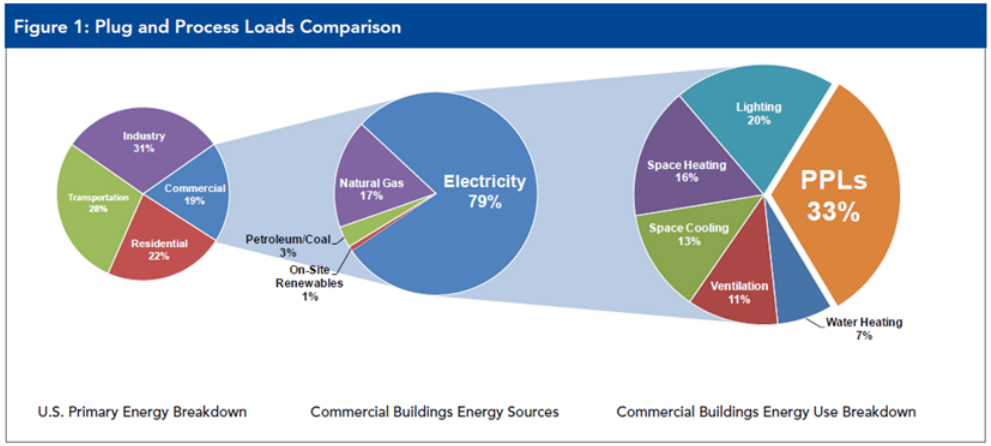
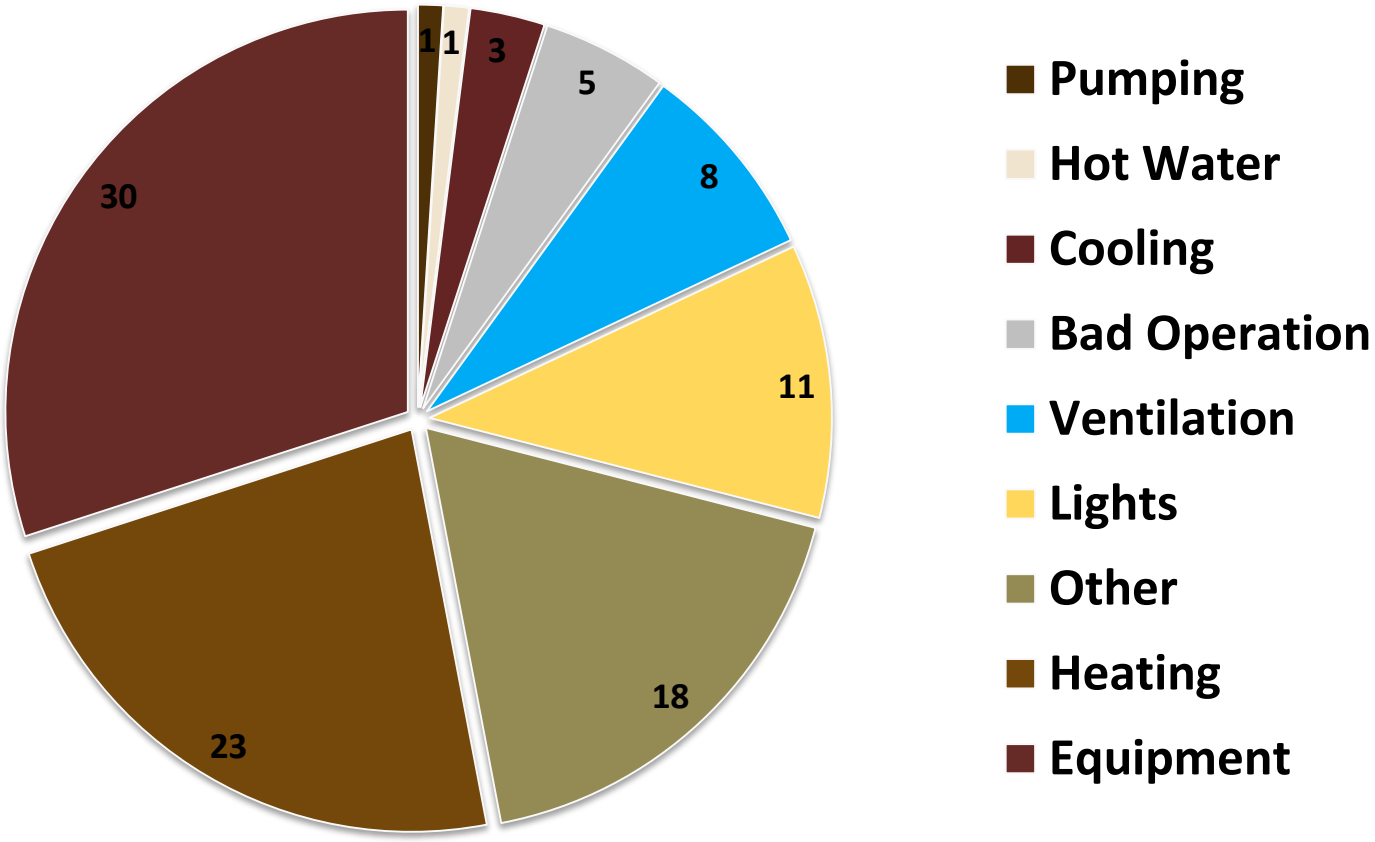
Code Barrier: Plug/Process Loads

- As energy codes and performance improve, plugs and process loads represent a larger part of the “pie”
- In ZNE buildings, PPLs can account for up to half of total energy consumption
- Almost impossible to meet many energy reduction goals with current approach to “unregulated” loads



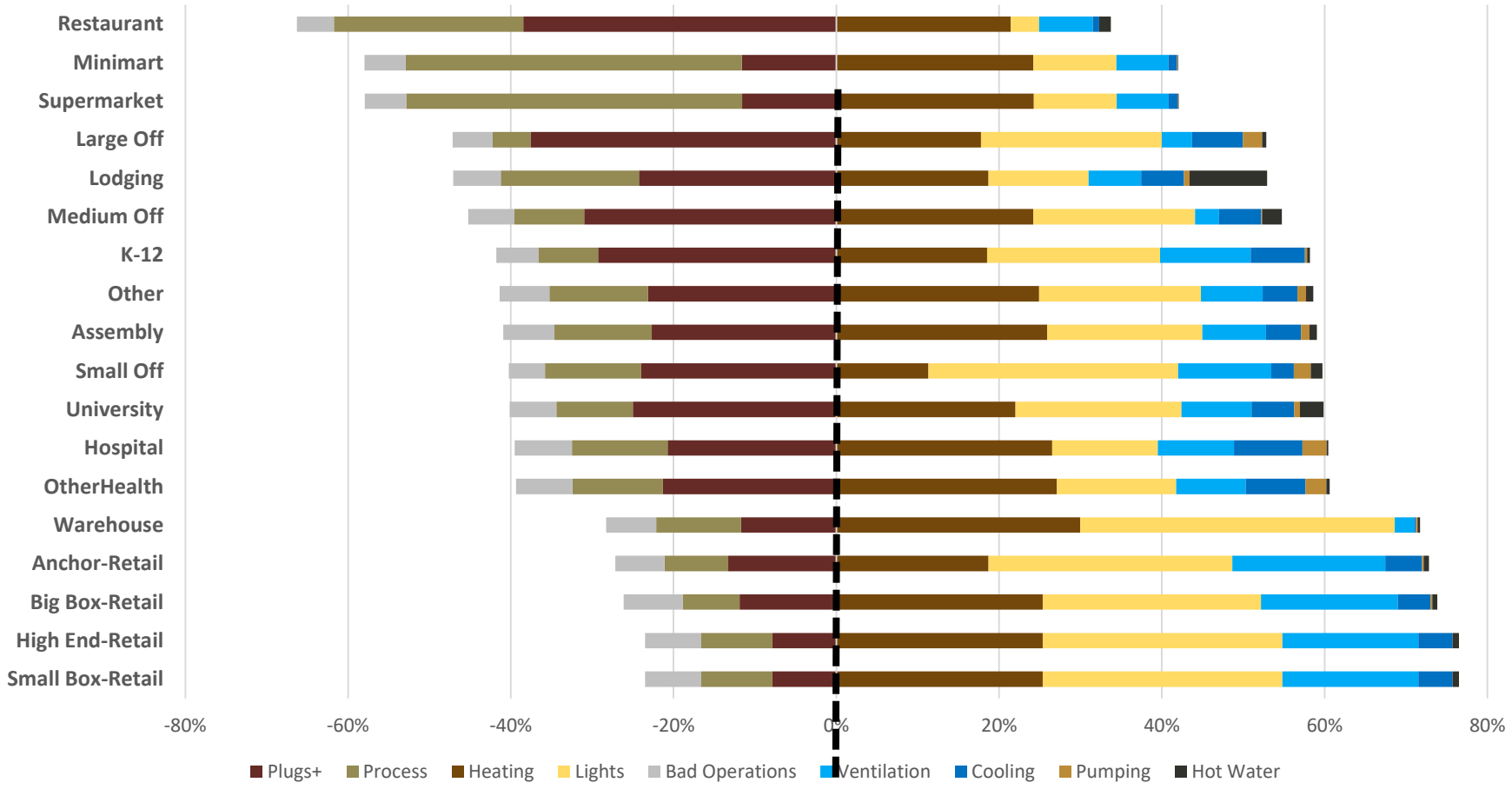
Source: NREL

Weighted End Use Consumption



Data from the Pacific Northwest

End Use by Type; Regulated vs. Unregulated



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Code Barrier: Federal Preemption

- National Appliance Energy Conservation Act (NAECA) and the Energy Policy and Conservation Act (EPCA)
  - NAECA disallowed states and other jurisdictions from setting their own more stringent appliance standards
  - EPCA extended preemption to certain HVAC and hot water equipment
- Limits progress on reducing energy used by preempted equipment
  - 78% in residences (2011)
  - 59% in commercial buildings (2011)
- See our recently completed White Paper

Other ZNE Code Challenges

- Existing buildings
- Energy-intensive buildings types
- Interaction of Fuels, Renewables and Energy Efficiency
- Grid Harmonization
- Operations and Outcomes

*See NBI Washington State Energy Code Roadmap

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Washington State Energy Code Roadmap

Issues, priorities, and sequences that will lead to success in meeting legislated targets for the Washington energy code.

70% reduction by 2031

Energy codes are anticipated to play a significant role in Washington's plans to to reduce carbon impacts from the building sector. But as codes target deep efficiencies to meet these goals, conventional code language and enforcement mechanisms face ever-growing challenges to deliver deep savings. This roadmap represents a path to meet the legislated code targets for new residential and commercial buildings in Washington law, and to identify the mechanisms and cycles by which code provisions can evolve to meet these goals.

Legislated Targets for Washington State Energy Code

- Residential and Nonresidential construction permitted under the 2031 state energy code must achieve a 70 percent reduction in annual net energy consumption (compared to the 2006 state energy code) *(RCW 19.27A.160)*

-and-

- Construct increasingly efficient homes and buildings that help achieve the broader goal of building zero fossil-fuel greenhouse gas emission homes and buildings by the year 2031 *(RCW 19.27A.020)*

Incremental Improvement Compared to Targets

Key Findings in the Washington Code Roadmap

A) Address Uneven Starting Points and Rates of Progress Among *Project Types*

We tend to represent energy code progress toward policy goals as a single linear path. In fact there is a great deal of variation across project types and even among individual buildings with respect to how much energy they use at basic code compliance levels. Therefore the makeup of the building stock and the way these buildings use energy will affect the rate of progress of code performance improvements.

This graph shows the total energy end use for the PNW commercial building stock as a whole. Achieving a 70% reduction requires that codes focus on major end-use categories.

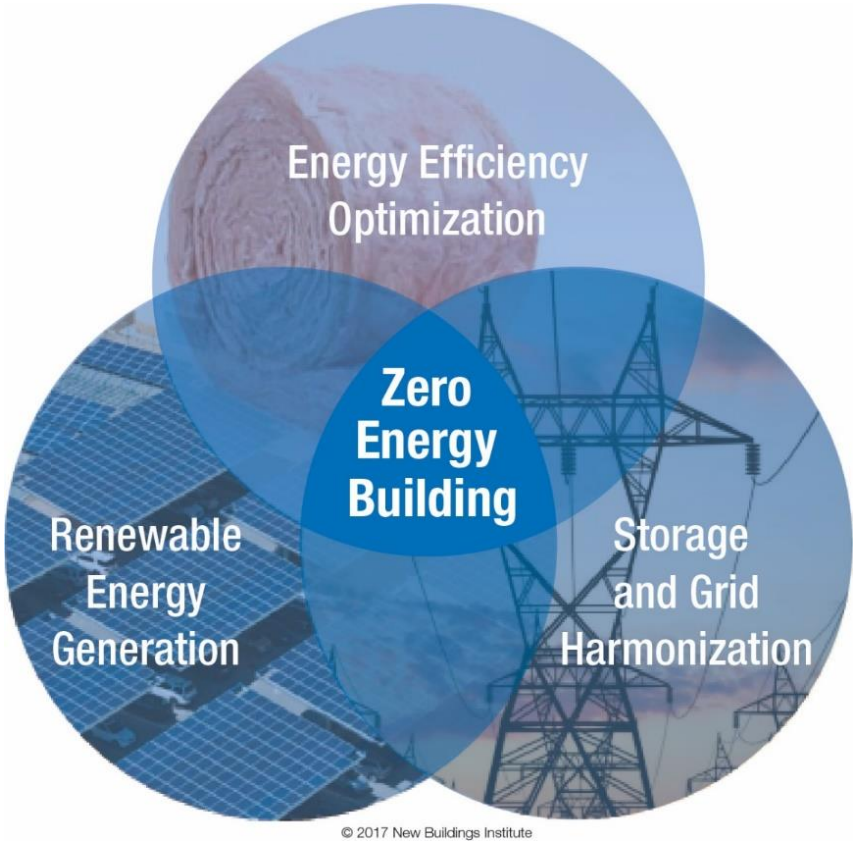
B) Building Systems Improvements Proceed at Different Rates

Although we talk about the energy code increasing in stringency as a code, different components of the code are changing at different rates. Technology improvements in lighting (primarily LED's) have allowed for rapid improvements in lighting efficiency to be captured in code requirements. But federal regulations have slowed improvements in state codes for furnaces and air conditioning.

C) Energy Code Scope Does Not Address Many Building Loads

Another clear challenge of the "2031" legislative mandate is that a large percentage of building energy loads are currently outside the scope of the energy code. The most significant components of these loads are plug and equipment loads, generated by computers, small appliances, printers and office machines, etc. Other unregulated loads such as industrial process machinery, servers, cooking and refrigeration equipment, can also be significant in certain project types. Taken together these loads make up *nearly half* of the current energy use in new buildings.

Complimentary Elements in ZNE



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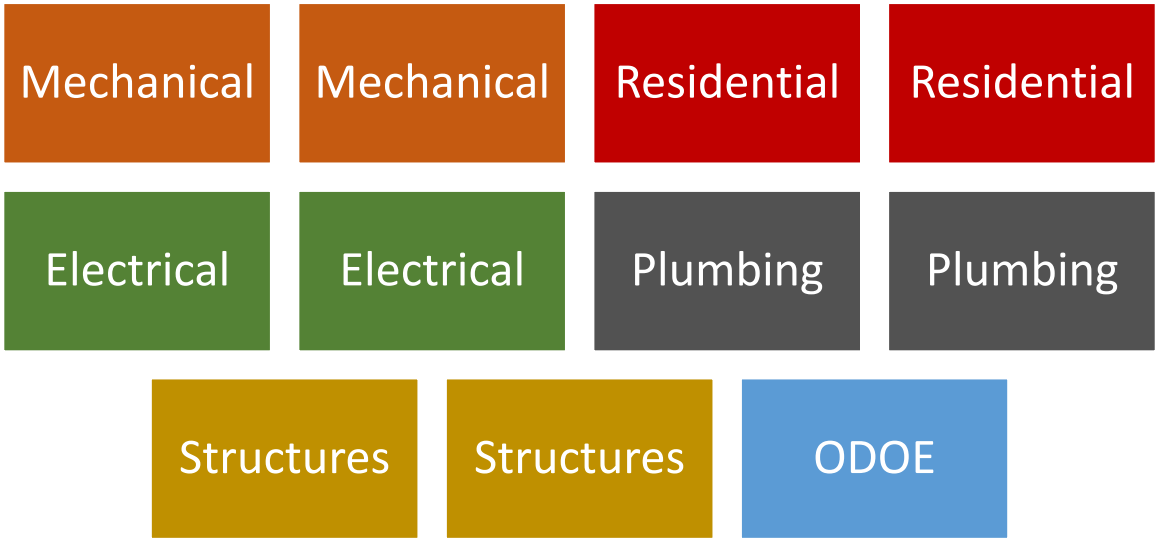
GENERAL CODE ADOPTION PROCESS

- In Oregon, all code development activities are overseen by a Governor-appointed board comprised of industry representatives
- The Oregon Energy Efficiency Specialty Code is overseen by the 11 member Construction Industry Energy Board (CIEB).



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GENERAL CODE ADOPTION PROCESS

- The Code adoption process in Oregon is a very public process, and is highly dependent on public input and proposals with multiple stages and opportunities for input
- Oregon energy code has general developmental guidance from SB 79 (Architecture 2030 = net zero GHG buildings) and overall state GHG reduction goals, as well as model code direction
- Oregon Codes (energy, mechanical, structural, plumbing, residential, etc.) are based on model codes (I-codes generally) and modified to suit Oregon needs

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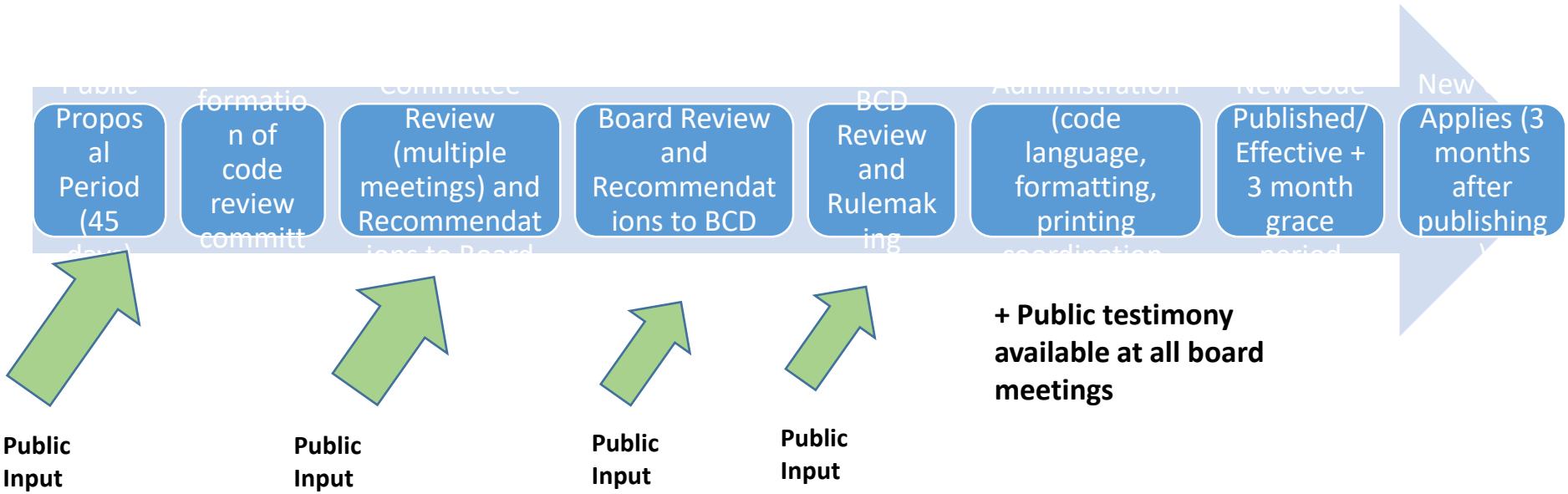
GENERAL CODE ADOPTION PROCESS



+ Public testimony available at all board meetings

Process takes about 1+ year, from start to finish

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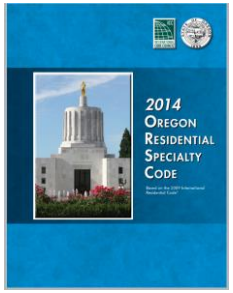
RECENT DEVELOPMENTS

ODOE	ODOE Role	Code Dev.	History	2017 ORSC	Future	HES	Involved



Residential Energy Code

2016				2017				2018			
1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q

In Development
Transition
Effective

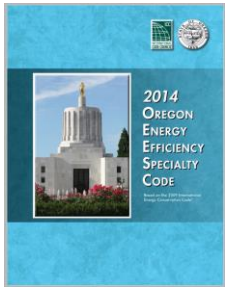
Public Proposal Period

8/1/16 – 9/14/16

- Board voted to utilize 2015 IECC, with Oregon amendments, as base
- Committees formed, analysis, board review, rulemaking complete. Now on to formatting and printing.

"New Code Effective" estimate:

October 1 2017, then 90 day transition



Commercial Energy Code

2017				2018				2019			
1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q

Public Proposal Period

11/16/16 – 1/13/17

+ Another Proposal Period 4Q 2017

- Similar to other codes, the public and board process is expected to incorporate model energy code and amend to make it better for Oregon

"New Code Effective" estimate:

4Q 2018 / 1Q 2019

Recent Developments

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Residential Energy Code

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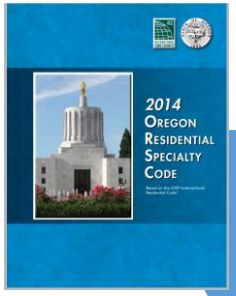

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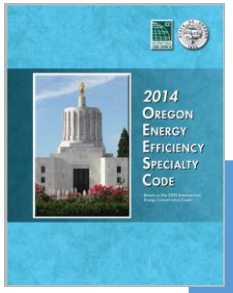

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"New Code Effective" estimate:

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PUBLIC PARTICIPATION

ODOE	ODOE Role	Code Dev.	History	2017 ORSC	Future	HES	Involved

- There are many opportunities for public participation, from code proposals, committee meetings, board meetings, rulemaking, etc.
- <u>The process relies upon public input</u>
- Need recommendations and input from engineering and design community regarding opportunities
- Encourage folks to work with local professional society chapters (OHBA, ASHRAE, USGBC, etc.) to participate in the building code development process

OREGON DEPARTMENT OF ENERGY

CONTACT INFORMATION

- Oregon Department of Energy

  http://www.oregon.gov/energy

  http://www.oregon.gov/energy/energy-oregon/Pages/Energy-Code.aspx

- Oregon Building Codes Division (OEESC)

  https://www.oregon.gov/bcd/codes-stand/Pages/energy-efficiency.aspx

- Contacts

Oregon Department of Energy

Blake Shelide – Facilities Engineer

Blake.Shelide@oregon.gov 503-373-7809

Roger Kainu – Residential Energy Analyst

Roger.Kainu@oregon.gov 503-580-7469

Oregon Building Codes Division – Energy Code

Mark Heizer – Technical Policy Analyst

Mark.R.Heizer@oregon.gov 503-373-0205

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Join Us in Pittsburgh

2018 Getting to Zero National Forum

Forum Co-hosts: nbi new buildings institute

ZNE Schools Workshop Sponsored by: U.S. DEPARTMENT OF ENERGY

Thank You!

Jim Edelson
Director of Codes and Policy, NBI
jim@newbuildings.org

David and Lucille Packard Foundation Building
Courtesy: EHDD