THE BUILDING ENERGY HUB

Code Workshops

IECC 2024 Residential Stretch Code Workshop

June 16, 2025

ILLINOIS GREEN ALLIANCE

The Building Energy Hub is a project of Illinois Green Alliance

DOE-ELEVATE-0010930-30

Who is the Hub?

Hub Partners

Program Partners

ELEVATE

IFA ILLINOIS FINANCE AUTHORITY Illinois Climate Bank

ICC INTERNATIONAL CODE COUNCIL

CHICAGO

Education, Technical, and Resource Development Partners

AIA Chicago

Argonne NATIONAL LABORATORY

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SEDAC SMART ENERGY DESIGN ASSISTANCE CENTER

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Funding Partners

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U.S. DEPARTMENT OF ENERGY

BUILDERS INITIATIVE

The Goals of the Hub are to:

- Educate & train building professionals
- Support diverse contractors
- Connect contractors to a project pipeline
- Build capacity for advanced codes and policies
- Streamline access to financial resources

The Hub is growing capacity for commercial & multi-family building retrofits.

Today's Presenters

Jerica Stacey
Director, Technical Training
International Code Council

Illinois Residential Stretch Code Workshop

An Introduction to 2023 Illinois Residential Stretch Code

The Building Energy Hub

This material is based upon work supported by the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE) under the Building Technologies Office Award Number DOE-ELEVATE-0010930-27.

THE BUILDING ENERGY HUB

What is a Stretch Code?

Home | Start Here | Resources | Education | About | Get Help

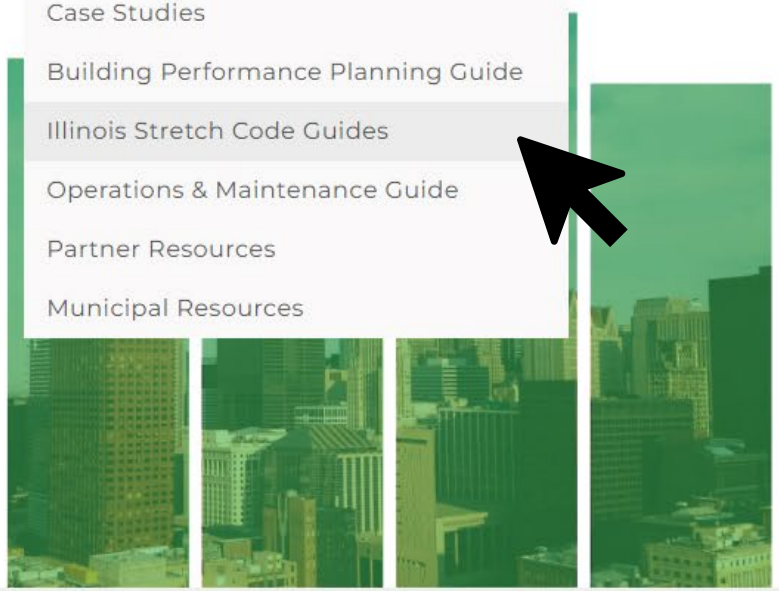
- Funding and Financing Resources
- Playbooks
- Technology Primers
- Case Studies
- Building Performance Planning Guide
- Illinois Stretch Code Guides
- Operations & Maintenance Guide
- Partner Resources
- Municipal Resources

Clear solutions. Trusted guidance.

Powering Illinois with clear building performance solutions.

How do I ask a specific question about my building?

Ask here



Get Started with the Hub

The Hub delivers practical, actionable building energy efficiency resources that help professionals achieve measurable improvements and navigate complex requirements with confidence.

GOAL & OBJECTIVES

This webinar focuses on amendments to the 2021 *International Energy Conservation Code*® (IECC) that comprise the 2023 Illinois Residential Stretch Energy Code.

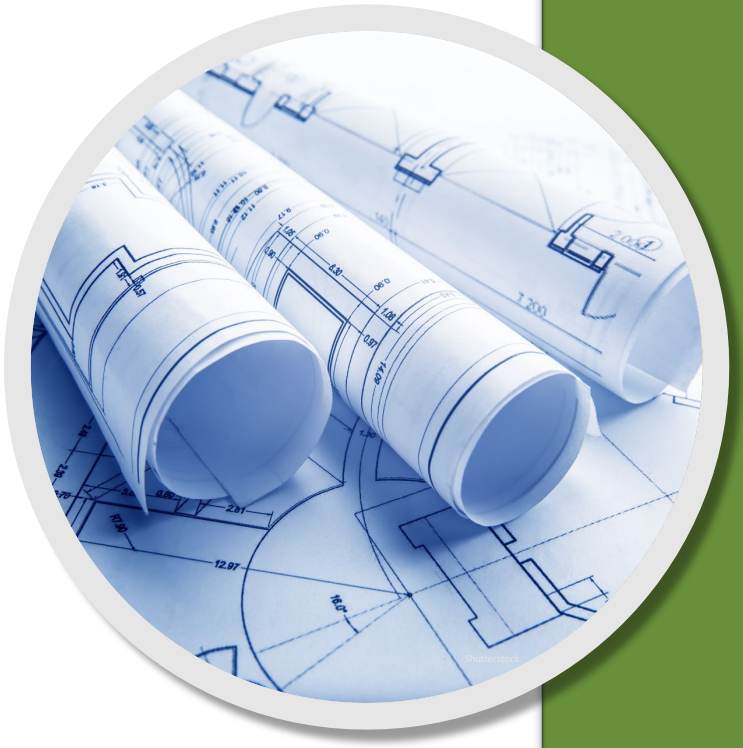
1) Describe the importance of energy codes in reducing building energy use and meeting the site energy indexes in the Climate and Equitable Jobs Act
2) Summarize the administrative amendments to the 2021 IECC in the 2023 Illinois Residential Stretch Code and those that improve useability of the code
3) Identify amendments made to the energy efficiency provisions of the 2021 IECC in the 2023 Illinois Residential Stretch Code and potential impact on the design, plan review and inspection communities
4) Locate resources, technical assistance, and support for Illinois stretch code adoption

INSTRUCTOR

Jerica Stacey

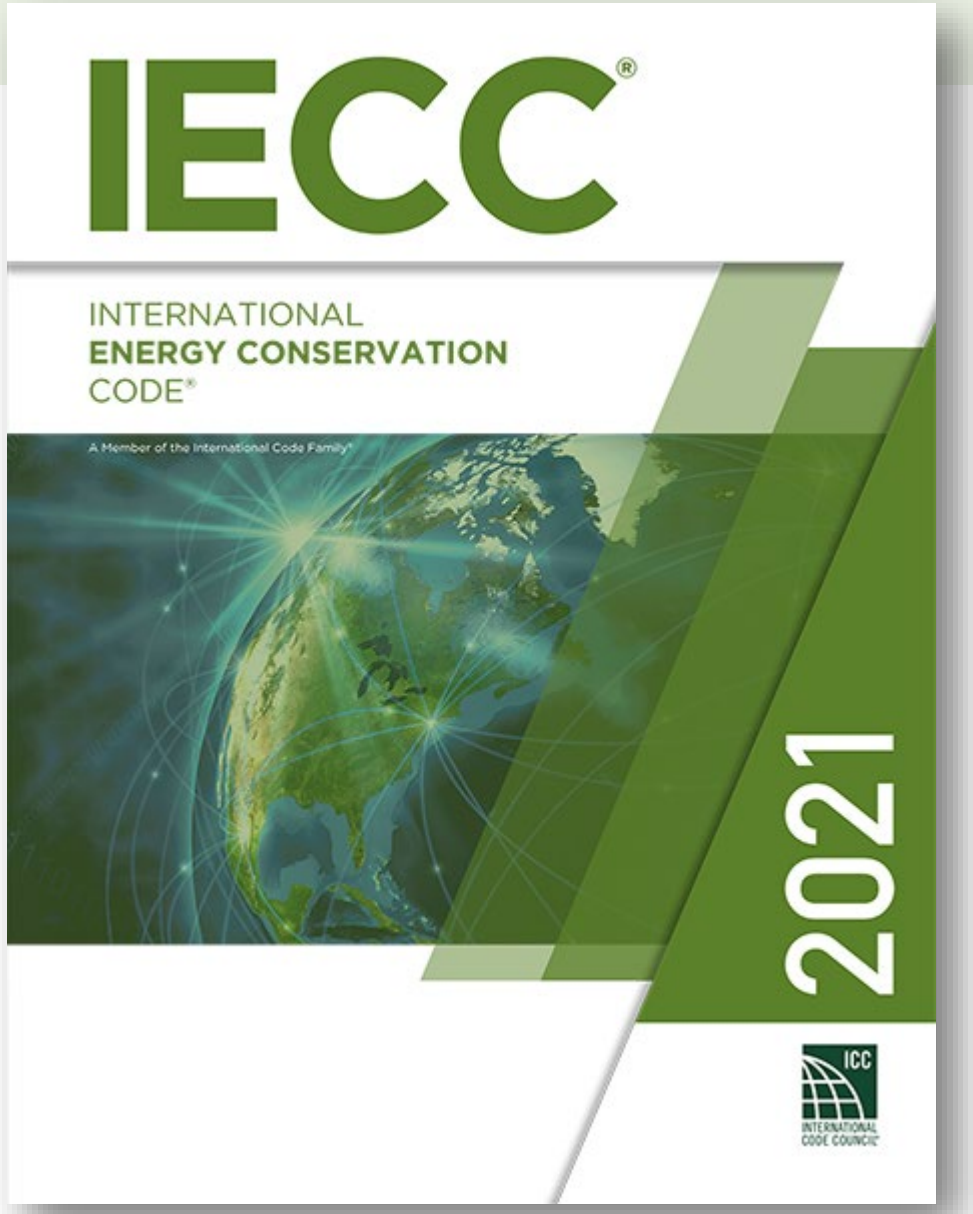
Director of Technical Training
International Code Council
Ammon, Idaho
Tel: 208.859.6578
jstacey@iccsafe.org

Overview of the 2021 IECC and 2023 Illinois Stretch Energy Code

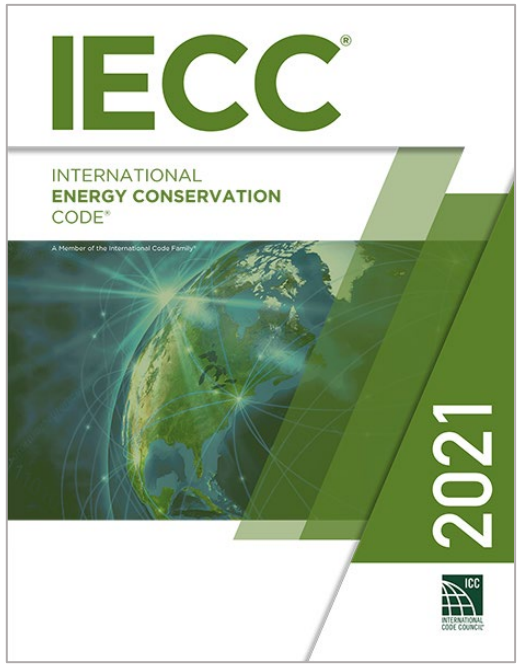


About the IECC

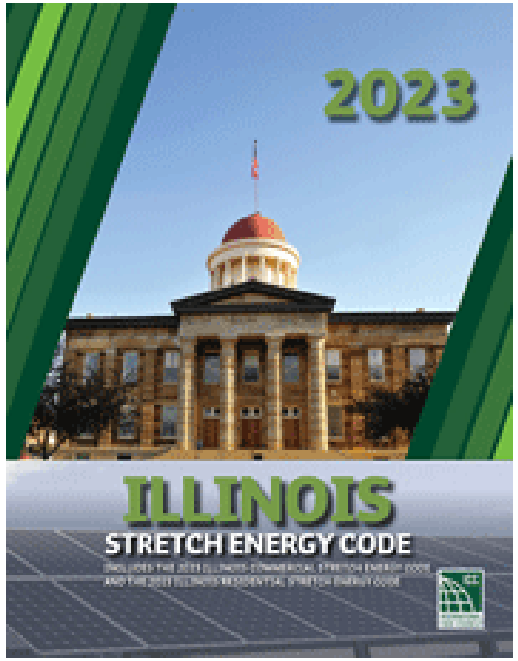
- The IECC regulates the design and construction of buildings for the effective use and conservation of energy over the useful life of each building
- This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective
- This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances



2021 IECC and the 2023 Illinois Stretch Energy Code



- Effective January 16, 2024
- Includes state-specific amendments



- Effective January 1, 2025
- Based on the 2021 IECC with amendments
- Where adopted, supersedes the Illinois Energy Conservation Code
- Evanstown first to adopt

AMENDMENT

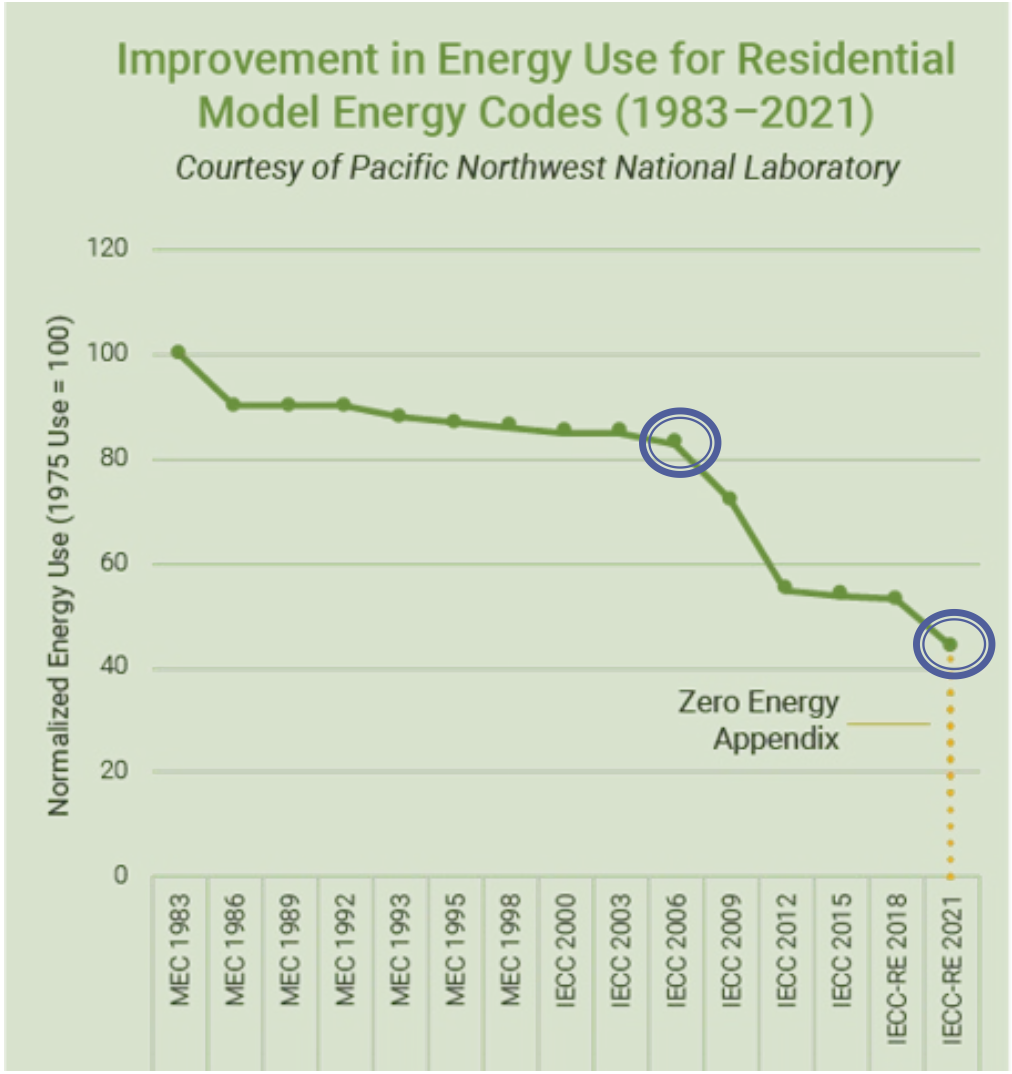
Residential Buildings Defined

RESIDENTIAL BUILDING. A detached one-family or two-family dwelling or any building that is three stories or less in height above grade that contains multiple dwelling units, in which the occupants reside on a primarily permanent basis, such as a townhouse, a row house, an apartment house, a convent, a monastery, a rectory, a fraternity or sorority house, a dormitory, and a rooming house; provided, however, that when applied to a building located within the boundaries of a municipality having a population of 1,000,000 or more, the term “residential building” means a building containing one or more dwelling units, not exceeding four stories above grade, where occupants are primarily permanent.

- IL-specific definition expands IECC definition for residential buildings

Energy Savings and Emissions Reductions – Residential

- 2021 IECC Residential DOE Determination
  - 9% increase in energy savings over the 2018 IECC
  - 9% carbon emissions reductions
- Roughly 40% increase in efficiency from the 2006 IECC



2023 IL Residential Stretch Energy Code Cost-Effectiveness Analysis, Compared to the 2021 IECC

Energy Cost Savings

9.6%

Life Cycle Energy Cost Savings

$2,355

Avoided Future Retrofit Costs

$6,474

MEMORANDUM

Pacific Northwest NATIONAL LABORATORY

Date: **1/8/2024**

To: **Lisa Hennigh, Illinois Capital Development Board**

Information Release # **PNNL- 35349**

From: **Rob Salcido, YuLong Xie, Fan Feng**

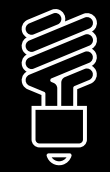
Subject: **Cost-Effectiveness Analysis of the Residential Provisions of the Illinois Stretch Energy Code Update**

As outlined in the Illinois Clean Energy Jobs Act, Public Act 102-0662, the State of Illinois is in the process of developing a stretch residential energy code. The proposed code is an enhancement of the 2021 International Energy Conservation Code (IECC), incorporating key energy saving and readiness measures from the 2024 IECC development process[1]. The State of Illinois requested that PNNL conduct a cost-effectiveness analysis by assessing the energy and economic impact of the code changes that make up the residential provisions of the Illinois Stretch Energy Code (Stretch Code).

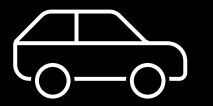
The proposed stretch code reduces energy use and operational costs for the occupant, while also ensuring homes are prepared for future electrified technologies, avoiding costly retrofit scenarios in the future.

The resulting analysis shows that the proposed code is cost-effective, yielding short-term and long-term consumer benefits when homes are built to the stretch code as compared to the 2021 IECC. Over the course of 30 years, a homebuyer will net approximately $2,355 in life-cycle energy cost savings as well as $6,474 in avoided future retrofit costs for the electrified technologies, resulting in a total life-cycle cost savings of $8,829.

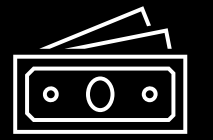
As shown in Table 2, when only considering energy cost savings, the average household can expect to save 9.6%, equating to $248 of annual utility bill savings. Over a 30-year period, these energy saving measures, collectively, will save almost $2 billion in energy costs and reduce statewide CO_2 emissions by 14,150,000 metric tons, equivalent to the annual CO_2 emissions of 3,077,000 cars on the road (1 MMT CO_2 = 217,480 cars driven/year) as outlined in Table 3. Adopting the Stretch Code will result in homes that are energy efficient, more affordable to own and operate, and which are designed and constructed to modern standards for health, comfort, and resilience.



Statewide energy savings of $2B over 30 years



Emission reductions equivalent to 3.1m cars



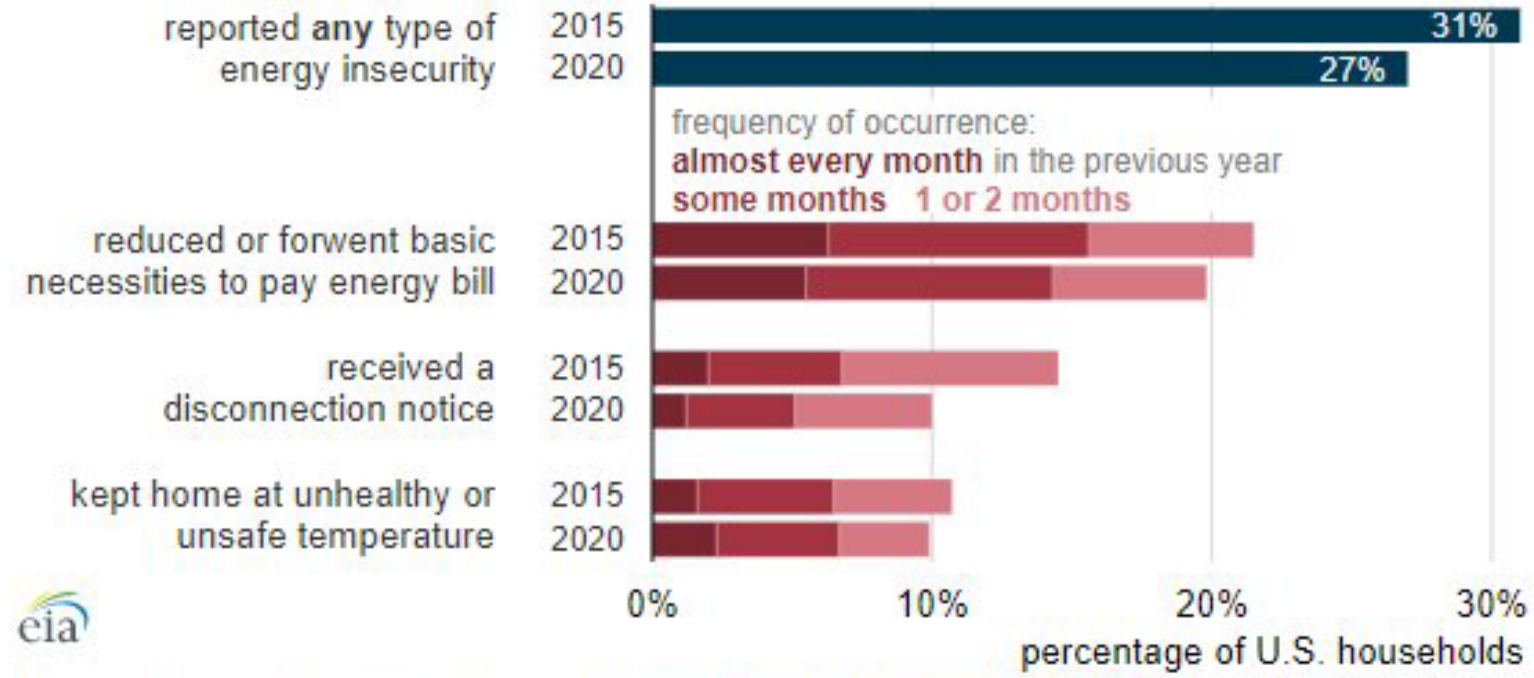
$248 of annual utility bill savings

Why is this important?

APRIL 11, 2022

In 2020, 27% of U.S. households had difficulty meeting their energy needs

U.S. household energy insecurity measures (2015 and 2020)



eia

Source: U.S. Energy Information Administration, *Residential Energy Consumption Survey* (RECS)

PRESS RELEASE

Study: One in Four Low-Income Households Spend Over 15% of Income on Energy Bills

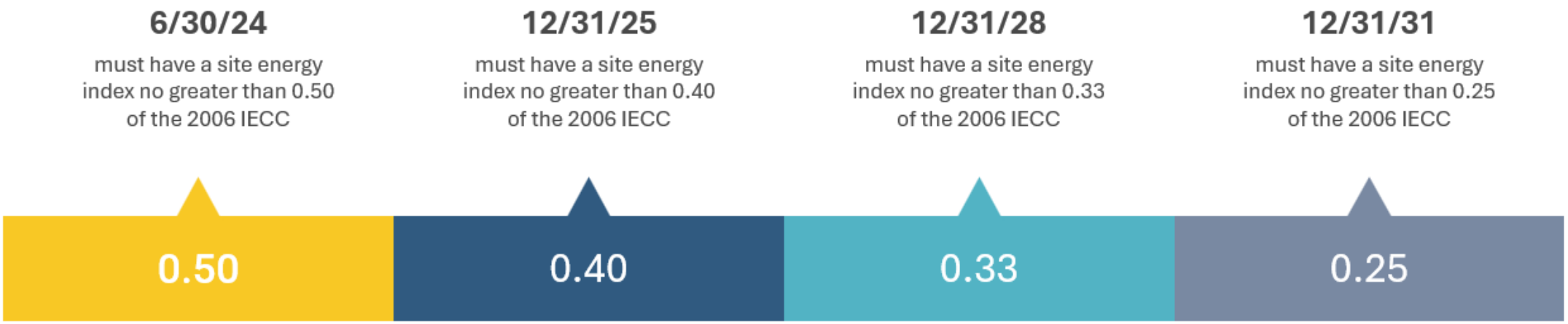
September 11, 2024

Climate and Equitable Jobs Act (CEJA)

- Incentivizes renewable energy development
- Accelerates electric vehicle adoption and expands charging station infrastructure
- Creates statewide clean energy workforce training programs to ensure our workforce is prepared for the jobs of the future
- Equitably supports communities facing energy transitions and much more

CEJA and Site Energy Indexes

Goal: achieve a site energy index of 0.25 of the 2006 IECC or less by end of 2031



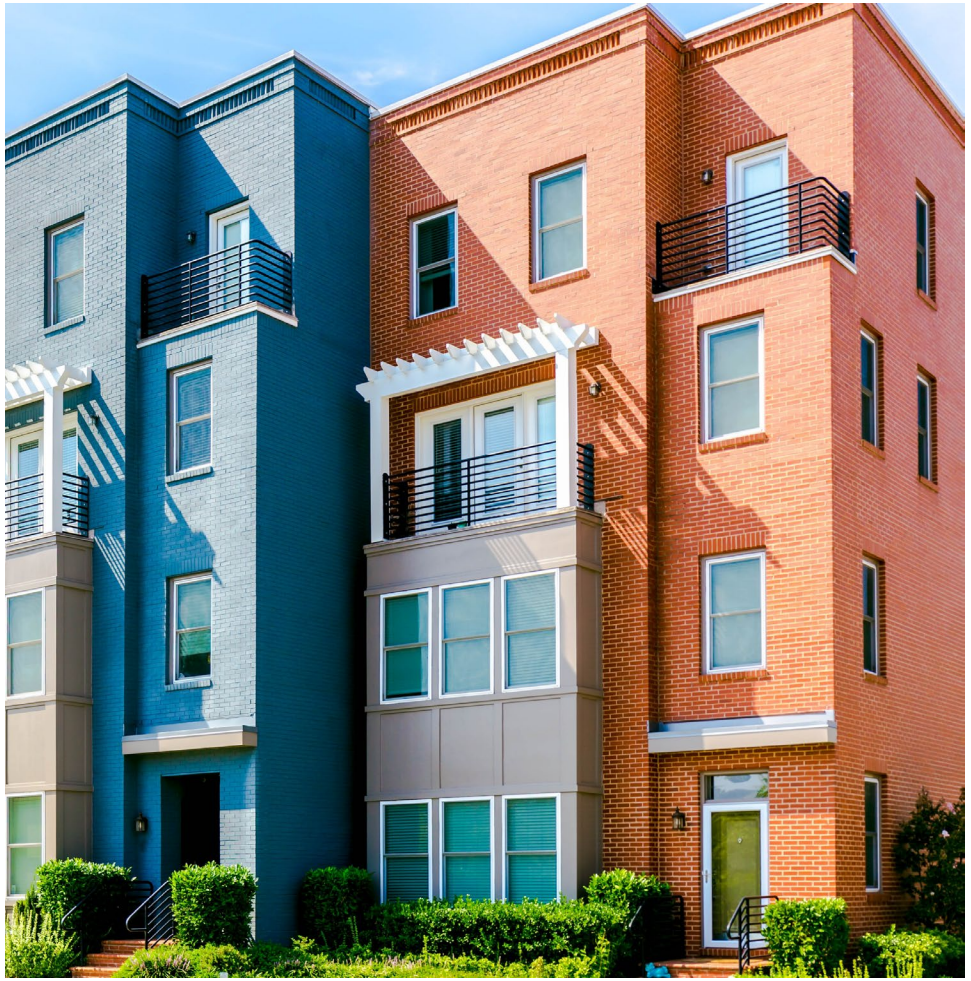
Codified in R101.1.1 Adoption

Administration, Definitions, and General Requirements

Significant Amendments to the 2021 IECC, Chapters 1-3

Chapter 1: Scope and Administration

- Establishes the limits of applicability of the code and describes how the code is to be applied and enforced



Chapter 1: Scope and Administration

- Establishes the limits of applicability of the code and describes how the code is to be applied and enforced
- Establishes authority and duties of the code official appointed by the authority having jurisdiction

Chapter 1: Scope and Administration

- Establishes the limits of applicability of the code and describes how the code is to be applied and enforced
- Establishes authority and duties of the code official appointed by the authority having jurisdiction
- Establishes the rights and privileges of the design professional, contractor and property owner

AMENDMENT

Compliance, R101.5

- AHJ to establish its own enforcement procedures

- Compliance submission options expanded
  - Compliance materials
  - Professional architect or engineer seal
  - REScheck compliance report

AMENDMENT

Above Code Programs, R102.1.1

- Passive House Institute
- Passive House Institute US
- Appendix RC, Zero Energy Residential Building Provisions

APPENDIX RC

AMENDMENT

Above Code Programs, R102.1.1

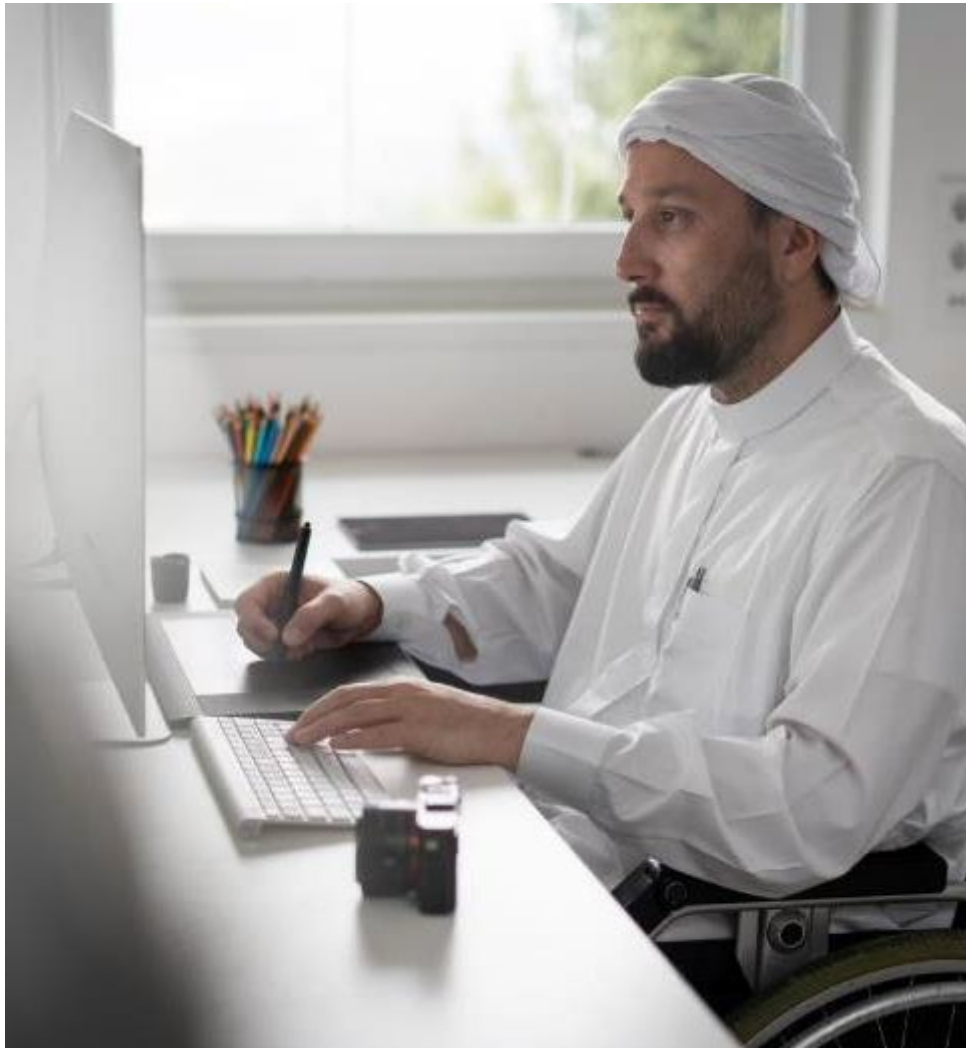
APPENDIX RC

- "Mandatory" requirements in Table R405.2
- Building thermal envelope meets minimum code provisions

AMENDMENT

Solar-ready System, Construction Documents, R103.2.2

- **Solar-ready system** shown in construction documents
  - Dedicated roof area
  - Roof dead load
  - Roof live load
  - Ground snow load
  - Routing of conduit or pre-wiring to electric service panel
  - Plumbing to service water heating system



AMENDMENT

Solar-ready System, Inspections, R105.2.3 and R105.2.5

Required Inspections

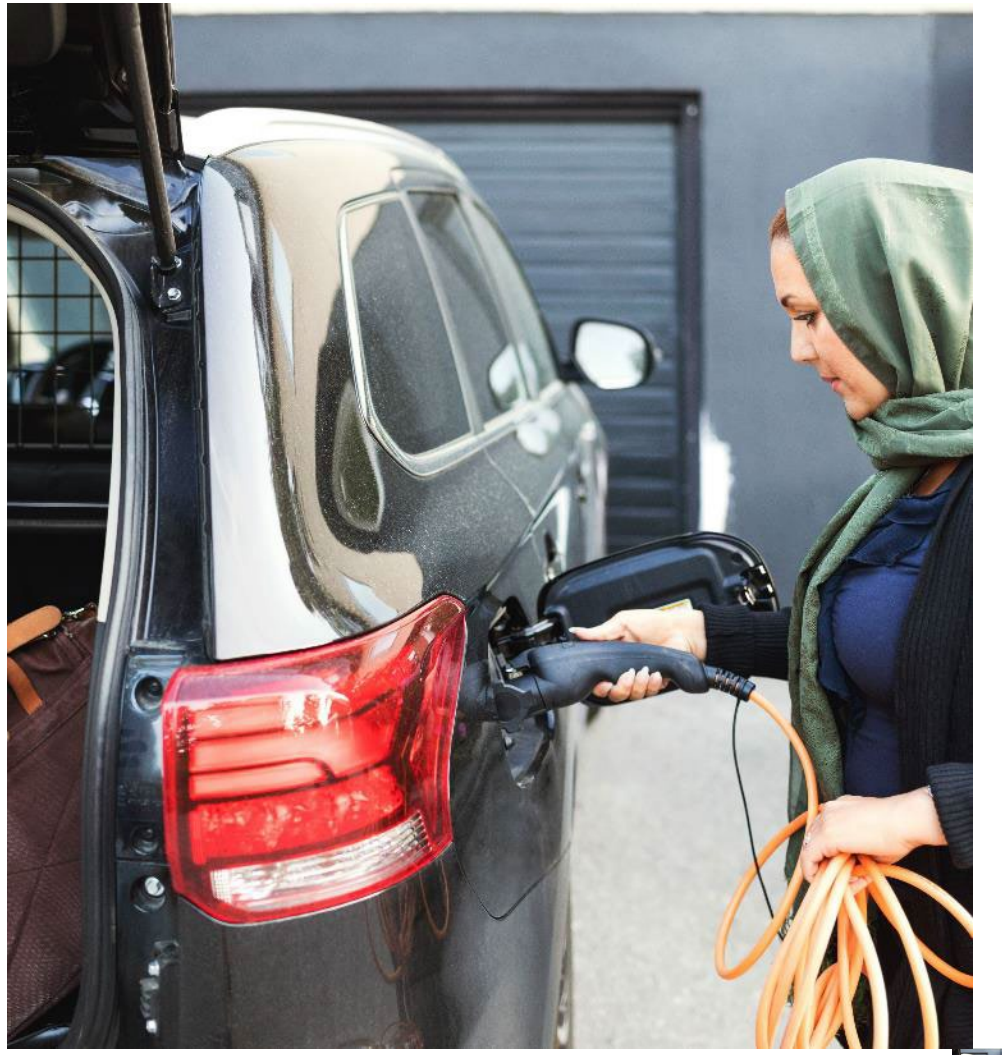
- Footing and foundation
- Framing and rough-in
- Plumbing rough-in — Verify pathways for routing of plumbing from solar ready zone to SWH system
- Mechanical rough-in
- Electrical rough-in — Verify locations, distribution and capacity of electrical system, as well as conduit or prewiring from solar ready zone to electrical panel
- Final

Chapter 2: Definitions

- IECC includes definitions for specific terms
- Most defined terms are *italicized* in code text
  - When definition is key to understanding a particular code provision
- Undefined terms
  - Other I-Code definitions apply
  - Common-use definitions apply

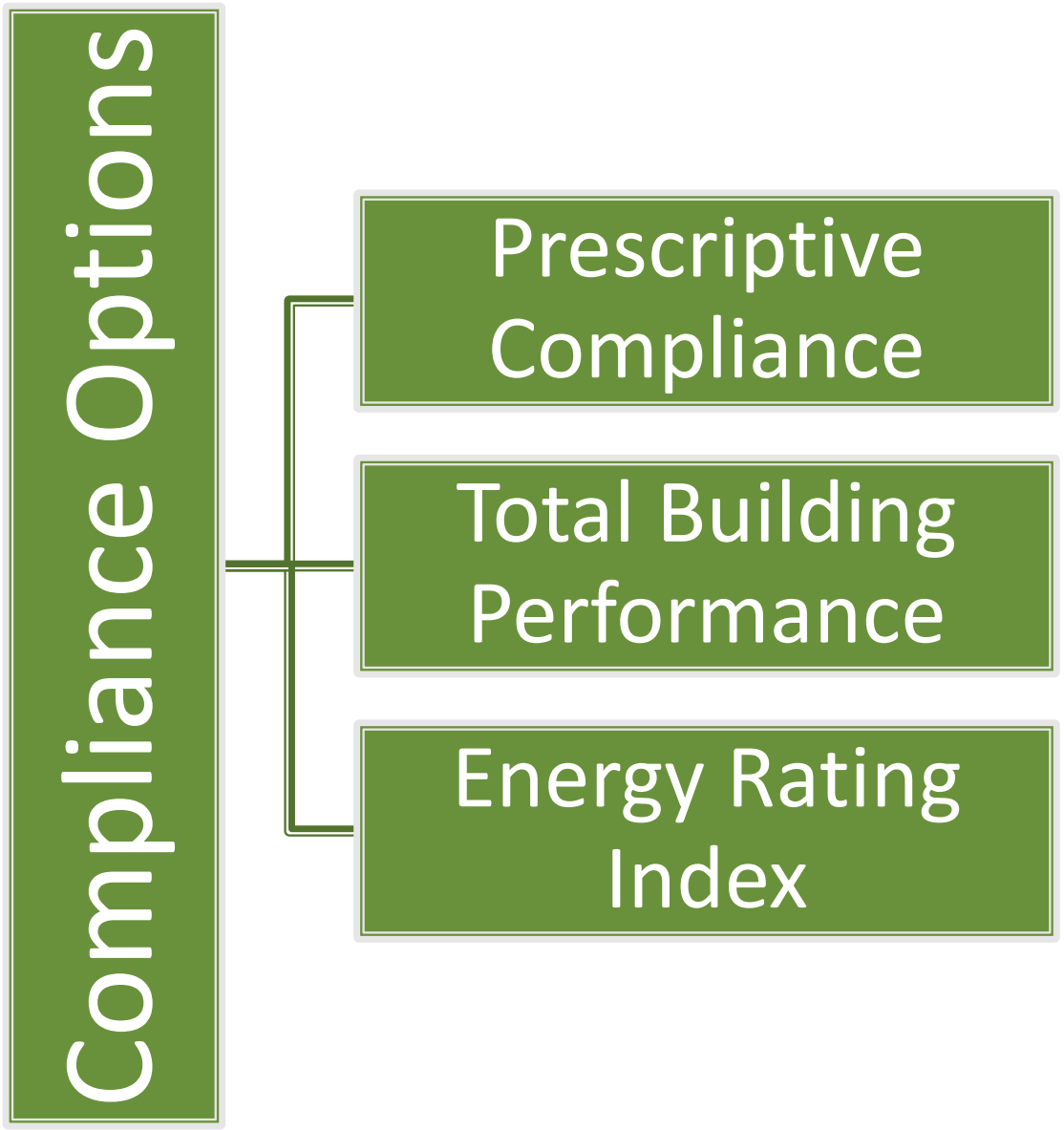
Stretch Code Definitions

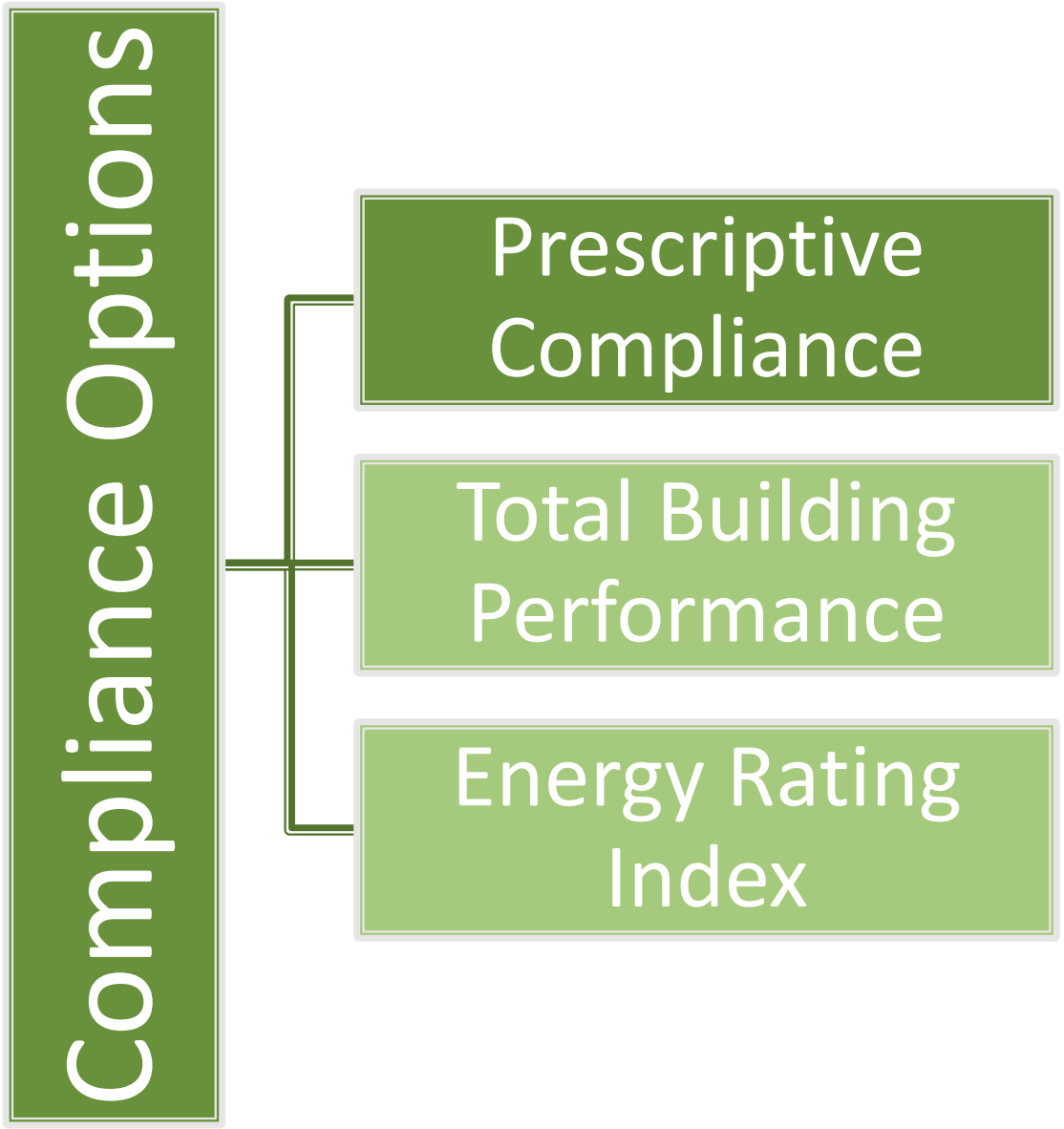
- Electric vehicle charging related terms
- Demand response related terms
- Approved source
- Gas heat pump space heating system
- Solar-ready zone



Residential Energy Efficiency Requirements

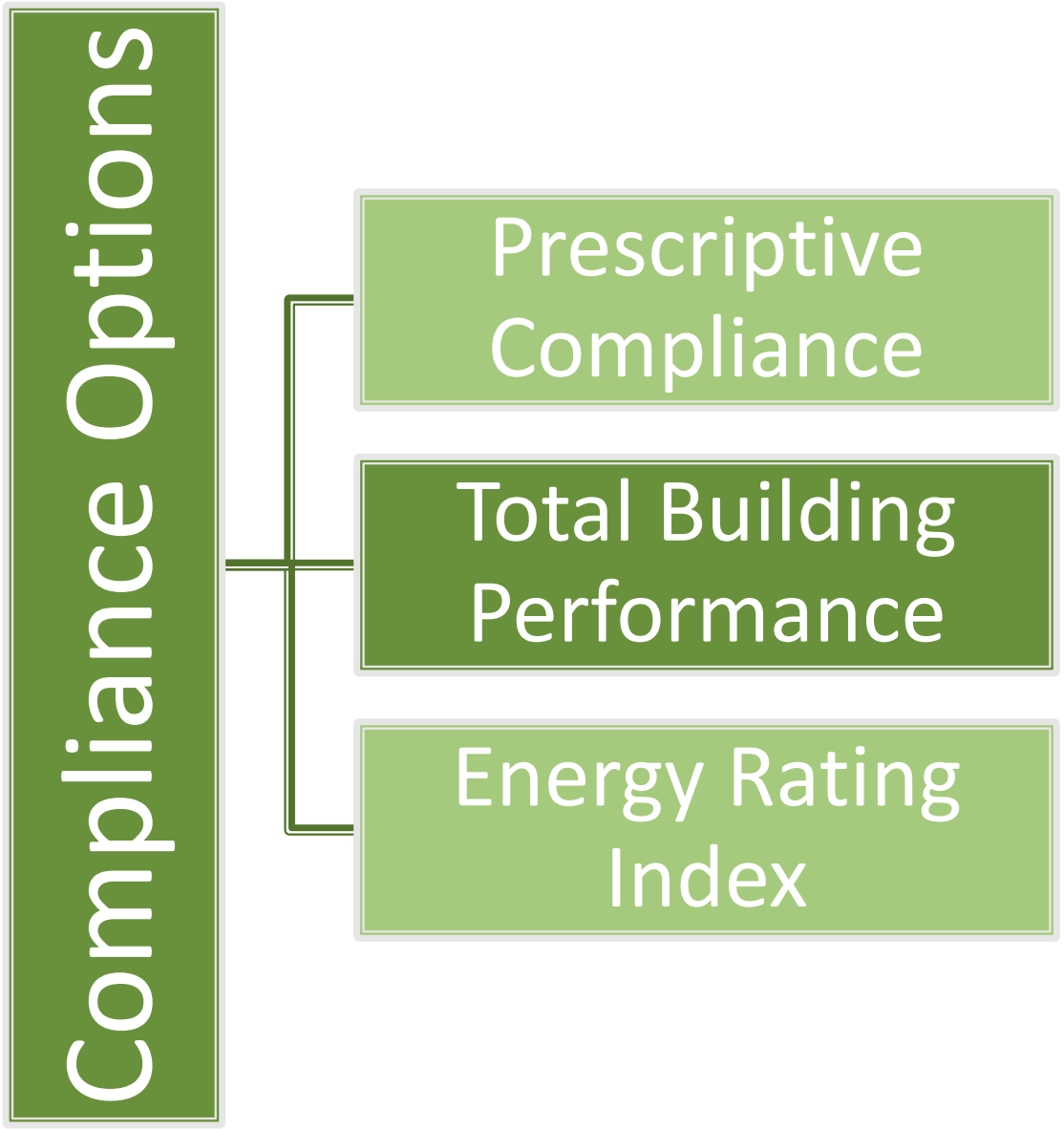
Significant Amendments to the 2021 IECC, Chapter 4





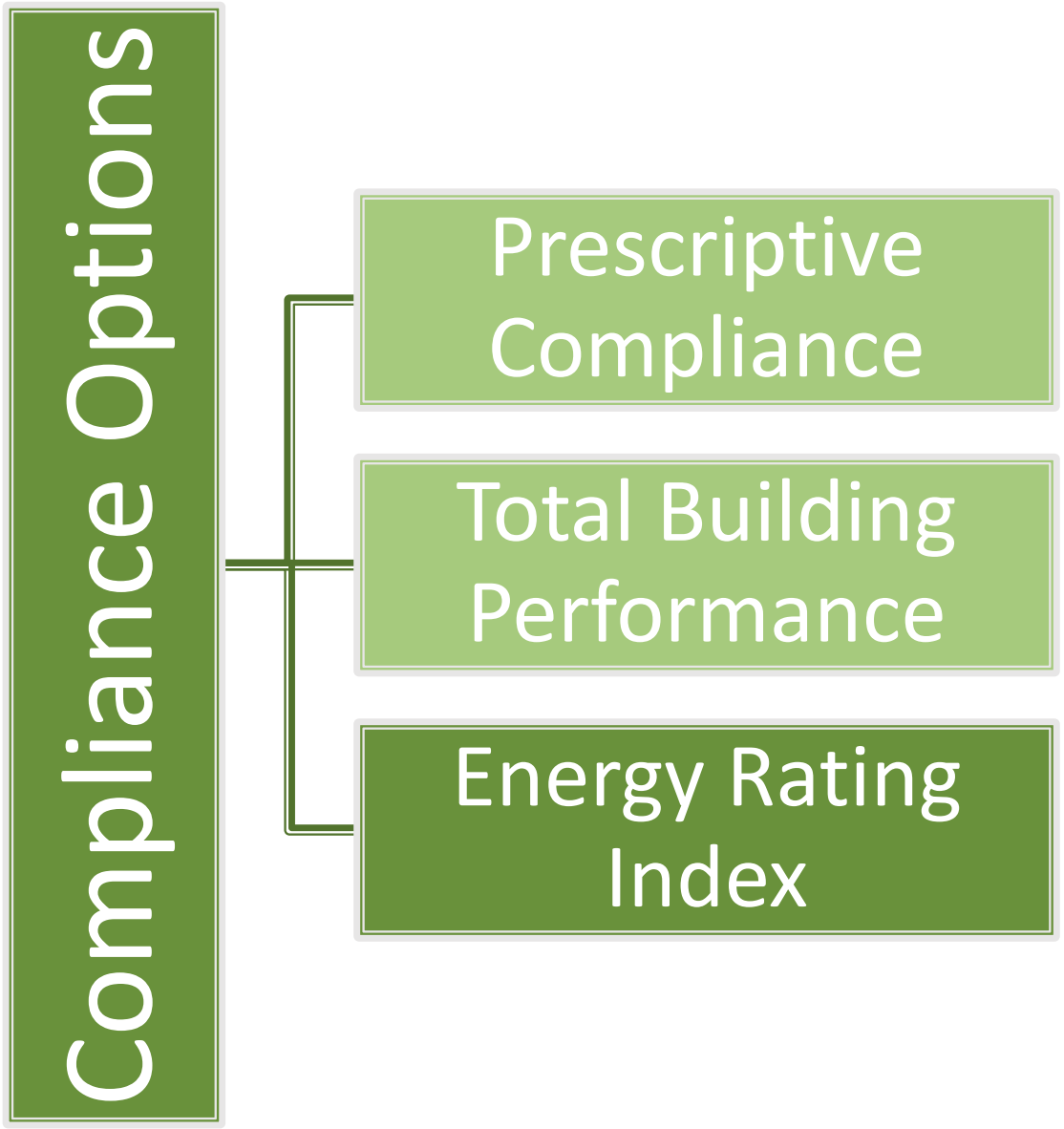
Sections R401 – R404, R408

- *Least* flexible option, comply with the code "as written"
- Does not require energy modeling
- Three options for insulation requirements
  - U-factor compliance
  - R-value compliance
  - Total UA alternative compliance
- Choice of additional energy efficiency credits



Section R405

- *More* flexible option
- Calculates the estimated **site energy use** of a building
  - Requires energy modeling
  - Analysis considers heating, cooling, mechanical ventilation, water heating
- Compliance based on
  - Table of required measures
  - Building thermal envelope backstop
  - Comparison of the site energy use of a proposed building to the site energy use of the standard reference design



Section R406

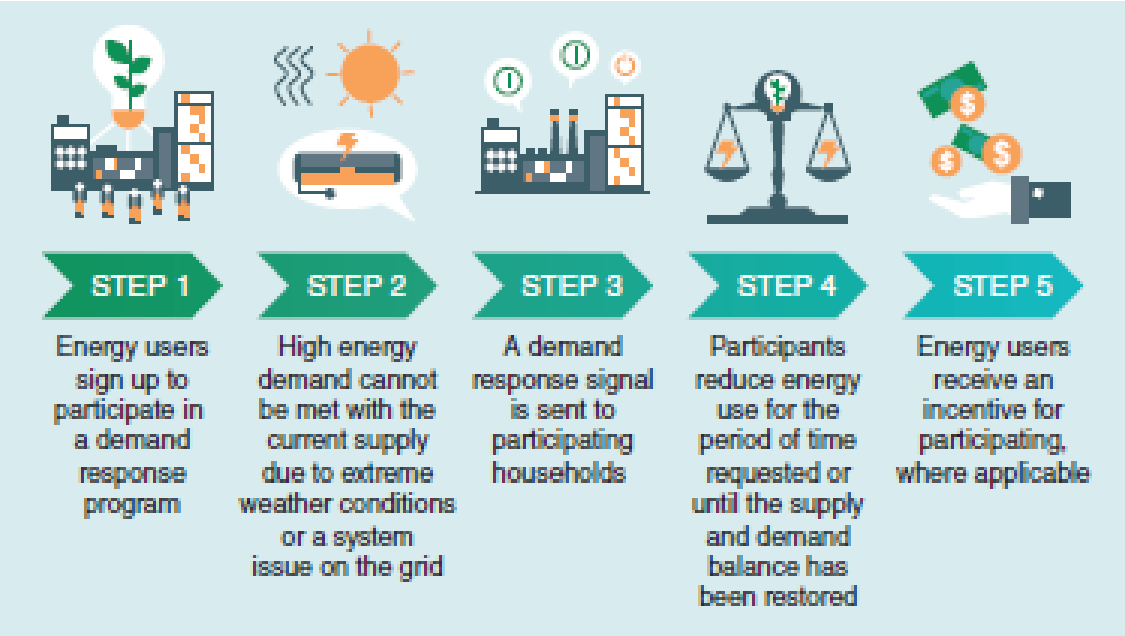
- *Most* flexible option
- Measures the **energy performance** of a building
  - Requires energy modeling
  - Analysis includes building thermal envelope, HVAC and water heating systems, lighting, appliances, fans, orientation, etc.
- Compliance based on
  - Table of required measures
  - Building thermal envelope backstop
  - Maximum ERI value with and without combustion equipment
- Requires a third party

Residential Energy Efficiency, Chapter 4 Overview

- R401 General
- R402 Building Thermal Envelope
- R403 Systems
- R404 Electrical Power and Lighting Systems
- R405 Simulated Building Performance
- R406 Energy Rating Index Compliance Alternative
- R407 Tropical Climate Region Compliance Path
- R408 Additional Efficiency Package Options

AMENDMENT

Demand Responsive Thermostat, R403.1.3



- All thermostats must be provided with a demand responsive control that allows participation in a utility demand response program
- Incrementally adjusts the heating and cooling setpoints in response to a demand response signal
- Assisted living facilities exempt

AMENDMENT

Demand Responsive Water Heating, R403.5.4

- Electric storage water heaters (40 – 120 gallons, 12kW or less) must be provided with demand responsive controls

Photo courtesy of Rheem

AMENDMENT

EV Infrastructure, R404.4

- One- and two-family dwellings and townhouses with a designated attached or detached garage must have one EV ready space

Electric Vehicle Definitions

- **EV READY SPACE.** An automobile parking space provided with a branch circuit and either an outlet or enclosure for connection to EVSE.

- **ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE).** Equipment for plug-in power transfer…specifically for the purpose of transferring energy between the premises wiring and the electric vehicle.

AMENDMENT

Electric Readiness, R404.5

- Sufficient electric infrastructure must be provided where non-electric space heating equipment, cooktops, ovens, clothes dryers, or water heaters are installed
- Unused conductors must be labeled as spares

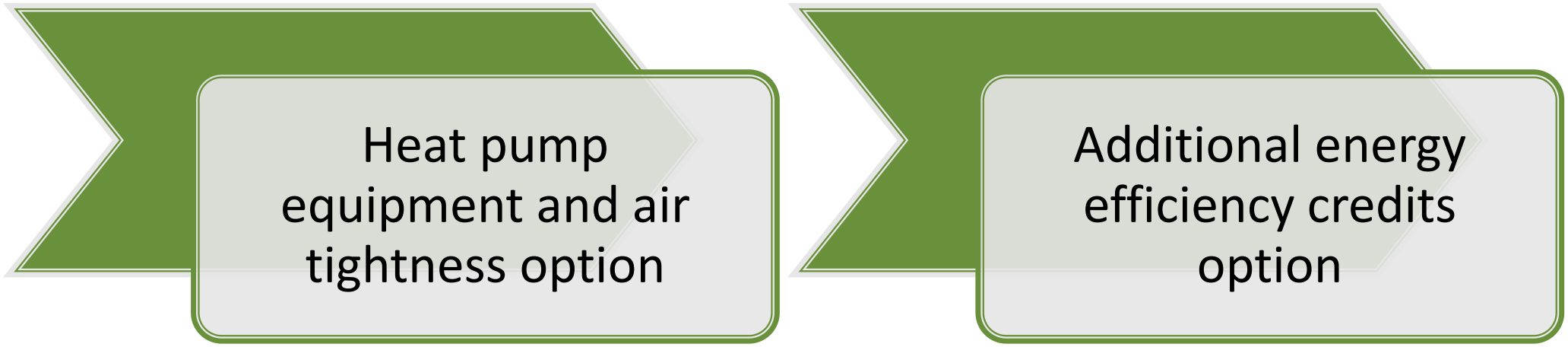
AMENDMENT

Renewable Energy Infrastructure, R404.6

- One- and two-family dwellings and townhouses, a section of the roof or building overhang must be designated and reserved for the future installation of PV

AMENDMENT

Additional Efficiency Requirements, R408



AMENDMENT

Heat Pump Equipment and Air Tightness

- Electric pump required for heating and cooling
- Heat pump water heater required

- Air leakage rate of 2.0ACH50 or less
- ERV or HRV required

AMENDMENT

Additional Energy Efficiency Credits

- Minimum of 30 credits required
- 35 credits required for homes larger than 5,000ft^2

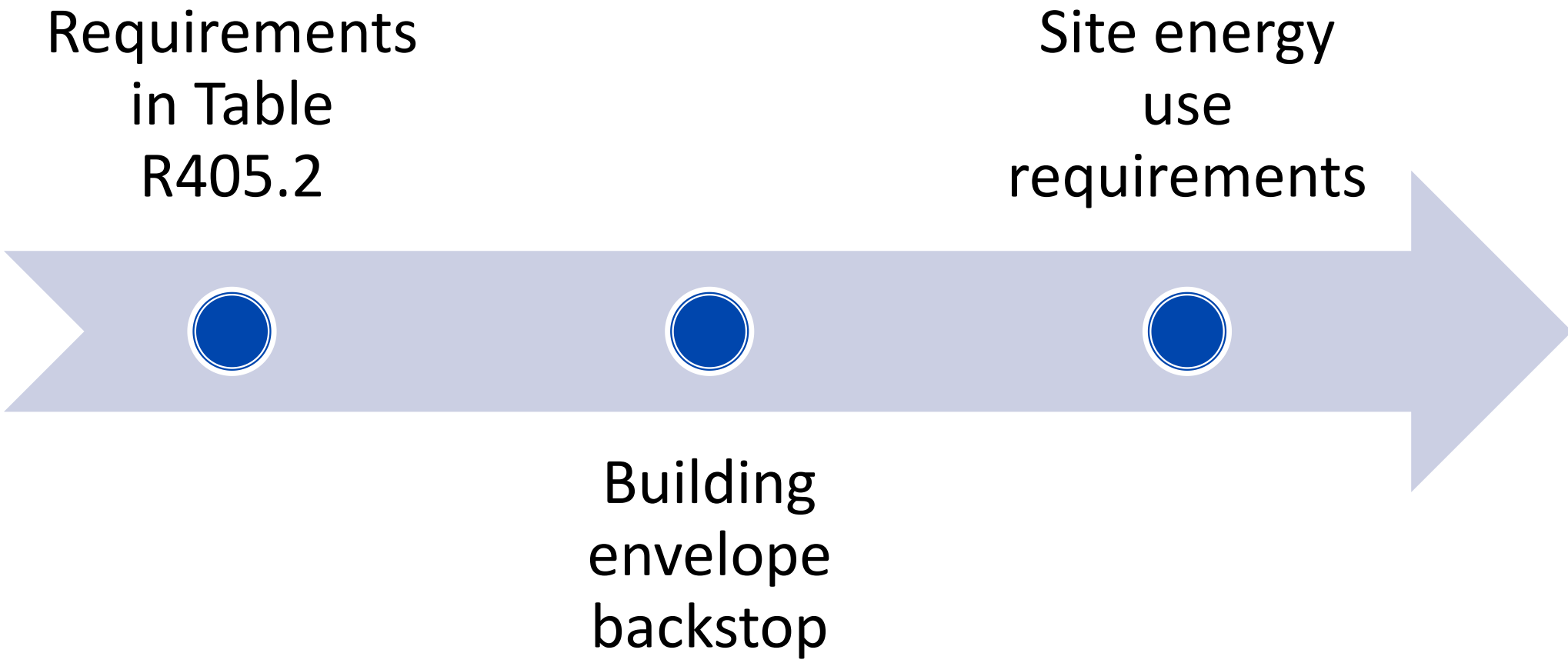
Enhanced envelope performance	More efficient HVAC equipment
Reduced energy use in SWH	More efficiency duct thermal distribution system
Improved air sealing and efficient ventilation	Energy efficient appliances

Credits for Additional Energy Efficiency (R408)				
Check Selected Measure	Measure Number	Measure Description	Credit Value	
			Climate Zone 4	Climate Zone 5
	R408.3.1.1 (1)	≥ 2.5% reduction in total UA	1	1
	R408.2.1.1 (2)	≥ 5% reduction in total UA	2	3
	R408.3.1.1 (3)	> 7.5% reduction in total UA	2	3
	R408.3.1.2	0.22 U-factor windows	3	4
	R408.3.2 (1)	High performance cooling system option 1	3	3
	R408.3.2 (2)	High performance cooling system option 2	3	2
	R408.3.2 (3)	High performance gas furnace option 1	5	7
	R408.3.2(4)	High performance gas furnace option 2	4	5
	R408.3.2(5)	High performance heat pump system option 1	21	31
	R408.3.2 (6)	High performance heat pump system option 2	22	32
	R408.3.2 (7)	Ground source heat pump	23	33
	R408.3.2 (8)	High performance gas heat pump space heating system option 1	8	11
	R408.3.2 (9)	High performance gas heat pump space heating system option 2	11	16

Section R405

Residential Simulated Building Performance

R405.2 Total Building Performance Compliance



R405.2 Total Building Performance Compliance (1)

TABLE R405.2REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE

SECTION[a]	TITLE
General	
R401.3	Certificate
R408	Additional efficiency requirements
Building Thermal Envelope	
R402.1.1	Vapor retarder
R402.2.3	Eave baffle
R402.2.4.1	Access hatches and door insulation installation and retention
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls
R404.4	Electric vehicle power transfer infrastructure
R404.5	Electric readiness
R404.6	Renewable energy infrastructure

AMENDMENT

R405.2 Simulated Building Performance Compliance (2)

2021 IECC Backstop

- Efficiency levels of the 2009 IECC

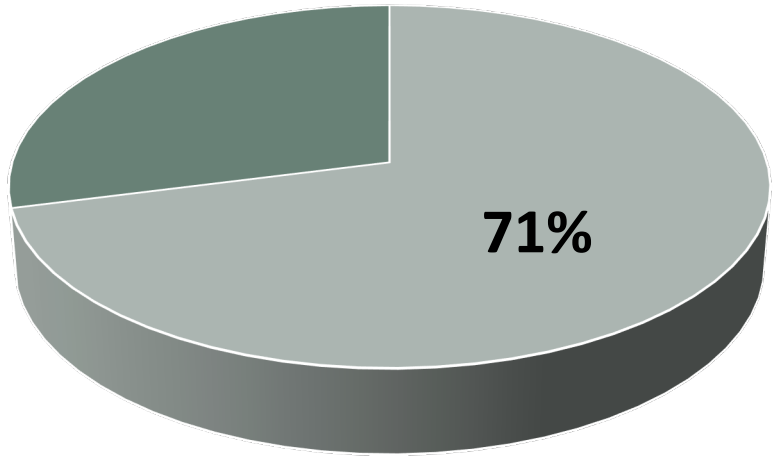
2023 Residential Stretch Code Backstop

- $UA_{\text{Proposed design}} \leq \mathbf{1.10} \times UA_{\text{Prescriptive reference design}}$

AMENDMENT

R405.2 Simulated Building Performance Compliance (3)

Site energy use of proposed design must be ≤ 71% of the site energy use of the standard reference design



Section R406

Residential Energy Rating Index Compliance Alternative

R406 – Energy Rating Index Overview

- ERI compliance requires the design to be a specified percentage better than the reference home
- Rated Home with Index of 100 = Reference Home meeting 2006 IECC
- Each 1% reduction in energy use = 1 point deduction from index
- Zero Energy Home = ERI Index of 0
- Essentially a HERS score with modified ventilation rate

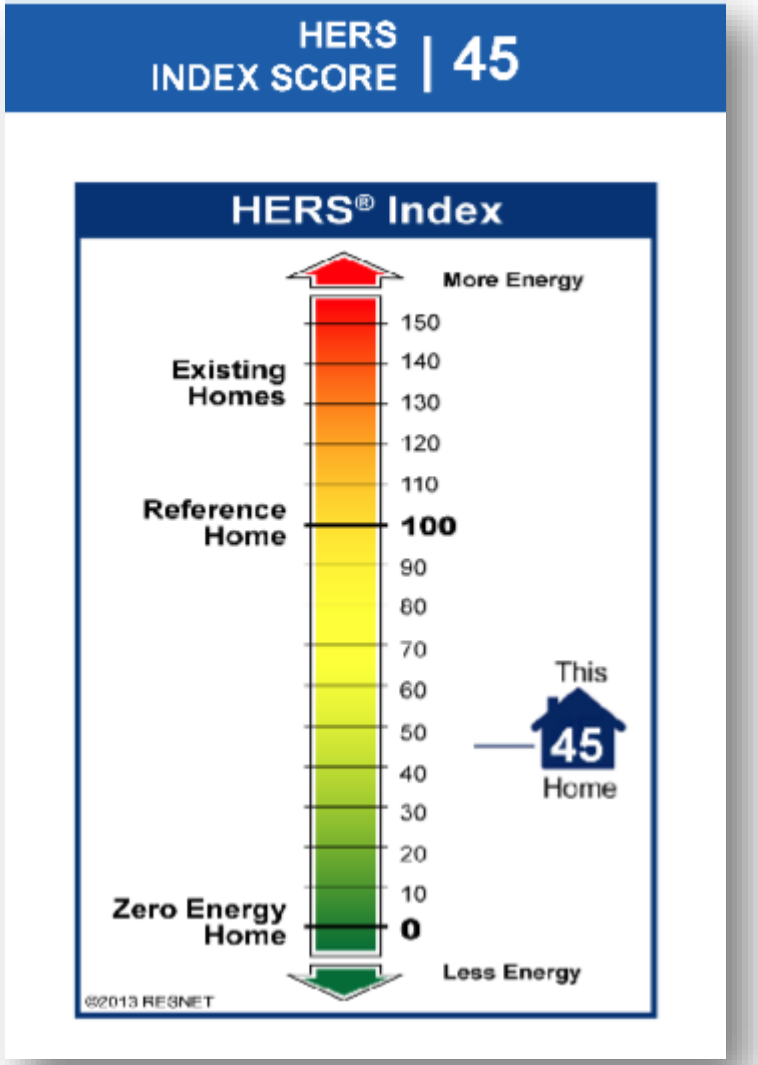


Image courtesy of P. Fairey, FSEC

R406.2 ERI Compliance

- Requirements in Table R406.2
- Building thermal envelope backstop
- ERI values in Table R406.5

Photo Courtesy of Building Efficiency Resources

Table R406.5 Maximum Energy Rating Index

Climate Zone	ERI Without Combustion Equipment	ERI With Combustion Equipment
4	54	51
5	55	50

Resources

- Read-only version of the 2023 Illinois Stretch Energy Code: https://codes.iccsafe.org/content/ILSEC2023P1
- The Building Energy Hub: https://www.buildinghub.energy/
- Cost effectiveness analysis of 2023 residential provisions: https://cdb.illinois.gov/content/dam/soi/en/web/cdb/business/codes/ecacouncil/stretch/docs/residential-stretch-code-cost-analysis-4-11-24.pdf
- Climate and Equitable Jobs Act: https://epa.illinois.gov/topics/ceja.html
- CEJA Updates & Program Status: https://dceo.illinois.gov/ceja/ceja-program-announcements.html

Resources

- Midwest Energy Efficiency Alliance: https://www.mwalliance.org/building-efficiency/building-energy-codes
- Building energy codes program: https://www.energycodes.gov/
- Residential Energy Consumption Survey: https://www.eia.gov/consumption/residential/
- ACEEE Energy Burden Study: https://www.aceee.org/press-release/2024/09/study-one-four-low-income-households-spend-over-15-income-energy-bills

International Code Council, Inc.
Training Department

888-ICC-SAFE, Ext 33821
Learn@ICCSAFE.org

Building Professional Careers!

Illinois Stretch Code Resources

Hub Stretch Code Guides

- 2023 Commercial Stretch Code Guide
- 2023 Residential Stretch Code Guide

Illinois Stretch Energy Code Compliance Checklists

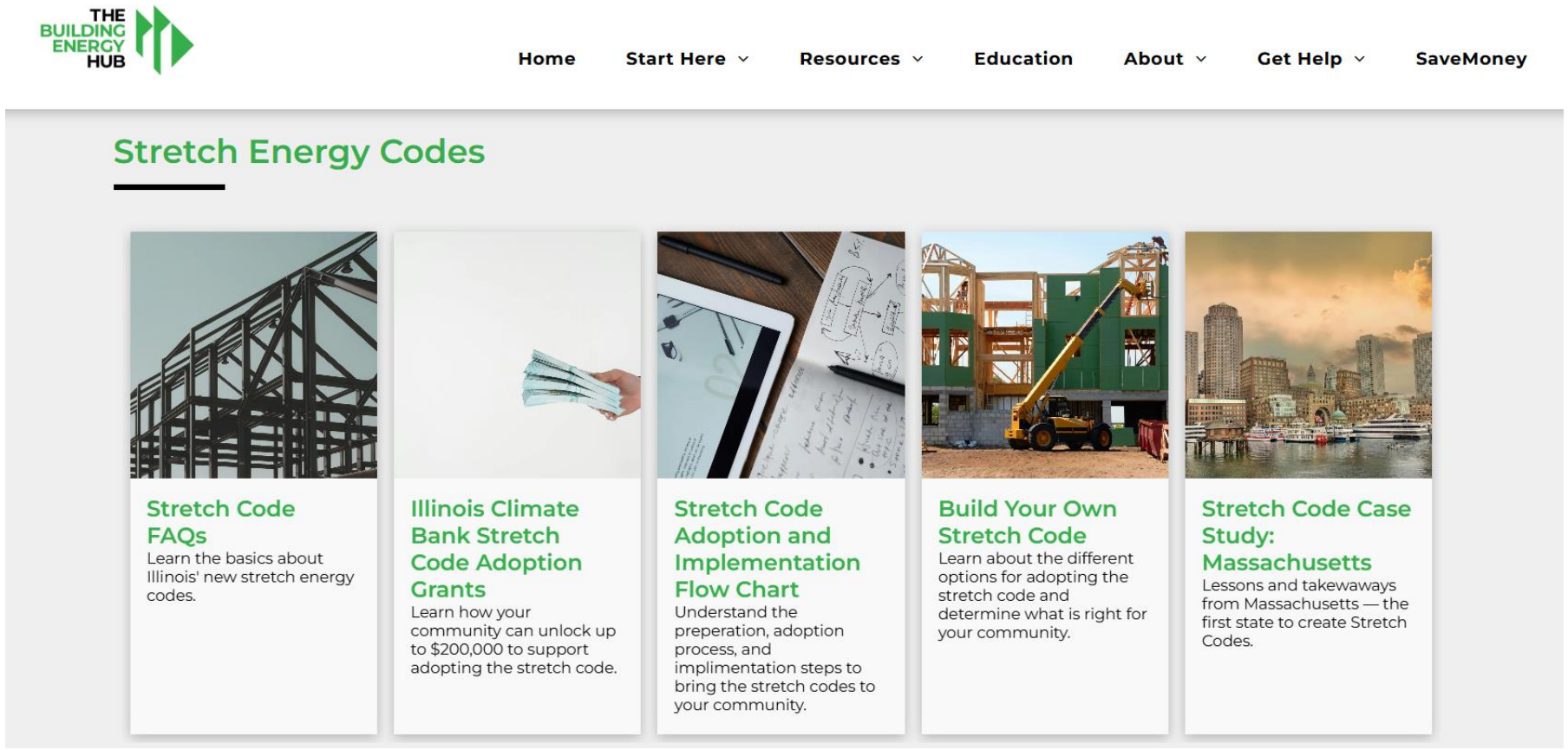
- 2023 Commercial Stretch Code Checklist
- 2023 Residential Stretch Code Checklist

SEDAC Energy Code Resources

- 2023 Commercial Stretch Code Primer
- 2023 Residential Stretch Code Primer

Hub: Municipal Resources

Benchmarking, Building Performance, Stretch Codes, Finance

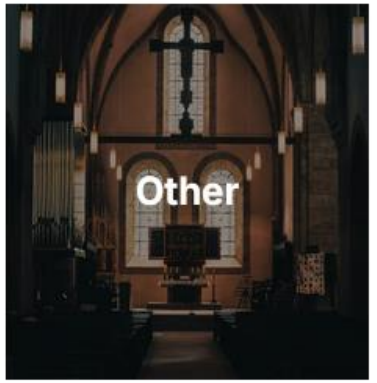


SCAN ME

Hub: Funding Resources

Financing Options by Building Sector

We've compiled useful resources to help you find suitable funding and financing options for your next project.



Engage with the Hub

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