Pacific Northwest NATIONAL LABORATORY

ENERGY CODES 2022

2022 National Energy Codes Conference
Day 02 Thursday, July 21st, 2022
1:00 PM to 2 PM Eastern Time

Setting Targets: Getting to Zero Energy Codes or Carbon Over Time

U.S. DEPARTMENT OF ENERGY BATTELLE

PNNL is operated by Battelle for the U.S. Department of Energy

Setting Targets: Getting to Zero Energy Codes or Carbon Over Time

Ellen Franconi, Ph.D., BEMP

Senior Research Engineer, Building Energy Codes Program

PNNL

Bertine Stelzer, MA

Program Manager, Residential New Construction

BC Hydro

Jamy Bacchus, PE, LEED AP BD+C, BEMP

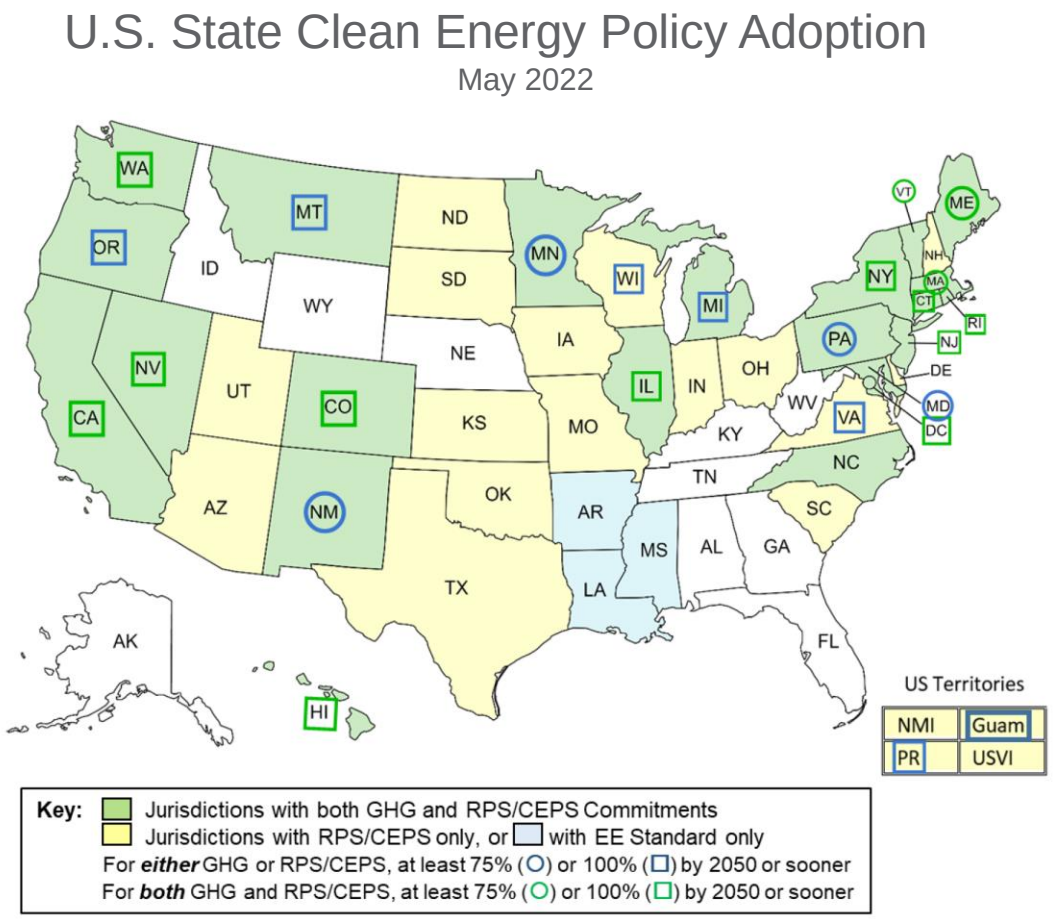
Mechanical Engineering Consultant

ME Engineers

Energy Targets: Getting to Zero Energy Codes or Carbon Over Time

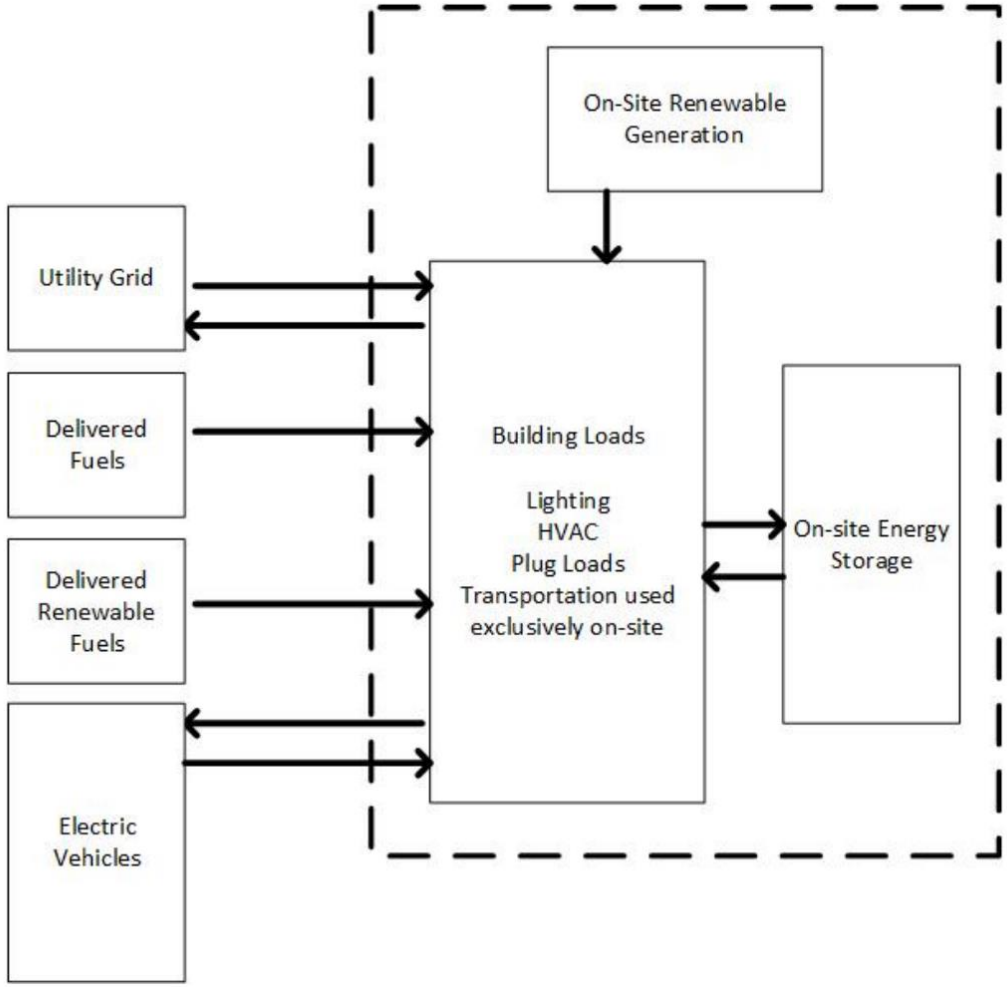
Many state and local jurisdictions are adopting policies to achieve greenhouse gas emissions reductions and growth in renewable energy use.

ZE buildings support these broader policy objectives.



Source: NRRI State Policies Tracker: Clean Energy and Climate Change Policies

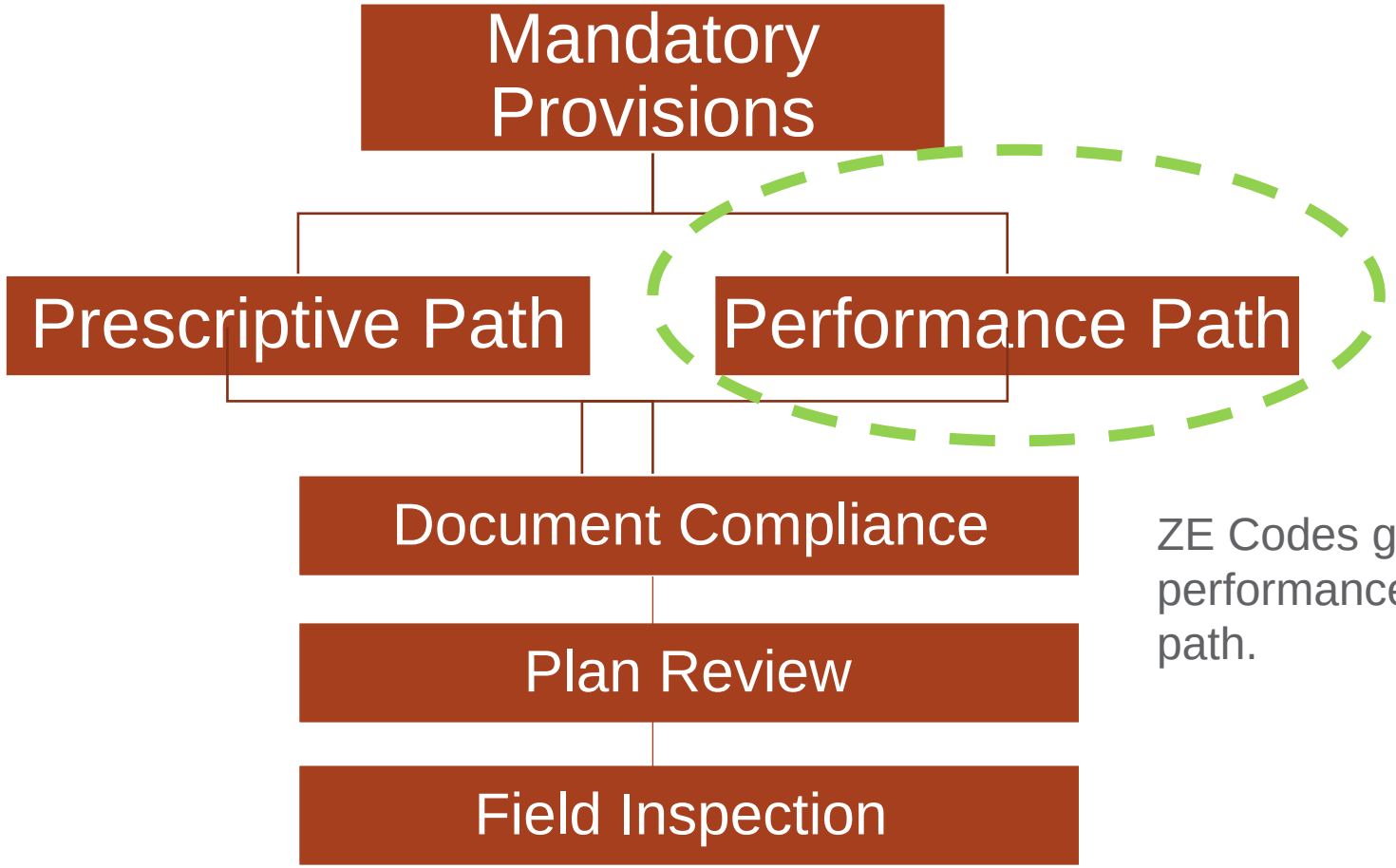
What is a Zero Energy Building?



Source: Torcellini et al. 2020. "The Future of Zero Energy Buildings: Produce, Respond, Generate." *Proceedings of the 2020 ACEEE Summary Study*, Washington, DC: ACEEE

- Concept - less energy resources, consumed, less environmental impact
- Strategy – highly efficient building + onsite renewables +offsite renewables + a clean grid
- ZE metrics
  - Site energy
  - Source energy
  - CO^2 equivalent
- ZE accounting
  - Net annual
  - Net instantaneous

Zero Energy Compliance in Energy Codes



ZE Codes generally utilize the performance compliance path.

Zero Energy Compliance in Energy Codes

Energy Code Example	Target	Metric Basis
2021 IECC-R Appendix RC	Zero	Annual site energy
2021 IECC-C Appendix CC	Zero	Annual source energy
Architecture 2030 Zero Code	Zero	Annual site energy

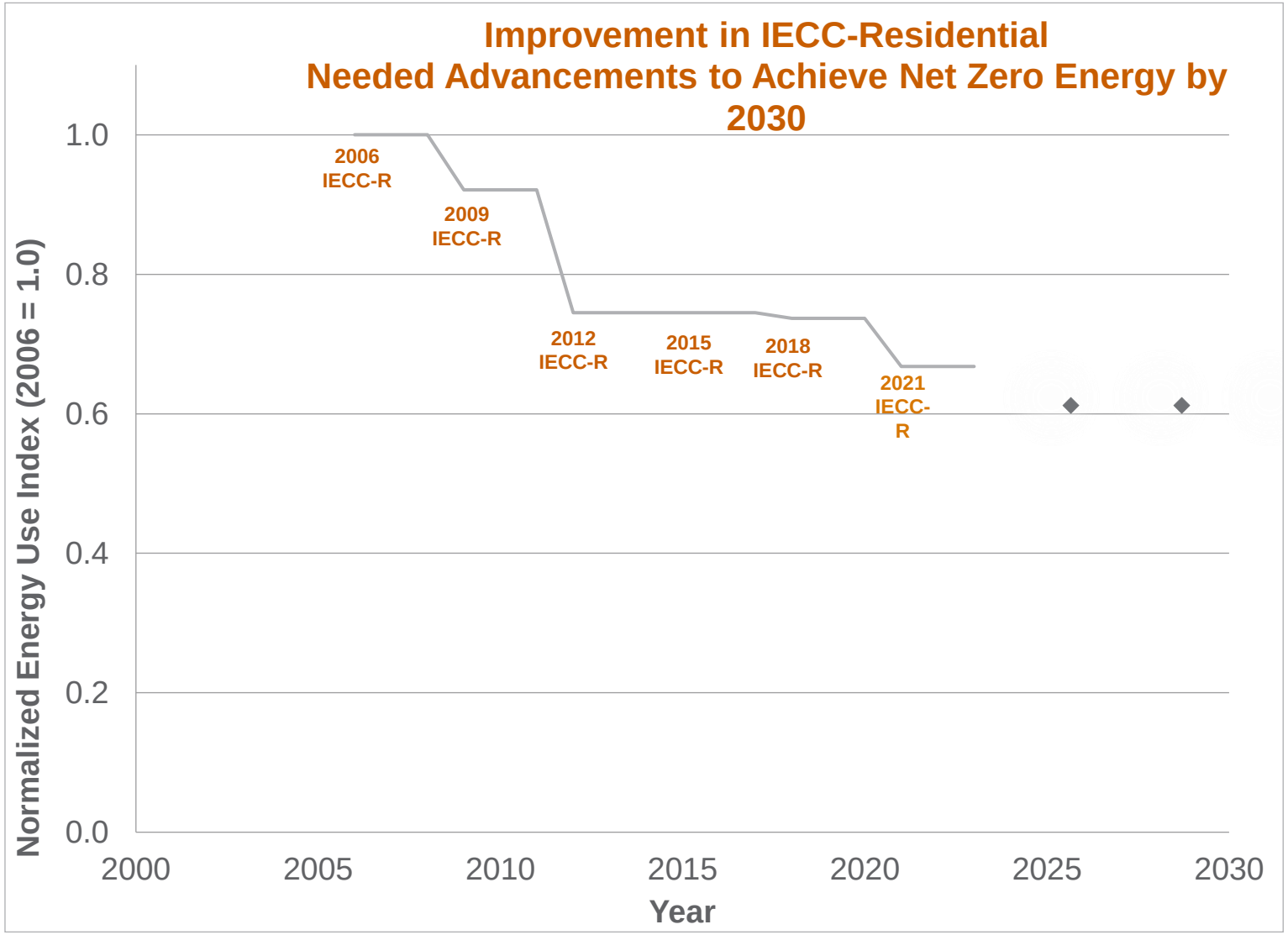
Pacific Northwest
NATIONAL LABORATORY

Zero Energy in Model Energy Code

Ellen Franconi, PNNL

Advanced efficiency measures and renewable energy model code requirements can support national ZE goals

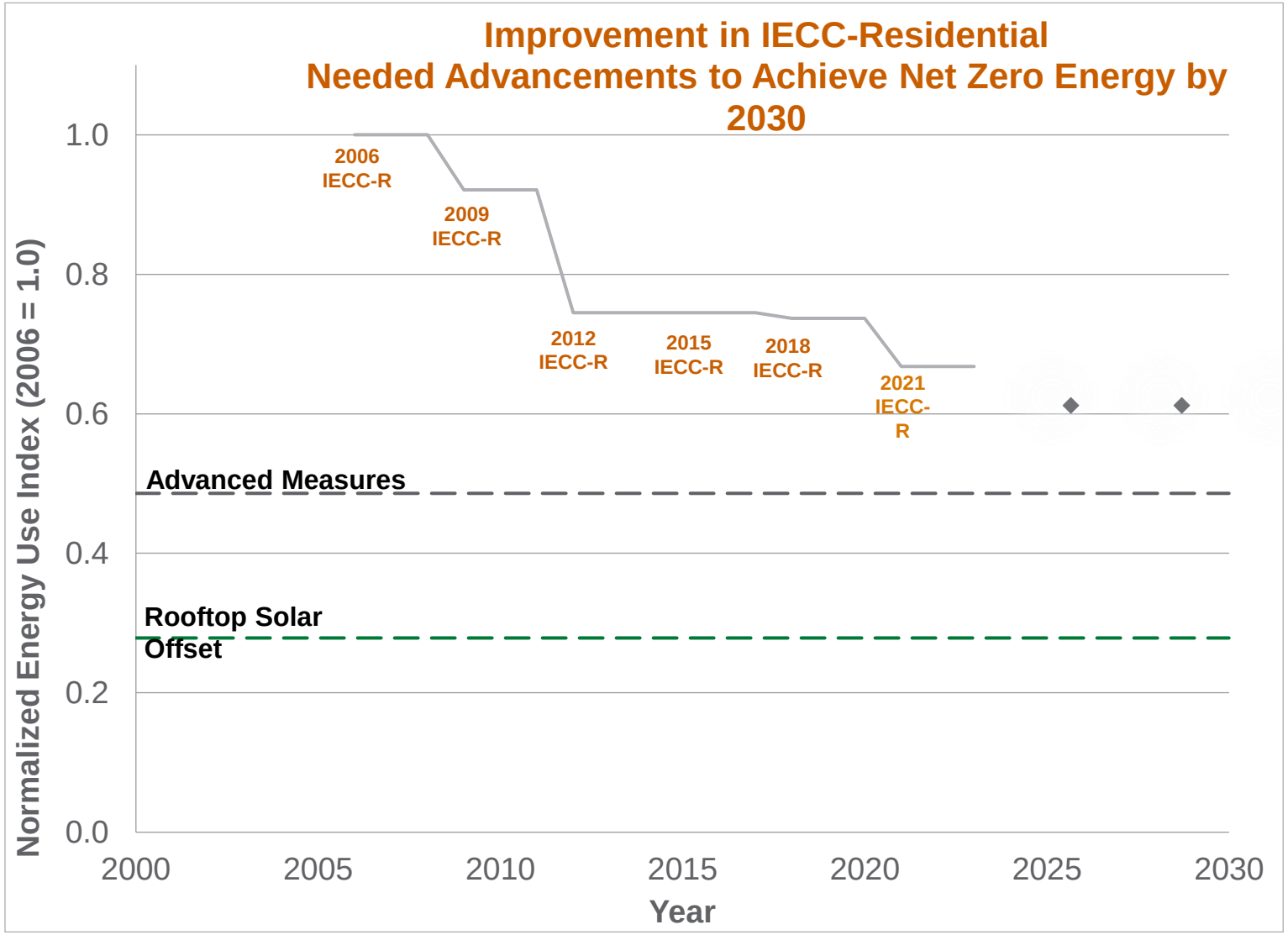
Residential Model Energy Code Example



- **Historic code improvement** over time

Advanced efficiency measures and renewable energy model code requirements can support national ZE goals.

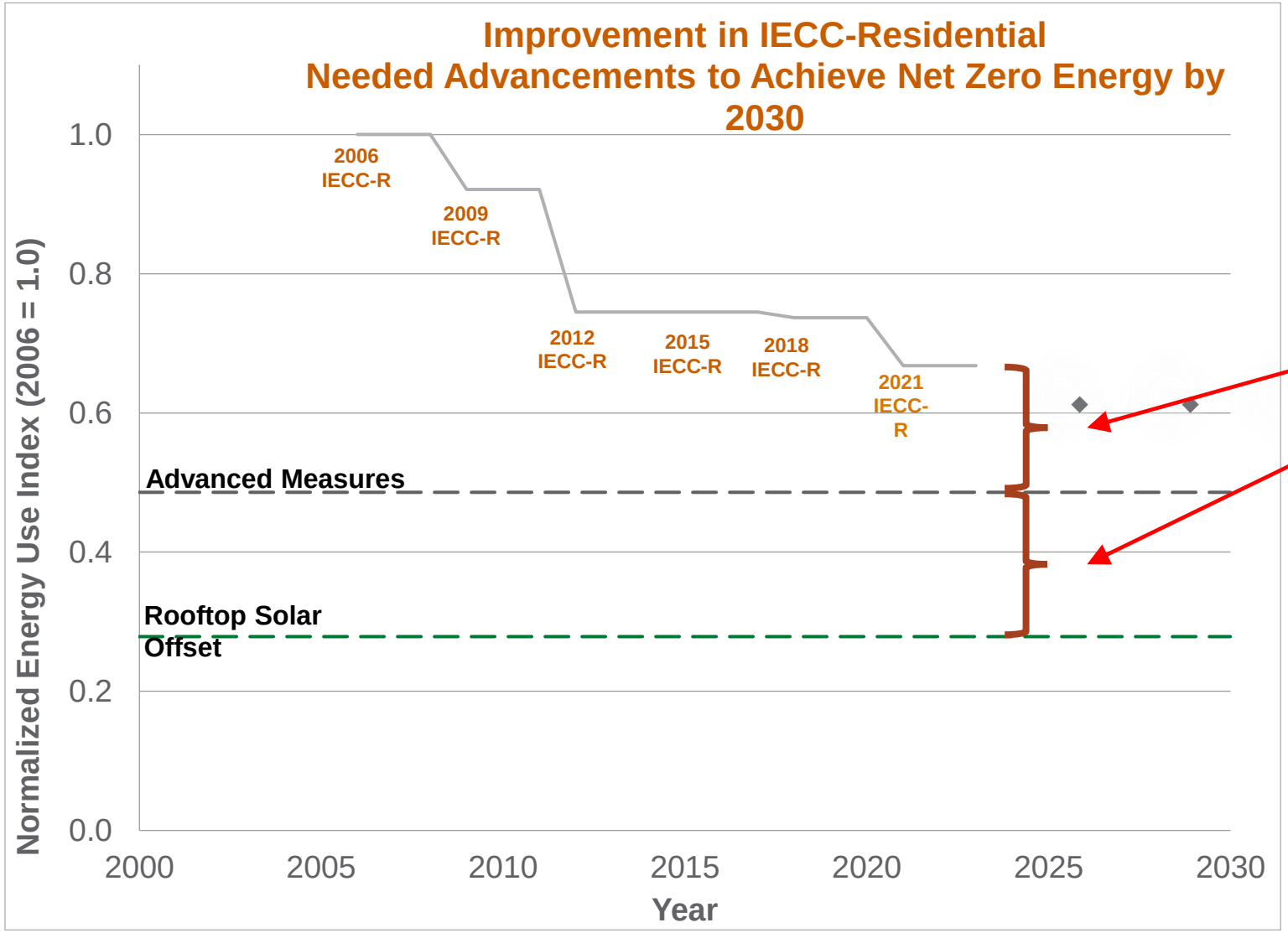
Residential Model Energy Code Example



- **Historic code improvement** over time
- ***Feasibility Study*** identifies level of improvement possible from:
  - Technologically feasible advanced measures
  - Rooftop solar offset

Advanced efficiency measures and renewable energy model code requirements can support national ZE goals.

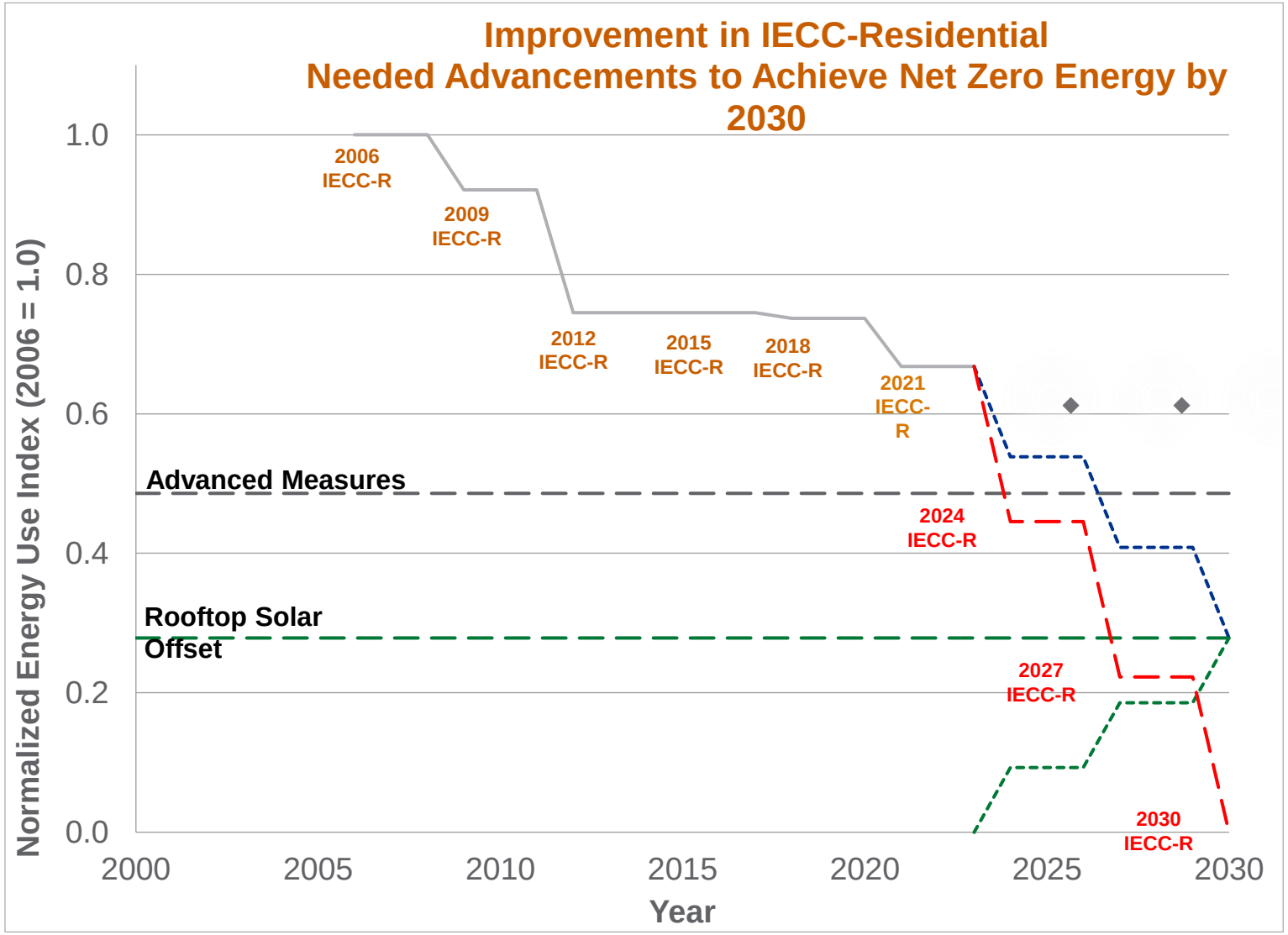
Residential Model Energy Code Example



- **Historic code improvement** over time
- ***Feasibility Study*** identifies level of improvement possible from:
  - Technologically feasible advanced measures
  - Rooftop solar offset
- Efficiency gap between current code and advanced measures
- Remaining gap
  - Improvements in regulated and unregulated loads
  - Offsets from off-site renewables

Advanced efficiency measures and renewable energy model code requirements can support national ZE goals.

Residential Model Energy Code Example



- ***Energy Targets*** demonstrates stepwise improvements to reach ZE by 2030 in three code cycles
  - Reductions in regulated energy use
  - Offsets from on-site renewables
  - Filling the gap with additional energy use reductions from efficiency improvements and off-site renewable energy procurement