



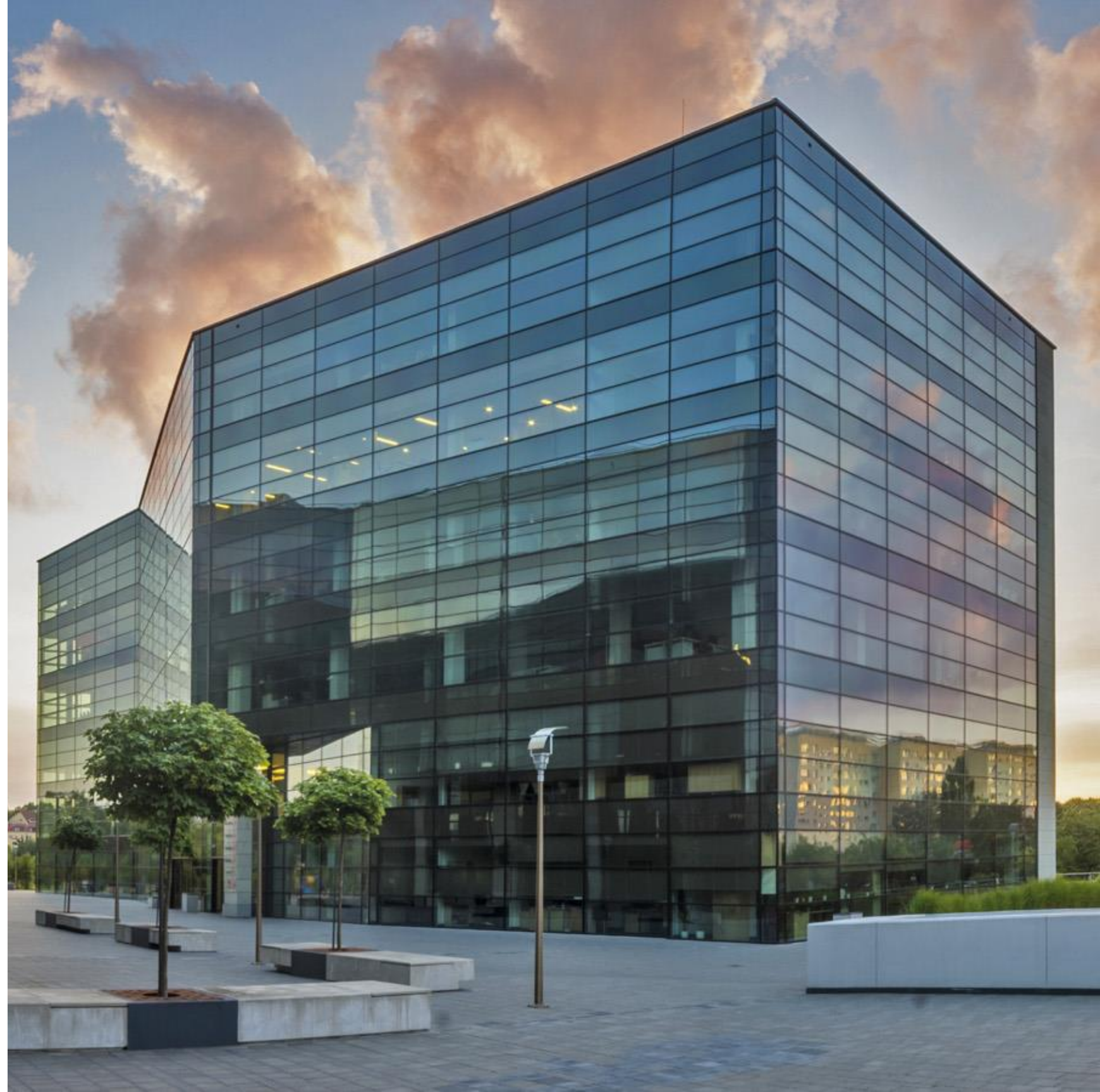
NZE Roadmap

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NZE Roadmap for Energy Code Precedence

As part of its legislative mandate to advance building energy codes, the U.S. Department of Energy (DOE) is accelerating efforts to make American buildings more efficient, resilient, and clean



“America’s path to a net-zero carbon economy runs straight through our buildings, which means we need to help households and commercial buildings across the nation reduce their emissions and convert to cheaper, cleaner energy,” **said Secretary Granholm.** “These new DOE investments and initiatives will help unlock new innovation for cleaner buildings, while preparing a strong, skilled and diverse American workforce to seize good-paying job opportunities right here at home.”

NZE Roadmap for Energy Code Background

Model Energy Code Determinations:

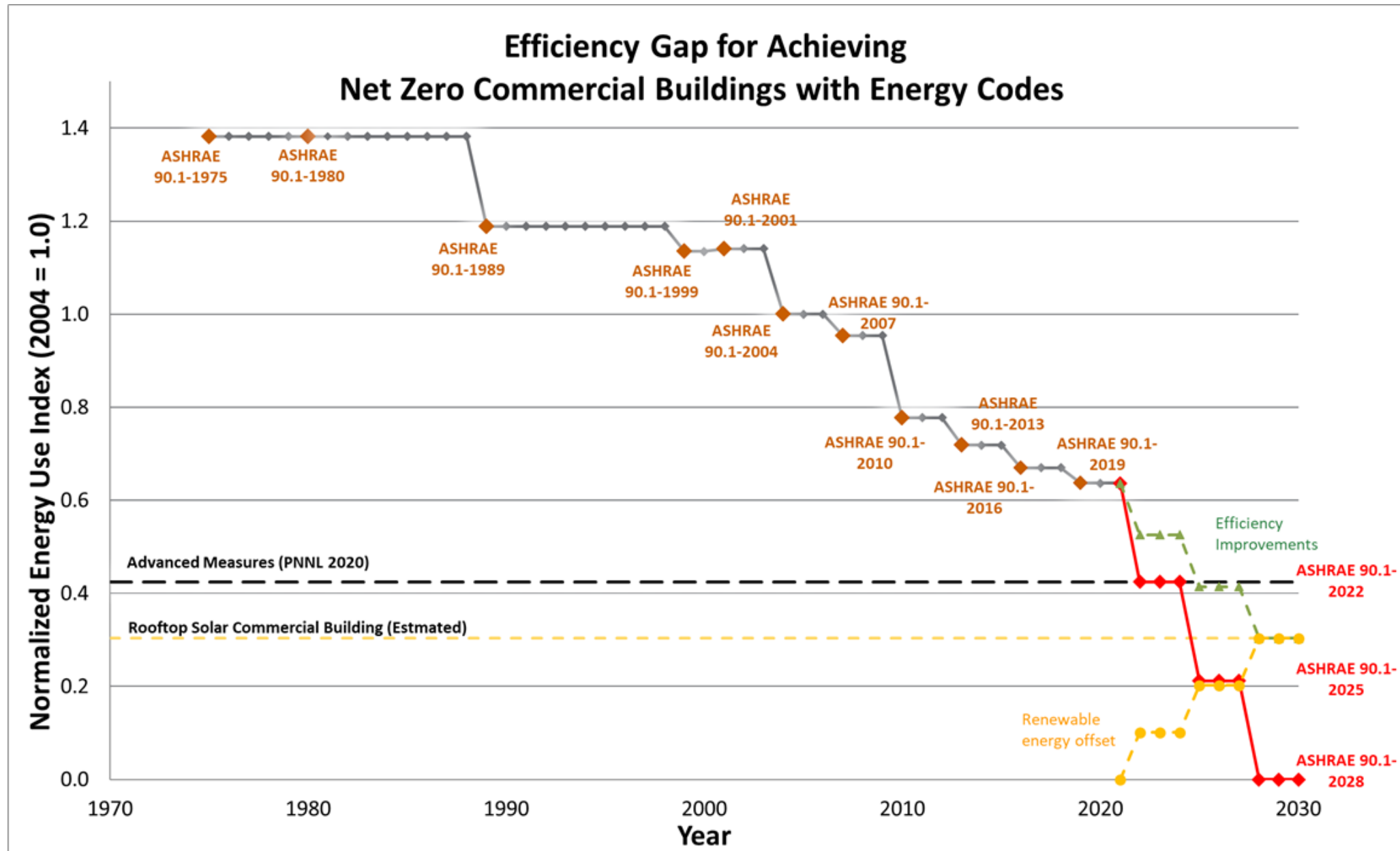
- Commercial (Standard 90.1-2019): 4.7% *site* energy savings
 - Published April 21 in the Federal Register (30-day public comment period)
- Residential (2021 IECC): 9.4% *site* energy savings
 - Published May 17 in the Federal Register (30-day public comment period)

Model Energy Code Development Processes:

- Focus: Stretch codes that can be adopted directly by states and local governments—and that can also be considered for the national model codes (via the ICC and ASHRAE development processes)
 - Example: Modules via a “plug-in” approach to enable advanced technologies (e.g., advanced EE, PV, EV, etc.) that can be layered on top of current state/local codes, as well as more comprehensive approaches (e.g., whole-building packages including advanced EE and decarbonization options)
 - The national code bodies have established zero energy goals—the IECC has embraced a goal of ZNE by 2030 (as at least an option)

NZE Roadmap for Energy Code

Accessing the efficiency gap – commercial code example

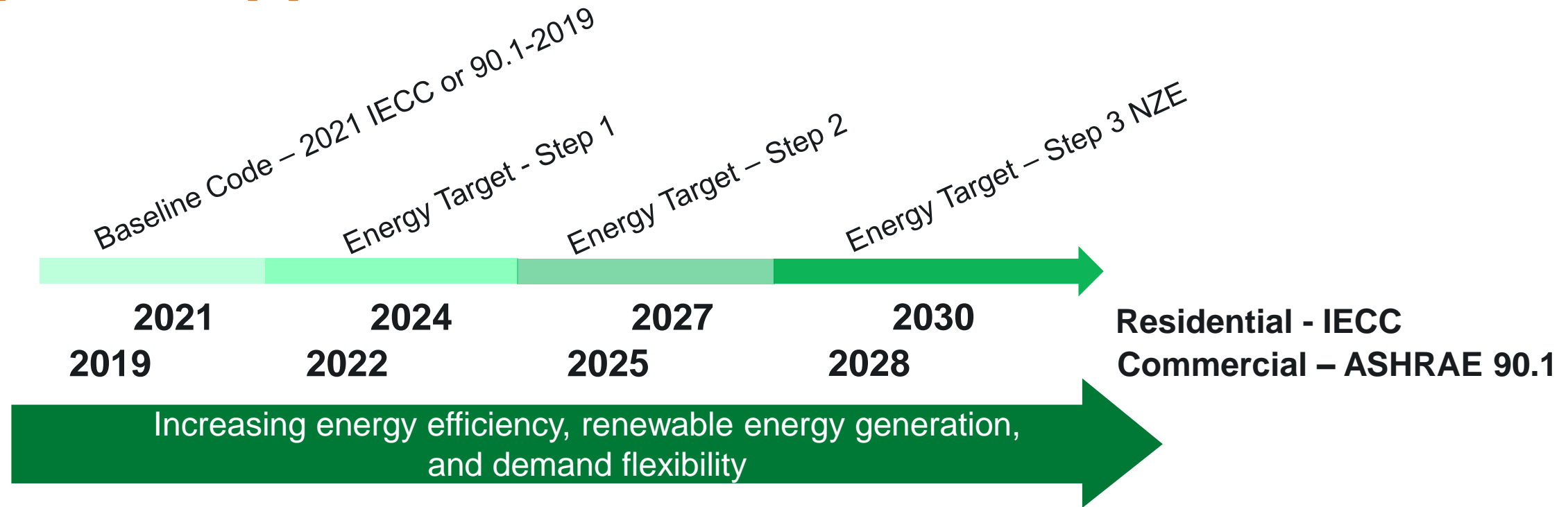


Source: Franconi, E, J. Lerond, C. Nambiar, D. Kim, D. Winiarski, and M. Rosenberg. *Filling the Efficiency Gap to Achieve Zero Energy Buildings with Energy Codes*. PNNL-30547, Pacific Northwest National Laboratory, Richland, Washington [publication pending].

NZE Roadmap for Commercial & Residential Codes

Proposed approach

**Decarbonized,
net-zero
energy
buildings**



Residential and Commercial Codes

- Increase efficiency from last code cycle (2021 IECC-R or ASHRAE Standard 90.1)
- Provide electrification packages
- Consider demand flexibility
- Address regulated and unregulated energy
- Boost envelope efficiency backstops
- Manage efficiency vs renewable energy trade-offs
- Prescriptive versus performance compliance paths

NZE Roadmap for Energy Code Overview

Themes in Pursuit of NZE	Details
<ul style="list-style-type: none"> Stretch code that amends the current code 	<p>Intended to support jurisdictions with NZE policies; will lay out a progressive path over the next 3 code cycles</p>
<ul style="list-style-type: none"> NZE objective 	<p>Progressively achieve zero energy by 2030 over the next three code cycles</p>
<ul style="list-style-type: none"> Zero carbon objective 	<p>Potentially to include carbon as a secondary metric for performance –based compliance</p>
<ul style="list-style-type: none"> Expands scope to plug and process loads 	<p>Carbon emissions factor will account for all building loads and renewable offsets; Reduced plug loads that can have a baseline defined and be validated in the field can be credited</p>
<ul style="list-style-type: none"> Increase in efficiency requirements compared to current code 	<p>Step-wise increase in efficiency initially through prescriptive requirements then through performance-based metrics</p>
<ul style="list-style-type: none"> Includes PV, energy storage and demand response controls 	<p>Will address PV as efficiency credit as well as demand response controls, load management, energy storage, and EVs</p>
<ul style="list-style-type: none"> Mixed fuel compliance as a transitional option as well as an all-electric option 	<p>Will move towards decarbonization requirements in advancing code years – going from electric ready to incentivizing full decarbonization through efficiency or additional option packages</p>
<ul style="list-style-type: none"> Supporting analysis 	<p>A range of critical needs that can be provided by PNNL and others</p>

NZE Roadmap for Energy Code

New approaches residential

- **Prescriptive Path**

- Optimize thermal envelope for high efficiency and cost effectiveness
- Provide flexible options for increasing efficiency (e.g., additional efficiency credits)
 - ✓ Address efficiency, load management and electrification packages
- Consider the role prescriptive compliance plays in future code cycles

- **Performance Paths (Total Building Performance and Energy Rating Index)**

- Establish high-efficiency envelope backstops
 - Establish compliance equity (equal levels of stringency for small and large homes)
 - Define a total building performance-based net-zero energy metric
 - Adjust ERI targets for net-zero energy (with and without renewable energy)
 - Allow envelope and HVAC efficiency tradeoffs against renewable energy?
 - Role of performance compliance paths – role of each, synergies?
- **At what rate should efficiency and renewables be stepped up across future code cycles?**

NZE Roadmap for Energy Code

New approaches commercial

- **Prescriptive Path**

- Provide flexible options for increasing efficiency (e.g., additional efficiency credits)
 - ✓ Address efficiency, load management and electrification packages
 - ✓ Include communication and control requirements to automatically respond to a demand response signal?
- Consider the role prescriptive compliance plays in future code cycles

- **Performance Paths**

- Establish a site-efficiency metric that doesn't include renewable energy or plug/process load reductions
- Establish a clean energy metric (e.g., carbon emissions) that accounts for plug/process load reductions and offset from renewable energy sources
- Require adherence to load management additional efficiency credit section
- **At what rate should efficiency and renewables be stepped up across future code cycles?**

Discussion Topics and Questions

- 1. The current model codes—2021 IECC and 90.1-2019—should serve as the basis for future code advancement**
 - Is this an appropriate baseline? How should future editions of the model codes be handled?
- 2. Future codes should orient around a goal of net-zero energy buildings by 2030**
 - Is this the appropriate target? Timeline?
 - What's the role of pure NZE vs. NZE-“Readiness”?
 - How can/should progress be measured toward future goals?
 - What are appropriate metrics (e.g., energy vs. carbon)?
 - What should DOE's role be in supporting such a goal?
- 3. How should a target like NZE be applied?**
 - Is NZE feasible for all building types and climates? Should some pursue net positive?
 - How should codes balance the role of energy efficiency and clean-energy technologies, such as PV and EV?
 - Should codes continue to emphasize energy efficiency or focus more on renewable and other integrated technologies like demand flexibility and resilience?