



# Understanding the Energy Rating Index Performance Path

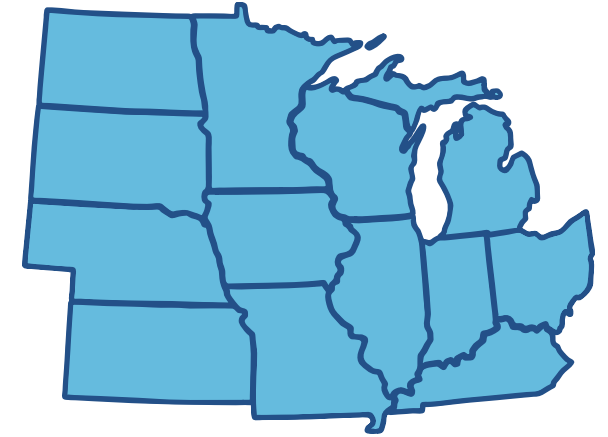


Webinar Will Begin Shortly

August 7, 2024

# Who We Are

The Midwest Energy Efficiency Alliance (MEEA) is a collaborative network, promoting energy efficiency to optimize energy generation, reduce consumption, create jobs and decrease carbon emissions in all Midwest communities.



MEEA is a non-profit membership organization with 170+ members, including:



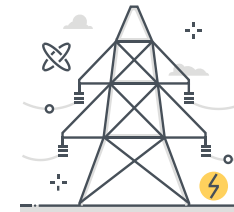
Energy Service  
Companies &  
Contractors



State & Local  
Governments



Academic &  
Research Institutions



Electric &  
Gas Utilities



Community-based  
Organizations

# Logistics

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Webinar is being recorded and will be shared with attendees.

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Attendees are muted.

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Questions? Use the Q & A Feature any time during presentation. Questions will be answered at the end.

# Today's Speakers

## *UNDERSTANDING THE ENERGY RATING INDEX PERFORMANCE PATH*



**Jerica Stacey**

International Code Council's  
Training Department  
Director of Technical Training



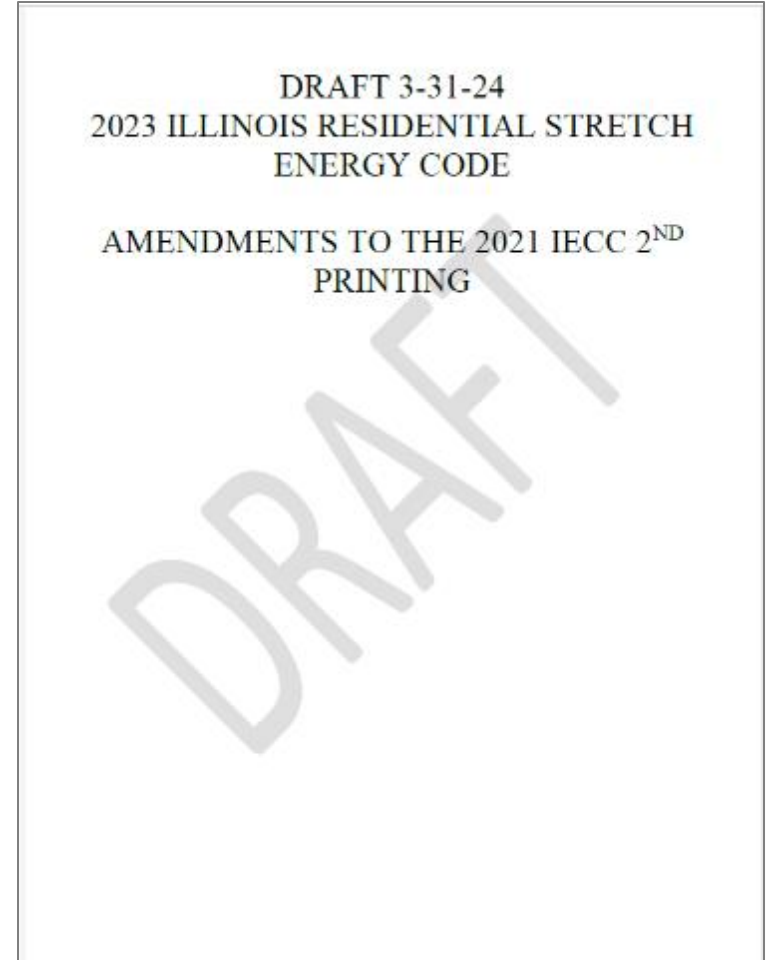
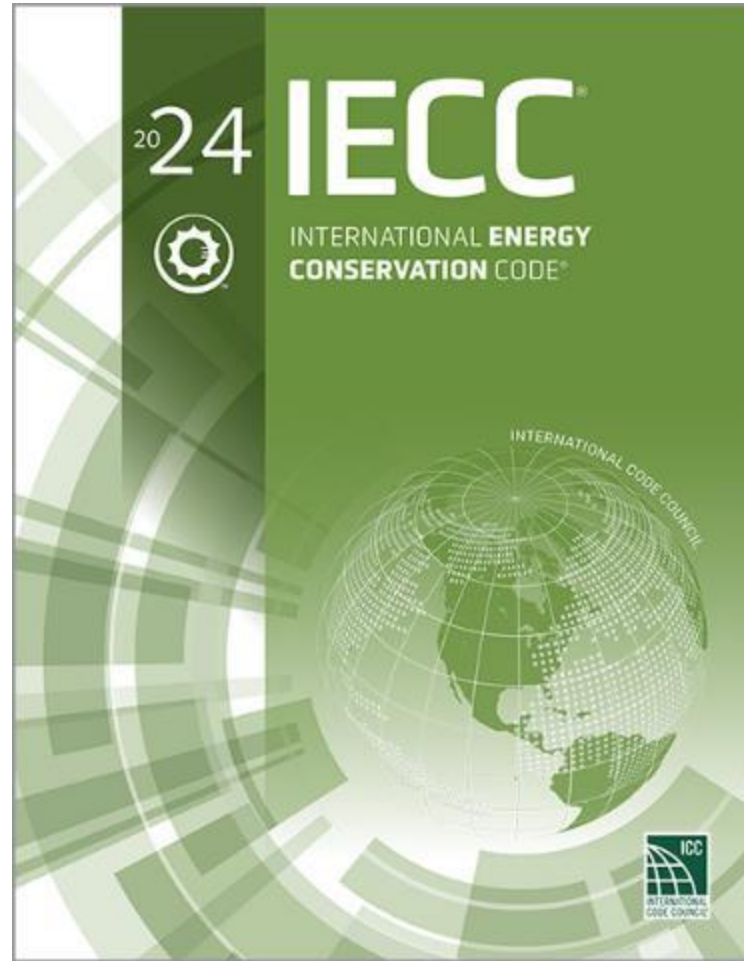
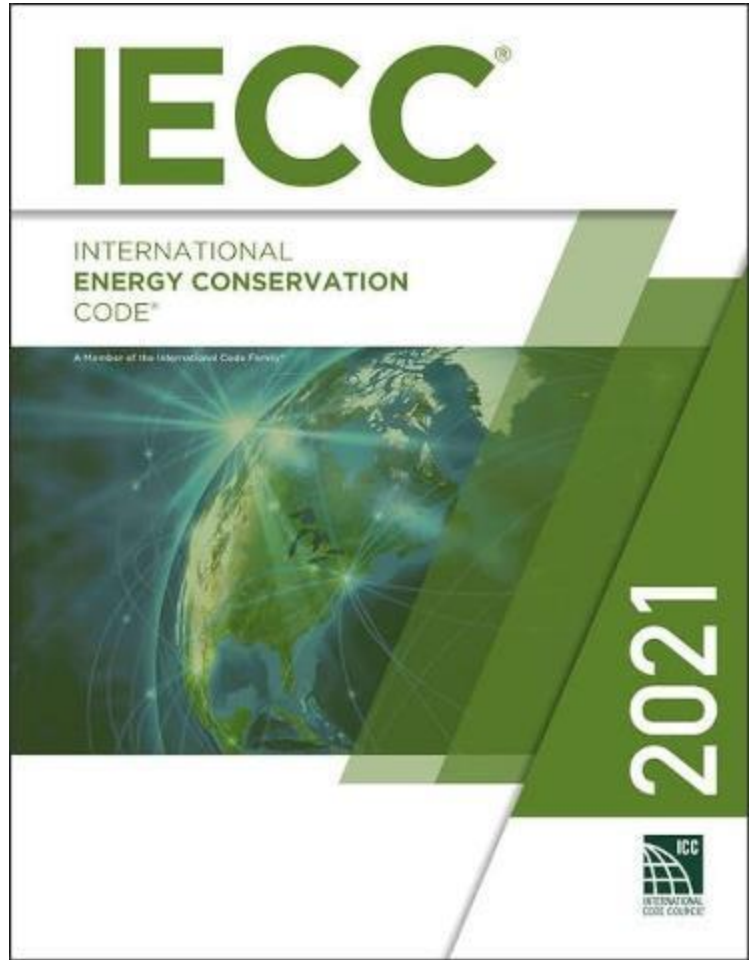
**Sandy Gallo**

Building Efficiency Resources  
Vice President

**This webinar focuses on the Energy Rating Index performance path of the 2021 and 2024 IECC.**

- 1) Compare the compliance options for residential projects
- 2) Describe the requirements for ERI compliance
- 3) Discuss documentation requirements for the ERI compliance path
- 4) Summarize the benefits of selecting ERI compliance



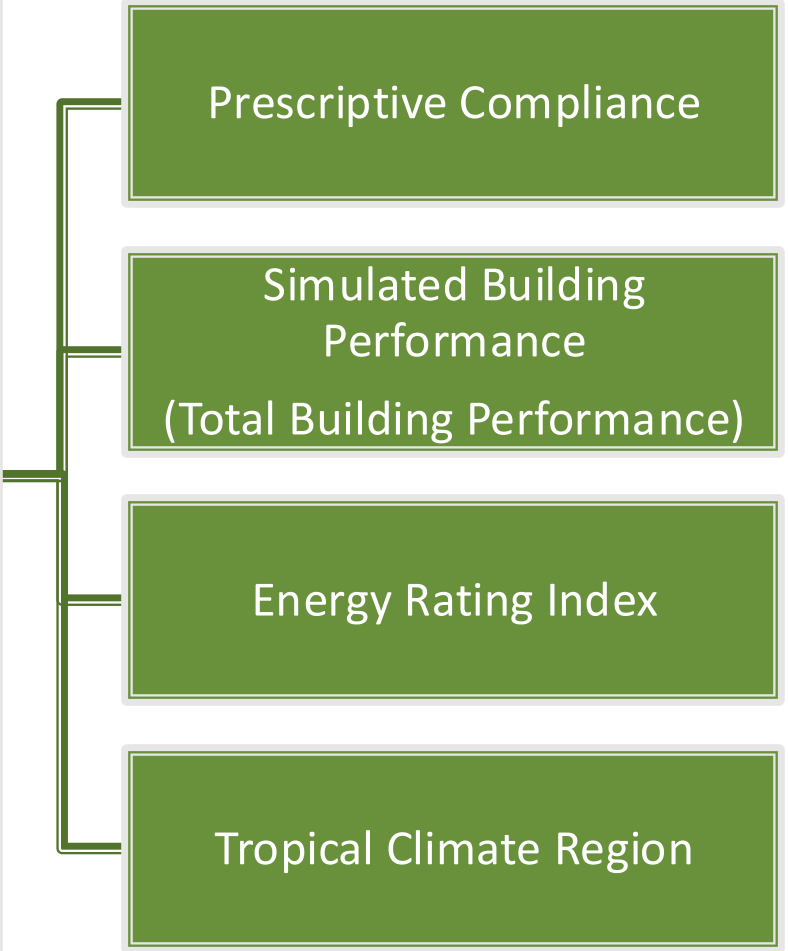


# Residential Compliance Options

Section R401.2, Application

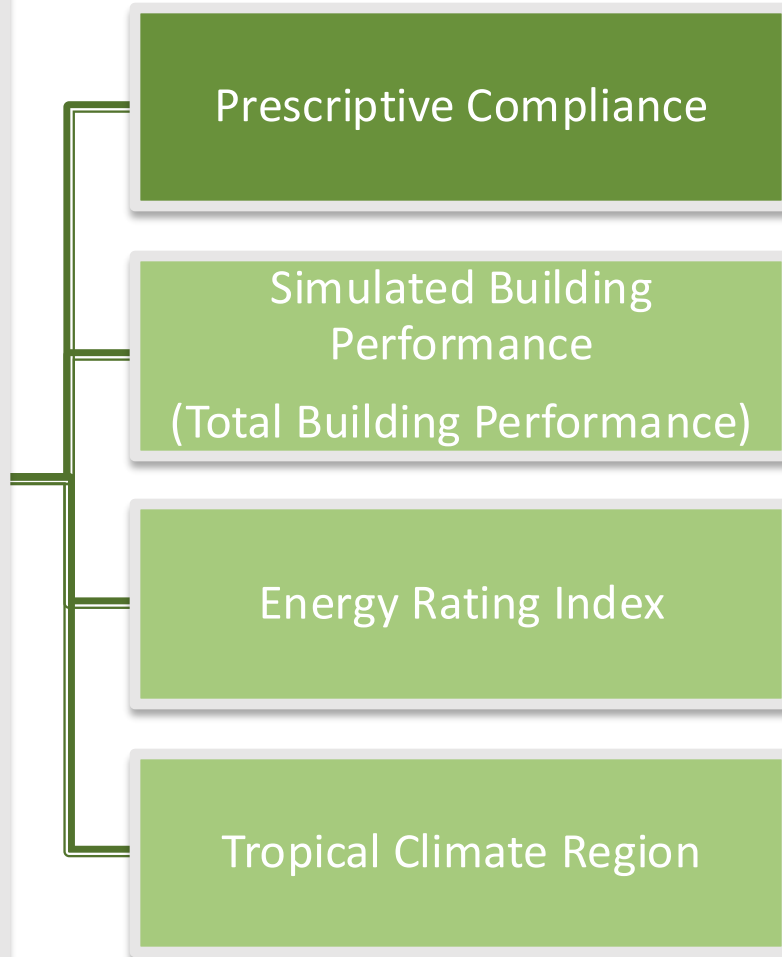


# Compliance Options





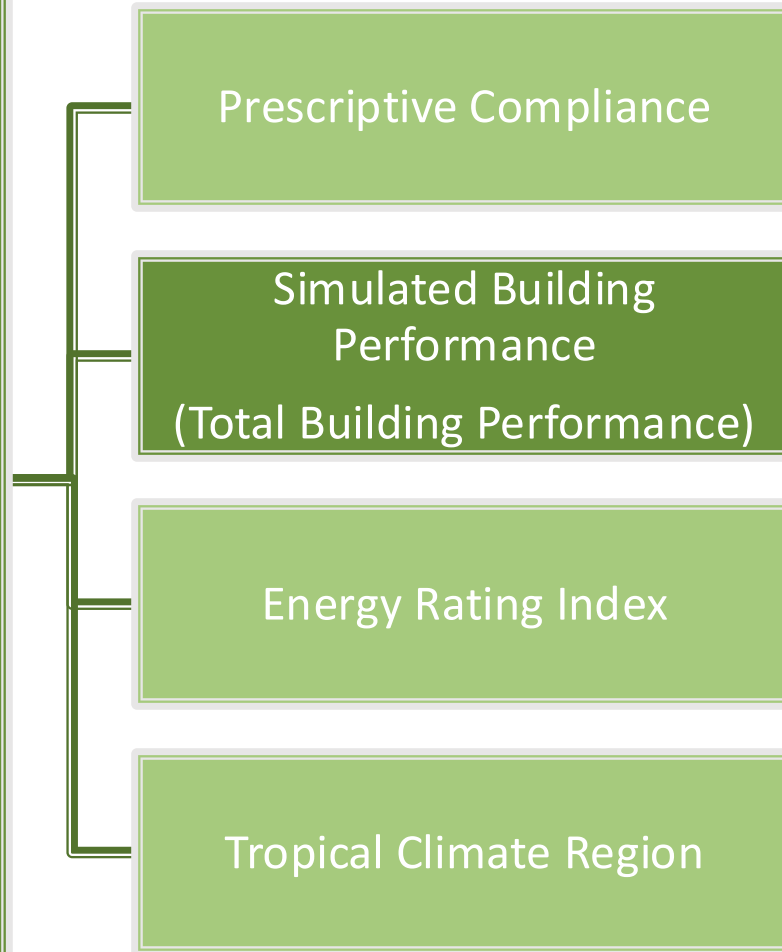
# Compliance Options



Sections R401 – R404, R408

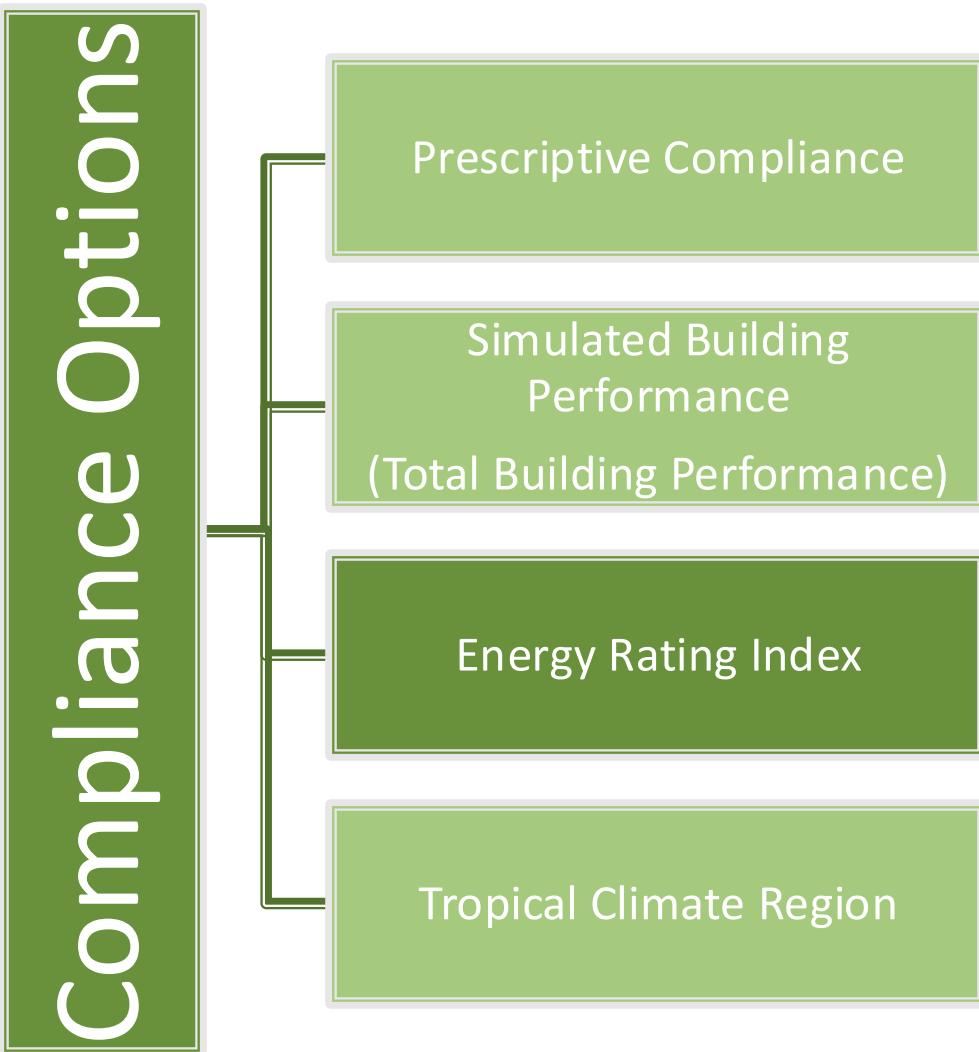
- *Least* flexible option, comply with the code “as written”
- Three options for insulation requirements
  - U-factor compliance
  - R-value compliance
  - Total UA (Component performance) alternative compliance
- Choice of additional energy efficiency credits

# Compliance Options



## Section R405

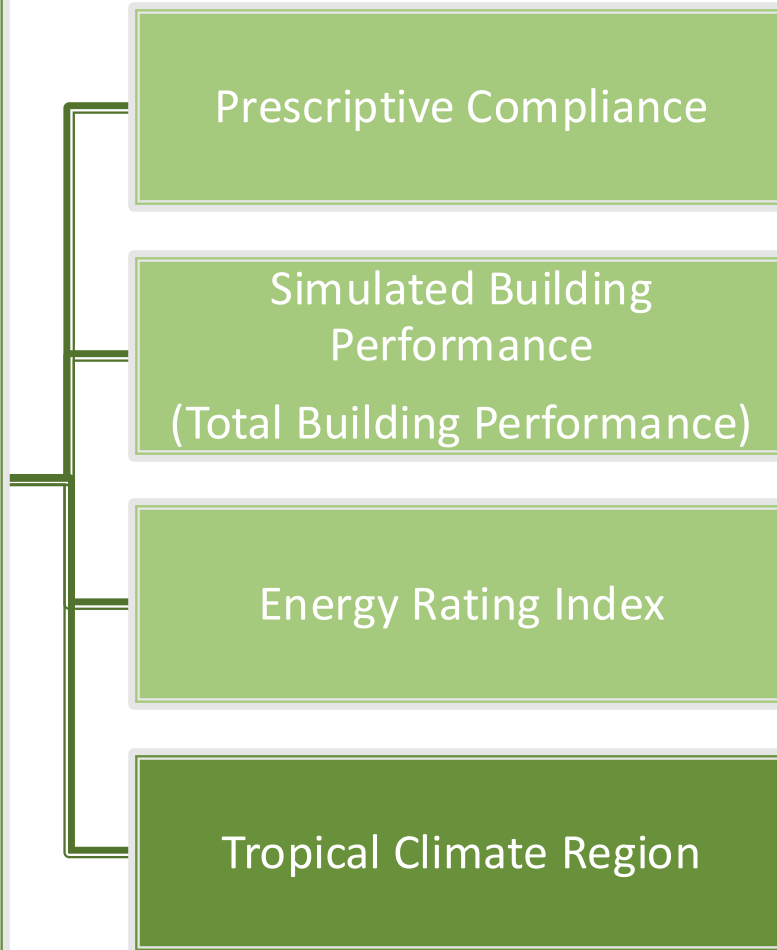
- *More* flexible option
- Calculates the annual estimated **energy cost** of a building
  - Requires energy modeling
  - Analysis considers heating, cooling, mechanical ventilation, water heating
- Compliance based on
  - Table of required measures
  - Building thermal envelope backstop
  - Comparison of the annual energy cost of a proposed building to the annual energy cost of the standard reference design
  - Additional energy efficiency (2021 IECC)



## Section R406

- *Most* flexible option
- Measures the **energy efficiency** 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
  - Additional energy efficiency (2021 IECC)

# Compliance Options



## Section R407

- Limited application
- 11 simplified requirements for buildings in tropical region
  - Limited air conditioned space
  - No heating
  - Renewable energy source powers service water heating

# All Compliance Paths

## Required Inspections

1. Footing and foundation
2. Framing and air barrier rough-in
3. Plumbing rough-in
4. Mechanical rough-in
5. Electrical rough-in
6. Insulation and fenestration rough-in
7. Final

## Required Performance Testing

- Envelope air leakage testing
- Duct system testing
- Mechanical ventilation system testing

# Complying with the ERI

Section R406, Energy Rating Index Compliance Alternative



# What is the Energy Rating Index?

- Measures the energy efficiency of a building
- ERI compliance requires the design to be a specified percentage better than the reference home
- Each 1% reduction in energy use = 1 point deduction from index

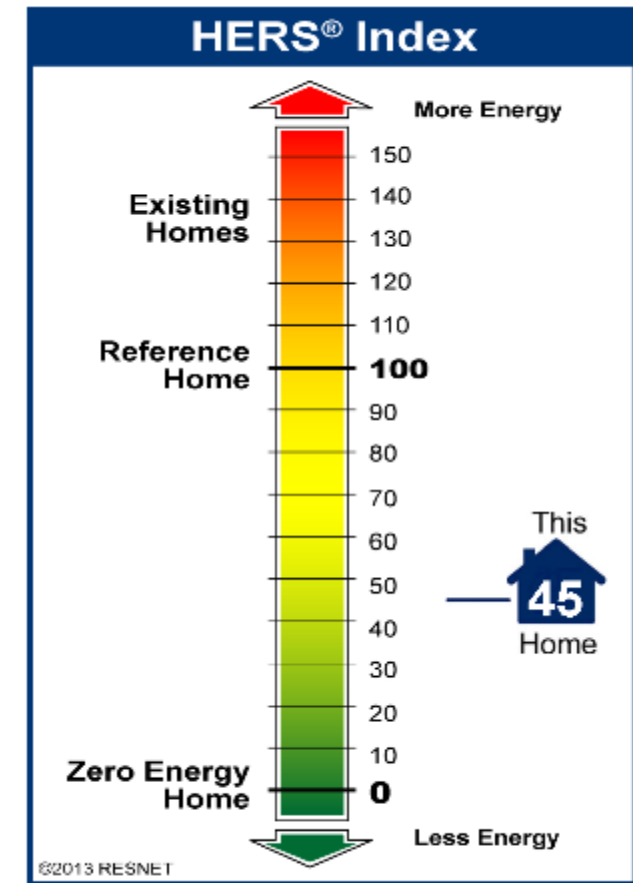


Figure courtesy of FSEC.

# Complying with the ERI Compliance Path

**1**

Table of required measures

**2**

Maximum ERI value

**3**

Building thermal envelope backstop

**4**

Additional energy efficiency (2021 IECC only)



2024 IECC

Table R406.2,  
Partial

TABLE R406.2—REQUIREMENTS FOR ENERGY RATING INDEX	
SECTION*	TITLE
<b>General</b>	
R401.3	Certificate
<b>Building thermal envelope</b>	
R402.1.1	Vapor retarder
R402.1.6	Rooms containing fuel-burning appliances
R402.2.4	Eave baffle
R402.2.5.1	Access hatches and door insulation installation and retention
R402.2.10	Slab-on-grade floors
R402.2.11	Crawl space walls
R402.5.1.1	Installation
R402.5.1.2	Air leakage testing
R402.5.1.3	Maximum air leakage rate
R402.5.2	Fireplaces
R402.5.3	Fenestration air leakage
R402.5.4	Recessed lighting
R402.5.5	Air-sealed electrical and communication outlet boxes
R406.3	Building thermal envelope
<b>Mechanical</b>	
R403.1	Controls
R403.2	Hot water boiler temperature reset
R403.3	Duct systems

2024 IECC

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<b>Mechanical</b>	
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R403.3	Duct systems

# R406.3, Building Thermal Envelope

## 2021 IECC

- Without on-site renewables
  - Proposed total UA  $\leq$   
prescriptive UA  $\times$  1.15
- With on-site renewables
  - Backstop of 2018 IECC
  - Credit for renewables limited to 5% of the total home energy use

# R406.3, Building Thermal Envelope

## 2021 IECC

- Without on-site renewables
  - Proposed total UA  $\leq$  prescriptive UA  $\times$  1.15
- With on-site renewables
  - Backstop of 2018 IECC
  - Credit for renewables limited to 5% of the total home energy use

## 2024 IECC

- Climate Zones 0-2
  - proposed total TC  $\leq$  prescriptive TC  $\times$  1.08
- Climate Zones 3-8
  - proposed total TC  $\leq$  prescriptive TC  $\times$  1.15
- No limit for renewables
  - Separate ERI score for OPP

# Maximum ERI Value, 2021 IECC

Table R406.5  
Maximum Energy Rating Index

Climate Zone	Energy Rating Index
0-1	52
2	52
3	51
4	54
5	55
6	54
7	53
8	53

# Additional Energy Efficiency, 2021 IECC

- Section R401.2.5, Additional energy efficiency
- Applies to all compliance paths
- For ERI alternative, reduce the target in Table R406.5 by at least 5%

# Maximum ERI Value, 2021 IECC

Table R406.5  
Maximum Energy Rating Index

Climate Zone	Energy Rating Index	ERI with 5% reduction
0-1	52	49
2	52	49
3	51	48
4	54	51
5	55	52
6	54	51
7	53	50
8	53	50

# Maximum ERI Value, 2024 IECC

TABLE R406.5  
MAXIMUM ENERGY RATING INDEX

CLIMATE ZONE	ENERGY RATING INDEX NOT INCLUDING OPP	ENERGY RATING INDEX WITH OPP
0 and 1	<del>52</del> 51	35
2	<del>52</del> 51	34
3	<del>51</del> 50	33
4	<del>54</del> 53	40
5	<del>55</del> 54	43
6	<del>54</del> 53	43
7	<del>53</del> 52	46
8	<del>53</del> 52	46



# Other Significant Changes to 2024 IECC

- Clarification that analysis is limited to the dwelling unit
- Removal of the mechanical ventilation rate deviation
- New requirement for software tools to be tested in accordance with ASHRAE 140

# Significant Changes to 2024 IL Stretch Energy Code

- Expanded list of required measures
  - EV infrastructure
  - Electric readiness
  - Renewable energy infrastructure
- Building thermal envelope
  - proposed total UA  $\leq$  prescriptive UA  $\times$  1.10

# Significant Changes in 2024 IL Stretch Energy Code

- Expanded list of required measures
  - EV infrastructure
  - Electric readiness
  - Renewable energy infrastructure
- Building thermal envelope
  - proposed total UA  $\leq$  prescriptive UA  $\times$  1.10

**TABLE R406.5  
MAXIMUM ENERGY RATING INDEX**

Climate Zone	Energy Rating Index Without Combustion Equipment <sup>a</sup>	Energy Rating Index With Combustion Equipment <sup>b</sup>
4	54	51
5	55	50

a. Any building that contains no *combustion equipment*.

b. Any building that contains *combustion equipment*.

# ERI Comparison: 2021, 2024, IL Stretch

Climate Zone	2021 ERI with 5% reduction, rounded	2024 ERI Not Including OPP	2024 ERI with OPP	2024 IL Stretch without Combustion Equipment	2024 IL Stretch with Combustion Equipment
0-1	49	51	35		
2	49	51	34		
3	48	50	33		
4	51	53	40	54	51
5	52	54	43	55	50
6	51	53	43		
7	50	52	46		
8	50	52	46		

# ERI and HERS: What's the Difference?

	ERI Compliance	HERS Score
Standard for calculating scores	Standard 301, specific version referenced in code year	Standard 301, most current version
Mandatory IECC measures	Yes	No
Demonstrates code compliance	Yes	No
Third-party verification required	Yes, although not required to be a HERS rater	Only RESNET HERS Raters can complete
Scores submitted to RESNET	No	Yes
Requires quality assurance oversight	No	Yes
Marketed as a HERS rated home	No	Yes

# BUILDING EFFICIENCY RESOURCES

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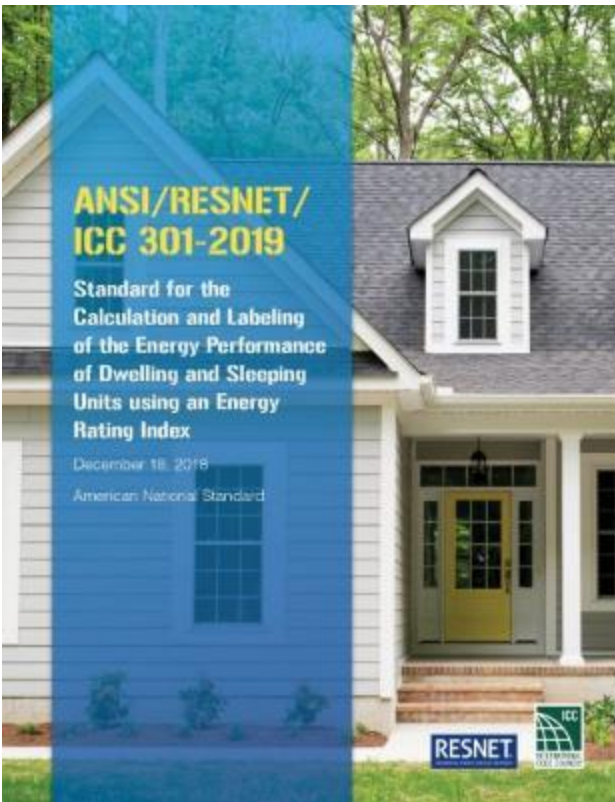
## Success with the Energy Rating Index (ERI)

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## Background on the ERI

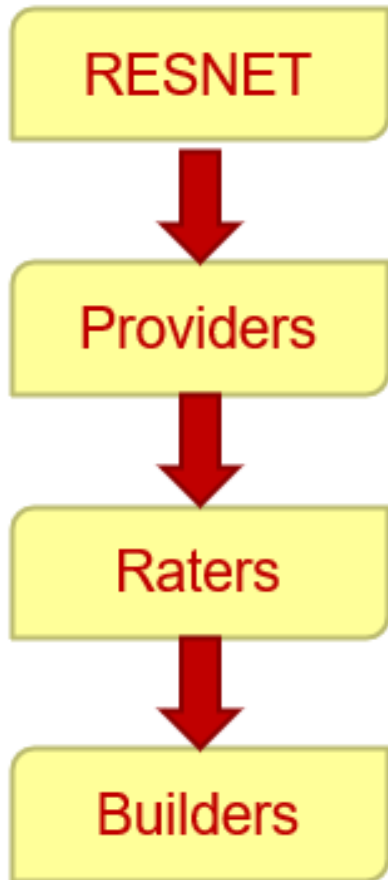
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- 501(c)3 non-profit organization
- Standards, policy and Quality Assurance oversight for residential energy efficiency industry
- 1996: Formed in partnership with DOE, NASEO, and mortgage industry
- First ANSI ERI Standard = 301-2014
  - Currently on 301-2019
  - 301-2022 soon to be adopted

# Energy Rating industry

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## ■ Composition of RESNET Industry

### ■ Raters

- Perform energy modeling, testing and inspections on homes
- May delegate aspects of the rating process to Rating Field Inspectors (RFIs) or HERS Modelers

### ■ Providers

- Quality Assurance (QA) Providers perform QA review of Raters' work
- Training Providers train RESET professionals

### ■ RESNET

- Led by staff, Board, committees
- Set standards, policies
- Oversee work of Providers





# Quality Assurance

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- All Raters and RFI are subject to RESNET Quality Assurance.
- Standards, policy and Quality Assurance oversight for residential energy efficiency industry enforced by RESNET and RESNET Certified Providers.
- All RESNET Professionals are subject to Professional Development requirements.

# Energy Raters and 3<sup>rd</sup> Party Energy Code Verification



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## IECC/HERS Compliance Specialists

- Created by IECC and RESNET
  - Must be a Certified RESNET Rater
  - Must pass the Residential Energy Code Inspector / Plus Examiner test
- Highlights Raters who are specifically trained and credentialed to understand energy codes
  - Help code officials select appropriate 3<sup>rd</sup> party verification professionals
- RESNET and ICC in process of creating IECC/HERS Code Compliance Program . MOU signed.
  - Integrates RESNET QA system and all code compliance paths

# ERI (R406) Process

## Pre-construction

REM/Rate v 14.0 - Andrews Residence 242 Griffin Road Wells NY 12190 Final to BER\_EsV2.5\_...

File Building View Extras Libraries Reports Tools Help

Building Name: Fox Hill Senior Living

Property Information:

Owner's Name:

Property Address: Fox Hill Senior Living

City: Crystal Lake

State: IL Zip:

Phone Number:

Builder Information:

Builder's Name: Weis Builders

Builder's Address:

Builder's Email:

Phone Number:

Plan/Model Name:

Community/Development: Fox Hill Senior Living

Permit Date/Number:

Analysis

Updated: 01:14:05 AM

Programs	
V2.0 ENERGY ...	Passes
V2.5 ENERGY ...	Passes
V3.0 ENERGY ...	Passes
Tax Credit	Passes
HERS Index	54
NY HERS Score	N/A
Code	
IECC 2012 Ene...	Fails
IECC 2009 Ene...	Passes
IECC 2006 Ene...	Passes
IECC 2004 Ene...	Passes
IECC 2003 Ene...	Passes
IECC 2001 Ene...	Passes
IECC 2000 Ene...	Passes
IECC 1998 Ene...	Passes
ECCCNYS-2010	Passes
ECC of Souther...	Passes
MEC 1995 Ener...	Passes
MEC 1993 Ener...	Passes
MEC 1992 Ener...	Passes
ASHRAE 90.2 ...	Passes

- Energy rater performs plans analysis and models home in energy modeling software (Ekotrope, REM/rate, etc)
- Projected Rating is produced based on plans/specs, and potentially worst-case option/orientation
  - Either performed by a Rater or HERS Modeler
- Documentation given to builder / code official for permits

# ERI (R406) Process

## Mid-Construction

- Site inspections
  - Verification of “minimum rated feature” data performed by approved energy rater or Rating Field Inspector (RFI)
- Key features include:
  - Plans verification: correct plan/option/window package
  - Foundation insulation (slabs/foundation walls)
  - Window / door performance values
  - Insulated assembly verification (type, Rvalue, insulation Grade)
  - Rough-in duct testing (where applicable)



# ERI (R406) Process

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## Final inspection

- Diagnostic testing
  - Airtightness testing (blower door)
  - Duct tightness (duct leakage)
  - Mechanical Ventilation
  - HVAC Grading (if included in rating)
- Final inspection items
  - Attic insulation
  - Mechanical specs, lighting, appliances, onsite power production (where applicable)



# ERI (R406) Process

## 2021 IECC R-406 Projected Energy Rating Index Report

### Property

Builder:  
Address: , MI 48221

### Organization

Company:  
Dream Development & Energy Technology,  
LLC  
Phone:  
Rater:Chris McTaggart

### Energy Rating Index Information

Projected Rating  
Rating No:  
Date Rated:  
Rater ID (RTIN):6444631

### Estimated Annual Energy Consumption\*

	Rated Home Calculated Energy Use (MBtu)	Rated Home Cost (\$/yr)
Heating	44.2	\$547
Cooling	2.2	\$112
Water Heating	5.8	\$287
Lights & Appliances	17.3	\$749
Photovoltaics	0.0	\$0
Service charge	-	\$120
<b>Total</b>	<b>69.5</b>	<b>\$1,814</b>

\*Based on standard operating conditions

### ERI with PV:52

### ERI without PV:52

### Annual Estimates

Electric (kWh):7,056.3	CO2 Emissions (Tons):6.3
Natural Gas (Therms):453.9	

Maximum Energy Rating Index:55

This Home's Energy Rating Index:52

PASS

This home MEETS the Energy Rating Index Score requirement of 2021 IECC R-406 for Climate Zone 5. It MEETS all of the requirements verified by Ekotrope. Mandatory requirements are summarized on the 2nd page of this report, some of which are not verified by Ekotrope.

Name: Chris McTaggart

Signature:

Organization: Dream Development & Energy

Date: 8/6/24 at 2:18 PM

## Post construction

- Confirmed Rating verifies as-built condition
- Rating submitted to QA Provider for review and registration
  - Ratings subject to both Field and File QA
- Documentation of rating given to builder and/or code official for Certificate of Occupancy.
- Other documentation of energy code verification measures (blower door/duct leakage test reports, etc) may be required.

# ERI (R406) Process

TABLE R406.2 REQUIREMENTS FOR ENERGY RATING INDEX

SECTION <sup>a</sup>	TITLE
<b>General</b>	
R401.2.5	Additional efficiency packages
R401.3	Certificate
<b>Building Thermal Envelope</b>	
R402.1.1	Vapor retarder
R402.2.3	Eave baffle
R402.2.4.1	Access hatches and doors
R402.2.10.1	Crawl space wall insulation installation
R402.4.1.1	Installation
R402.4.1.2	Testing
<b>Mechanical</b>	
R403.1	Controls
R403.3 except Sections R403.3.2, R403.3.3 and R403.3.6	Ducts
R403.4	Mechanical system piping insulation
R403.5.1	Heated water calculation and temperature maintenance systems
R403.5.3	Drain water heat recovery units
R403.6	Mechanical ventilation
R403.7	Equipment sizing and efficiency rating
R403.8	Systems serving multiple dwelling units
R403.9	Snow melt and ice systems
R403.10	Energy consumption of pools and spas
R403.11	Portable spas
R403.12	Residential pools and permanent residential spas
<b>Electrical Power and Lighting Systems</b>	
R404.1	Lighting equipment
R404.2	Interior lighting controls
R406.3	Building thermal envelope

## Keys to success working with Raters as approved 3<sup>rd</sup> parties

- Identify Raters who are IECC/HERS Compliance Specialists or IECC Residential Inspector / Plans Examiner designation
- Verify clearly the scope of work of the Rater
  - ERI score verification alone does not constitute code compliance
  - Clarify if Rater is performing review of other mandatory requirements
- Request information on Rater's QA Provider and engage them on the quality assurance process

# R406

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Compliance scenario



# R406 Compliance Scenario: 2021 IECC

## Home in Michigan (CZ5)

### IECC 2021 Building UA Compliance

**Property**  
 , MI 48221  
 CZ5 MI 2x4 DOE ZERH  
 Initial House Design

**Organization**  
 Dream Development & Ener  
 Chris McTaggart

**Inspection Status**  
 Results are projected

**Builder**

This report is based on a proposed design and does not confirm field enforcement of design elements.

#### Building UA

Elements	IECC Reference	As Designed
Ceilings	47.6	41.6
Above-Grade Walls	55.7	94.1
Windows, Doors and Skylights	100.2	90.3
Slab Floor:	47.5	47.5
Framed Floors	0.0	0.0
Foundation Walls	83.5	104.1
Rim Joists	7.2	7.0
<b>Overall UA (Design must be equal or lower):</b>	<b>341.7</b>	<b>384.6</b>

#### Requirements

❗	R402.1.5	Total UA alternative compliance fails by 12.0%.	Specified envelope UA is 385 BTU / hF. This exceeds the maximum of 342 BTU / hF by 12.0%.
✅	R402.3.2	Average SHGC: 0.40 Max SHGC: 0.40	Average SHGC of 0.40 is greater than the maximum of 0.40.
✅	R402.4.1.2	Air Leakage Testing	Air sealing is 2.30 ACH at 50 Pa and 0.11 CFM50 / ft² Shell Area. It must not exceed 3.00 ACH at 50 Pa or 0.28 CFM50 / ft² Shell Area.
✅	R403.3.1	Duct insulation	All ducts are inside the thermal envelope or outside and insulated to at least R8.0.
✅	R404.1	Lighting Equipment	At least 100.0% of fixtures shall be high-efficacy lamps, currently 100.0% are high-efficacy.
✅	Mandatory Checklist	Mandatory code requirements that are not checked by Ekotrope must be met.	2021 IECC Required Items must be checked as complete.
✅	R403.6.2	Mechanical Ventilation Efficacy	
✅	R403.6.1	Mechanical Ventilation Energy Recovery	
❗	R403.3.0	Duct Leakage Testing	A forced air duct exceeds the Post-Construction total leakage limit of 4 CFM @ 25 Pa / 100 ft² CFA
⚠️	R403.5.2	Hot water pipe insulation	Hot water pipes at least 3/4 in diameter must be insulated to R-3 at minimum.
✅	R402.5	Area-weighted average fenestration SHGC	Area-weighted average fenestration SHGC is 0.4. The maximum allowed value is [No Limit].
✅	R402.5	Area-weighted average fenestration U-Factor	
✅	R402.4.1.3	Prescriptive Air Leakage	Air sealing is 2.30 ACH at 50 Pa. It must not exceed 3.00 ACH at 50 Pa.
✅	IRC M1505.4.3	Mechanical Ventilation Rate	
✅	R408.2	Additional efficiency package options	✓ R408.2.3 - Reduced energy use in service water-heating ✓ R408.2.4 - More efficient duct thermal distribution system ✓ R408.2.5 - Improved air sealing and efficient ventilation - HRV/ERV must not use recirculation as a defrost strategy, and an ERV must additionally have at least 30% latent recovery/moisture transfer.

Design fails to meet the requirement for IECC 2021 Prescriptive compliance by 12.6%.

- Home has a decreased level of envelope thermal performance
  - 2x4 R-15 above-grade wall construction w/o continuous insulation.
    - R-20+5/R-13+10/R-30 Prescriptive
  - R-15 cavity basement walls
    - R-15 continuous / R-19 cavity Prescriptive
- Does not meet UA tradeoff (fails by 12.6%)

# R406 Compliance

## Scenario: 2021 IECC

### 2021 IECC R-406 Projected Energy Rating Index Report

Property	Organization	Energy Rating Index Information
Builder: Address: , MI 48221	Company: Dream Development & Energy Technology, LLC Phone: Rater:Chris McTaggart	Projected Rating Rating No: Date Rated: Rater ID (RTIN):6444631

Estimated Annual Energy Consumption*		
	Rated Home Calculated Energy Use (MBtu)	Rated Home Cost (\$/yr)
Heating	44.2	\$547
Cooling	2.2	\$112
Water Heating	5.8	\$287
Lights & Appliances	17.3	\$749
Photovoltaics	0.0	\$0
Service charge	-	\$120
<b>Total</b>	<b>69.5</b>	<b>\$1,814</b>

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Name: Chris McTaggart	Signature:	
Organization: Dream Development & Energy	Date: 8/6/24 at 2:18 PM	

## Home in Michigan (CZ5)

- Home complies with ERI score
  - CZ5 table score: 55
  - w/ 5% less (Better): 52
  - Home scores a 52, Passes
  
- Meets thermal envelope backstop
  - Reference UA x 1.15 = 393
    - Must be within 15 percent of UA
  - Home UA = 385
  
- Has good mechanicals, ESTAR appliances, 100% LED lighting, better windows, ducts inside conditioned space, 3 ACH50 and an ERV installed.

# ERI and Existing Buildings

2024 IECC Chapter 5



# Existing Buildings

- 2024 IECC better outlines compliance options for existing buildings
  - Existing buildings may comply prescriptively or using a performance option
  - Both R405 and R406 specifically named
  - Additions and alterations complying with R406 exempt from additional energy efficiency credit requirements



- 1) The IECC includes multiple options for residential code compliance.
- 2) The Energy Rating Index compliance path provides the greatest amount of flexibility among all compliance paths.
- 3) The ERI path offers many benefits in addition to flexibility including third party verification.

# Discussion



**15<sup>TH</sup> ANNUAL**  
**MIDWEST**  
**BUILDING ENERGY**  
**CODES CONFERENCE**



SEPT. 25-26  
CINCINNATI, OH  
**REGISTER**  
**TODAY**



- [Graduate Hotel Cincinnati](#)
- Review innovative programs, celebrate energy savings, discuss the potential impact of policy changes throughout the region
- Also, time for networking and connecting!

**15<sup>TH</sup> ANNUAL**  
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# Upcoming MEEA Webinar

## *Willdan's Energy Design Assistance - Maximizing Energy Efficiency with Utility-Sponsored DSM Programs*

- **When:** August 20th, 12 pm CT
- **Who:** Vinoth Sekar, Senior Project Manager; Jim Dillon, Business Development Manager
- **What:** Learn how teams can leverage utility-sponsored Demand Side Management (DSM) programs to evaluate current and emerging technologies using energy modeling early in design
- Energy Design Assistance programs support teams through an interactive whole-building analysis process, informing them how the modeled project costs, carbon emissions, energy savings, and incentives would change under different design options