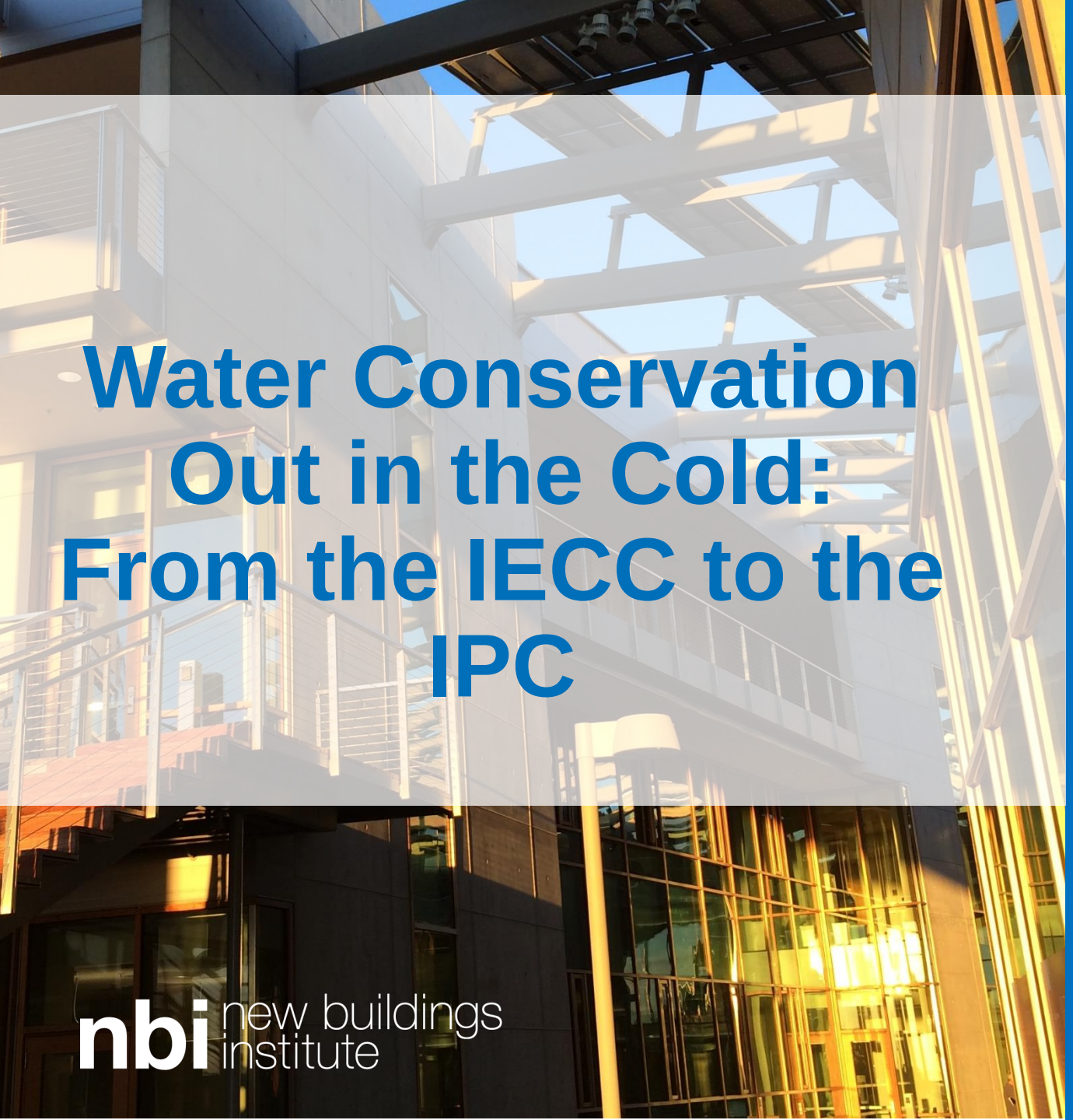

Water Conservation Out in the Cold: From the IECC to the IPC

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Jim Edelson

New Buildings Institute

Hot Water Forum

Portland, Oregon

March 21, 2018

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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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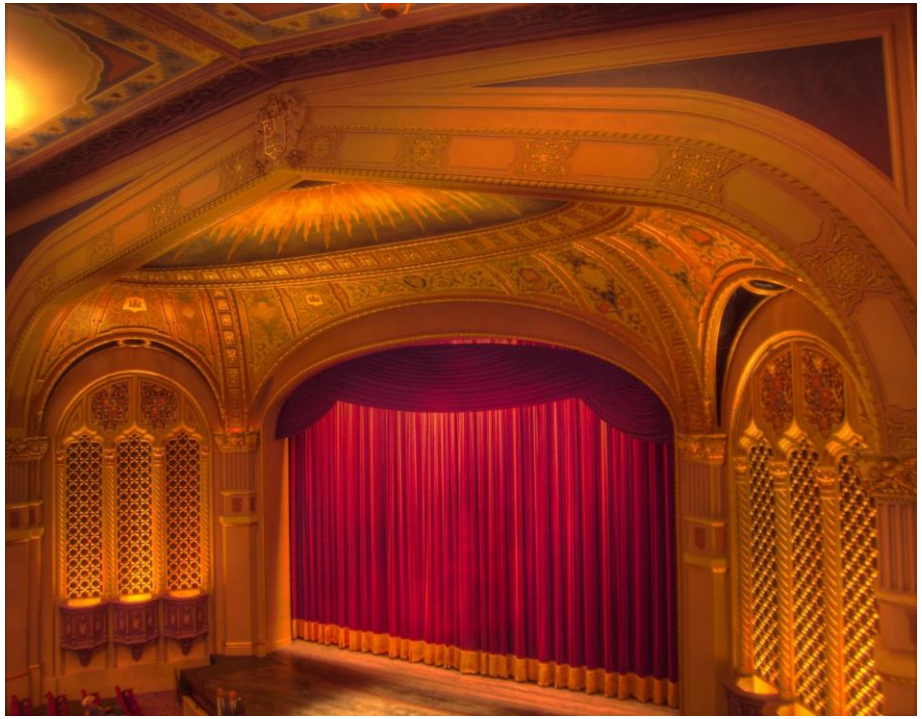
Agenda



1. Hot Water enters center stage in energy codes
2. When the going gets hot, the ICC (IECC) exits stage right
3. An empty stage will be filled by a cast of characters

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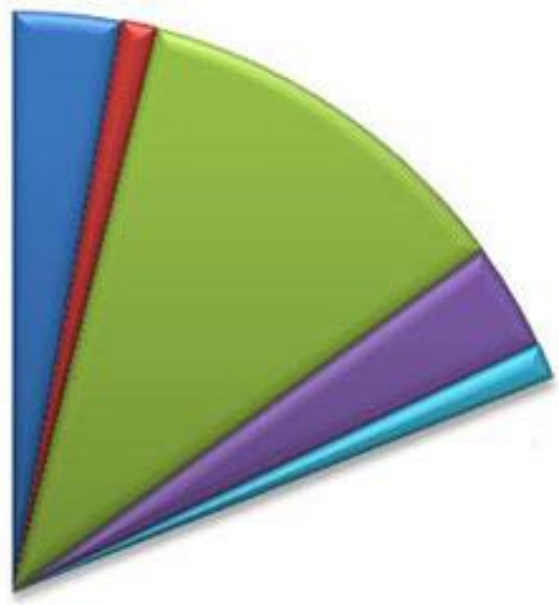
Water Use Means Energy Use

In a 2002 report, the Electric Power Research Institute (EPRI) estimated that **nearly 4% of the nation's electricity use** goes toward moving and treating water and wastewater by public and private entities.

Water-related electricity use is 48 terawatt-hours (TWh) per year and accounts for nearly **20% of California's total electricity consumption**



- Agricultural End-Use: 3%
- Agricultural Water Supply and Treatment: 1%
- Residential, Commercial and Industrial Water End-Use: 11%
- Residential, Commercial and Industrial Water Supply and Treatment: 3%
- Wastewater Treatment: 1%

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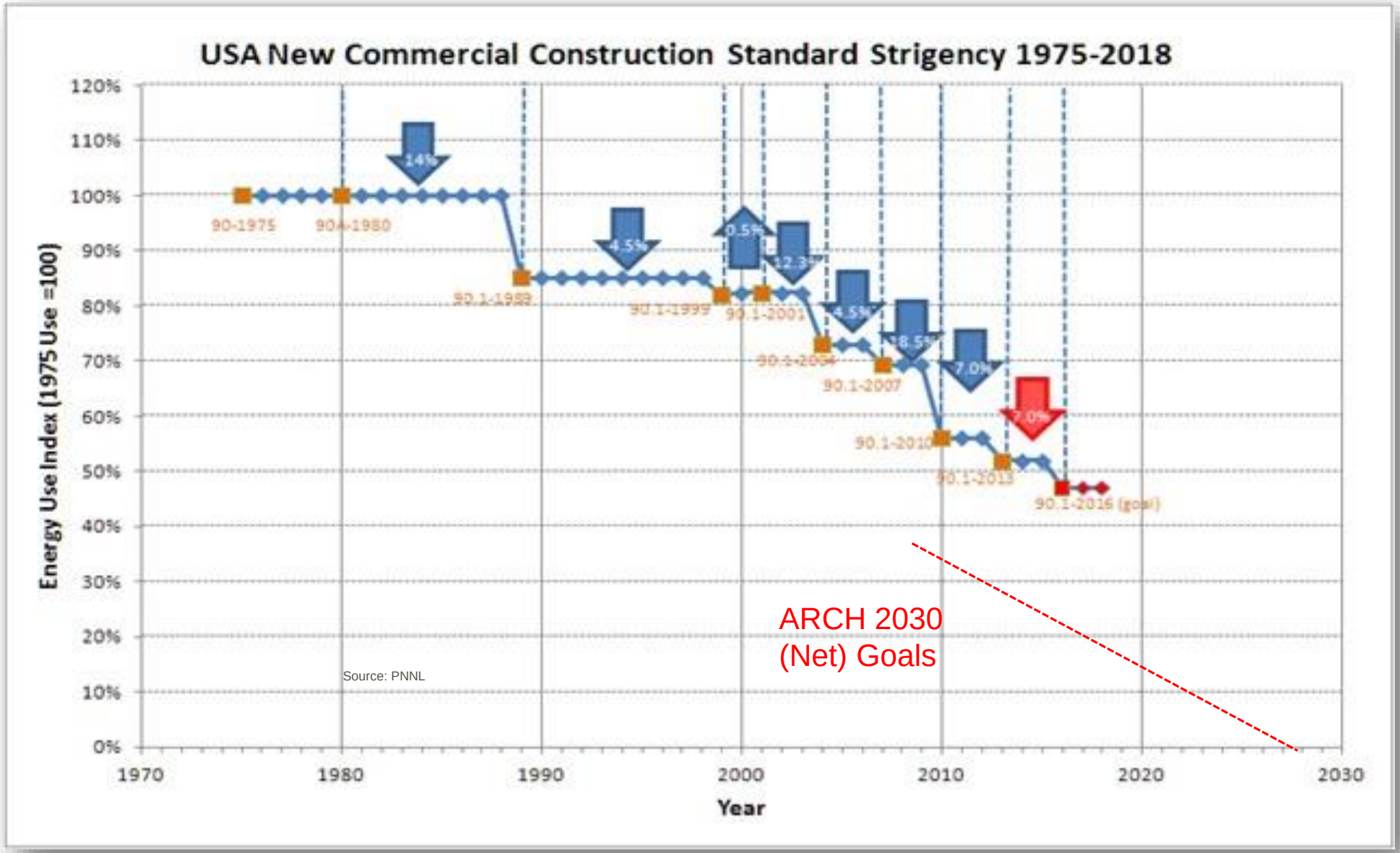

Source: PNNL

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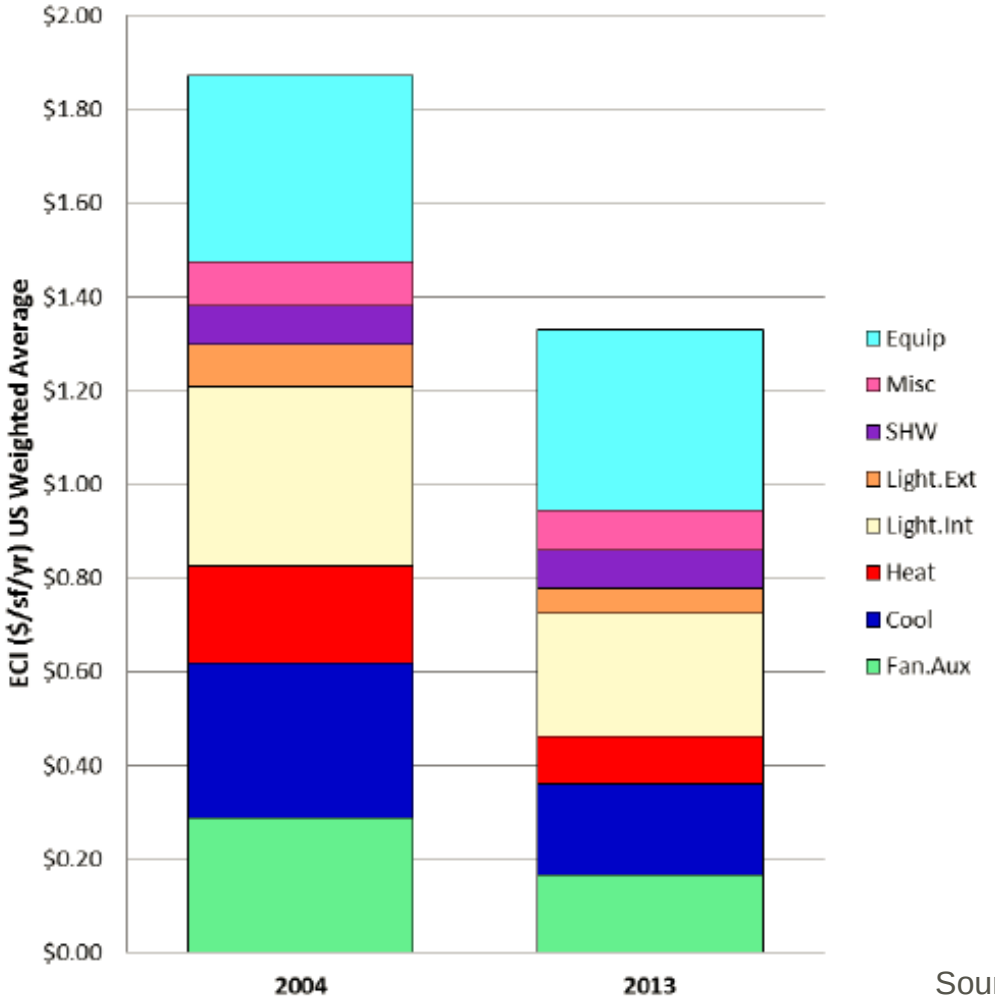
Progress 2004 - 2013

- Codes have been able to drive savings in some areas
  - More efficient equipment and lighting are big drivers
- Codes seem unable to address other end uses as well
  - Equipment and Misc. loads
  - Service hot water (SHW)



Source: PNNL

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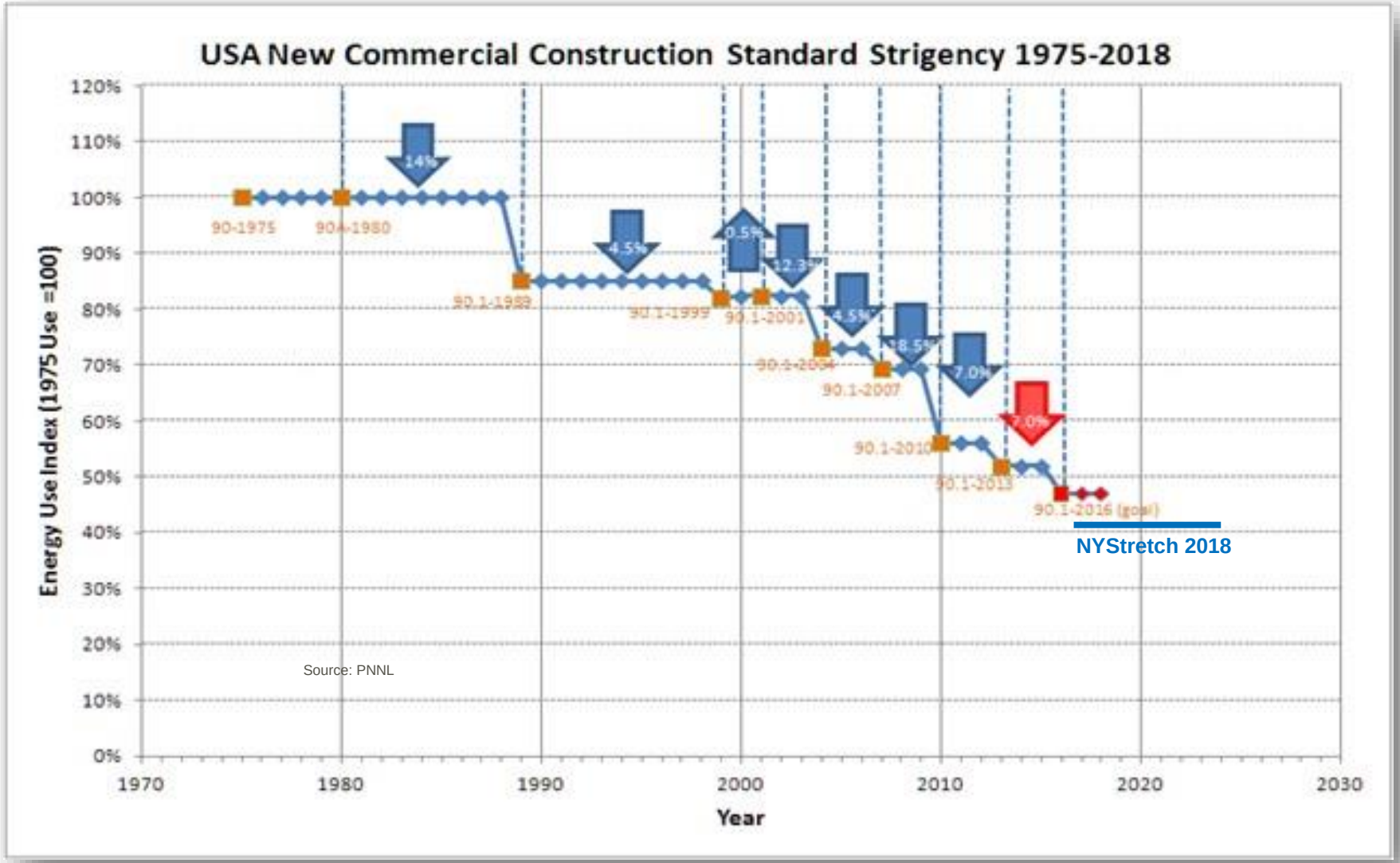
Status of Model Codes

Source: PNNL



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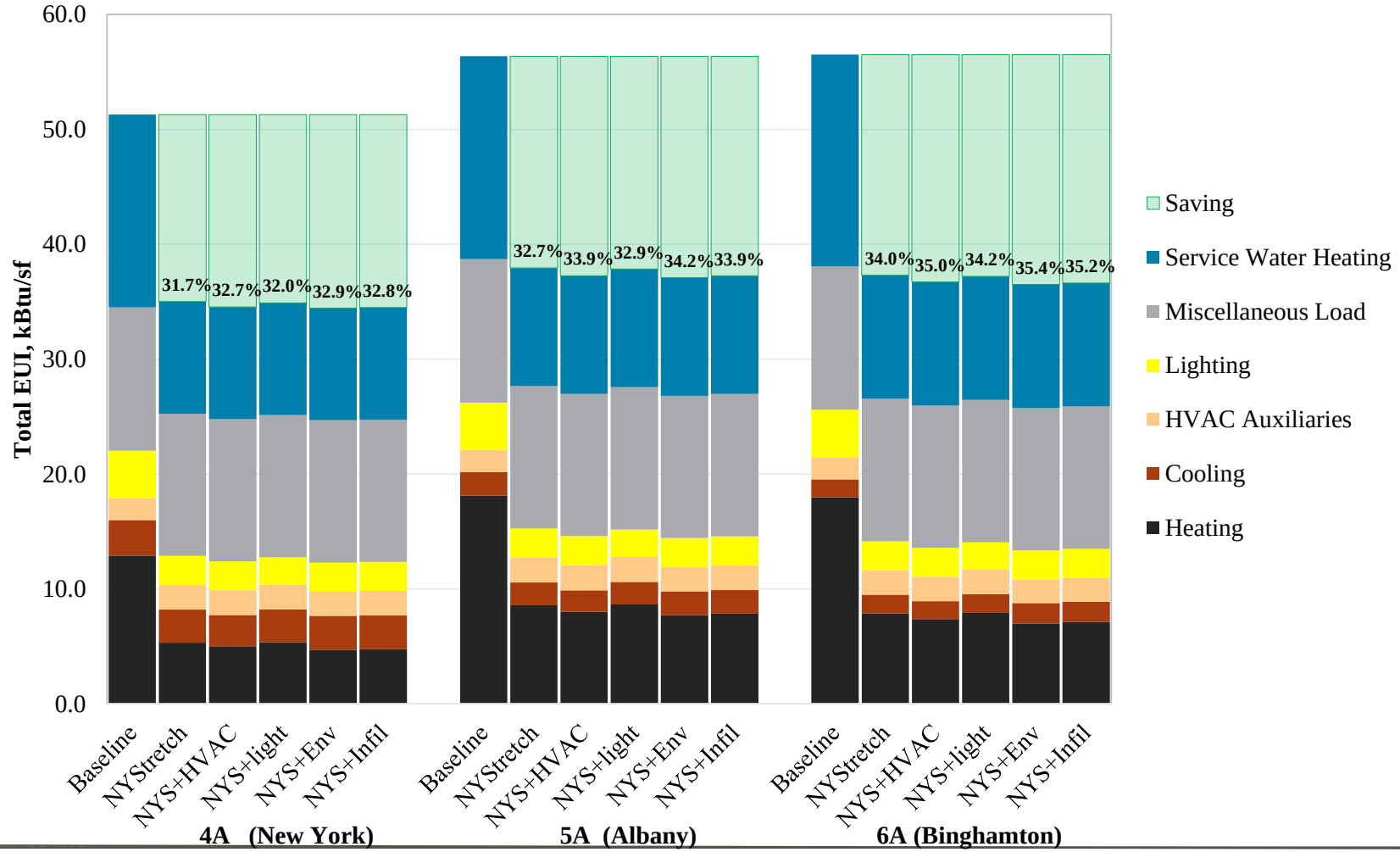
Efficiency Packages in NYStretch Code – Energy 2018

10-story Apartment



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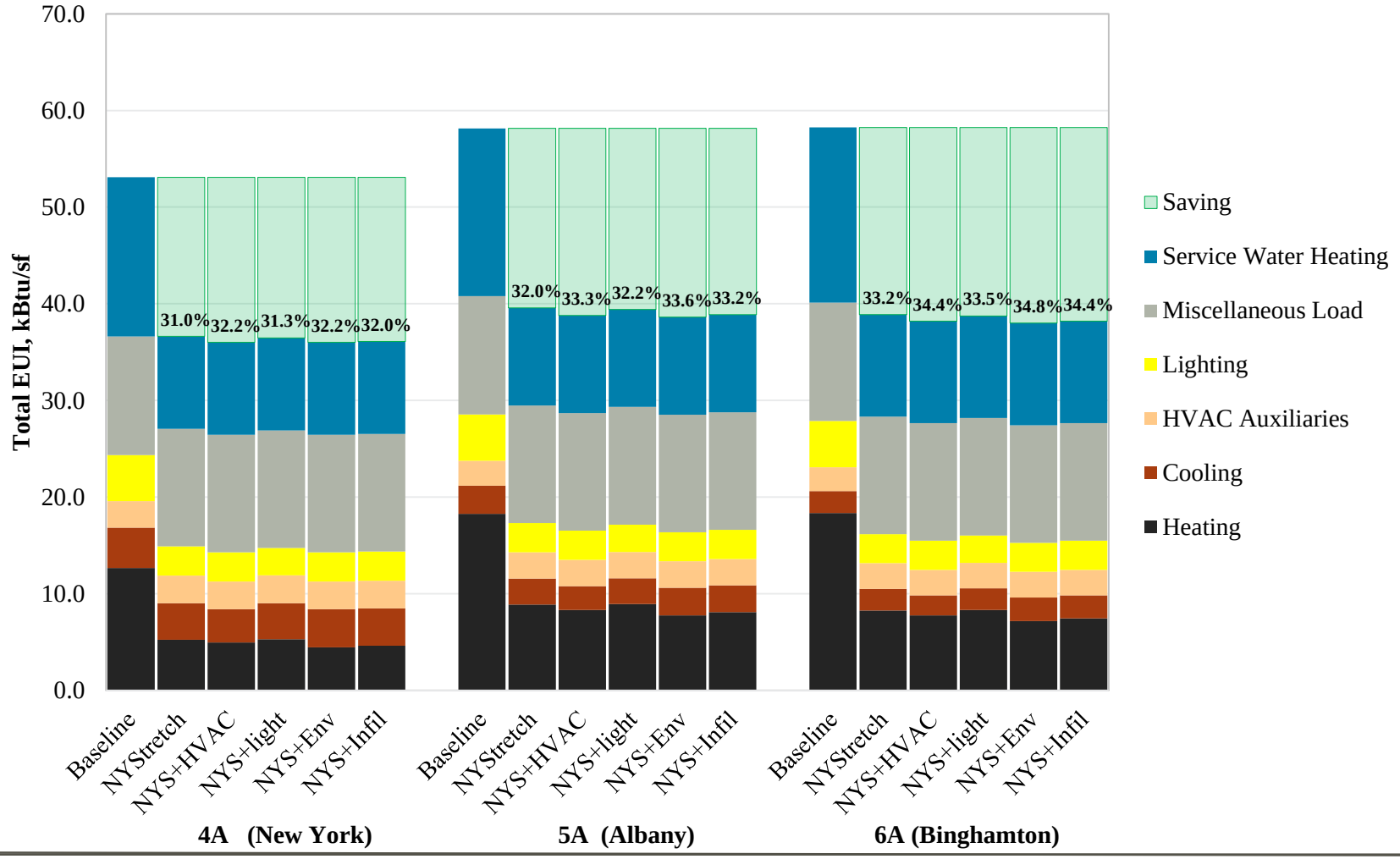
EEM Results
10-story Apt

Pacific Northwest NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965

EEM #	Energy Design Measures	10-story Apartment		
		4A	5A	6A
		Site EUI Saving %		
	Baseline 90.1-2013	---	---	---
1	Enhanced insulation for roofs and walls	0.3%	0.3%	0.5%
2	Enhanced windows	1.0%	0.8%	1.4%
3	Air leakage testing for large buildings	4.9%	5.2%	5.4%
4	Reduced LPD for interior lighting and high efficacy lights in dwelling units	2.2%	1.9%	1.8%
5	Occupancy sensors and automatic lighting controls including egress lighting	0.2%	0.2%	0.2%
6	Exterior lighting control	NA	NA	NA
7	Fan power limit: 0.8 W/cfm VAV and 0.65 W/cfm CAV	NA	NA	NA
8	Cooling towers in CZ 5 & 6	NA	NA	NA
9	Hotel guestroom HVAC vacancy control	NA	NA	NA
10	SWH waste heat recovery	13.1%	12.5%	13.1%
11	Plug load reduction	NA	NA	NA
12	Thermal bridging	2.7%	1.7%	1.8%
13	Exterior lighting power	NA	NA	NA
14	Elevator	0.2%	0.2%	0.2%
15	ERV for Apartment makeup air units	8.8%	10.9%	10.7%
16	Demand-based recirculated DHW controls	1.1%	1.0%	1.0%

Efficiency Packages in NYStretch Code – Energy 2018

20-story High-rise



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EEM Results
20-story Apt

Pacific Northwest NATIONAL LABORATORY
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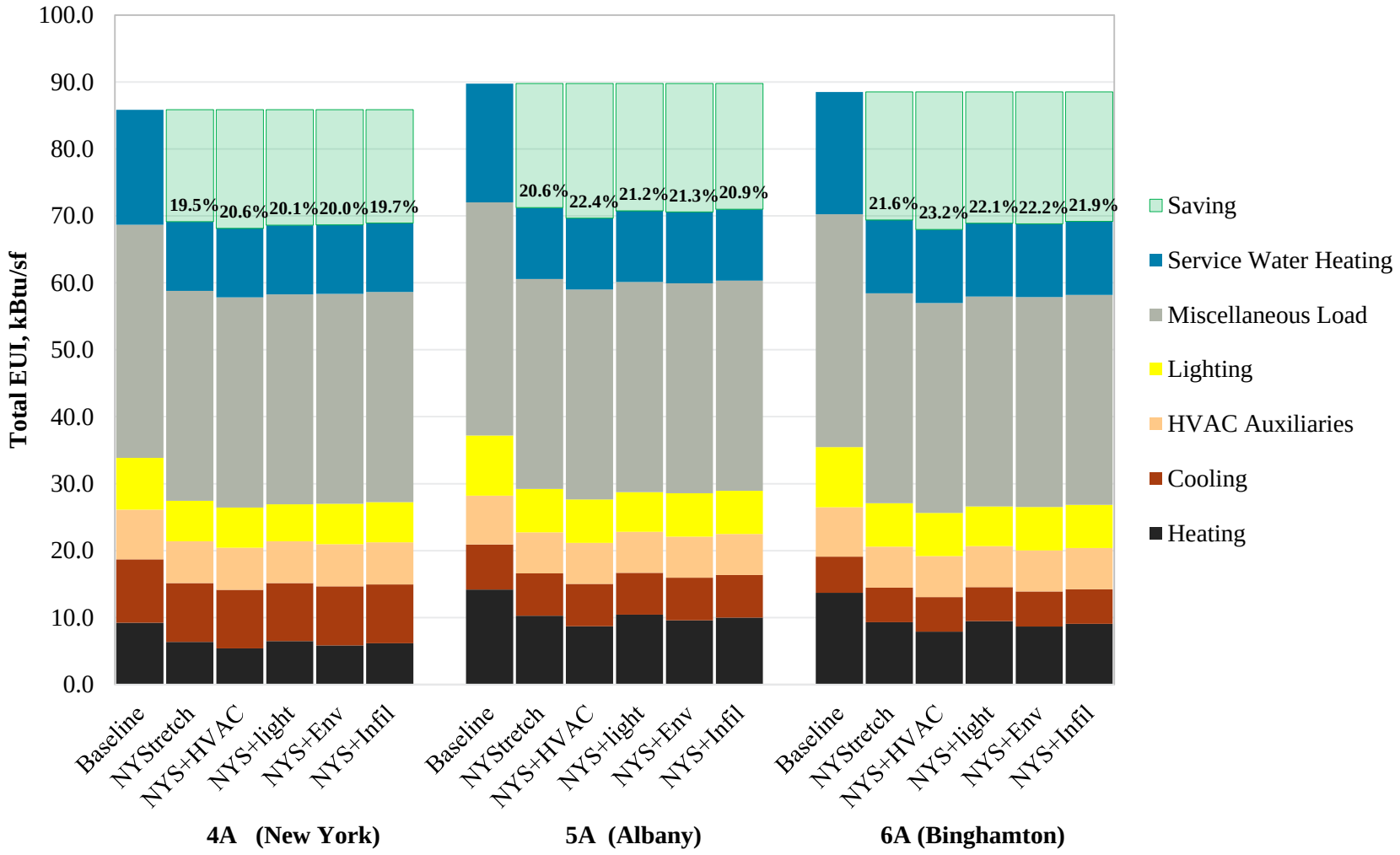
EEM #	Energy Design Measures	20-story Apartment		
		4A	5A	6A
		Site EUI Saving %		
	Baseline 90.1-2013	---	---	---
1	Enhanced insulation for roofs and walls	0.2%	0.2%	0.3%
2	Enhanced windows	1.5%	1.2%	2.0%
3	Air leakage testing for large buildings	4.6%	5.0%	5.1%
4	Reduced LPD for interior lighting and high efficacy lights in dwelling units	2.7%	2.3%	2.2%
5	Occupancy sensors and automatic lighting controls including egress lighting	0.2%	0.2%	0.2%
6	Exterior lighting control	NA	NA	NA
7	Fan power limit: 0.8 W/cfm VAV and 0.65 W/cfm CAV	0.03%	0.01%	0.01%
8	Cooling towers in CZ 5 & 6	NA	NA	NA
9	Hotel guestroom HVAC vacancy control	NA	NA	NA
10	SWH waste heat recovery	12.4%	11.9%	12.5%
11	Plug load reduction	NA	NA	NA
12	Thermal bridging	NA	NA	NA
13	Exterior lighting power	NA	NA	NA
14	Elevator	0.2%	0.2%	0.2%
15	ERV for Apartment makeup air units	8.3%	10.2%	10.1%
16	Demand-based recirculated DHW controls	1.0%	0.9%	0.9%

Efficiency Packages in NYStretch Code – Energy 2018

Hotel



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EEM Results
Hotel

Pacific Northwest NATIONAL LABORATORY
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EEM #	Energy Design Measures	Large Hotel		
		4A	5A	6A
		Site EUI Saving %		
	Baseline 90.1-2013	---	---	---
1	Enhanced insulation for roofs and walls	0.2%	0.2%	0.3%
2	Enhanced windows	0.9%	0.7%	1.3%
3	Air leakage testing for large buildings	1.1%	1.4%	1.4%
4	Reduced LPD for interior lighting and high efficacy lights in dwelling units	1.8%	1.2%	1.5%
5	Occupancy sensors and automatic lighting controls including egress lighting	0.2%	0.1%	0.1%
6	Exterior lighting control	NA	0.3%	0.3%
7	Fan power limit: 0.8 W/cfm VAV and 0.65 W/cfm CAV	0.6%	0.5%	0.5%
8	Cooling towers in CZ 5 & 6	NA	NA	NA
9	Hotel guestroom HVAC vacancy control	3.0%	3.9%	4.0%
10	SWH waste heat recovery	8.0%	7.9%	8.2%
11	Plug load reduction	3.7%	3.4%	3.4%
12	Thermal bridging	0.4%	0.6%	0.6%
13	Exterior lighting power	0.04%	0.8%	0.8%
14	Elevator	0.4%	0.4%	0.4%
15	ERV for Apartment makeup air units	NA	NA	NA
16	Demand-based recirculated DHW controls	NA	NA	NA

Fourteen ICC Codes

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The 2018 IECC Proposals

- **C406.8 High-efficiency faucets** The flow rate of a lavatory faucet installed in a dwelling unit shall not exceed 1.5 gpm (0.11L/s) at 60 psi
- **C404.9 Shower heads (Mandatory).** The flow rate of fixed and handheld shower heads shall not exceed 2.0 gpm at 80 psi.

Reason Statement: The Natural Resources Defense Council (NRDC) estimates that significant energy and water savings could accrue nationwide if these revised flow rates for showerheads became effective in 2018 (savings estimates apply to residential). Energy and water savings potential for showerheads: 1,553 MWh (Megawatt hours) of electricity per year by 2030; 112 million therms of natural gas per year by 2030; and 86 million gallons of water per day by 2030.

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The PMI position (accepted by ICC Board)

- **Matt Sigler, representing Plumbing Manufacturers International requests Disapprove.**
- Proposals that dealt with water consumption requirements for plumbing fixtures and fittings in the ICC Codes were discussed during the Group A hearings and will be in the 2018 IPC and/or IRC. If CE 247 is approved, it will conflict with the actions taken by the IPC Committee.

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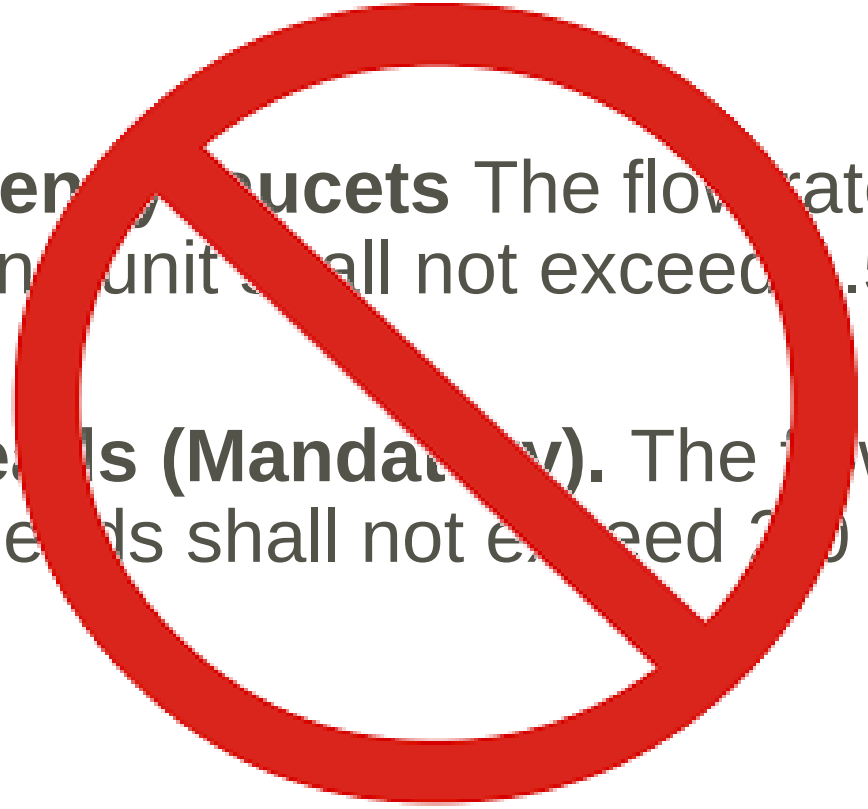
The 2018 IECC Saga



- **C406.8 High-efficien[illegible]aucets** The flow rate of a lavatory faucet installed in a dwellin[illegible]unit [illegible]all not exceed[illegible].5 gpm (0.11L/s) at 60 psi
- **C404.9 Shower he[illegible]ds (Mandat[illegible]y).** The f[illegible]w rate of fixed and handheld shower he[illegible]ds shall not e[illegible]eed [illegible]0 gpm at 80 psi.

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“Fall Between the Cracks”?

IECC

C101.3 Intent. This code shall regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building.

IPC

101.3 Intent. The purpose of this code is to establish minimum standards to provide a reasonable level of safety, health, property protection and public welfare by regulating and controlling the design, construction, installation, quality of materials, location, operation and maintenance or use of plumbing equipment and systems.

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Other energy issues – proposed language

- a. Where a shower is served by multiple shower heads, the combined flow rate of all shower heads controlled by a single valve shall not exceed the maximum flow rate, or the shower shall be designed to allow only one shower head to be in operation at a time.
- b. Consumption tolerances shall be determined from referenced standards.

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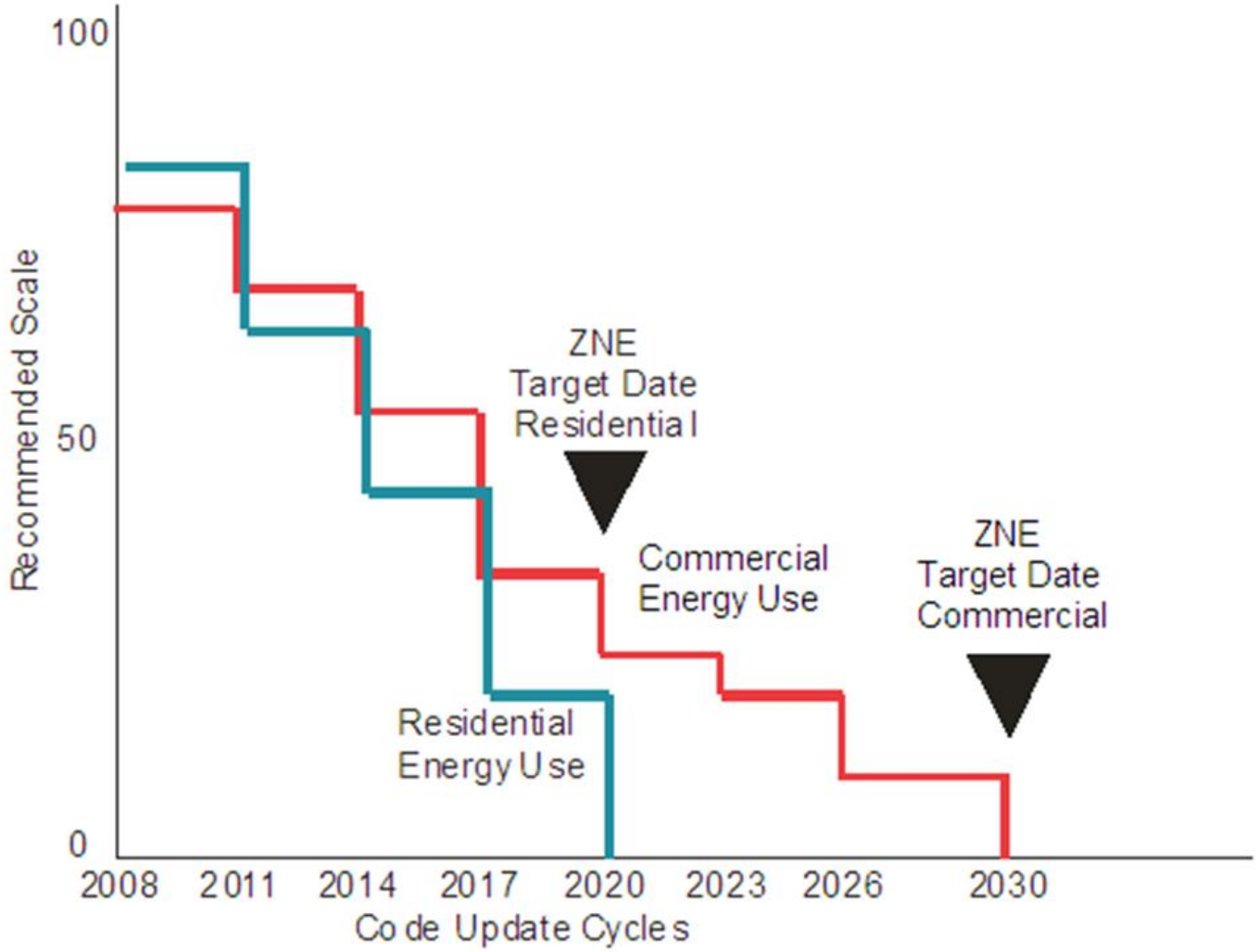
California Leads the Way



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“A Wave of Stretch Codes”

CASE STUDY: A Wave of New and Improved Stretch Codes

After Massachusetts developed the region’s first stretch code in 2010, there was a five-year lull in stretch code activity*. Now Vermont, New York, and Rhode Island have or are expected to implement stretch codes.

Vermont’s 2016 stretch code is mandatory for projects subject to the state’s Land Use and Development Act, which constitutes about one third of residential building activity, but is also available for use by any individual as a voluntary, beyond-code standard.

New York’s NY Stretch program, available early 2018, aims to achieve 10-15 percent savings beyond the 2015 IECC for both residential and commercial new construction. It also features provisions for existing buildings. Development of the next version of NY stretch code based on the 2018 IECC is in development.

Rhode Island’s updated commercial stretch code and new residential stretch code will be published early 2018. Rhode Island was first in the region to utilize the IgCC as the basis of its stretch code. The residential stretch code is based on the Department of Energy’s Zero energy Ready Homes Program.

In 2016 **Massachusetts** updated its base code to the 2015 IECC, and also updated the state stretch code. The new stretch code is more efficient than the base code, however with a significantly reduced scope then prior stretch codes additionally the new stretch code no longer addresses existing buildings.

*The **District of Columbia** adopted a Green Building Code based on the IgCC in 2013, but this is a mandatory extension of its building codes.

Source: NEEP Codes Toolkit, Dec. 2016

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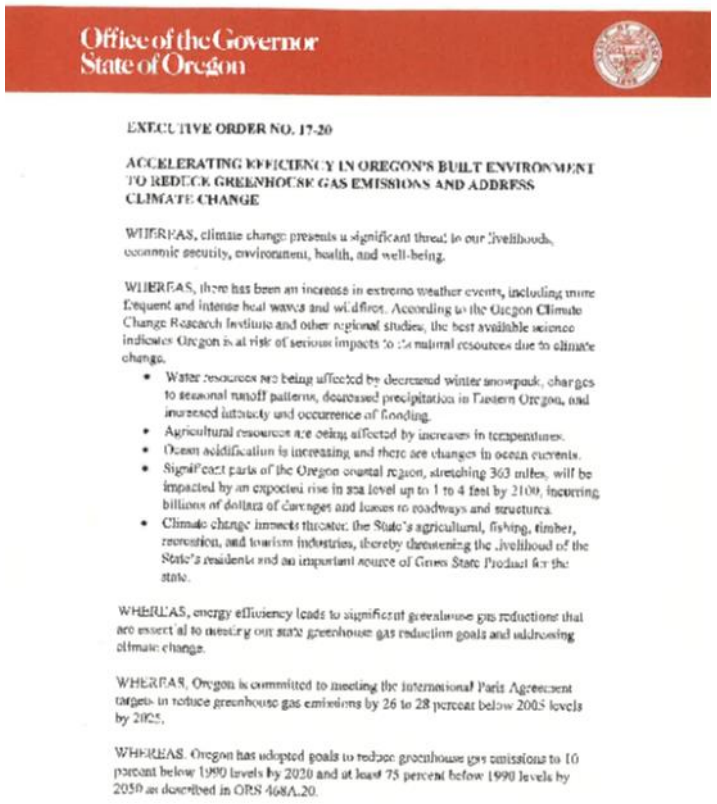
Oregon's Energy Policy



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
- Energy Efficiency in New Construction Equivalent to ASHRAE 189.1 - 10/1/2022
- High Efficiency Water fixtures by 1/1/2020 – Commercial and Residential
- Retrofits of Existing Buildings
- Cost Analysis
- 50000 Evs by 2020 Statewide
- Electric Vehicles / Chargers in Agencies
- West Coast Electric Fleet Bulk Purchase
- DEQ EV Rebate Program
- Consistency with CA on auto mfr. EV rate
- Greater access to EV charging throughout Oregon

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GETTING TO ZERO CARBON CODES AND POLICIES (+)

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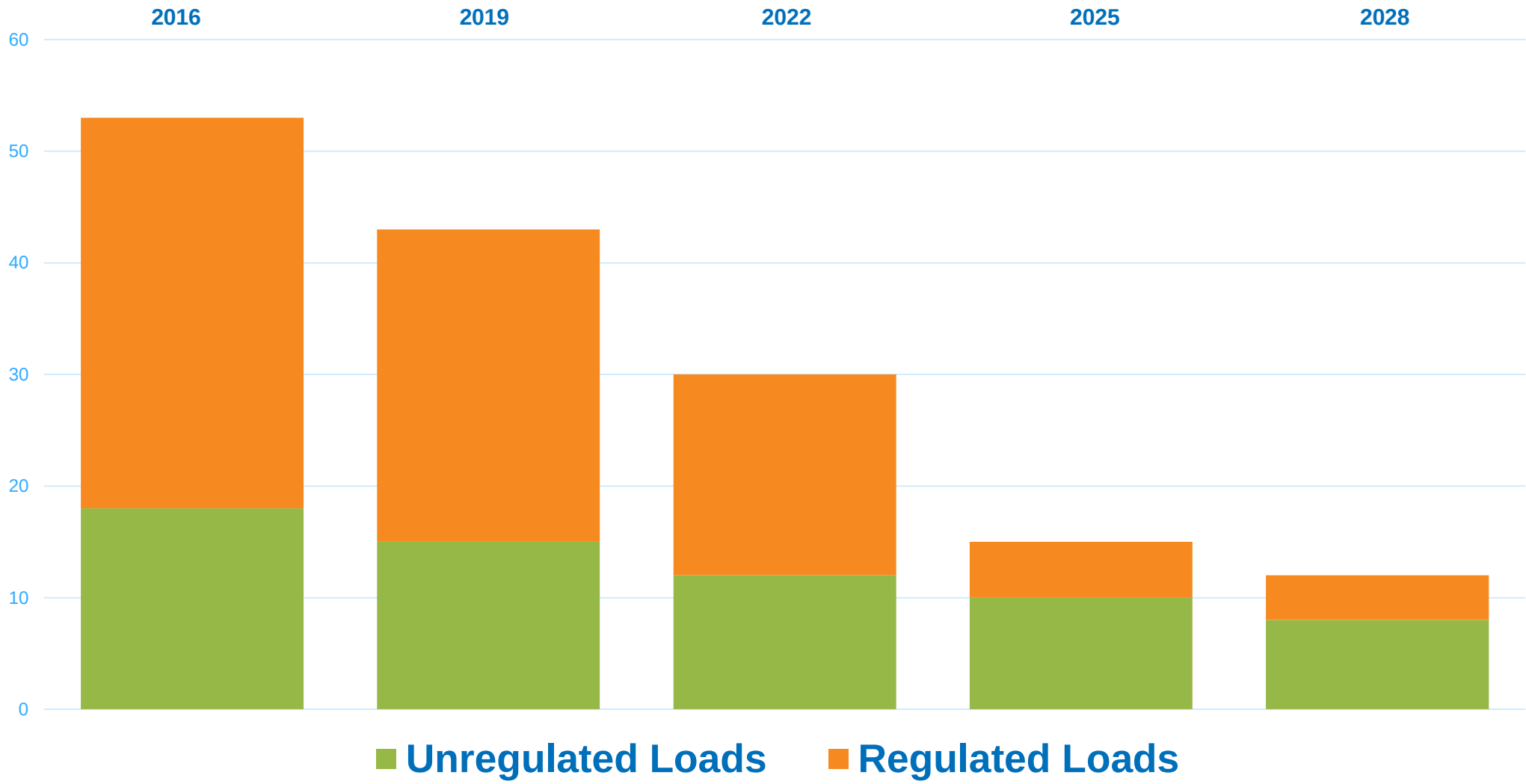
Zero Energy Code Schematic



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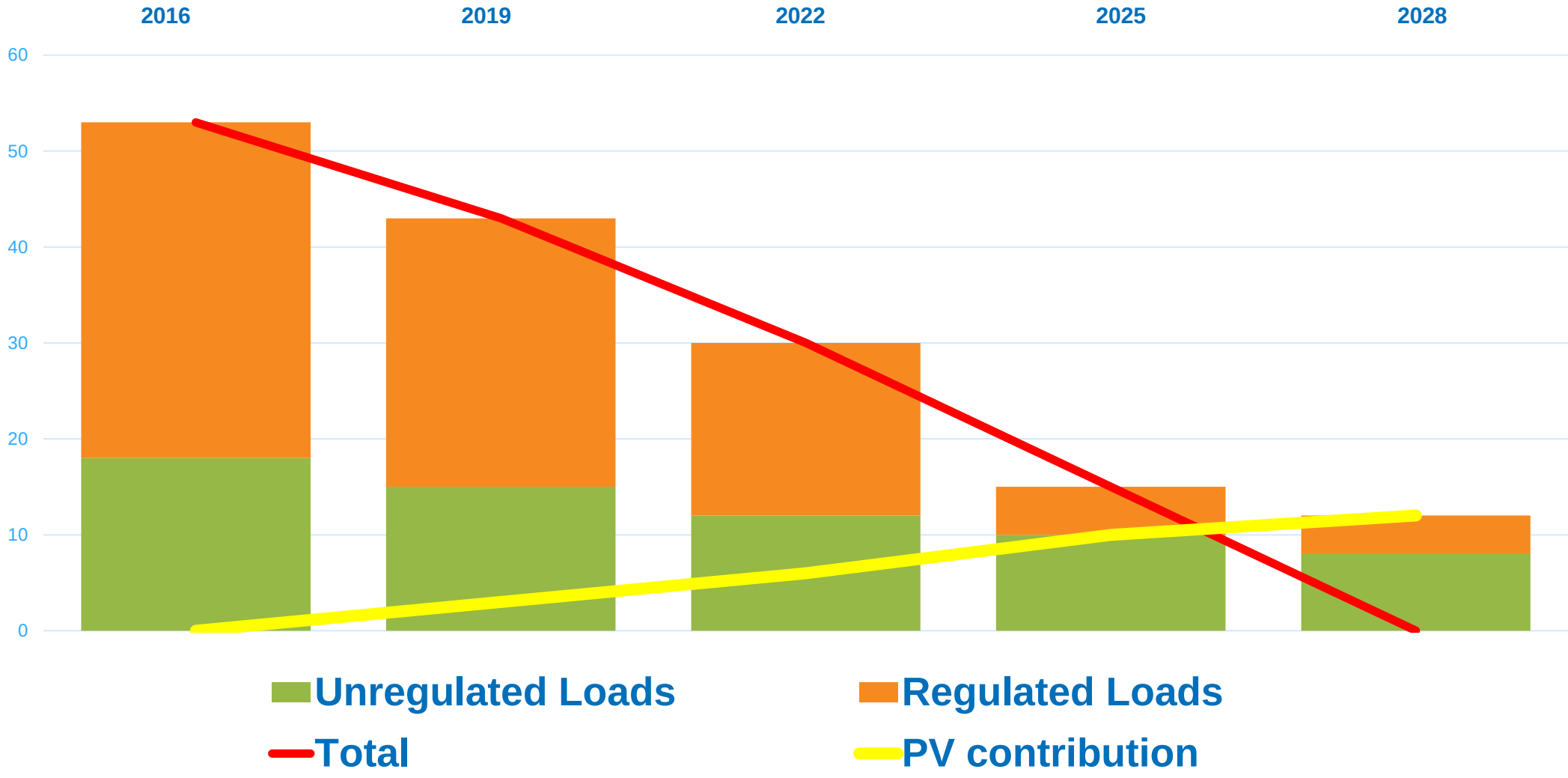
Renewable energy sources



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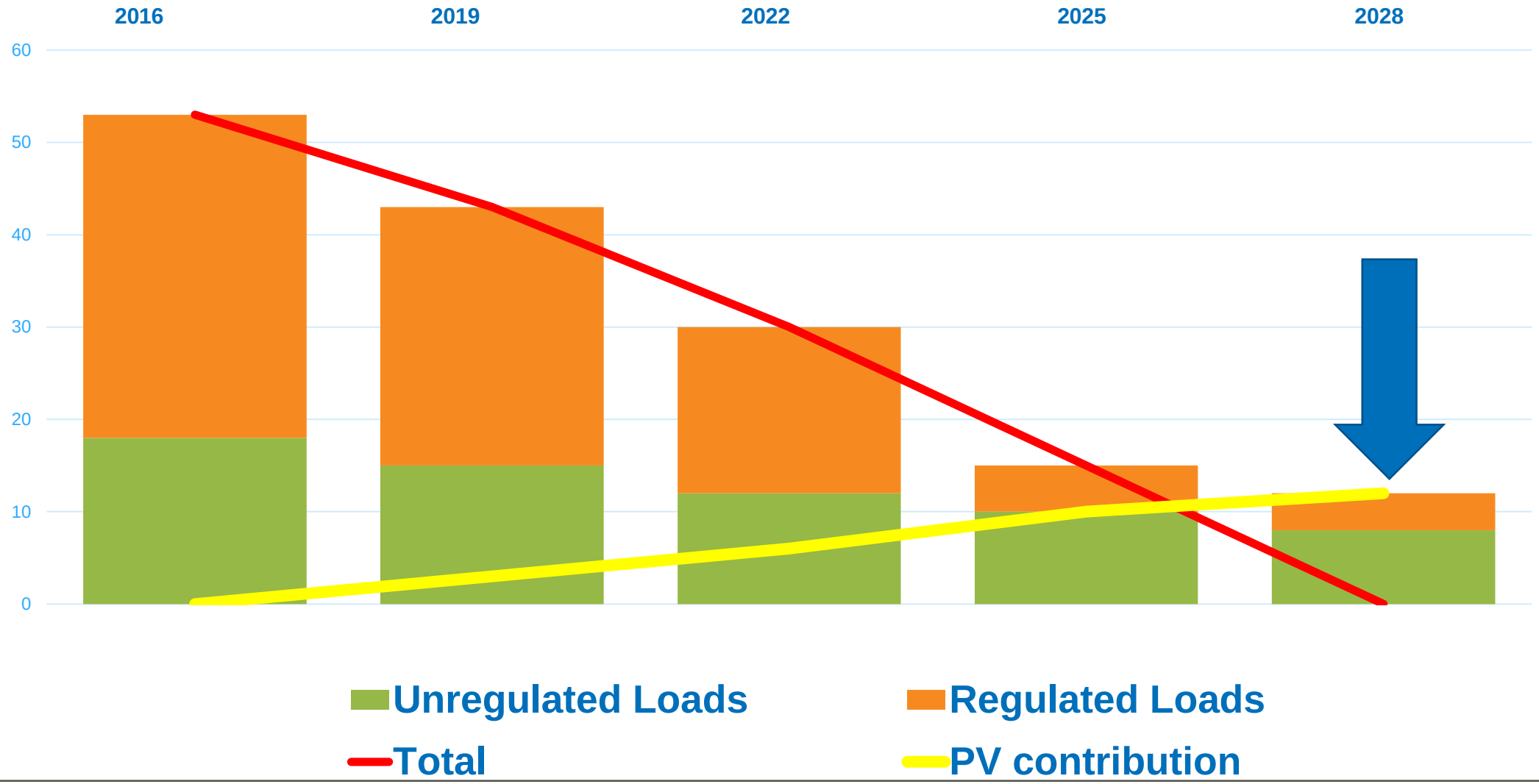
In ZEB – All energy is renewable



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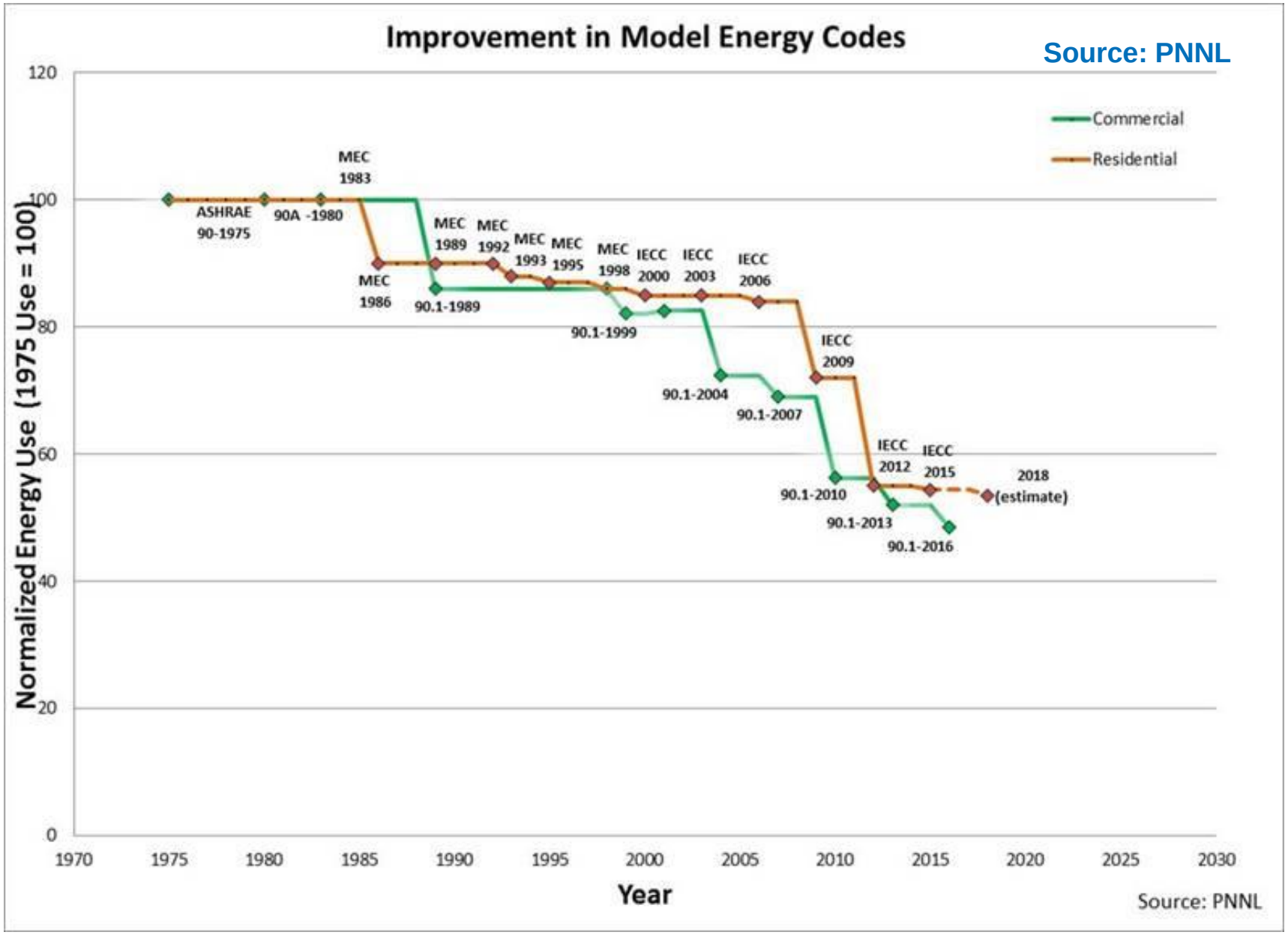

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Water and the Future of the IECC

- Patchwork of regulations
- Wasted energy and water
- New scope limit on IECC falls further behind 90.1
- Additional jurisdictions looking for alternatives
- Problem for IECC gets worse, not better

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Thank You!

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

David and Lucille Packard Foundation Building
Courtesy: EHDD