Illinois Stretch Energy Code Concepts

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Erin Sherman, RMI

January 2023
Metropolitan Mayors Caucus

Agenda

What	Who
Overview of Stretch Codes, Targets, and Process	Erin
Residential Stretch Code Concept Overview: • Energy Efficiency • Renewables & Grid Integration • Electrification (Including EV Charging) • Existing Buildings • Performance, Certification, & Appendix Paths	Diana
Residential Q&A	Facilitator: Erin
Commercial Stretch Code Concept Overview (Same Topics)	Diana
Commercial Q&A	Facilitator: Erin

Quick Facts About Energy Codes

About Stretch Codes

What? The energy code sets requirements for new buildings, alterations, and additions with the intention of saving energy.

Where? In IL, energy codes are currently set at the statewide level and enforced locally. Chicago sets its own energy code.

Who? The Illinois Energy Code Advisory Council (IL ECAC) reviews the latest International Energy Conservation Code (IECC) after its publication. IL ECAC makes a recommendation to the Capital Development Board (CDB). CDB has authority to initiate rulemaking to update the energy code.

About Stretch Codes

Quick Facts About ***Stretch*** Codes

What? Stretch codes provide a more ambitious option to save energy. Localities' legislatures may adopt the stretch code for their building officials to enforce instead of the statewide energy code.

When? The first stretch code is scheduled to be available for adoption by the end of this year.

What's different? Localities can currently adopt a more efficient commercial energy code, but cannot adopt a more efficient residential energy code. The stretch code will provide a standardized, more-ambitious option for both building types.

About Stretch Codes

Quick Facts About ***Stretch*** Codes

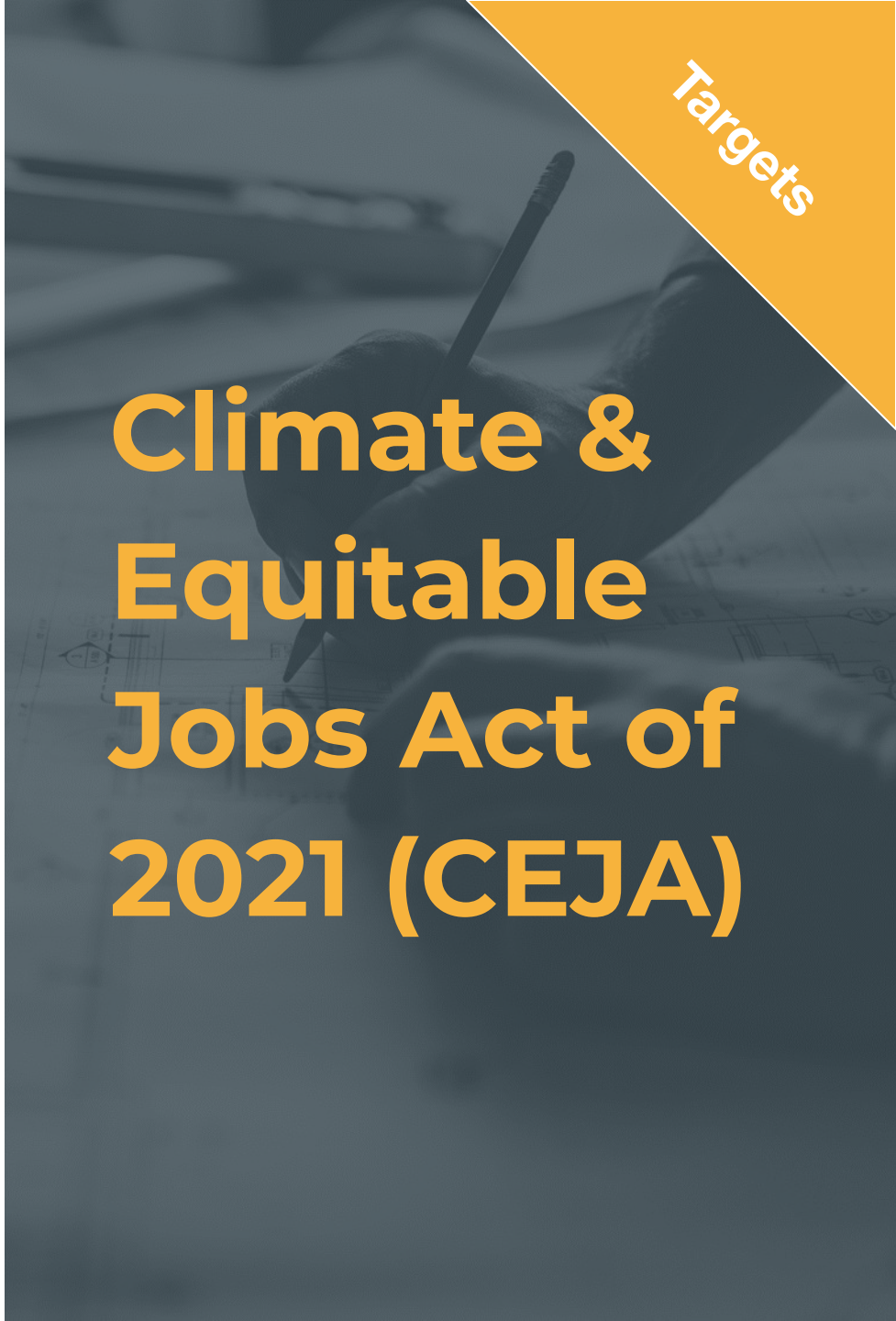
What? Stretch codes provide a more ambitious option to save energy. **Localities' legislatures may adopt the stretch code for their building officials to enforce** instead of the statewide energy code.

YOU are the most important stakeholders!

The stretch codes will have a minimal effect unless localities like yours adopt them.

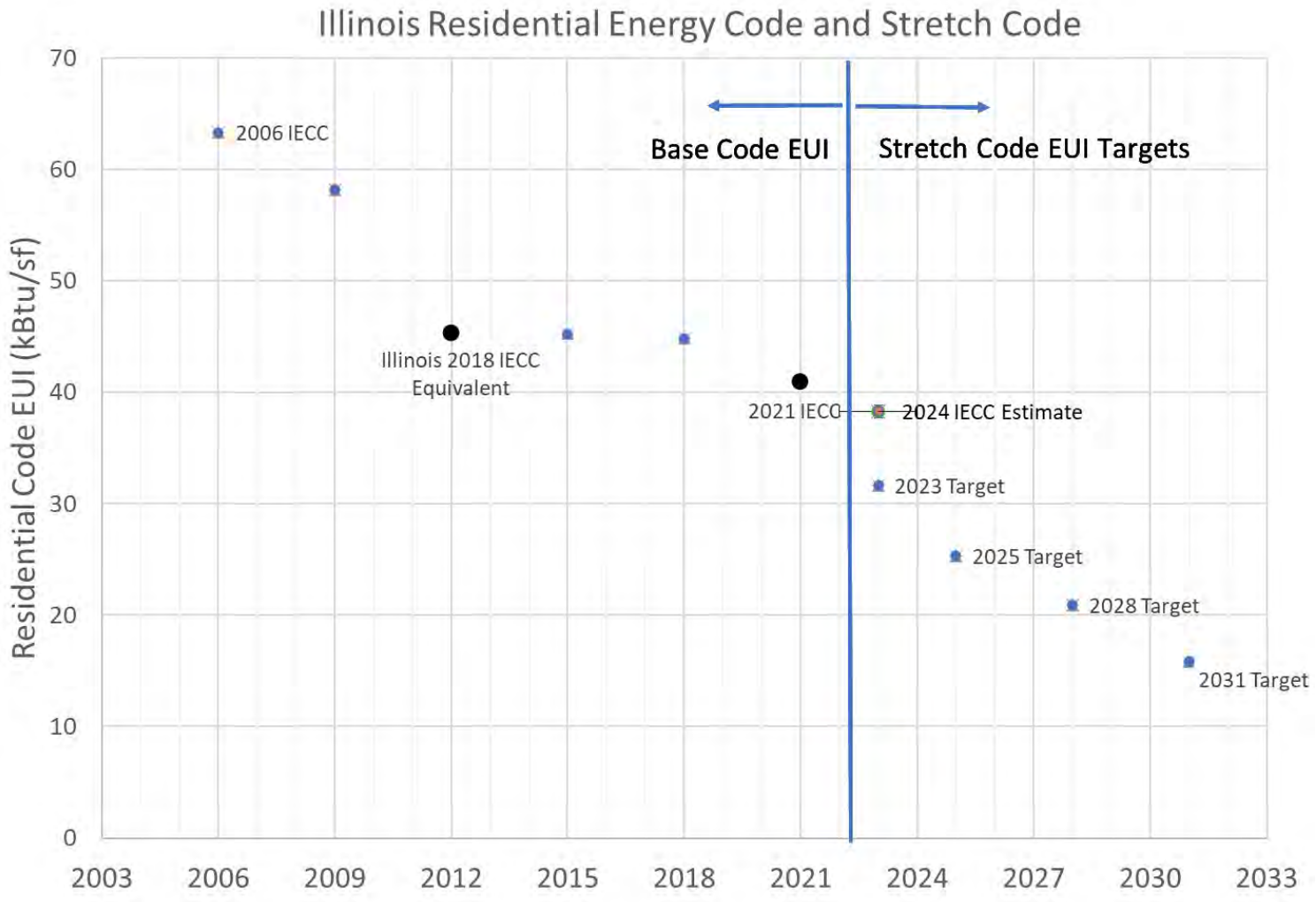
What's required in Illinois stretch codes?

- CEJA directs CDB to establish a stretch code by 12/31/2023
- The stretch code must meet certain energy use targets from CEJA, *not counting reductions from renewable energy*:
  - Commercial: 60% of Site Energy Use of 2006 IECC
  - Residential: 50% of Site Energy Use of 2006 IECC
- IL ECAC to deliver recommendations to CDB by 7/31/23



Residential EUI Targets

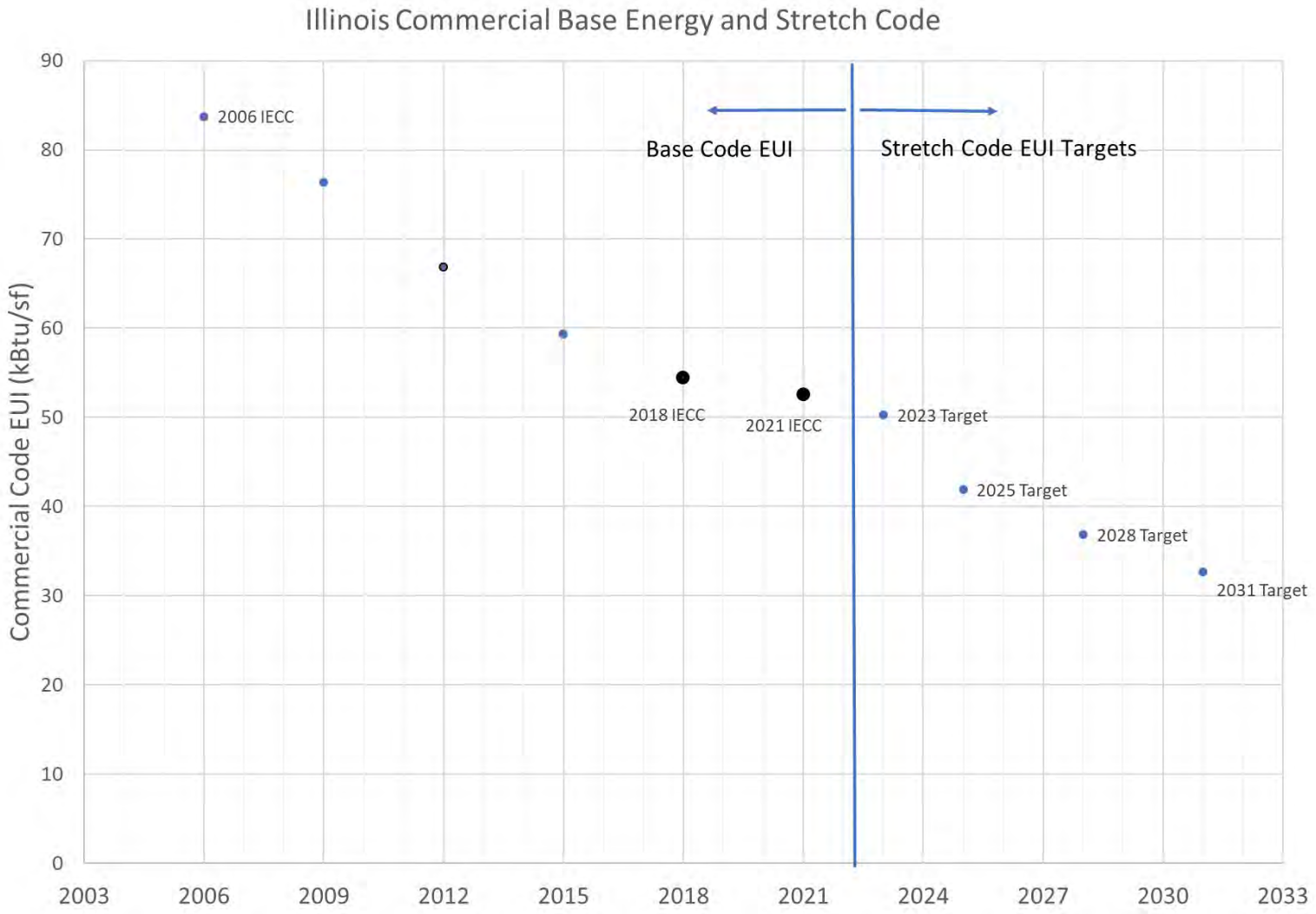
Targets



Code	% Reduction
2018 IECC	
2021 IECC	9.8%
2023 Stretch	**22.7%**
2025 Stretch	20.0%
2028 Stretch	17.5%
2031 Stretch	24.2%

Commercial EUI Targets

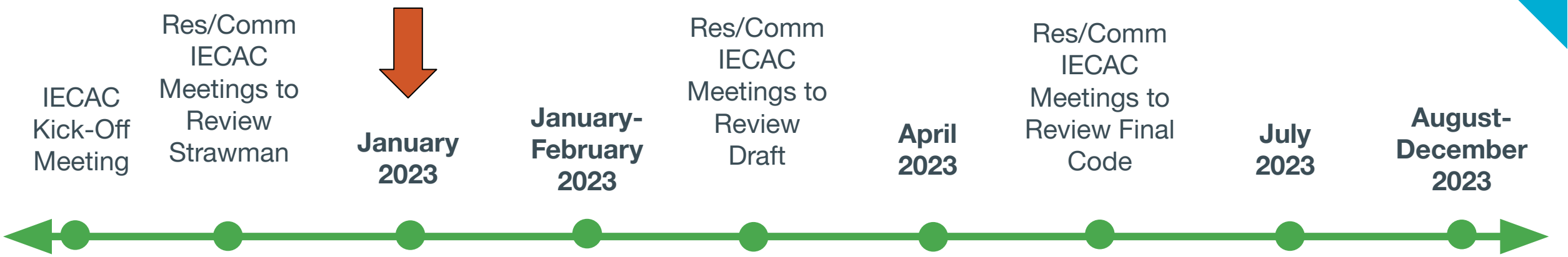
Targets



Code	% Reduction
2018 IECC	
2021 IECC	3.5%
2023 Stretch	**4.4%**
2025 Stretch	16.7%
2028 Stretch	12.0%
2031 Stretch	11.4%

Timeline

Process



Commercial Meeting: Jan 18
Residential Meeting: Jan 23
Written comment due February 3.

Codes for Climate™

Process

Two ways to comment

Vocally in public comment meetings:

- General comments will be taken during the last ~30 minutes of the meeting, limited to two minutes each
- Brief clarifying questions and comments will be taken after each topical section; each clarification period will be limited to five minutes
- Message Lisa Hennigh to be added to the queue. Note if your comment is **general** (to be addressed at the end of the meeting) or **topical** (to be addressed after the section)

In writing by February 3:

- Use web forms to submit comments
- Proposals using a process similar to that in base code will also be accepted at CDB.BuildingCodes@illinois.gov

Process

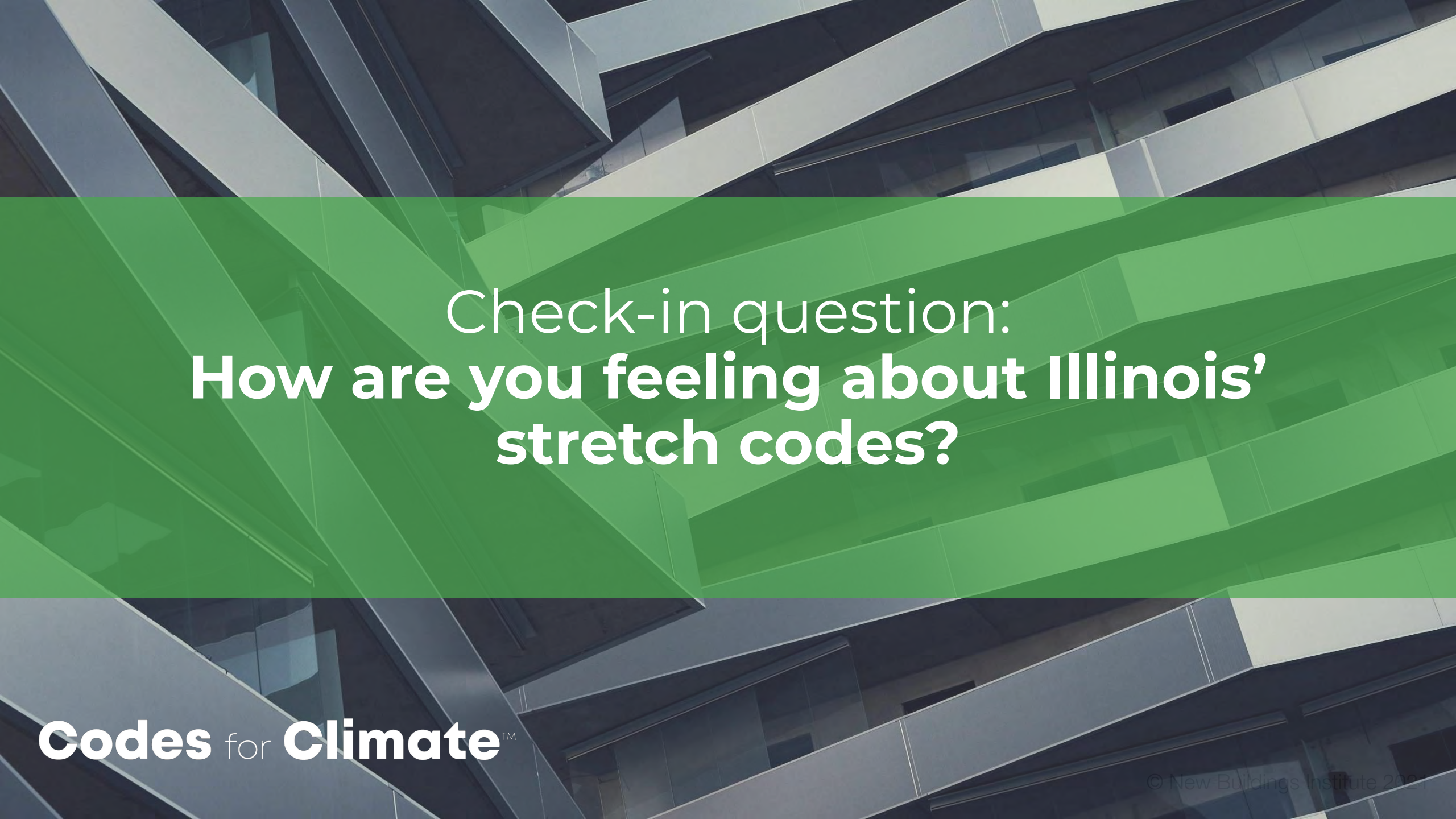
Compendium of proposals

- Residential file here & Commercial file here
- Each row is a proposal under consideration for the stretch code
- Links to reference material and IECAC vote outcomes are included
- Reference code: 2021 IECC as amended for IL (in rulemaking)

Residential example

Process

#	Reference link	Name / summary	Long description	Topic (IECC)	Strawman vote outcome	Notes	
6	PNNL Analysis of Credit Savings for IL Climate Zones	Package option: All 30 points flexible	One of as many as 6 options to achieve sufficient efficiency from the residential credit table. Thirty points must be achieved and they can be achieved in any combination.	Packages/Points	Yes (7 to 1)		
7	n/a	Require heat pumps for space heating	Require an electric heat pump be used for space heating.	Energy efficiency	No (5 to 1)		
8	R404.5 Electric readiness	Electric ready excluding space heating	All home end uses except space heating made electric ready (outlets at locations of non-electric appliances, appropriate capacity in breaker box, etc.).	Lighting & Power	Yes (7 to 0)		
9	RECPI-6-21 with EV-ready rather than EV-capable requirements	EV ready	EV charging made electric ready (outlets at locations of non-electric appliances, appropriate capacity in breaker box, etc.). Note that 2024 IECC proposal includes some requirements for EV capability (i.e., electrical capacity and conduit installed with no wall outlet), and the concept proposed for Illinois replaces those with EV-ready requirements.	Lighting & Power	Yes (7 to 0)	See also RECPI-7-21	See also RECPI-9-21
10	RED1-342-22	Elec ready for space heating	Add space heating to the end uses required to have outlets, capacity, etc.	Lighting & Power	Yes (6 to 1)		



Check-in question:

How are you feeling about Illinois' stretch codes?

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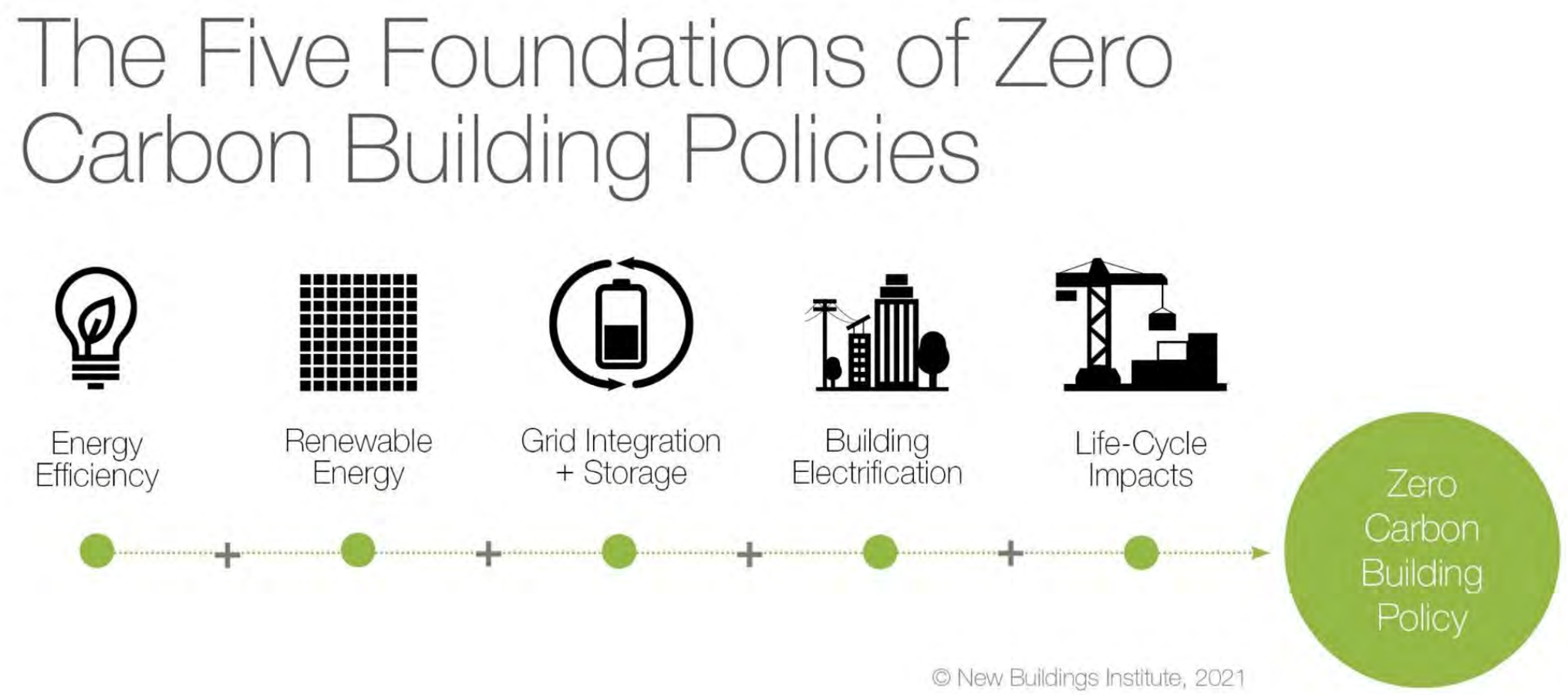
Stretch Energy Code Concept Topics



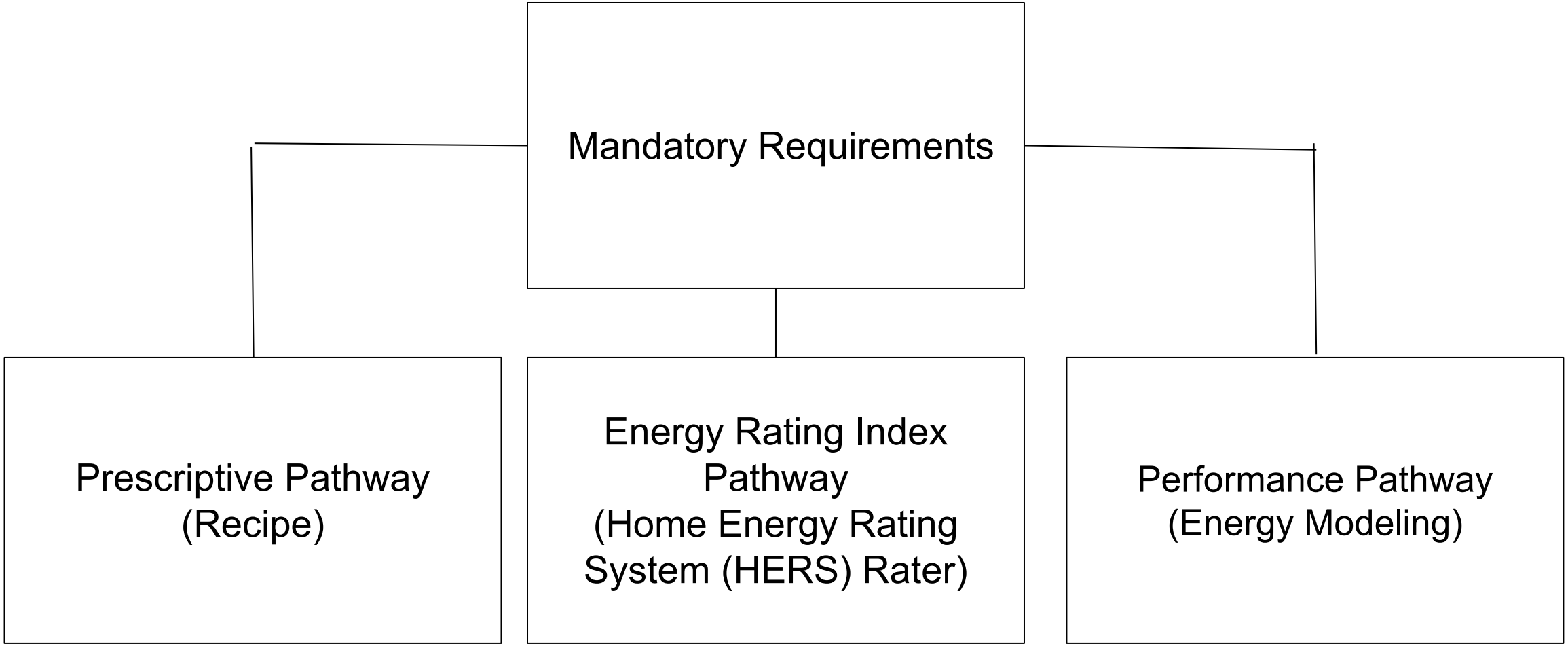
Residential Concept Topics

Five main topic areas (and sources of proposals above 2021 IECC):

- Energy Rating Index (ERI), Performance Pathway (2024 IECC + Improvements), and Above Code Programs
- Efficiency (2024 IECC + Improvements)
- Renewables and Grid Integration (2024 IECC+ Improvements)
- Electrification (EVs +Electric Ready 2024 IECC + Improvements)
- Existing Buildings (2024 IECC + Improvements)

Pathways towards Code Compliance, Certification, & Appendix Pathways

Pathways towards codes compliance



Energy Rating Index and Performance Pathway

- Revise ERI targets to reflect stretch code requirement
- Include 2024 IECC amendment to R406.4 to improve ventilation rate assumption in ERI pathway
- Revise performance pathway (modeling) to reflect stretch code requirement (base on site EUI not energy cost and change standard reference design home)

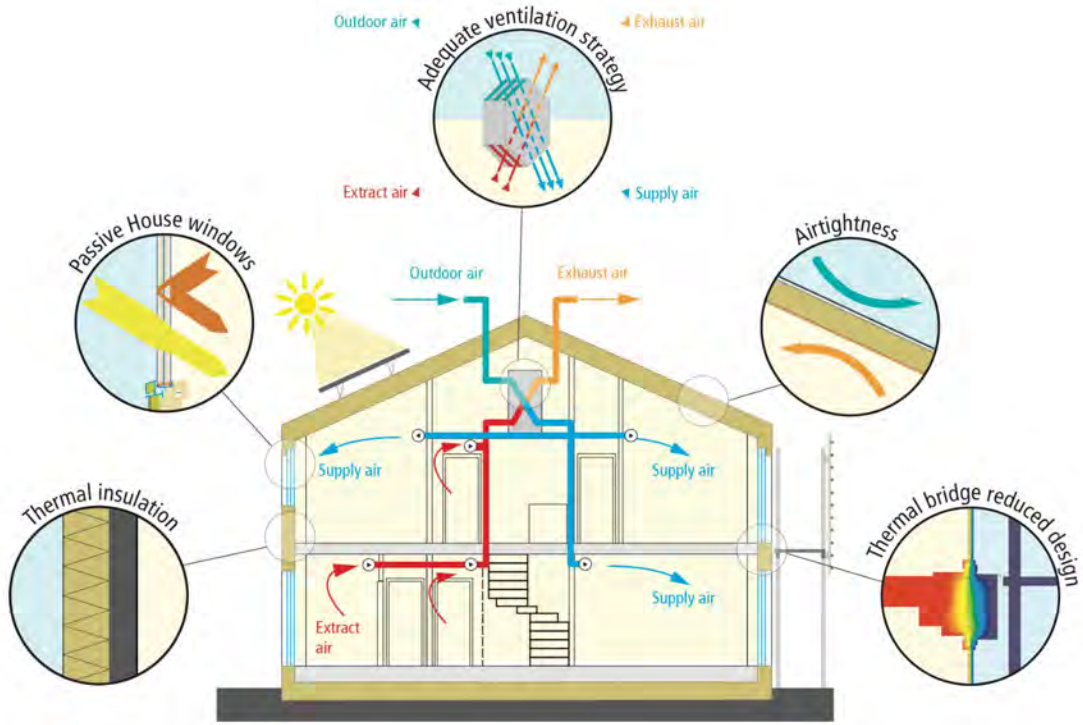
TABLE R406.5
MAXIMUM ENERGY RATING INDEX

CLIMATE ZONE	ENERGY RATING INDEX
0-1	52
2	52
3	51
4	54
5	55
6	54
7	53
8	53

Above Code Programs: Passive House Institute U.S. (PHIUS)

- PHIUS certified buildings comply with stretch energy code (CEJA)
- 2021 IECC: Net Zero Homes (Inflation Reduction Act)

Appendix RC:
Zero Energy Residential Building Provisions



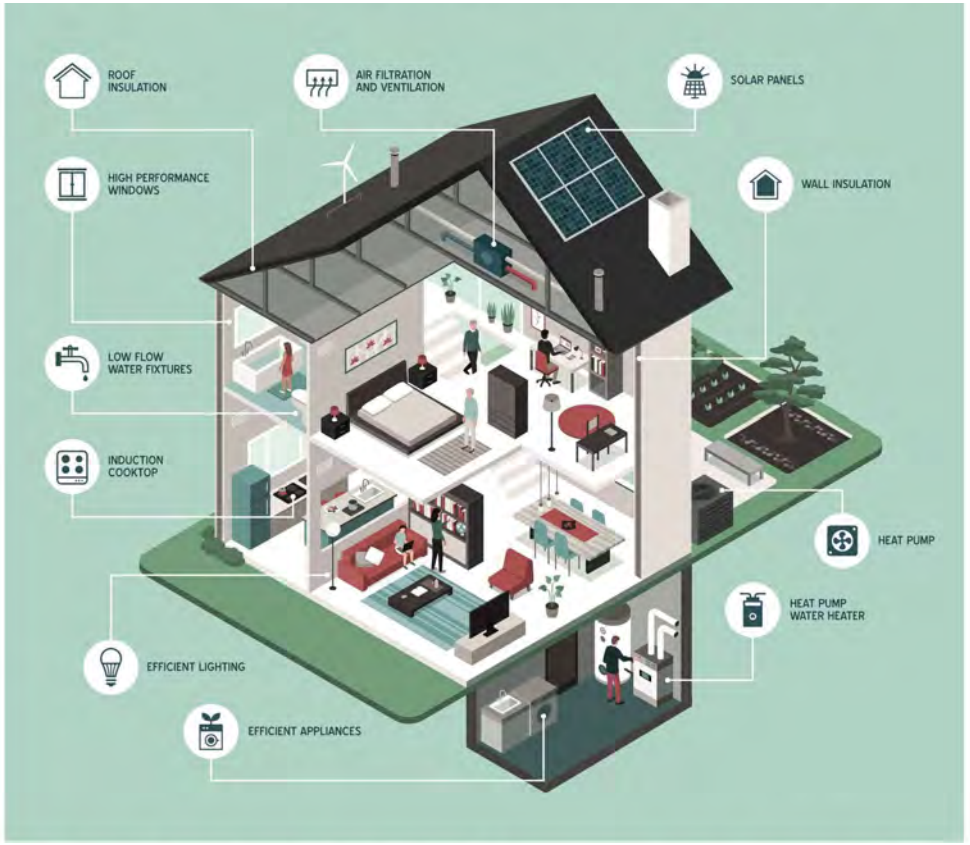
Clarifying questions on alternative compliance path concepts

Energy Efficiency: Tight Efficient Home or Flexible Energy Credits

Prescriptive paths under consideration: two ways to meet CEJA target

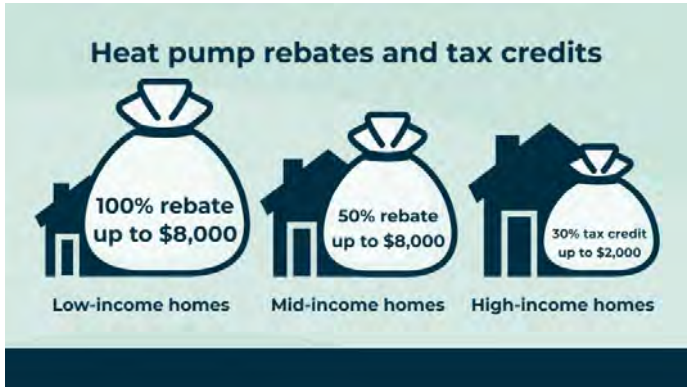
Pathway 1: Efficient Heating and Water Heating with heat pumps, Tight Building and Balanced Ventilation

Pathway 2: Most Flexibility: Attain 30 credits from 37 different efficiency options



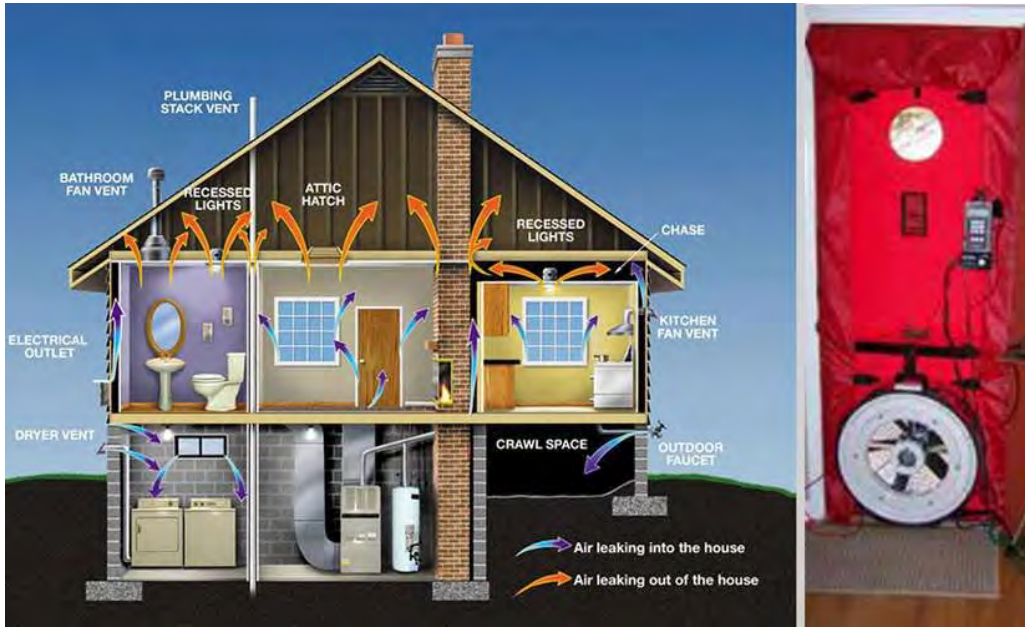
Pathway 1: Heatpumps and Heatpump Water Heaters

- Heatpumps for space heating and cooling and water heating are very efficient
  - Reduces utility bills
  - Health and Safety
  - Reduces carbon emissions
- Incentives from Inflation Reduction Act for Existing Buildings
  - Heatpump: 30% tax credit -$8,000 rebate
  - Heatpump water heater: 30% tax credit - $1,750 rebate



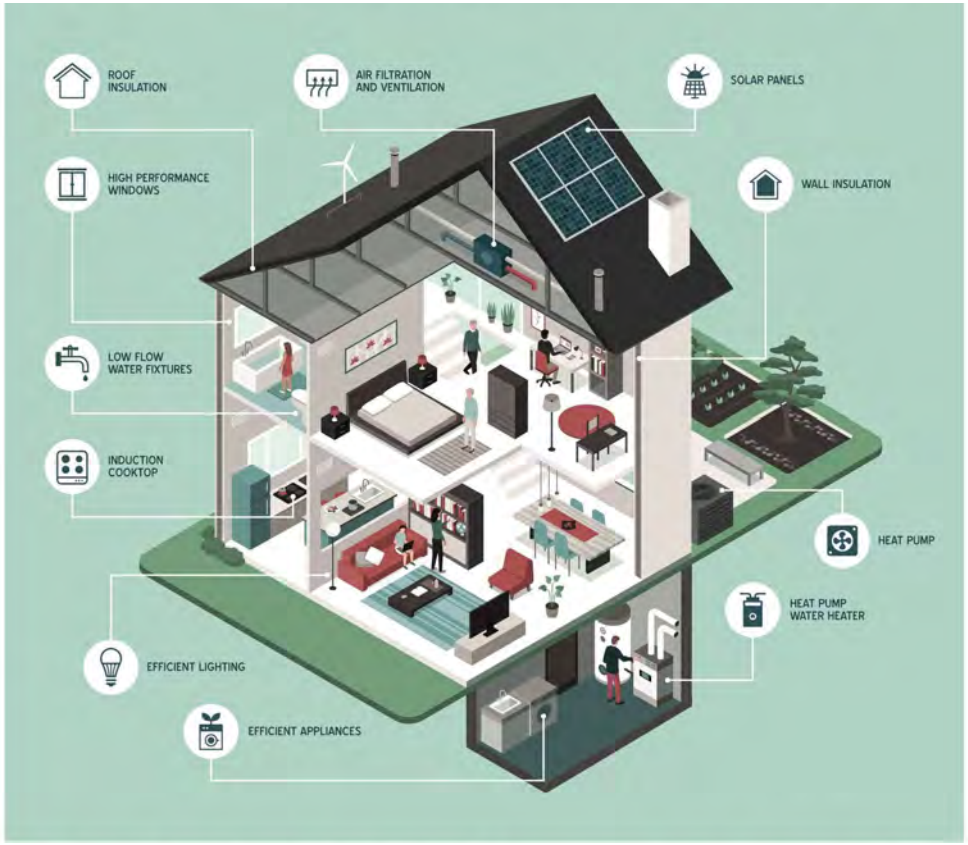
Pathway 1: Tight Building/Balanced Ventilation

- Air sealed to 2 air changes per hour at 50 pascals (ACH50) + Energy Recovery Ventilator (ERV)/Heat Recovery Ventilator (HRV)
  - Comfort
  - Health
  - Lower utility bills
- Current Illinois Code: 4 ACH50, 2021 IECC: 3 ACH50
- Stretch Code: 2 ACH50



Pathway 2: Energy Credits for New Buildings

- Choose among 37 efficiency measures. Each measure is associated with a number of energy credits.
- 1 credit= 1% energy efficiency savings
- Achieve approximately 30 credits depending on climate zone (30% savings)
    - Exact number of credits pending energy modeling, to be completed this Spring



Clarifying questions & comments on energy efficiency concepts

Renewables and Grid Integration

Solar-Ready Requirement

- Section R404.6 2024 IECC
- Chicago Transformation Code: Solar-ready low-rise multifamily
- Solar-ready zone (space on roof)
- Reserved electrical space
- Conduit from zone to electrical panel
- **In addition to 2024 IECC draft:** Multifamily buildings to meet commercial stretch code renewable requirements

Demand Responsive Water Heaters and Thermostats

- R403.5.5
- Electric storage water heaters from 40 gallons to 120 gallons
- Demand Responsive Controls (CTA-2045-B) required

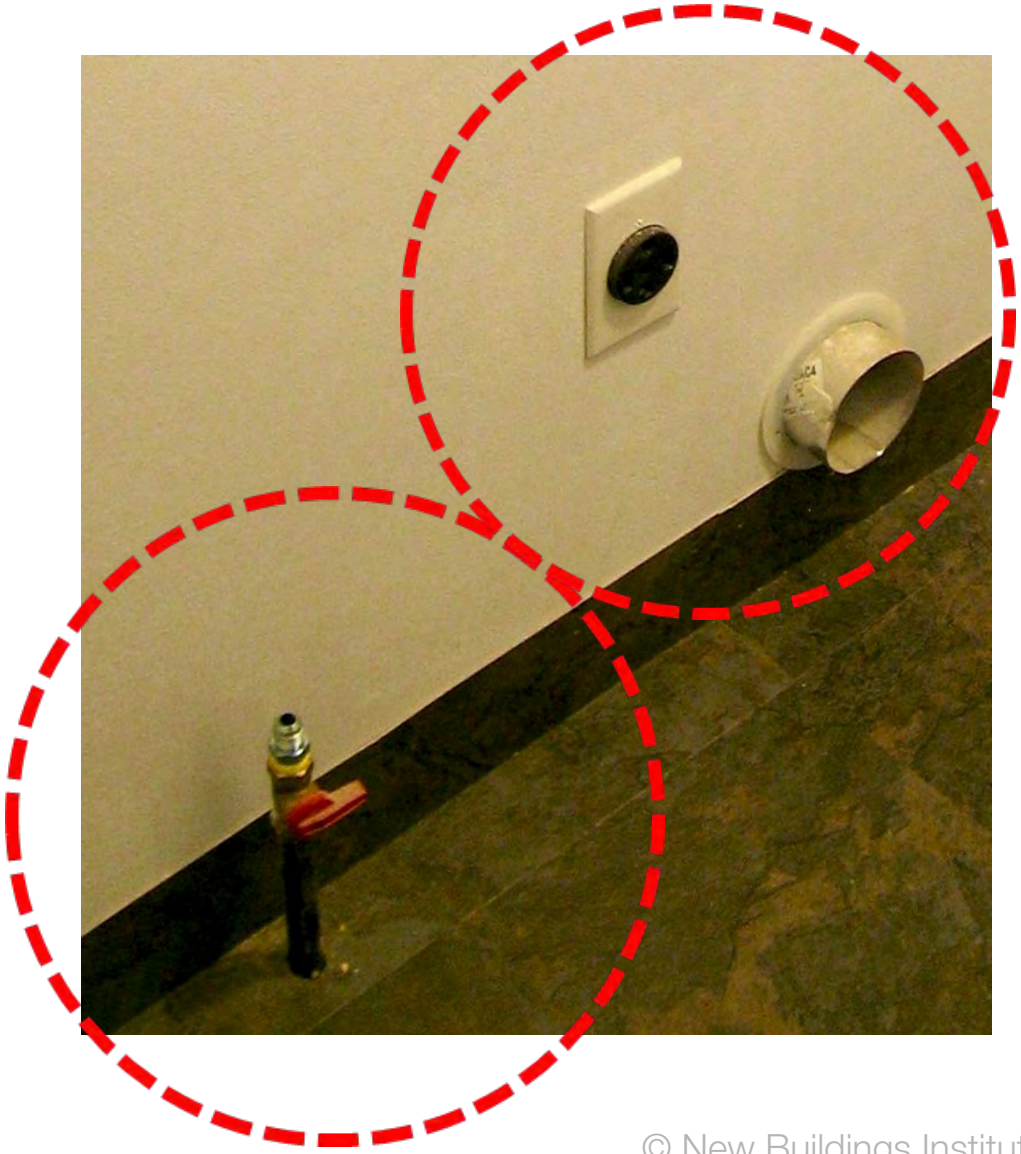
- R408.2.8
- Demand responsive thermostats required in stretch code

Clarifying questions & comments on renewable energy & grid integration concepts

Electrification

Electric-Ready Requirements

- R404.5
- Key Areas: Water Heating, Cooking, Clothes Drying, Space Heating
- Electric Readiness Required: Electrical Outlet and Electrical Capacity
- Space and Condensate Drain for Heat Pump Water Heater
- Included in Chicago Energy Transformation Code for Multifamily and Single Family



Electric Vehicle (EV)-Ready Requirements

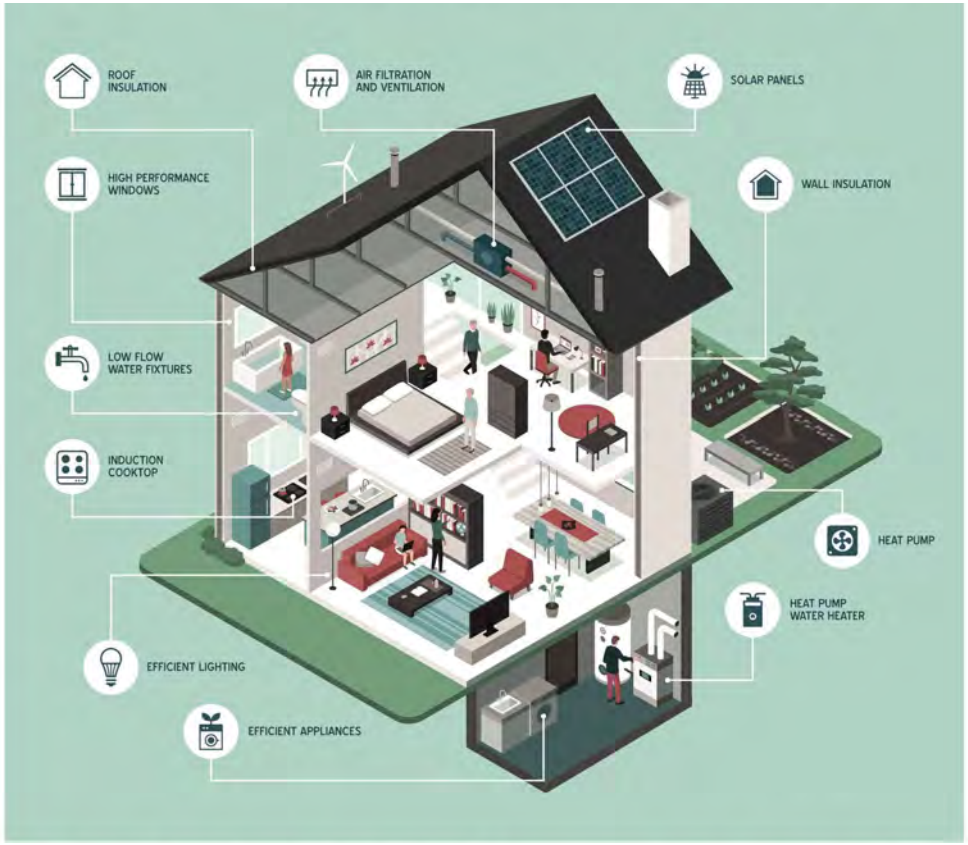
- R404.7: 2024 IECC,
- Also part of Chicago Transformation Code
- Single Family: One space per dwelling unit: EV-Ready or EV Charger Installed
- Multifamily: Comply with commercial EV stretch code requirements

Clarifying questions & comments on electrification concepts

Existing Buildings

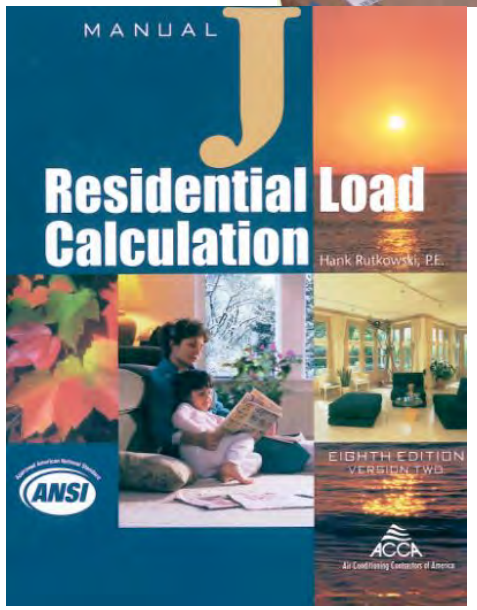
Energy Credits for Existing Buildings

- R503.1.5/R506: 2024 IECC
- Requires existing buildings undergoing an addition or substantial alteration to achieve certain number of credits from R408 (energy credits section)



Existing HVAC System Requirements

- R503.1.2: Duct Testing Requirement for Alterations when more than 25% of registers or total length of ducts are relocated, where duct system is increased by 25%
- R503.1.2.2 Requires New HVAC Equipment to be Right-Sized in Existing Buildings
- R503.1.2.4 Controls for HVAC equipment must meet controls requirements



Clarifying questions & comments on existing building concepts

- Are you interested in exploring residential stretch code adoption for your locality?
- Are you interested in submitting a comment on the stretch code by February 3?
- What do you especially like about the residential stretch code?
- What are your top concerns?

Discussion to follow

Commercial Concept Topics

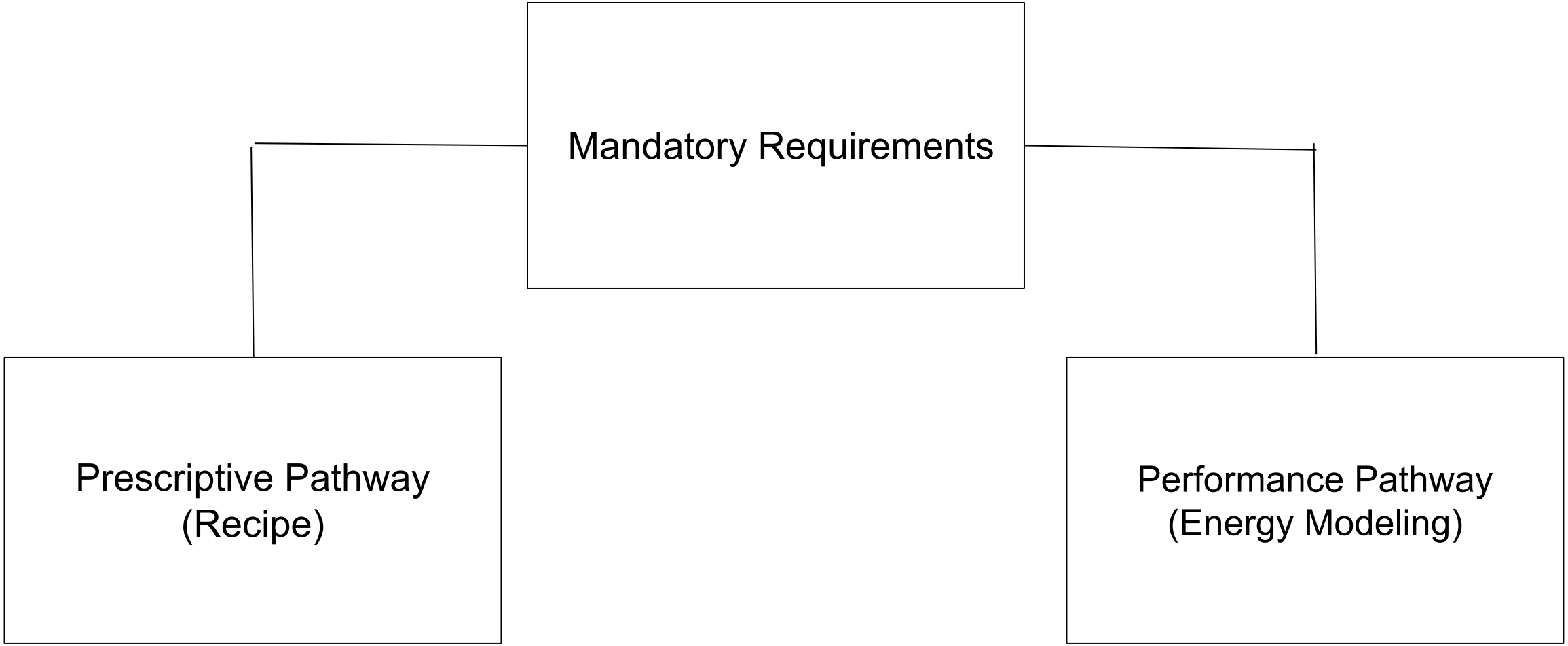
- Based on 2024 IECC
- Five main topic areas (and sources of proposals):
  - Efficiency (2024 IECC)
  - Renewables and Grid Integration (2024 IECC)
  - Electrification (EVs 2024 IECC+ Electric-Ready)
  - Existing Buildings (2024 IECC + Targeted Updates)
  - Performance Pathway and Above Code Programs

Why start with the 2024 IECC?

- Meets efficiency targets in CEJA
- Will prepare Illinois design and construction sectors for meeting 2024 IECC when adopted as base code in 2026
- Ensures the Illinois stretch energy code will always be more stringent than the base energy code, as stretch code will be updated by December 31, 2025
- Vetted by industry experts through ICC standard development process

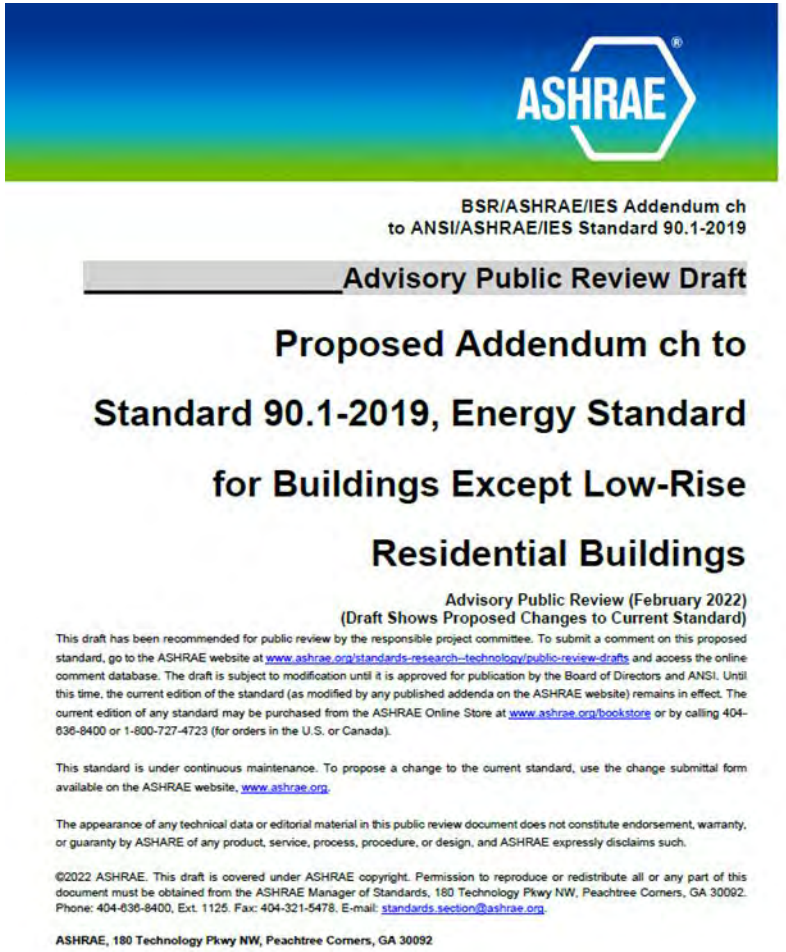
Performance, Certification, and Appendix Pathways

Pathways towards codes compliance



Reducing Site Energy Use via Performance Pathway

- By default, the Performance Pathway is based on reducing energy costs
- To align with CEJA, instead base performance pathway on site energy use
- Addendum ch to 90.1-2019



BSR/ASHRAE/IES Addendum ch
to ANSI/ASHRAE/IES Standard 90.1-2019

Advisory Public Review Draft

Proposed Addendum ch to
Standard 90.1-2019, Energy Standard
for Buildings Except Low-Rise
Residential Buildings

Advisory Public Review (February 2022)
(Draft Shows Proposed Changes to Current Standard)

This draft has been recommended for public review by the responsible project committee. To submit a comment on this proposed standard, go to the ASHRAE website at www.ashrae.org/standards-research--technology/public-review-drafts and access the online comment database. The draft is subject to modification until it is approved for publication by the Board of Directors and ANSI. Until this time, the current edition of the standard (as modified by any published addenda on the ASHRAE website) remains in effect. The current edition of any standard may be purchased from the ASHRAE Online Store at www.ashrae.org/bookstore or by calling 404-636-8400 or 1-800-727-4723 (for orders in the U.S. or Canada).

This standard is under continuous maintenance. To propose a change to the current standard, use the change submittal form available on the ASHRAE website, www.ashrae.org.

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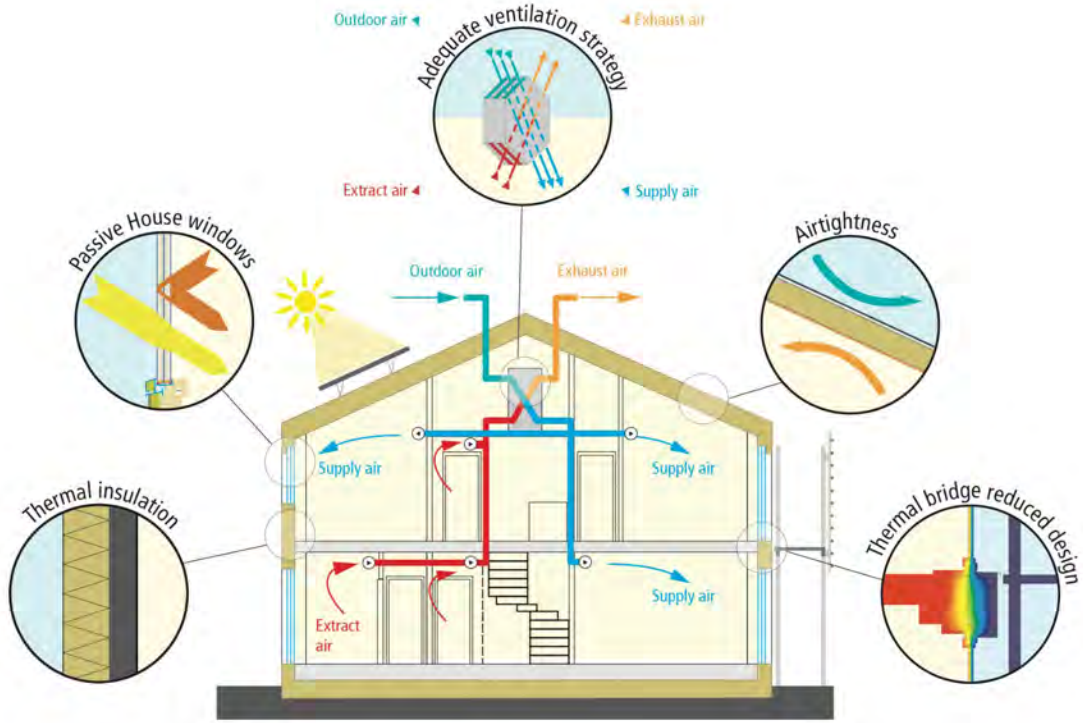
ASHRAE, 180 Technology Pkwy NW, Peachtree Corners, GA 30092

Above Code Programs: Passive House Institute U.S. (PHIUS)

- PHIUS certified buildings comply with stretch energy code (CEJA)
- 2021 IECC: Net Zero Buildings (Inflation Reduction Act)

Appendix CC:
Zero Energy Commercial Building Provisions



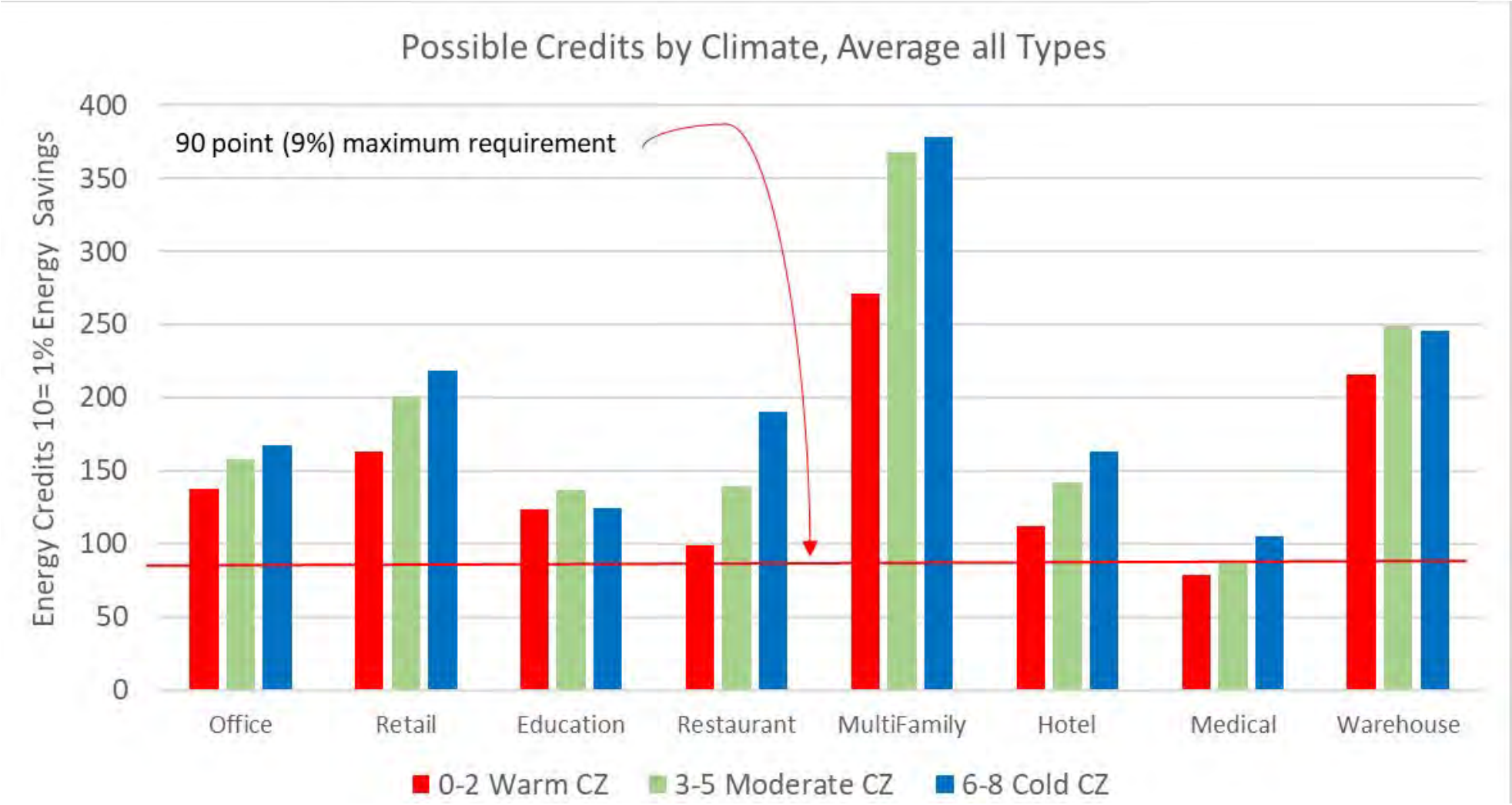
Clarifying questions on alternative compliance path concepts

Energy Efficiency

Energy Credits for New Buildings

- 2021 IECC: 16 energy efficiency measures and 10 credits (2.5% cost savings)
- CEPI-193/Section C406.1.1
- Accounts for half of total efficiency gain between 2021 and 2024 IECC (~5%)
- Choose among 31 efficiency measures
- Achieve between 30-90 points depending on building type and climate zone (average 7% savings)

Energy Credits for New Buildings



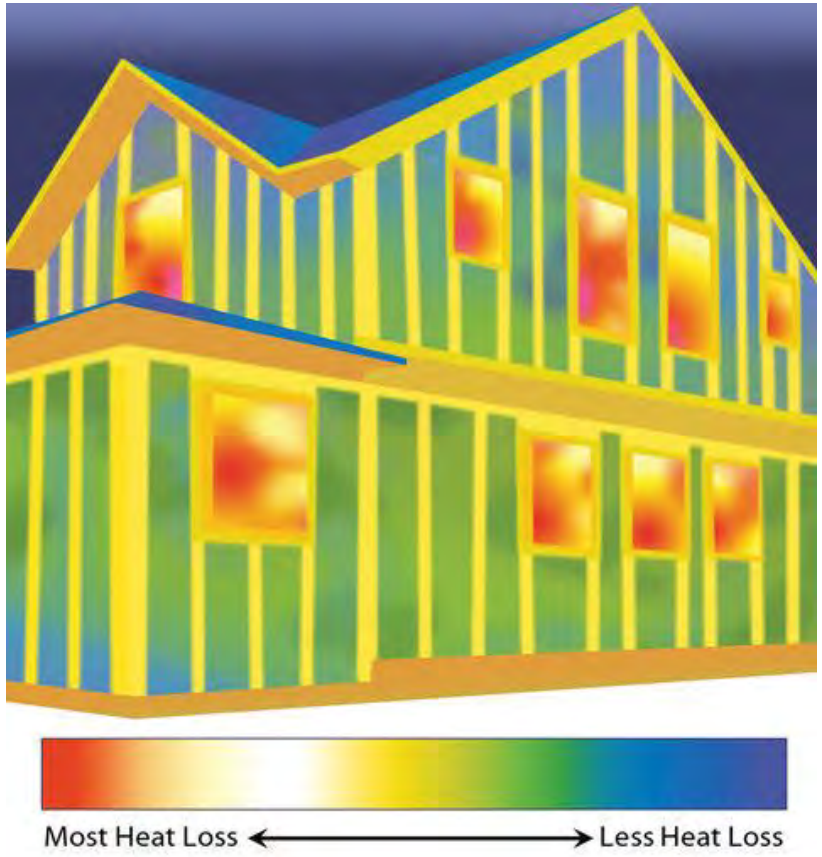
Thermal Bridging Requirements

Chicago Energy Transformation Code: Thermal blocks at balconies and parapets.

2024 IECC: CECPI-4/Section C402.7

Addresses thermal bridges from:

- Balconies, slabs and decks
- Cladding supports
- Structural beams and columns
- Vertical fenestration
- Parapets



Horticultural Lighting

Illinois Base and Chicago Energy Transformation Code:

- PPE 2.2 umol/J for indoor growing spaces and 1.7 umol/J for greenhouses
- Expands regulations for cannabis facilities to local food production.

Keep base code amendment for stretch code.

2024 IECC: PPE of 1.9 umol/J for indoor grow spaces and 1.7 umol/J for greenhouses (CEPI-185/C405.4)

Clarifying questions & comments on energy efficiency concepts

Renewables and Grid Integration

Prescriptive Renewables Requirement

- CECPI-2/Section C405.15
- Mandatory On-Site Renewable Energy (10-12% of building energy use)
  - 0.75W/s.f. of the three largest floors
- Off-site Renewable Energy required when on-site is not possible
- Chicago Energy Transformation Code: Solar-ready for low-rise commercial

Prescriptive Grid Integration Measures

- Smart Thermostats (CEPI-99/C403.4.6)
- Demand responsive water heaters (CEPI-125/C404.10)
- Demand responsive lighting (CEPI-176/C405.2.9)
- Energy Storage Readiness (CEPI-7/C405.16)

Renewable and Load Management Credits for New Buildings

- Illinois Base and Chicago Transformation Code: Trade-off efficiency with load management
- 2024 IECC: CEPI-193/Section C406
- New renewable/load management requirement (can’t trade with efficiency)
- Choose among 8 renewable/load management measures
- Credits based on time of use energy cost savings

Clarifying questions & comments on renewable energy & grid integration concepts

Electrification

New Electric-Ready Requirements

- 2024 IECC-C Proposal in Public Comment Period- Not in Draft
- Included in Chicago Energy Transformation Code for Multifamily and Single Family
- Key Areas: Heating, Water Heating, Cooking, Clothes Drying and Lighting
- Electric Readiness Required: Electrical Outlet and Electrical Capacity
- More Efficiency Points Required When Not Using a Heat Pump for Space Heating

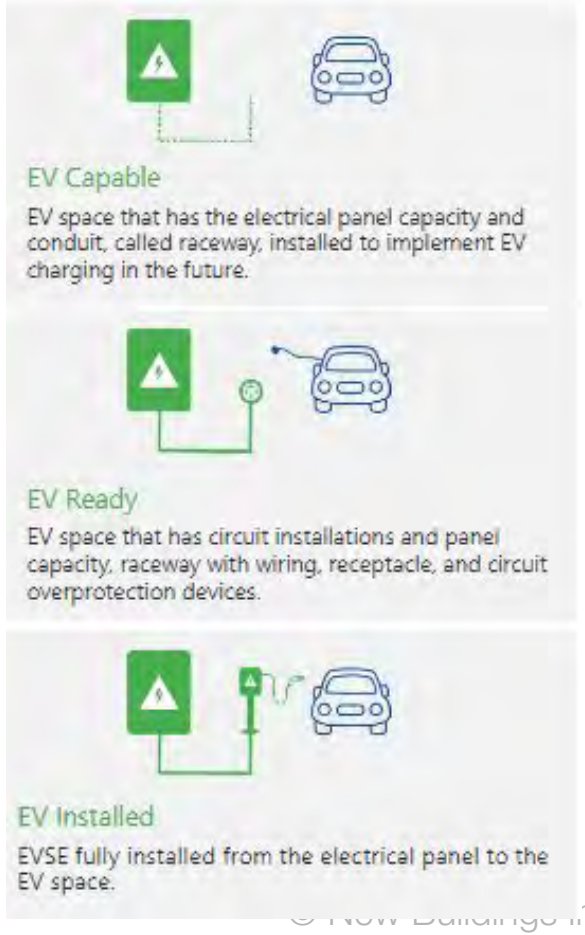
EV Infrastructure Requirements

CECPI-1/Section C405.14

Chicago: EV-Ready Ordinance (20% of spaces are EV-ready)

TABLE C405.14.1
REQUIRED EV POWER TRANSFER INFRASTRUCTURE

Occupancy	EVSE Spaces	EV Ready Spaces	EV Capable Spaces
Group A	10%	0%	10%
Group B	15%	0%	30%
Group E	2%	0%	5%
Group F	2%	0%	5%
Group H	1%	0%	0%
Group I	2%	0%	5%
Group M	10%	0%	10%
Group R-1	20%	5%	75%
Group R-2	20%	5%	75%
Group R-3 and R-4	2%	0%	5%
Group S exclusive of parking garages	1%	0%	0%
Group S-2 parking garages	1%	0%	0%

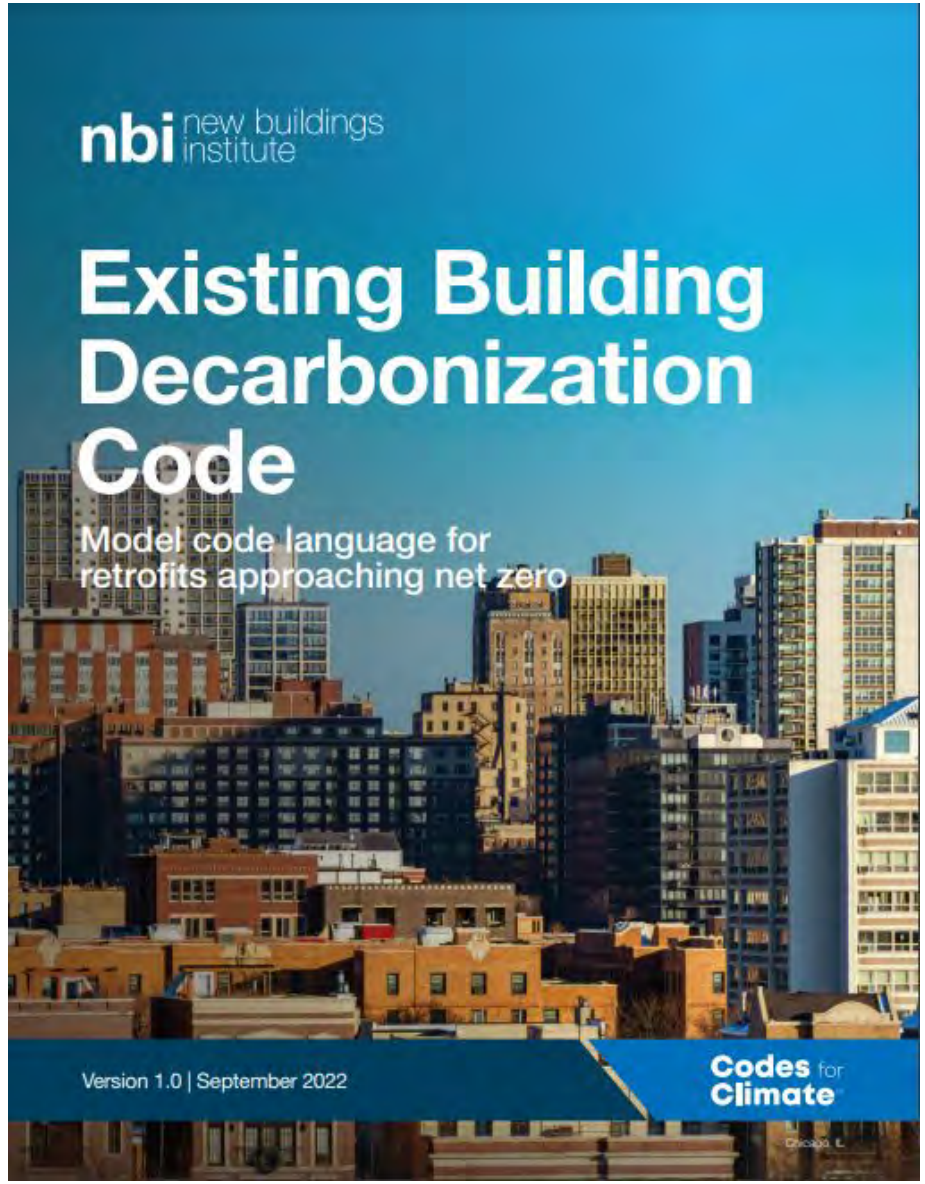


Clarifying questions & comments on electrification concepts

Existing Buildings

Energy Credits for Existing Buildings

- CEPI-204/Section C506
- Alterations: 10% of energy credits for 1% savings
- Additions: 50% of energy credits for 3.5% savings
- **In Addition to 2024 IECC-C Draft:** Define Substantial Energy Alteration and require additional credits for mixed fuel and fewer credits for electric buildings

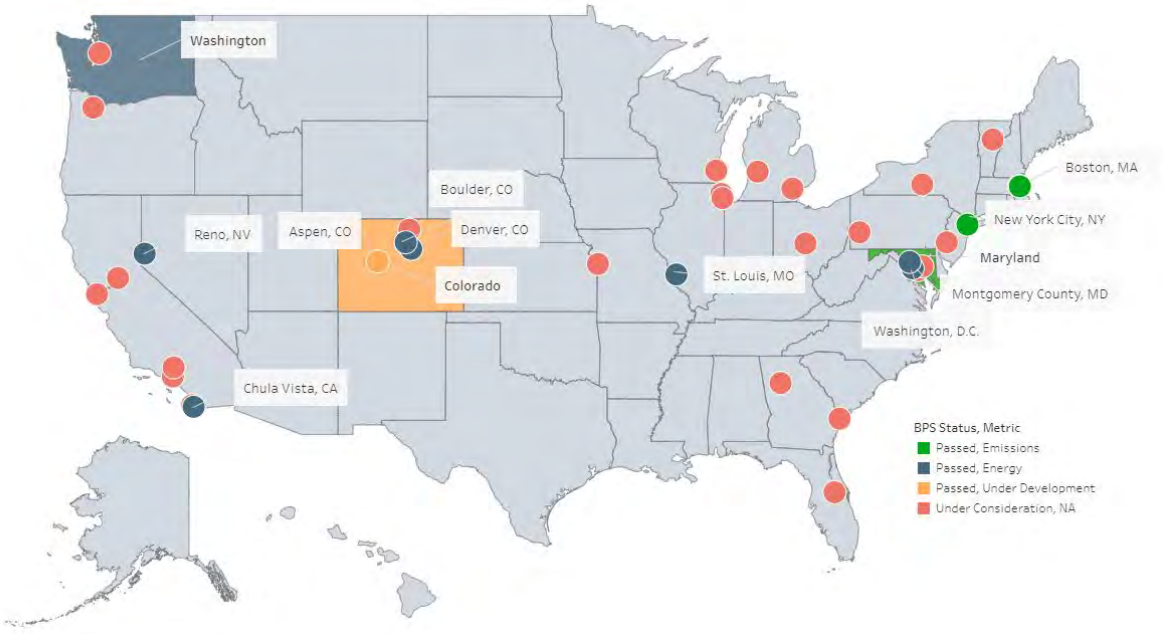


Existing HVAC System Requirements

- Duct Testing Requirement for Alterations (CEPI-219/C503.3.5)
- Requires New HVAC Equipment to be Right-Sized in Existing Buildings (CEPI-228/C503.3.7)
- Alterations Acceptance Testing (Retro commissioning if replaced HVAC systems) (CEPI-229/C503.3.4)

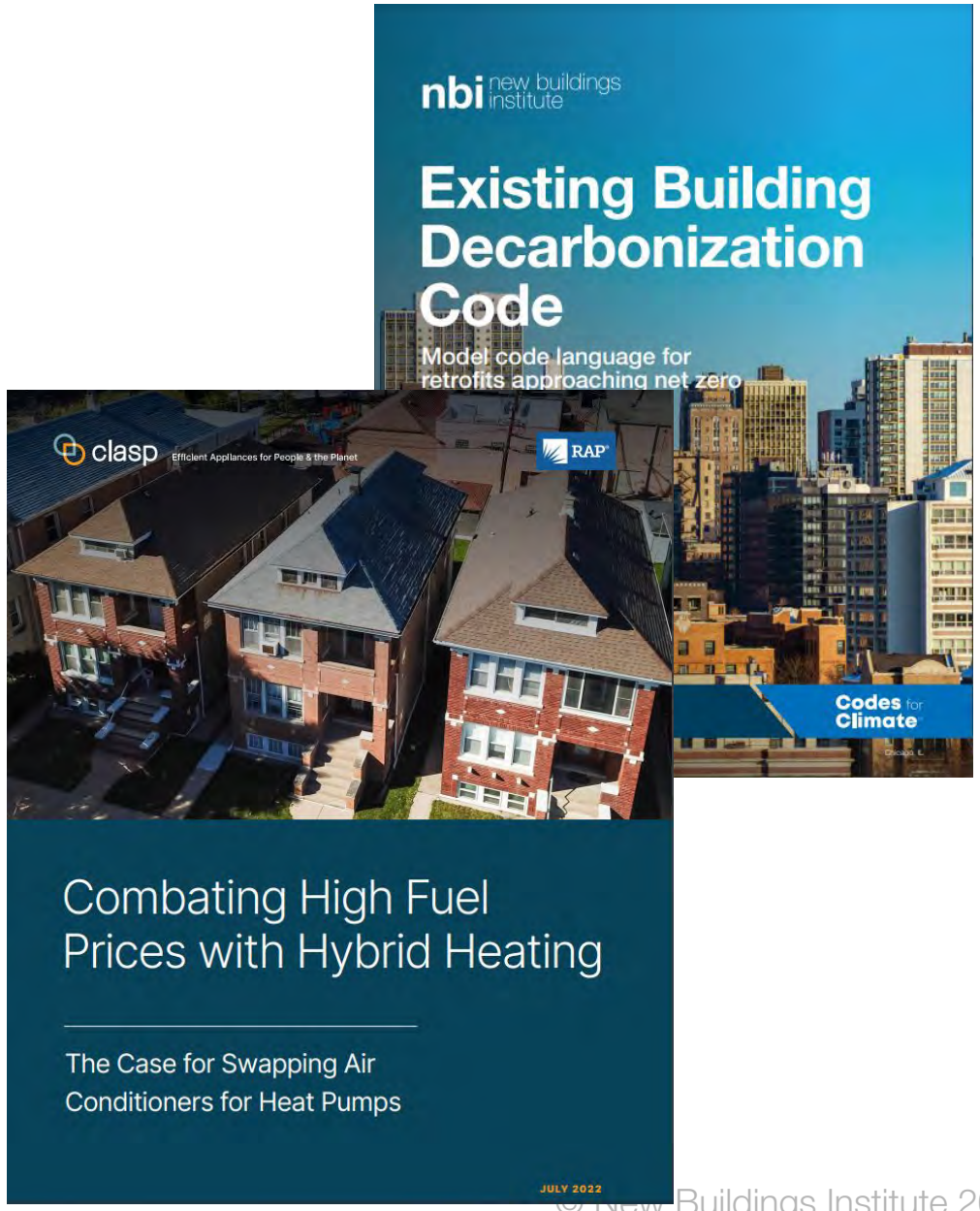
Energy Monitoring for More Buildings and EV Monitoring

- Requires energy monitoring and commissioning for buildings greater than 10,000 s.f.
  (CEPI-138/Section C405.13
  CEPI-215/Section C408.2)
- Requires energy use of EVs separate from building energy use
  (CEPI-140/Section C405.13)
- Crucial for successful implementation of Building Performance Standards
  (requirements for existing buildings)



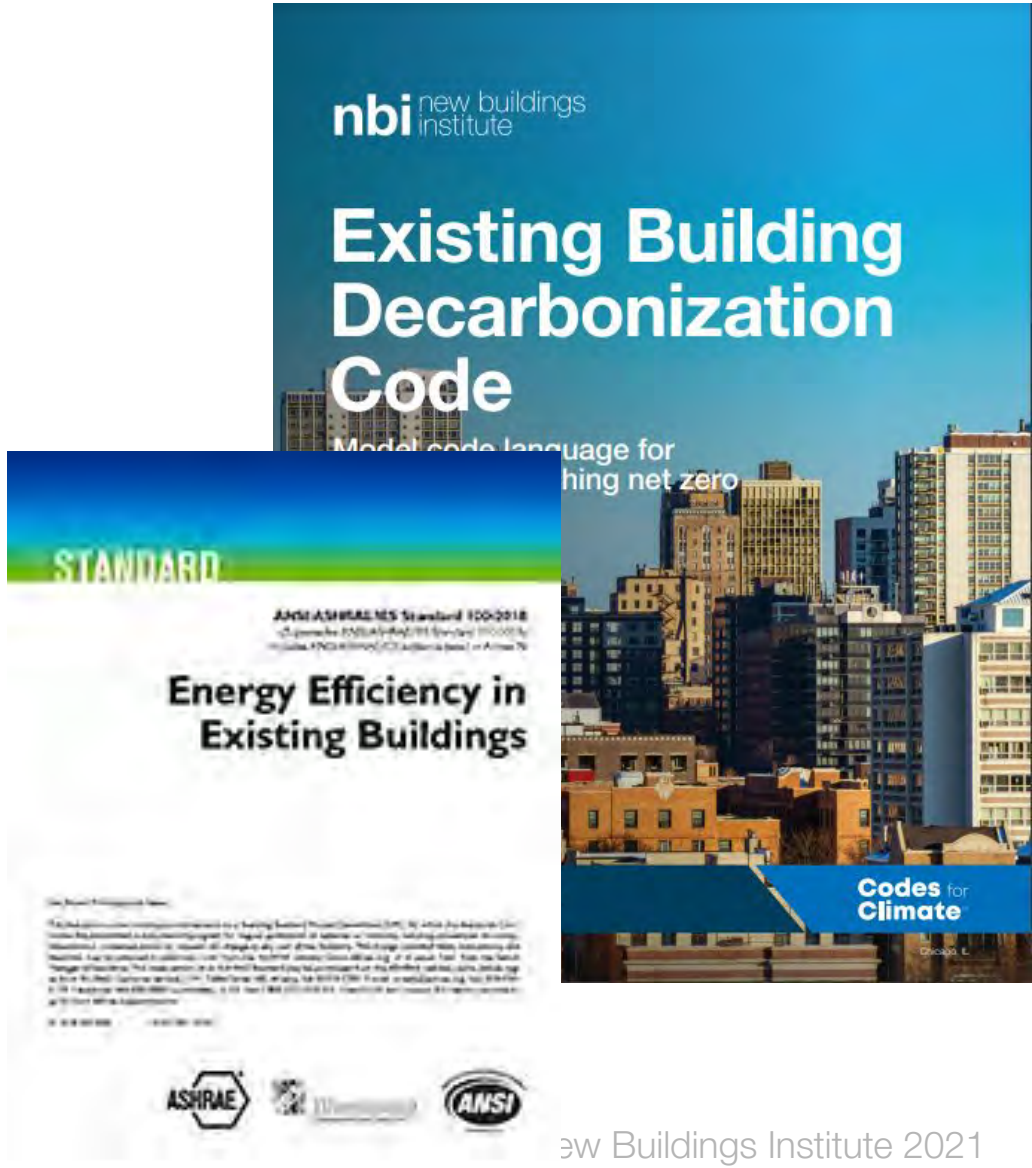
New HVAC Proposals

- New and replacement unitary air conditioners must be heat pump equipment.
- Existing space heating systems converted to supplementary heat.



New Existing Building Proposals

- Defines Substantial Improvement (50% of market value)
- Buildings undergoing substantial improvement must meet site EUI according to ASHRAE Standard 100



Clarifying questions & comments on existing building concepts

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- Are you interested in submitting a comment on the stretch code by February 3?
- What do you especially like about the commercial stretch code?
- What are your top concerns?

Discussion to follow

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Two ways to comment

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- General comments will be taken during the last ~30 minutes of the meeting, limited to two minutes each
- Brief clarifying questions and comments will be taken after each topical section; each clarification period will be limited to five minutes
- Message Lisa Hennigh to be added to the queue. Note if your comment is **general** (to be addressed at the end of the meeting) or **topical** (to be addressed after the section)

In writing by February 3:

- Use web forms to submit comments
- Proposals using a process similar to that in base code will also be accepted at CDB.BuildingCodes@illinois.gov

Thank You

Contact Info for Questions:

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Appendix:
Additional reference slides - Residential

Codes for Climate™

Revisions from 2024 IECC-R Draft for CEJA Compliance

- R408 credits have to equate to site EUI savings without renewables:
  - Remove renewables from energy credit pathway
  - Remove wall insulation trade-off allowance
  - Make demand responsive capable thermostats mandatory

Credits for Additional Energy Efficiency

TABLE R408.2
CREDITS FOR ADDITIONAL ENERGY EFFICIENCY

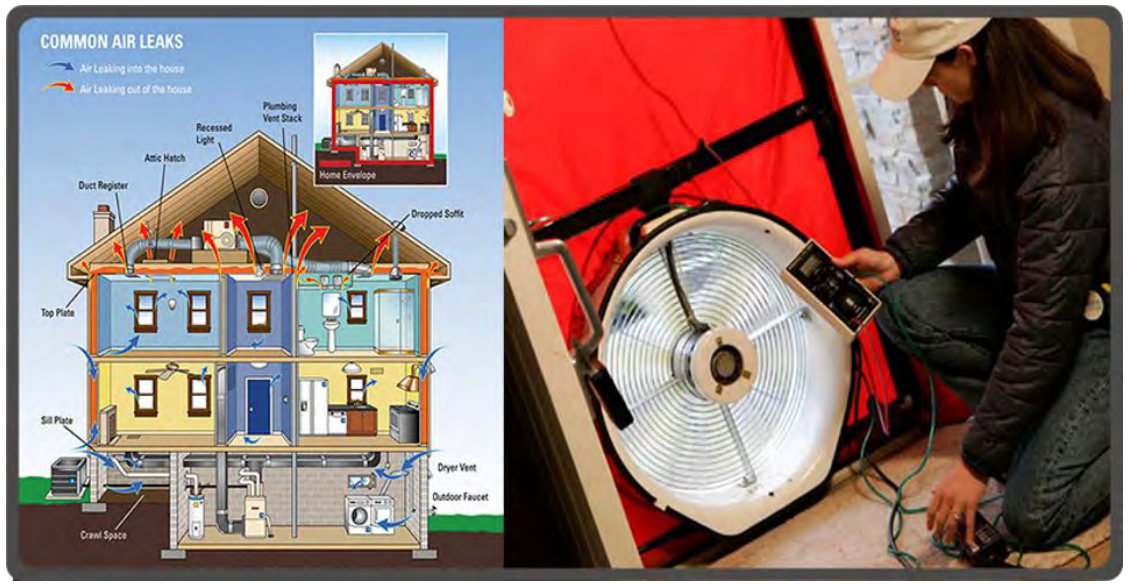
Measure Number	Measure Description	Credit Value								
		Climate Zone 0 & 1	Climate Zone 2	Climate Zone 3	Climate Zone 4	Climate Zone 4C	Climate Zone 5	Climate Zone 6	Climate Zone 7	Climate Zone 8
R408.2.1.1(1)	≥2.5% Reduction in total UA	0	0	0	1	1	1	1	1	1
R408.2.1.1(2)	≥5% reduction in total UA	0	1	1	2	2	3	3	3	3
R408.2.1.1(3)	>7.5% reduction in total UA	0	1	2	2	2	3	3	4	4
R408.2.1.2(1)	0.22 U-factor windows	1	2	2	3	3	4	4	4	5
R408.2.1.2(2)	U-factor and SHGC for windows per Table R408.2.1	1	1	1	0	0	0	0	1	2

Envelope Measures for Credits

1. UA Reduction (≥2.5%)
2. UA Reduction (≥5%)
3. UA Reduction (≥7.5%)
4. 0.22 U-factor windows
5. U-factor and SHGC for windows in Table R408.2.1 (NA in CZ 4 and 5)
6. Cool Roof

Envelope Measures Continued

1. 2 ACH50 air leakage rate with ERV/HRV installed
2. 2 ACH50 air leakage rate with balanced ventilation
3. 1.5 ACH50 air leakage rate with balanced ventilation
4. 1.5 ACH50 air leakage rated with ERV or HRV installed
5. 1 ACH50 air leakage rate with ERV or HRV installed

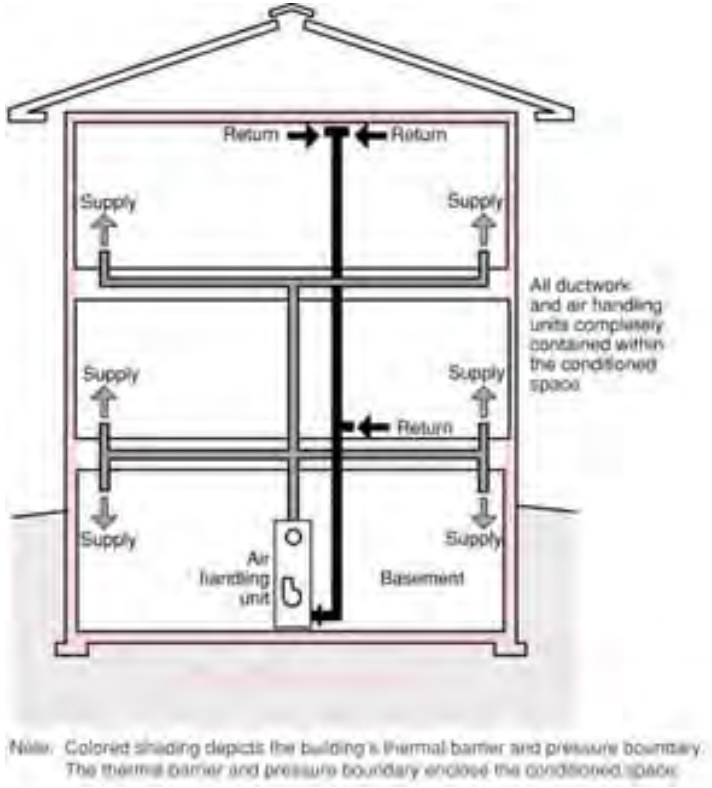


HVAC Measures for Credits

1. A/C ≥ 16 SEER
2. A/C ≥ 18 SEER/14 EER
3. Furnace ≥ 92% AFUE
4. Furnace ≥ 95% AFUE + ≥ 15.2 SEER2 AC
5. Furnace ≥ 95% AFUE + ≥ 16 SEER2 AC
6. Furnace ≥ 96% AFUE
7. Air Source Heat Pump ≥ 9 HSPF/16 SEER
8. Air Source Heat Pump ≥ 10 HSPF/16 SEER
9. Ground Source Heat Pump ≥ 3.5 COP
10. Ductless Singe Zone
11. Ductless Multizone (Non-ducted indoor unit)
12. Ductless Multizone (ducted or mixed)

Duct Thermal Distribution System Measures

1. 100% of ductless thermal distribution system or hydronic thermal distribution system in building thermal envelope
2. 100% of ducts in conditioned space
3. Reduced total duct leakage (≤2 CFM25/s.f.)



Note: Colored shading depicts the building's thermal barrier and pressure boundary. The thermal barrier and pressure boundary enclose the conditioned space.

Hot Water Measures for Credits

1. Gas-fired storage water heaters (UEF≥0.81 for less than 55g)
2. Gas-fired instantaneous water heaters (UEF≥0.95)
3. Electric water heaters (Integrated HPWH UEF≥3.3)
4. Electric water heaters (120V or Split System HPWH UEF≥2.2)
5. Solar hot water heating system (SUEF ≥2.2
6. Compact hot water distribution

ENERGY STAR® Certified Appliances for Credits

Prescriptive paths under consideration

With heat pump requirement

1. Water Heating Package + Heat Pump (HP) Heating/Cooling Requirement
2. HP heating/cooling + HP Hot Water + 2ACH50 + ERV/HRV
3. HP heating/cooling + 2ACH50 + ERV/HRV

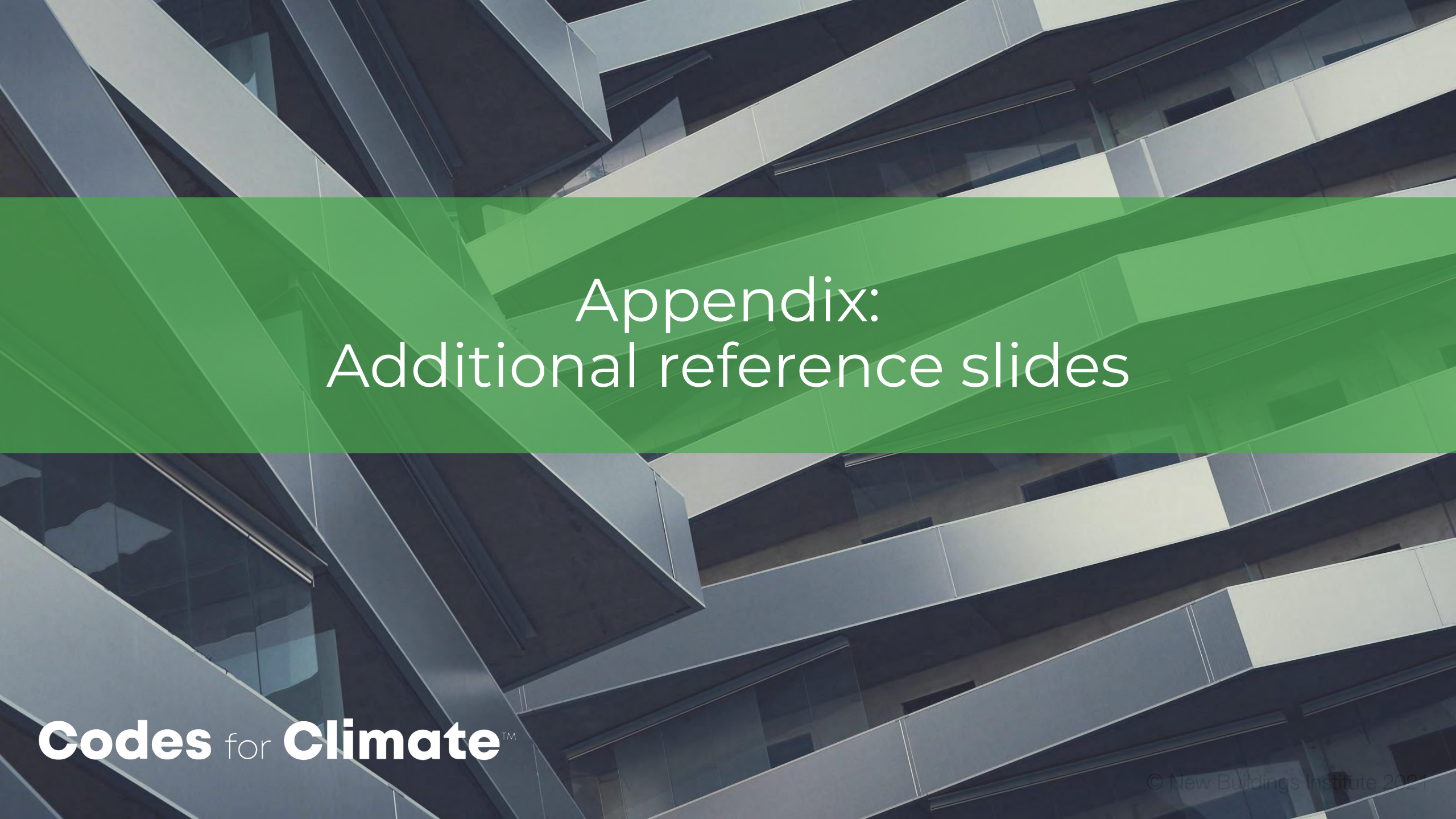
Without heat pump requirement

1. Water Heating Package + 2 ACH50 + ERV/HRV + 10 Credits
2. 2ACH50 + ERV/HRV + 20 Credits
3. Attain 30 points, no required selections

Proposed Water Heating Package Requirement

Chose one of five water heating packages:

Component	Package 1	Package 2	Package 3	Package 4	Package 5
Efficient pipe length/volume	X		X		
Drainwater heat recovery		X			
Recirculating pump		X			
DWH equipment efficiency			>2.9 UEF	>2.9 UEF	>3.2 UEF
Efficient plumbing fixtures	X	X		X	
Solar WH serves 25% of hot water needs	X				



Appendix:
Additional reference slides

Codes for Climate™

Energy Credits Requirements Table

TABLE C406.1.1
ENERGY CREDIT REQUIREMENTS BY BUILDING OCCUPANCY GROUP

Building Occupancy Group	Climate Zone																	
	0A	0B	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
R-2, R-4, and I-1	65	66	67	77	80	86	80	81	90	86	90	90	86	90	90	70	89	80	78
I-2	43	42	38	37	36	38	32	32	30	36	36	35	43	43	44	46	47	50	53
R-1	63	62	66	65	70	71	77	80	84	81	83	88	85	86	90	83	87	87	85
B	62	62	64	66	66	65	64	64	68	70	72	74	71	73	77	71	74	74	71
A-2	70	70	72	72	75	75	70	73	82	69	74	78	67	72	78	60	67	57	51
M	80	79	83	79	81	84	67	74	87	80	66	65	79	62	50	75	67	75	58
E	56	57	55	58	58	57	59	62	59	61	66	62	64	67	67	65	67	63	58
S-1 and S-2	61	60	61	60	58	57	44	54	62	85	68	75	90	82	72	90	89	90	90
All Other	31	31	31	32	32	33	30	32	36	35	35	35	37	36	36	36	37	36	34

Envelope and HVAC Measures for Credits

Envelope

1. Envelope Performance
2. UA Reduction (15%)
3. Envelope Leak Reduction
4. Add Roof Insulation
5. Add Wall Insulation
6. Improve Fenestration

HVAC

1. HVAC Performance (TSPR)
2. Heating Efficiency
3. Cooling Efficiency
4. Residential HVAC Control
5. DOAS/Fan Control

HVAC Total System Performance Ratio (TSPR)

- CEPI-76/Section C409
- More efficient HVAC system selection
- Avoids complex modeling
- Reduces operating costs and carbon emissions

$$\text{TSPR} = \frac{\textit{Annual Heating and Cooling Load}}{\textit{Annual Site Energy Use of HVAC System}}$$

Hot Water Measures for Credits

1. SHW Preheat Recovery
2. Heat Pump Water Heater
3. Efficient Gas Water Heater
4. SHW Pipe Insulation
5. Point of Use Water Heaters
6. Thermostatic Balancing Valves
7. SHW Heat Trace Systems
8. SHW Submeters
9. SHW Distribution Sizing
10. Shower Heat Recovery

Lighting and Other Measures for Credits

1. Energy Monitoring
2. Lighting Performance
3. Lighting Dimming and Tuning
4. Increase Occupancy Sensors
5. Increase Daylight Area
6. Residential Light Control
7. Efficient Elevator
8. Commercial Kitchen Equipment
9. Residential Kitchen Equipment
10. Fault Detection

Additional efficiency opportunities

CEPI-097-21	Boiler Controls	Introduces requirements for boiler oxygen controls, combustion air controls, and variable fan motors for larger boilers, thereby improving part-load performance
CECPI-007-21	Indoor Lighting Efficiency	This proposal consolidates actions by the SC of the following CEPI-178, 179, 180, 182, 183, and 184 into one consensus proposal by improving indoor lighting efficiency for buildings.
CEPI-107-21	Direct digital control airflow rates	Increases efficiency of both compliance options for multi-zone VAV systems with DDC: eliminates the blanket allowance to use 20% of the peak airflow rate in option 1 and the 20% floor in Option 2.
CEPI-119-21	Fan Power Limits	Update fan power limits for HVAC systems based on Title 24-2022

Additional efficiency, continued

CEPI-120-21	Central Fan Integrated efficacy	More efficient fan motors and design for dwelling units that ensures that fans are not used for both heating/cooling and OA together
CEPI-130-21	Service water heating insulation	Updates piping insulation requirements for service water heating systems to align with ASHRAE 90.1
CEPI-173-21	Lighting Parking Lot Activity Sensors	Reduces lighting power allowance for luminaires serving outdoor parking areas.
CEPI-128-21	Water Heater Efficiency High Capacity	Requires a 92% efficiency when multiple water heaters are connected to the same system. Exception for renewables is removed.

Alignment with the current state of the market

CEPI-077-21	Boiler High Capacity Space Heating Gas	Implementation oriented to ensure that condensing boilers operate as they should (and at their most efficient)
CEPI-156-21	Lighting Dimming controls	Replaces light reduction controls with dimming controls because with LED technology, this is the standard lighting reduction control design.
CEPI-164-21	Daylighting Controls	Reduce wattage minimum for daylight responsive controls to account for LEDs
CEPI-189-21	Lighting exterior updates	Reduces lighting power allowances for building exteriors to account for LED lighting

Renewable and Load Management Credit Requirements Table

TABLE C406.1.2
RENEWABLE AND LOAD MANAGEMENT CREDIT REQUIREMENTS BY BUILDING OCCUPANCY GROUP

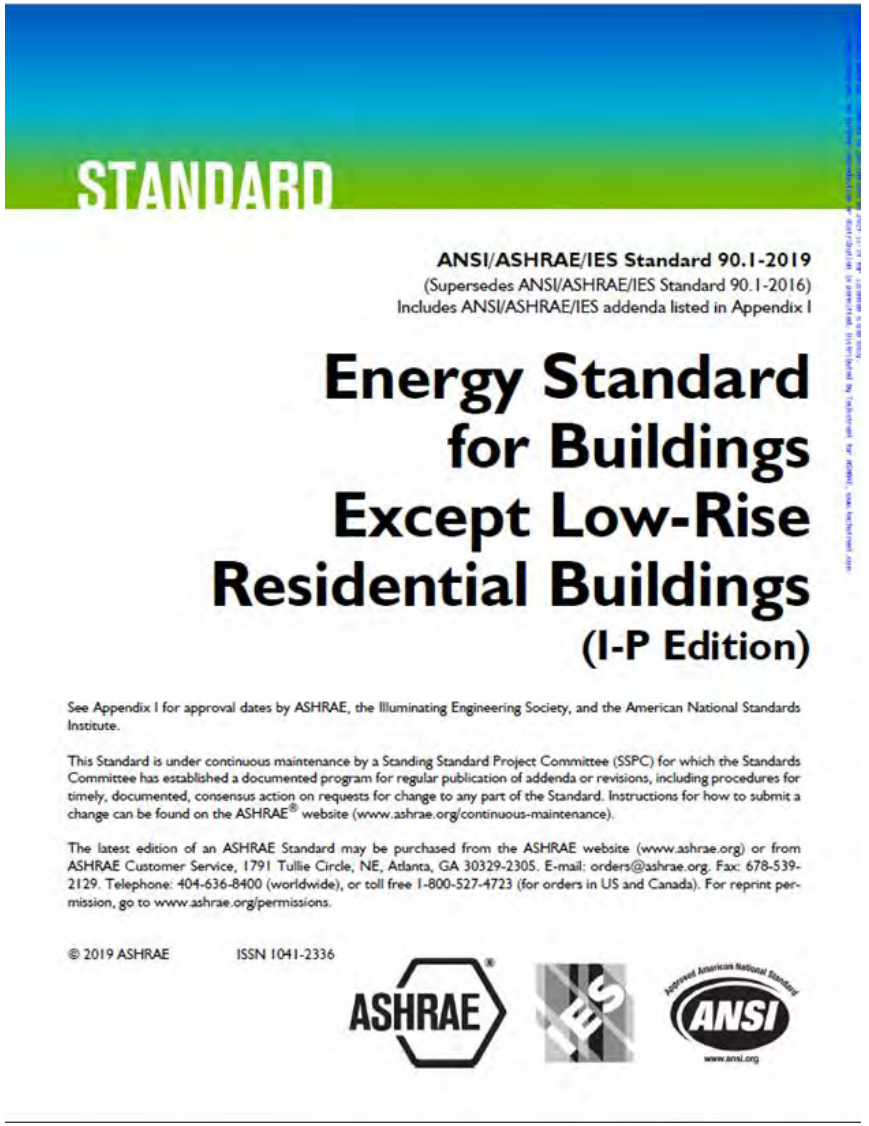
Building Occupancy Group	Climate Zone																	
	0A	0B	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
R-2, R-4, and I-1	64	59	70	69	73	89	72	90	90	63	90	70	51	75	66	48	48	50	42
I-2	31	32	33	32	33	36	31	40	34	32	43	32	29	37	33	34	34	27	23
R-1	41	40	48	44	48	58	54	61	63	50	61	47	42	55	50	41	41	40	32
B	63	64	74	75	78	89	83	90	90	77	90	86	68	90	83	72	72	68	58
A-2	12	12	13	13	12	17	13	17	17	12	17	13	12	12	12	12	12	8	7
M	71	70	84	84	90	90	90	90	90	81	90	90	77	90	90	76	76	71	58
E	49	55	64	61	69	83	73	90	90	67	90	75	61	86	74	66	66	60	47
S-1 and S-2	90	90	90	90	90	90	90	90	90	90	90	90	70	90	90	61	61	61	53
All Other	56	55	66	63	69	80	69	87	88	59	86	68	51	72	66	51	51	48	40

Renewable and Load Management Measures

1. Renewable Energy
2. Lighting Load Management
3. HVAC Load Management
4. Automated Shading
5. Electric Energy Storage
6. Cooling Energy Storage
7. SHW Energy Storage
8. Building Thermal Mass

IL ECAC Voted Against: Require ASHRAE 90.1 Appendix G

- Require buildings going the performance pathway use ASHRAE 90.1 Appendix G
- Most common performance pathway method used
- Most technically accurate
- Simplifies Compliance


STANDARD

ANSI/ASHRAE/IES Standard 90.1-2019
(Supersedes ANSI/ASHRAE/IES Standard 90.1-2016)
Includes ANSI/ASHRAE/IES addenda listed in Appendix I

Energy Standard for Buildings Except Low-Rise Residential Buildings
(I-P Edition)

See Appendix I for approval dates by ASHRAE, the Illuminating Engineering Society, and the American National Standards Institute.

This Standard is under continuous maintenance by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the Standard. Instructions for how to submit a change can be found on the ASHRAE® website (www.ashrae.org/continuous-maintenance).

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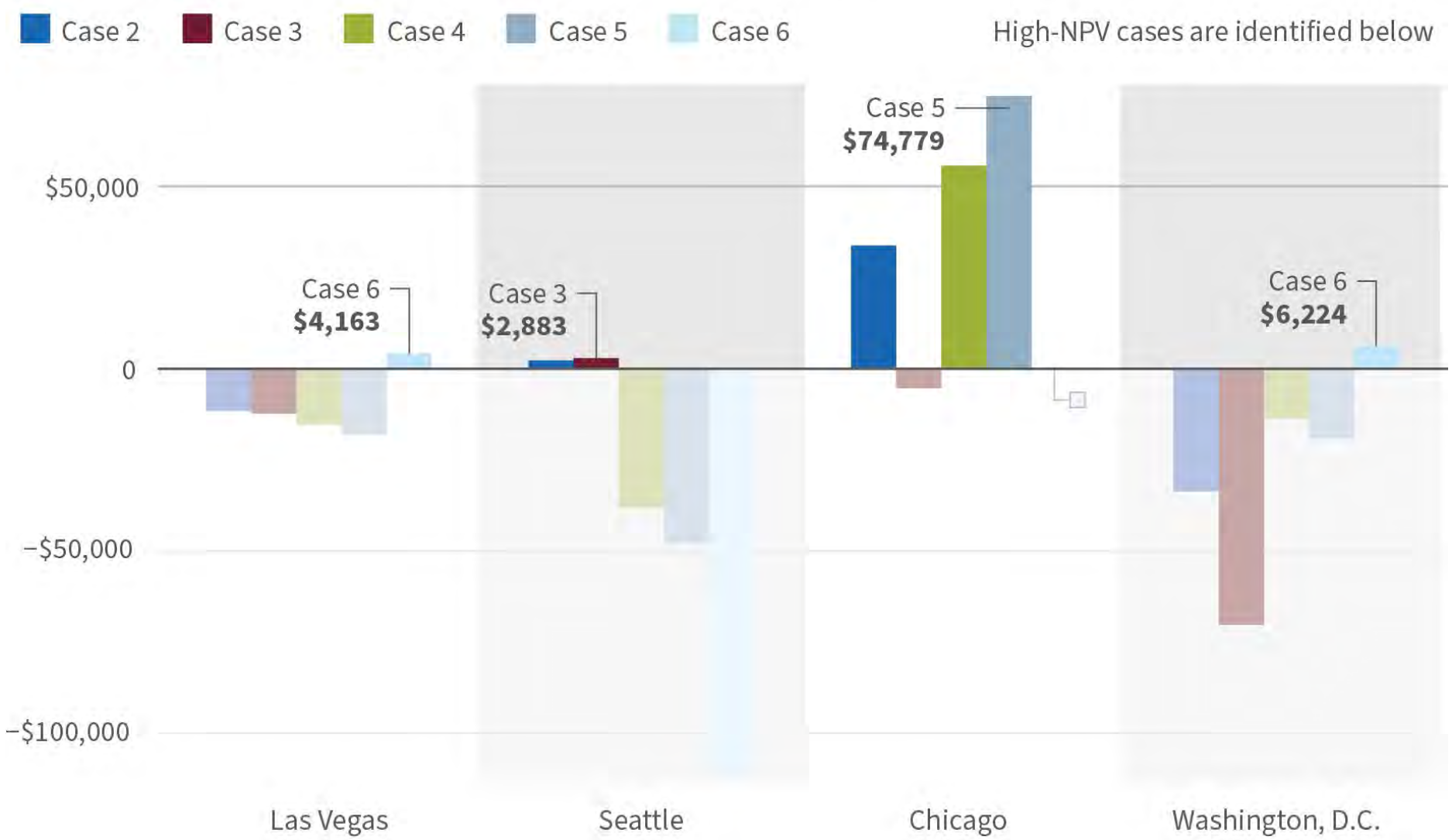
ASHRAE IES ANSI

The 20-year net present value of each case by city



The economics of electrifying Chicago

Case	Existing RTU replaced with:	Efficiency details	PV details
1. No electrification	Conventional gas RTU		
2. Partial electrification	Heat-pump RTU with gas backup		
3. Full electrification	Heat-pump RTU with electric resistance backup		
4. Efficient electrification	Heat-pump RTU with electric resistance backup + ERV + efficiency measures	10% fan power efficiency improvement	
5. Efficient electrification + demand management	Heat-pump RTU with electric resistance backup + ERV + demand management + efficiency measures	10% fan power efficiency improvement	
6. Efficient electrification + demand management + PV	Heat-pump RTU with electric resistance backup + ERV + demand management + PV + efficiency measures	10% fan power efficiency improvement	100 kW DC, azimuth 180°, flat panels, 25% of roof area