Raising the Bar:
Advancing the Versions of the ENERGY STAR Residential New Construction Programs

2021 ENERGY STAR
Residential New Construction Partner Meeting

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Agenda

- In the next few weeks, we'll have a stakeholder feedback period for:

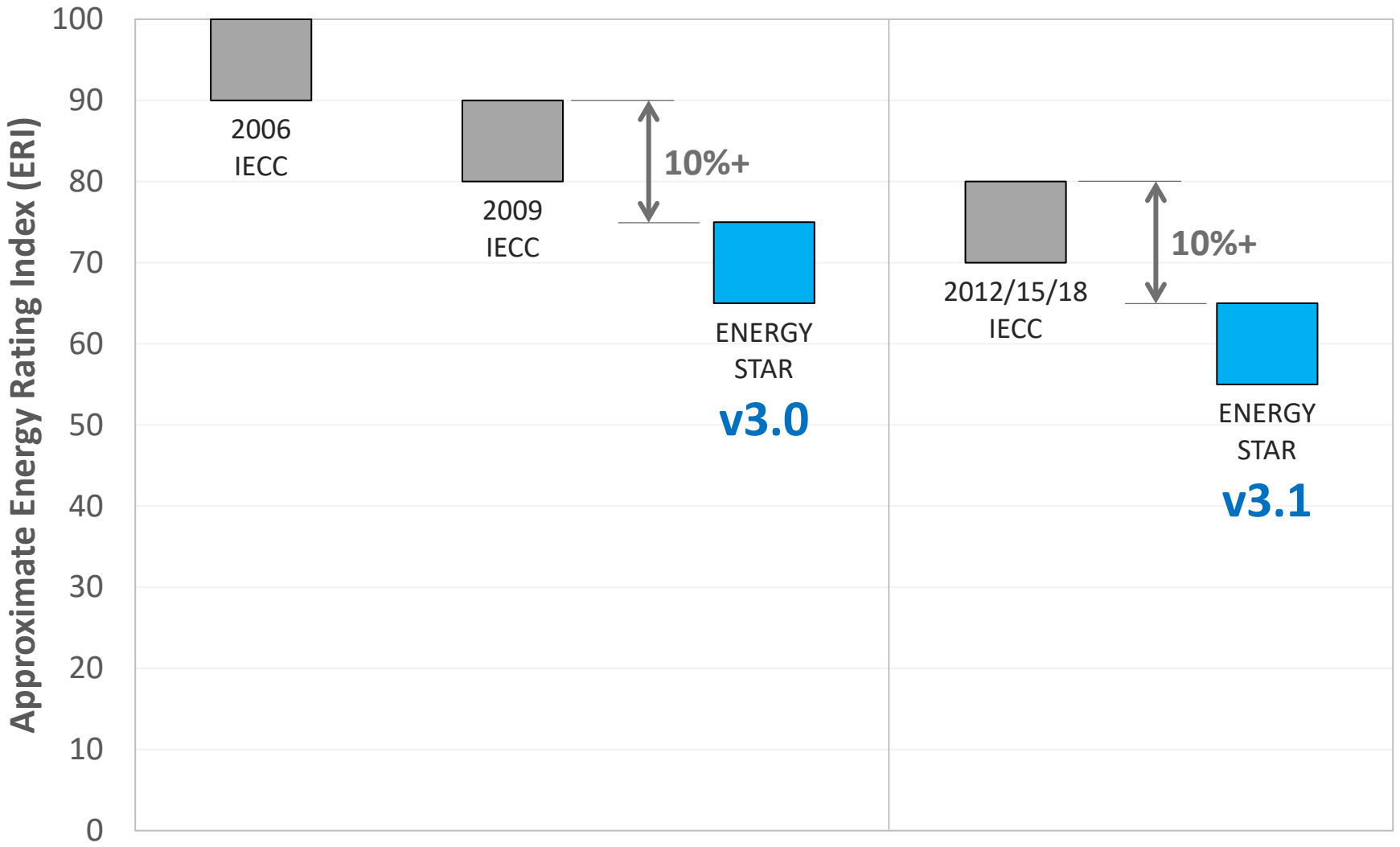
1. Transition from lowest tier of our national programs:
   - Single-Family National **Version 3.0** to **3.1**.
   - Multifamily National **Version 1.0** to **1.1**.

2. Definition of a new national Version for states that adopt the 2021 IECC:
   - Single-Family National **Version 3.2**
   - Multifamily National **Version 1.2**

- Disclaimer: Proposals are still being finalized, so subject to slight changes.

Proposal #1:
National Transition to v3.1 / v1.1

Modern code evolution



Key components of ENERGY STAR versions

Performance Target

- V3.0: ~65-75 ERI target
- V3.1: ~55-65 ERI target

+

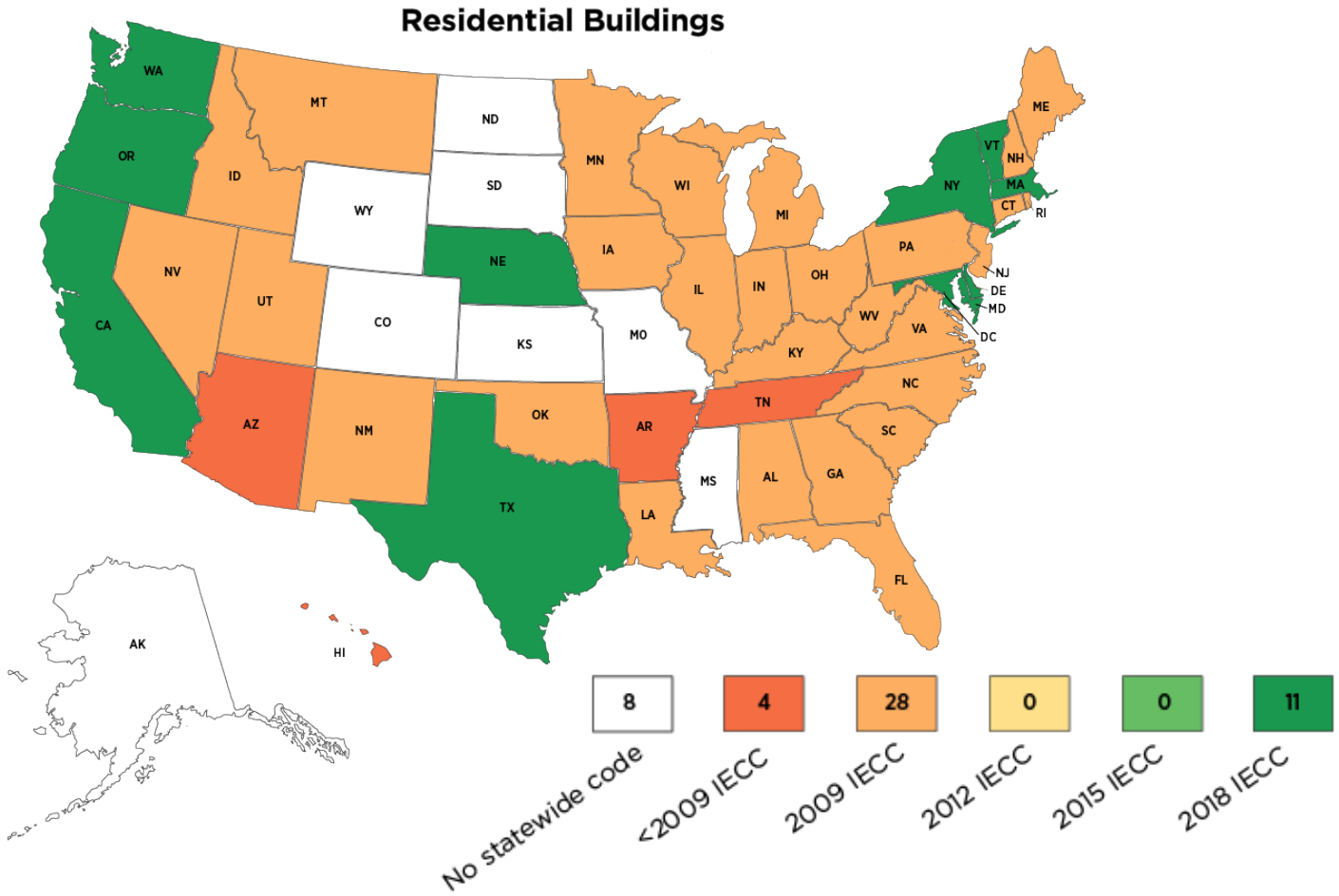
Mandatory Features

Ensure that efficiency is not delivered by sacrificing indoor air quality, comfort, & durability

Key difference between v3 and v3.1 is the performance target

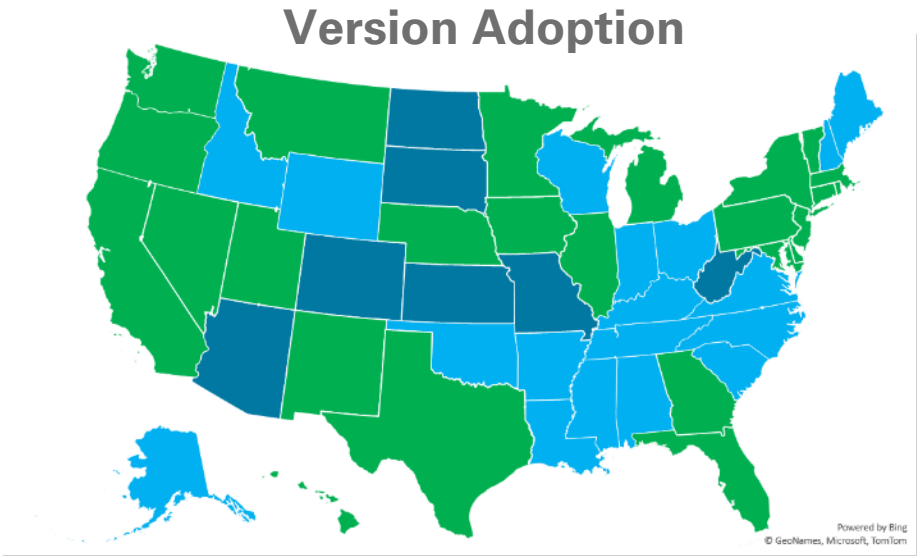
- More stringent ENERGY STAR ERI Target.
- Achievable using off-the-shelf technologies, such as:
  - Lower infiltration rates
  - Better windows & doors
  - More efficient heating and cooling systems
  - Tankless water heater
  - More efficient lighting
- No new mandatory measures required.
- No changes to the ENERGY STAR checklists.

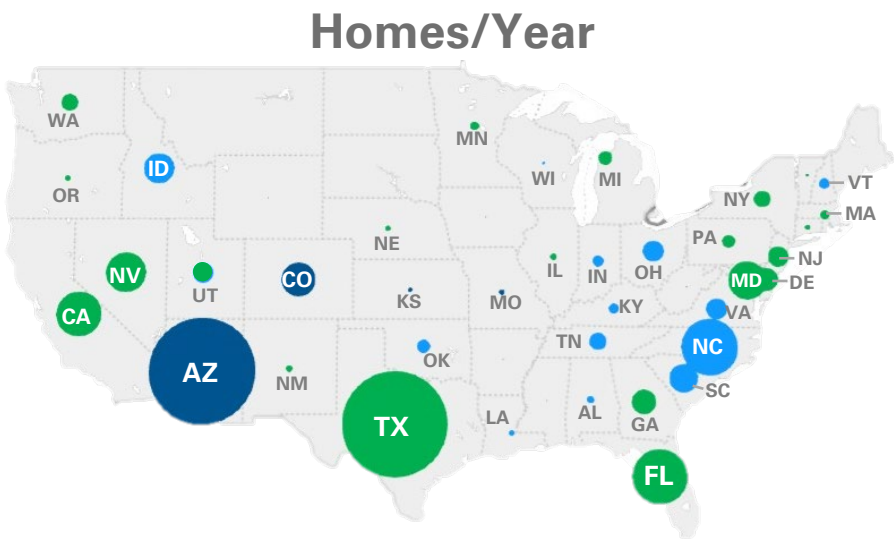
Adoption of state energy codes



Source: DOE/EERE https://www.energycodes.gov/status/residential

Current implementation of ENERGY STAR versions





25 **Version 3.1+** (national or regional), including 3 states with upcoming transition dates defined*

7 **Version 3.0** due to home rule, meaning no statewide code to trigger version change

18 **Version 3.0** due to code ≤ 2009 IECC

*Includes GA, UT and NM, for which EPA has already announced a transition to Version 3.1 based on state code updates.

What are we proposing?

- Transitioning all states still using Version 3.0 to **Version 3.1**.
- For MFNC, similar transition of states using Version 1.0 to **Version 1.1**.
- Transition date of **January 1, 2023** (based on permit date).
- This means that the National v3.0 program requirements would be sunset.

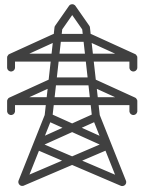
Rationale for transitioning to Version 3.1

- Over the next 5 years, transitioning all remaining states to Version 3.1 could help homeowners:

Save over

$150 million

in consumer energy costs



Avoid more than

800 million

killowatt-hours electricity

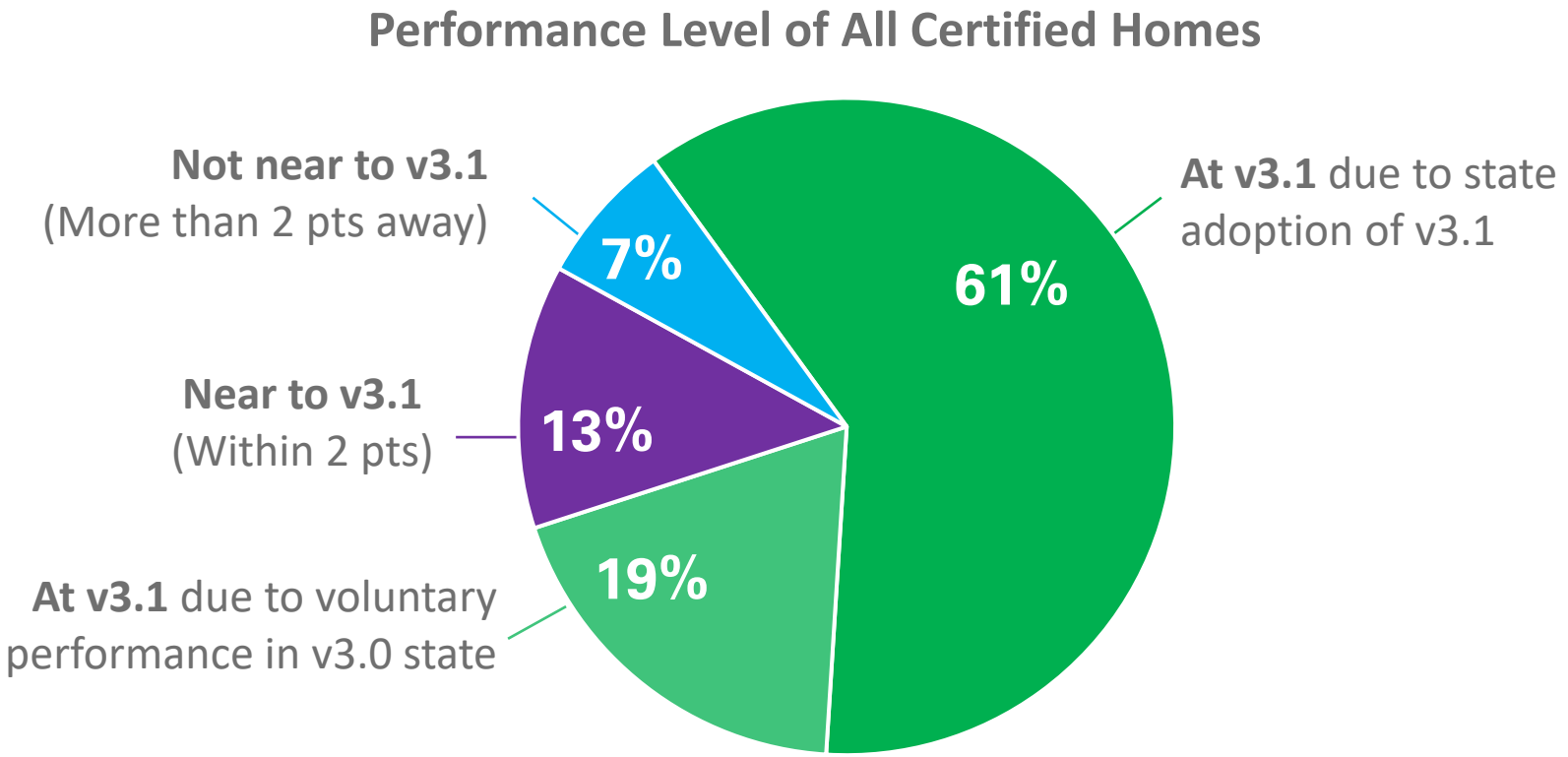
Achieve nearly

1 million

metric tons of carbon dioxide equivalent reductions

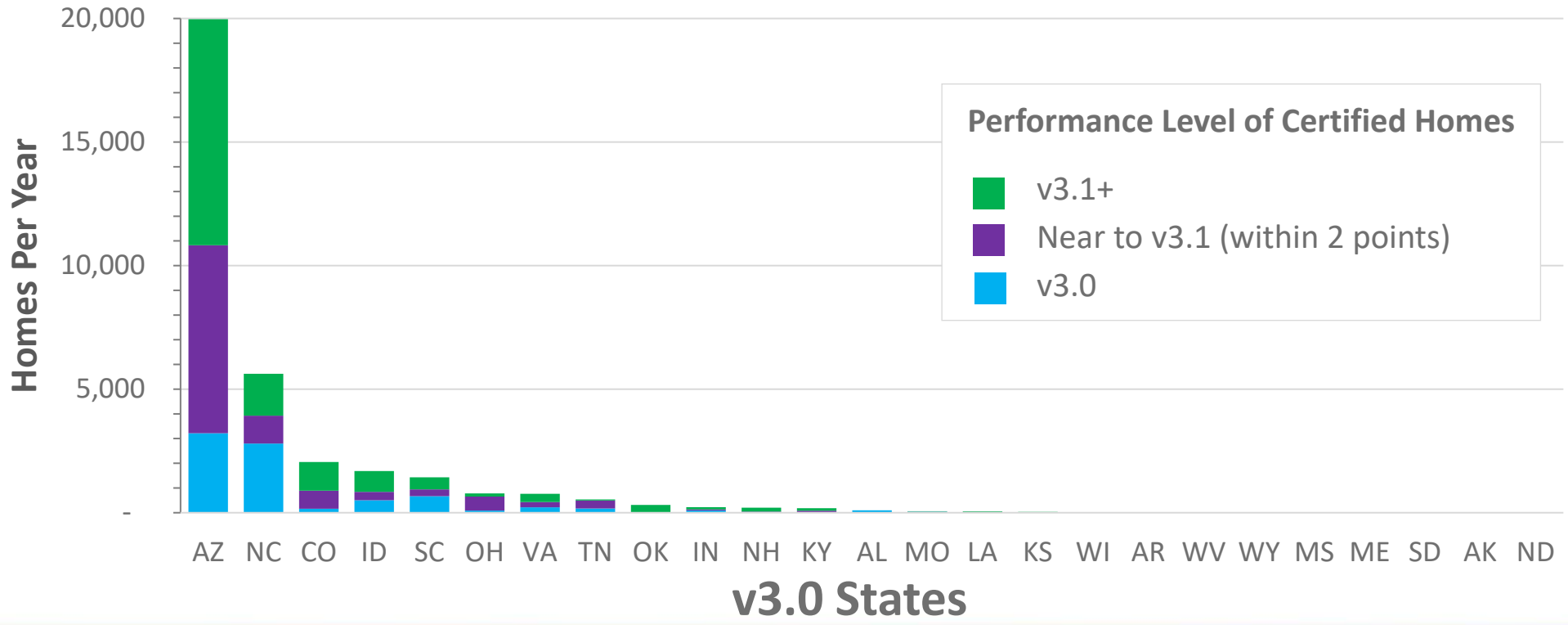
Rationale for transitioning to Version 3.1

- **93%** of single-family homes certified as ENERGY STAR between 08/2019 and 08/2020 were already **at or near the v3.1**:



Rationale for transitioning to Version 3.1

- Within states still using Version 3.0, most homes are in AZ, NC, CO, ID & SC.
- In states >100 homes/year, at least **half** of the homes are already performing at or near **Version 3.1**:



Proposed National v3.1 transition timeline

- Formal proposal and stakeholder feedback period will start in the next few weeks.
- Final determination anticipated by the end of the year.
- If the policy is adopted after the comment period:
  - The transition period would extend through the end of 2022.
  - For states currently using National v3.0, all homes permitted on or after **January 1, 2023**, would be required to meet National v3.1.

Pop quiz question #1:

- What's the key difference between Version 3.0 and Version 3.1?
  A. You have to add an ERV or HRV to the home.
  B. The number of checklists doubles.
  C. The ENERGY STAR ERI target is about 10 points more stringent.

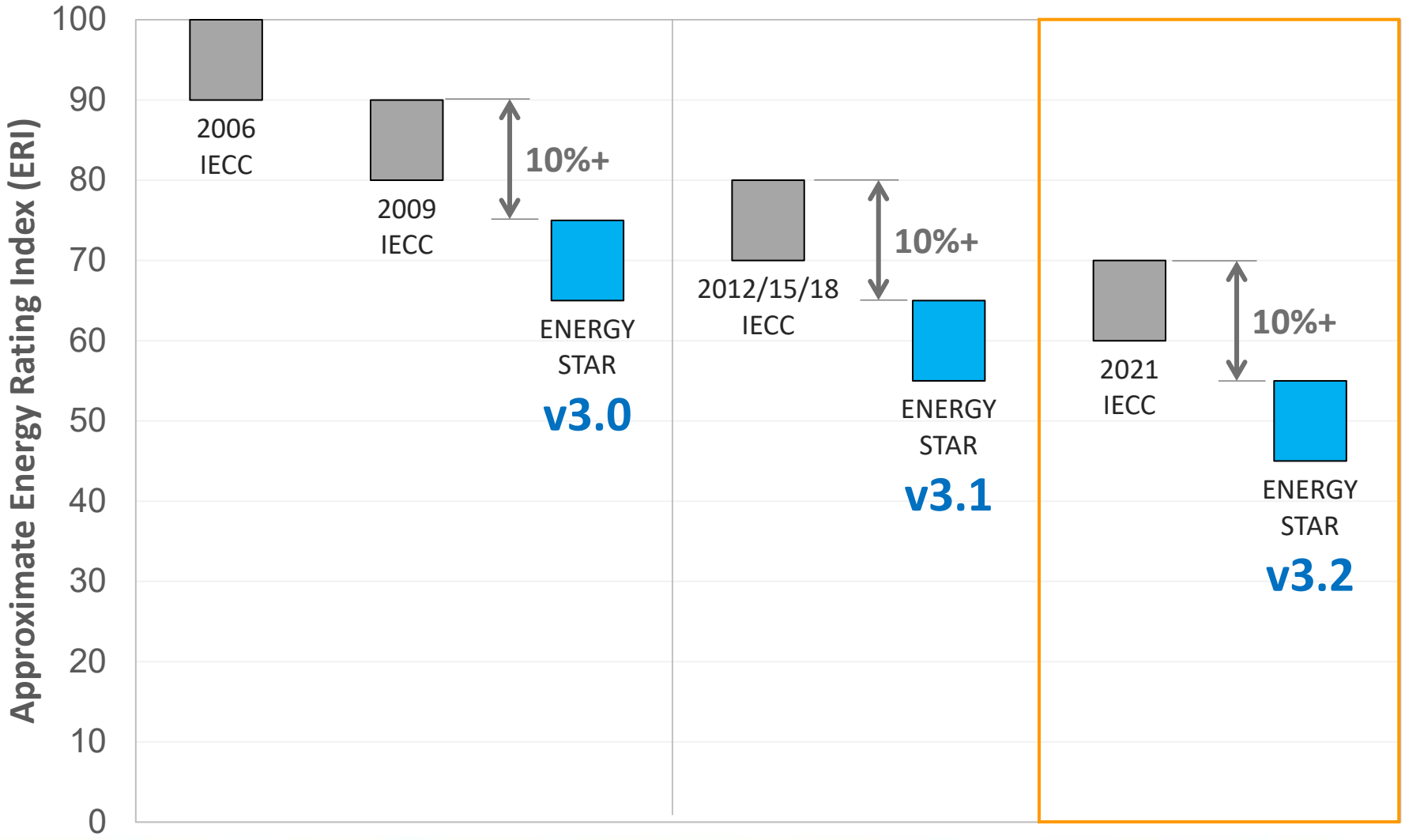
Pop quiz question #2:

- What happens under this proposal to states currently using National v3.1?
  A. Nothing. Proposal only affects states using National v3.0.
  B. States using National v3.1 required to meet DOE ZERH.
  C. Homes in states already using National v3.1 get a gold star.

Proposal #2:
Definition of National v3.2 / v1.2

Single-Family New Homes
Version 3.2

Modern code evolution



Process for developing new Versions

- Performance target determined by defining a ‘Reference Design.’

Home / Apartment To Be Built | **Reference Design Measures** | **Performance Target**

- Iterative energy modeling used to identify a package of measures that:
  - Generate at least 10% savings
  - Are practical for a builder to incorporate

Home configurations modeled to develop National v3.2

- 16 home configurations modeled:

House Parameters Consistent Across Climate Zones

Parameter	Value
Number of stories	Two
Conditioned floor area per floor (sq. ft.)	1,188
Total conditioned floor area (sq. ft.)	2,376
Perimeter (ft.)	54 x 22
Ceiling height (ft.)	8.5
Bedrooms	3
Window area (% of floor area) & distribution	15%, Evenly distributed
Exterior door quantity & total area	2 doors, 42 sq. ft.

House Parameters Varied Across Climate Zones

Parameter		CZ 1	CZ 2	CZ 3	CZ 4	CZ 4C & 5	CZ 6	CZ 7	CZ 8
Location		Miami FL	Tampa FL	Fort Worth TX	St. Louis MO	Indianapolis IN	Burlington VT	Duluth MN	Fairbanks AK
Foundation type		Slab				Unconditioned basement			
Space heating, cooling, & DHW	Cfg. A	Electric air-source heat pump & electric DHW							
	Cfg. B	Gas furnace, AC, & gas DHW							

Defining baseline efficiency measures

- Modeled each home configuration with baseline efficiency measures:
  - Essentially aligned with the 2021 IECC prescriptive path.
  - 2021 IECC prescriptive path also requires selection of one efficiency package:
    1. Enhanced envelope performance – 95% UA
    2. More efficient HVAC equipment – HP or Furnace + AC
    3. **Reduced energy use in water heating – instant gas, HPWH, or solar**
    4. More efficient duct thermal distribution system
    5. Improved air sealing and efficient ventilation – 3.0 ACH50 + ERV/HRV

Key efficiency features of 2021 IECC baseline homes

Climate Zone	1	2	3	4	4C & 5	6	7	8
Thermal Enclosure								
Ceiling Insulation	R-30	R-49		R-60				
Ceiling Insulation Grade	I							
Wall Insulation	R-13 Cavity		R-20 Cavity	R-20 Cavity + R-5 Continuous				
Wall Insulation Grade	II							
Frame Floor Insulation	Not present			R-19	R-30		R-38	
Floor Insulation Grade	Not present			II				
Slab Insulation & Depth	Uninsulated		R-10 2 ft	Not present				
Window U-factor / SHGC	0.40 / 0.25		0.30 / 0.25	0.30 / 0.40				
Door U-factor	0.40		0.30					
Infiltration and Mechanical Ventilation								
Infiltration (ACH50)	5		3					
Mech. Vent. Type & Efficiency (CFM / W)	Supply Fan / 2.9				Exhaust Fan / 2.8			
HVAC								
Furnace & AC Efficiency (AFUE / SEER)	80 / 15				80 / 14			
Heat Pump Efficiency (AFUE / SEER)	8.8 / 15							
HVAC Grade	Airflow Deviation: -25% / Watt Draw Efficiency: 0.58 W per CFM / Refrigerant Grade: III							
Thermostat Type	Programmable							
Duct Leakage to Outside (CFM / 100 ft^2 of CFA) & Insulation	4 CFM per 100 ft^2 of CFA / R-8							
Duct Location	75% Attic / 25% Cond. Space			50% Attic / 50% Basement				
DHW								
Efficiency & Capacity (EF / Gal.)	Gas: 0.82 / 0 (Instantaneous); Electric: 2.00 / 60							
Lighting & Appliances								
Lighting	100% Tier 1, Per ANSI / RESNET / ICC 301							
Refrigerator (kWh/yr)	491							
Dishwasher	NAECA Minimum Defaults, Per ANSI / RESNET / ICC 301							

Key efficiency features of National v3.2 Reference Design

Climate Zone	1	2	3	4	4C & 5	6	7	8
Thermal Enclosure								
Ceiling Insulation	R-30	R-49		R-60				
Ceiling Insulation Grade	I							
Wall Insulation	R-13 Cavity		R-20 Cavity + R-5 Continuous					
Wall Insulation Grade	I							
Frame Floor Insulation	Not present			R-19	R-30		R-38	
Floor Insulation Grade	Not present			I				
Slab Insulation & Depth	Uninsulated		R-10 2 ft	Not present				
Window U-factor / SHGC	0.40 / 0.25		0.30 / 0.40		0.27 / 0.40			
Door U-factor	0.17							
Infiltration and Mechanical Ventilation								
Infiltration (ACH50)	3		3					
Mech. Vent. Type & Efficiency (CFM / W)	Supply Fan / 2.9				Exhaust Fan / 2.8			
HVAC								
Furnace & AC Efficiency (AFUE / SEER)	80 / 16			90 / 16	95 / 14			
Heat Pump Efficiency (AFUE / SEER)	9.2 / 16							
HVAC Grade	Airflow Deviation: -20% / Watt Draw Efficiency: 0.52 W per CFM / Refrigerant Grade: III							
Thermostat Type	Programmable							
Duct Leakage to Outside (CFM / 100 ft^2 of CFA) & Insulation	0 CFM per 100 ft^2 of CFA / No Insulation (Not Applicable)							
Duct Location	100% Cond. Space							
DHW								
Efficiency & Capacity (EF / Gal.)	Gas: 0.90 / 0 (Instantaneous); Electric: 2.06 / 60							
Lighting & Appliances								
Lighting	100% Tier 2, Per ANSI / RESNET / ICC 301							
Refrigerator (kWh/yr)	450							
Dishwasher	ENERGY STAR Defaults, Per ANSI / RESNET / ICC 301							

Cost effectiveness calculations

- Next, cost effectiveness of ‘Reference Design’ was calculated.
- Goal is to achieve positive cashflow for the consumer:
  - Efficiency measures increase utility savings from homeowner
  - Incremental cost of measures result in higher monthly mortgage cost

Illustrative Cost-Effectiveness Calculation

Annual Purchased Energy			Total Upgrade Cost	Monthly Purchased Energy Savings	Monthly Mortgage Upgrade Cost	Monthly Net Cash Flow
2021 IECC Home	ES v3.2 Home	Savings				
$1,850	$1,550	$300	$1,500	$25	$8	$17

Resulting ERI targets and cost-effectiveness results

Draft National v3.2 ERI Targets & Cost / Savings Summary

					2021 IECC		ENERGY STAR Version 3.2							
#	CZ	Location	Found.	HVAC Equipment Type	Annual Purchased Energy Costs	ERI Score	Annual Purchased Energy Costs	ERI Score	Annual Purchased Energy Savings		Total Upgrade Cost	Monthly Purchased Energy Savings	Monthly Mortgage Upgrade Cost	Net Cash Flow
1	1	Miami, FL	Slab	Elec. Air-Source HP	$1,506	63	$1,289	52	$217	14%	$1,284	$18	$7	$11
2	1	Miami, FL	Slab	Gas Furnace / Elec. AC	$1,448	64	$1,227	53	$221	15%	$1,450	$18	$8	$11
3	2	Tampa, FL	Slab	Elec. Air-Source HP	$1,474	67	$1,249	54	$225	15%	$1,536	$19	$8	$11
4	2	Tampa, FL	Slab	Gas Furnace / Elec. AC	$1,378	67	$1,169	55	$209	15%	$1,702	$17	$9	$8
5	3	Fort Worth, TX	Slab	Elec. Air-Source HP	$1,749	60	$1,469	48	$280	16%	$835	$23	$4	$19
6	3	Fort Worth, TX	Slab	Gas Furnace / Elec. AC	$1,485	62	$1,268	50	$217	15%	$1,253	$18	$7	$11
7	4	St. Louis, MO	Bsmt.	Elec. Air-Source HP	$1,871	63	$1,539	50	$332	18%	$1,517	$28	$8	$20
8	4	St. Louis, MO	Bsmt.	Gas Furnace / Elec. AC	$1,484	64	$1,242	49	$242	16%	$1,818	$20	$10	$10
9	5	Indianapolis , IN	Bsmt.	Elec. Air-Source HP	$2,212	68	$1,779	53	$433	20%	$1,553	$36	$8	$28
10	5	Indianapolis , IN	Bsmt.	Gas Furnace / Elec. AC	$1,643	70	$1,318	50	$326	20%	$2,449	$27	$13	$14
11	6	Burlington, VT	Bsmt.	Elec. Air-Source HP	$2,413	70	$1,907	54	$507	21%	$1,553	$42	$8	$34
12	6	Burlington, VT	Bsmt.	Gas Furnace / Elec. AC	$1,746	75	$1,345	50	$401	23%	$2,701	$33	$15	$19
13	7	Duluth, MN	Bsmt.	Elec. Air-Source HP	$3,186	71	$2,430	54	$756	24%	$1,553	$63	$8	$55
14	7	Duluth, MN	Bsmt.	Gas Furnace / Elec. AC	$2,061	75	$1,511	48	$550	27%	$2,701	$46	$15	$31
15	8	Fairbanks, AK	Bsmt.	Elec. Air-Source HP	$5,102	76	$3,827	57	$1,275	25%	$1,301	$106	$7	$99
16	8	Fairbanks, AK	Bsmt.	Gas Furnace / Elec. AC	$2,597	73	$1,902	47	$695	27%	$2,637	$58	$14	$44

- Key takeaways:
  1. Typical ENERGY STAR ERI target is ~50-55
  2. The proposed reference design achieves ≥ 10% savings
  3. The proposed reference design is cost-effective

Proposed change to mandatory thermal backstop level

- Under Version 3.0 and 3.1, the thermal backstop is:
  a) The 2009 IECC prescriptive path or UA equivalent, or,
  b) For homes with low infiltration, 133% x UA of the 2009 IECC
- Regardless of ERI, a home cannot have an enclosure worse than these limits.
- But a home can trade off between:
  - Ceiling insulation
  - Wall insulation
  - Foundation insulation
  - Windows
  - Doors

Proposed change to mandatory thermal backstop level

- The 2021 IECC has higher insulation levels than the 2009 IECC in most CZ's:

CZ	Code	Windows	Ceiling	Wall: Cavity + Cont	Frame Floor	Basement Wall	Crawlspace Wall	Slab
1	2009 IECC	1.2	30	13	13	0	0	0
	2021 IECC	0.50	30	13	13	0	0	0
2	2009 IECC	0.65	30	13	13	0	0	0
	2021 IECC	0.40	49	13	13	0	0	0
3	2009 IECC	0.50	30	13	19	13	13	0
	2021 IECC	0.30	49	20	19	13	13	10, 2ft
4	2009 IECC	0.35	38	13	19	13	13	10, 2ft
	2021 IECC	0.30	60	20 + 5	19	13	13	10, 4ft
4C & 5	2009 IECC	0.35	38	20	30	13	13	10, 2ft
	2021 IECC	0.30	60	20 + 5	30	19	19	10, 4ft
6	2009 IECC	0.35	49	20	30	19	13	10, 4ft
	2021 IECC	0.30	60	20 + 5	30	19	19	10, 4ft
7 & 8	2009 IECC	0.35	49	21	38	19	13	10, 4ft
	2021 IECC	0.30	60	20 + 5	38	19	19	10, 4ft

Proposed change to mandatory thermal backstop level

- Calculated UA trade-offs for a typical home:
  - 2,400 sq. ft.
  - Two-stories
  - 15% WFA
  - Various foundation types

Windows			
Area	U-value	UA	Change in UA
360	0.35	**126**	**-**
360	0.30	**108**	**-18**
360	0.25	**90**	**-18**

Walls				
Area	R-value	U-Value	UA	Change in UA
1978	13	0.077	**152**	**-**
1978	15	0.067	**132**	**-20**
1978	19	0.053	**104**	**-28**
1978	21	0.048	**94**	**-10**

Ceilings				
Area	R-value	U-Value	UA	Change in UA
1200	38	0.026	**32**	**-**
1200	49	0.020	**24**	**-7**
1200	60	0.017	**20**	**-4**

Proposed change to mandatory thermal backstop level

- In Climate Zone 1, 2021 IECC is basically the same as the 2009 IECC.
- In Climate Zone 2, for a slab-on-grade home:

Climate Zone	2	
IECC Version	**2009**	**2021**
Ceiling Insulation	30	49
Wall Insulation: Cavity + Cont	13	13
Windows & Doors	0.65	0.40
Frame Floor Insulation	13	13
Basement Wall Insulation	0	0
Crawlspace Wall Insulation	0	0
Slab Insulation	0	0

Scenario Name	2021 IECC	Alt. 1
Ceiling Insulation	49	30
Wall Insulation: Cavity	13	13
Wall Insulation: Continuous	None	None
Window U-factor	0.40	0.30
Door U-factor	0.40	0.17
Frame Floor Insulation	n/a	n/a
Basement Wall Insulation	n/a	n/a
Crawlspace Wall Insulation	n/a	n/a
Slab Insulation & Depth	None	None
Total UA for Home	**449.9**	**412.0**
% better than 2021 IECC		8.4%

Proposed change to mandatory thermal backstop level

- In Climate Zone 5-8, for a conditioned basement home:

Climate Zone	5	
IECC Version	**2009**	**2021**
Ceiling Insulation	38	60
Wall Insulation: Cavity + Cont	20	20 + 5
Windows & Doors	0.35	0.30
Frame Floor Insulation	30	30
Basement Wall Insulation	13	19
Crawlspace Wall Insulation	13	19
Slab Insulation	10, 2ft	10, 4ft

Scenario Name	2021 IECC	Alt. 1	Alt. 2	Alt. 3
Ceiling Insulation	60	60	49	49
Wall Insulation: Cavity	20	21	23	21
Wall Insulation: Continuous	5	None	None	None
Window U-factor	0.30	0.27	0.27	0.24
Door U-factor	0.30	0.17	0.17	0.17
Frame Floor Insulation	n/a	n/a	n/a	n/a
Basement Wall Insulation	19	21	19	13
Crawlspace Wall Insulation	n/a	n/a	n/a	n/a
Slab Insulation & Depth	None	None	None	None
Total UA for Home	**379.2**	**378.4**	**378.7**	**373.8**
% better than 2021 IECC		0.2%	0.1%	1.4%

Proposed change to mandatory thermal backstop level

- In Climate Zone 3, for a slab-on-grade home:

Climate Zone	3	
IECC Version	**2009**	**2021**
Ceiling Insulation	30	49
Wall Insulation: Cavity + Cont	13	20
Windows & Doors	0.50	0.30
Frame Floor Insulation	19	19
Basement Wall Insulation	13	13
Crawlspace Wall Insulation	13	13
Slab Insulation	0	10, 2ft

Scenario Name	2021 IECC	Alt. 1	Alt. 2	Alt. 3
Ceiling Insulation	49	49	49	49
Wall Insulation: Cavity	20	15	15	15
Wall Insulation: Continuous	None	3	5	3
Window U-factor	0.30	0.28	0.28	0.24
Door U-factor	0.30	0.17	0.17	0.17
Frame Floor Insulation	n/a	n/a	n/a	n/a
Basement Wall Insulation	n/a	n/a	n/a	n/a
Crawlspace Wall Insulation	n/a	n/a	n/a	n/a
Slab Insulation & Depth	10, 2ft	R5, 2ft	None	None
Total UA for Home	**341.7**	**337.6**	**338.8**	**338.9**
% better than 2021 IECC		1.2%	0.8%	0.8%

Proposed change to mandatory thermal backstop level

- In Climate Zone 4, for a home with:

Climate Zone	**4**	
IECC Version	**2009**	**2021**
Ceiling Insulation	38	60
Wall Insulation: Cavity + Cont	13	20 + 5
Windows & Doors	0.35	0.30
Frame Floor Insulation	19	19
Basement Wall Insulation	13	13
Crawlspace Wall Insulation	13	13
Slab Insulation	10, 2ft	10, 4ft

Foundation	Conditioned Basement				Slab		
Scenario Name	**2021 IECC**	**Alt. 1**	**Alt. 2**	**Alt. 3**	**2021 IECC**	**Alt. 1**	**Alt. 2**
Ceiling Insulation	60	49	49	49	60	60	49
Wall Insulation: Cavity	20	21	23	21	20	23	21
Wall Insulation: Continuous	5	None	None	None	5	None	None
Window U-factor	0.30	0.27	0.27	0.24	0.30	0.27	0.24
Door U-factor	0.30	0.17	0.17	0.17	0.30	0.17	0.17
Frame Floor Insulation	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Basement Wall Insulation	13	21	15	13	n/a	n/a	n/a
Crawlspace Wall Insulation	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Slab Insulation & Depth	None	None	None	None	10, 4ft	10, 4ft	10, 4ft
Total UA for Home	**384.4**	**383.1**	**382.6**	**373.8**	**300.5**	**300.3**	**299.9**
% better than 2021 IECC		0.3%	0.5%	2.8%		0.1%	0.2%

Proposed change to mandatory thermal backstop level

- For homes certified using Version 3.2, we're proposing to increase the thermal backstop to the 2021 IECC prescriptive levels or UA equivalent.
- Also planning to retain a less stringent backstop for tight homes.
- Keep in mind, Version 3.2 will only be implemented in states with 2021 IECC.

What are we proposing?

- A new version of the ENERGY STAR Single-Family New Homes program requirements: **National Version 3.2**.
- The only differences between National v3.1 and v3.2 are a more stringent ERI target (~50-55) and a new thermal backstop. No other changes.
- Only to be implemented in states that adopt the 2021 IECC or equivalent; implementation date one year after enforcement of new state code.

Pop quiz question #3:

- What's the key difference between Version 3.1 and proposed Version 3.2?
  - A. A more stringent ERI target.
  - B. A more stringent ERI target and a new thermal backstop.
  - C. Battery storage required in every home.

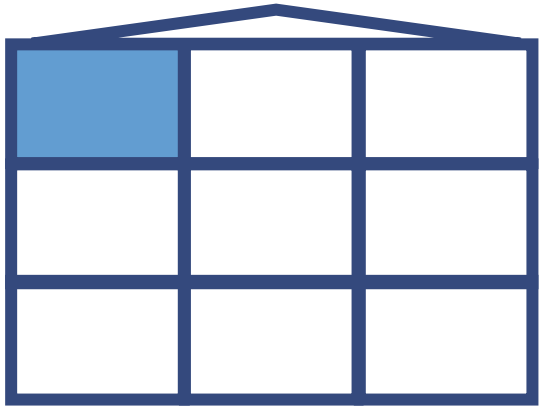
Pop quiz question #4:

- What's the typical range of ERI targets for the proposed Version 3.2?
  A. ~ 0-10
  B. Exactly 50 for every home
  C. ~ 50-55

Multifamily New Construction
Version 1.2

Process for developing new Versions

- Performance target determined by defining a ‘Reference Design.’



Home / Apartment
To Be Built

+

- Insulation
- Heating Systems
- Cooling Systems
- Lighting
- Appliances
- Etc.

Reference Design
Measures

=

Performance
Target

- Iterative energy modeling used to identify a package of measures that:
  - Generate at least 10% savings
  - Are practical for a builder to incorporate

Unit configurations modeled to develop National v1.2

- 14 building configurations modeled:

Unit Parameters Consistent Across Climate Zones

Parameter	Value
Number of stories per unit	One
Conditioned floor area per floor (sq. ft.)	1,200
Number of stories in building	3
Unit perimeter (ft.)	30 x 40
Ceiling height (ft.)	8.5
Bedrooms	2
Window area & distribution	23% of exterior wall (not including breezeway)
Exterior door quantity & total area	1 door, 21 sq. ft.

Unit Parameters Varied Across Climate Zones

Parameter		CZ 1	CZ 2	CZ 3	CZ 4	CZ 4C & 5	CZ 6	CZ 7
Location		Miami FL	Tampa FL	Fort Worth TX	St. Louis MO	Indianapolis IN	Burlington VT	Duluth MN
Foundation type		Slab				Slab		
Space heating, cooling, & DHW	Cfg. A	Electric air-source heat pump & electric DHW						
	Cfg. B	Gas furnace, AC, & gas DHW						

Defining baseline efficiency measures

- Modeled each unit configuration with baseline efficiency measures:
  - Essentially aligned with the 2021 IECC Residential prescriptive path.
  - 2021 IECC prescriptive path also requires selection of one efficiency package:
    1. Enhanced envelope performance – 95% UA
    2. More efficient HVAC equipment – HP or Furnace + AC
    3. Reduced energy use in water heating – instant gas, HPWH, or solar
    4. **More efficient duct thermal distribution system**
    5. Improved air sealing and efficient ventilation – 3.0 ACH50 + ERV/HRV

Key efficiency features of 2021 IECC-R baseline MF units

Climate Zone	1	2	3	4	4C & 5	6	7	8
Thermal Enclosure								
Ceiling Insulation	R-30	R-49		R-60				
Ceiling Insulation Grade	I							
Wall Insulation	R-13 Cavity		R-20 Cavity + R-5 Continuous					
Wall Insulation Grade	II							
Frame Floor Insulation	Not present			R-19	R-30		R-38	
Floor Insulation Grade	Not present			II				
Slab Insulation & Depth	Uninsulated		R-10 2 ft	Not present				
Window U-factor / SHGC	0.40 / 0.25		0.30 / 0.40					
Door U-factor	0.40		0.30					
Infiltration and Mechanical Ventilation								
Infiltration (compartmentalization)	**0.5 (cfm50/ft^2)**		**0.3 (cfm50/ft^2)**					
Mech. Vent. Type & Efficiency (CFM / W)	Air Cycler / 1.2				Exhaust Fan / 2.8			
HVAC								
Furnace & AC Efficiency (AFUE / SEER)	80 / 15				80 / 14			
Heat Pump Efficiency (AFUE / SEER)	8.8 / 15							
HVAC Grade	Airflow Deviation: -25% / Watt Draw Efficiency: 0.58 W per CFM / Refrigerant Grade: III							
Thermostat Type	Programmable							
Duct Leakage to Outside (CFM per 100 sq. ft. of CFA)	4							
Duct Location	**100% Conditioned Space (Ground, Middle and Top Floors)**							
DHW								
Efficiency & Capacity (EF / Gal.)	**Gas: 0.62 / 40 ; Electric: 0.95 / 40**							
Fixtures	Standard							
Lighting & Appliances								
Lighting	100% Tier 1, Per ANSI / RESNET / ICC 301							
Refrigerator (kWh/yr)	491							
Dishwasher	NAECA Minimum Defaults, Per ANSI / RESNET / ICC 301							

Key efficiency features of National MFNC v1.2 Reference Design

Climate Zone	1	2	3	4	4C & 5	6	7	8
Thermal Enclosure								
Ceiling Insulation	R-30	R-49		R-60				
Ceiling Insulation Grade	I							
Wall Insulation	R-13 Cavity		R-20 Cavity + R-5 Continuous					
Wall Insulation Grade	I							
Frame Floor Insulation	Not present			R-19	R-30		R-38	
Floor Insulation Grade	Not present			I				
Slab Insulation & Depth	Uninsulated		R-10 2 ft	Not present				
Window U-factor / SHGC	0.40 / 0.25		0.30 / 0.40		0.27 / 0.40			
Door U-factor	0.17							
Infiltration and Mechanical Ventilation								
Infiltration (compartmentalization)	0.3 (cfm50/ft^2)		0.3 (cfm50/ft^2)					
Mech. Vent. Type & Efficiency (CFM / W)	Supply Fan / 2.9				Exhaust Fan / 2.8			
HVAC								
Furnace & AC Efficiency (AFUE / SEER)	80 / 16			90 / 16	**90 / 14**			
Heat Pump Efficiency (AFUE / SEER)	9.2 / 16							
HVAC Grade	Airflow Deviation: -20% / Watt Draw Efficiency: 0.52 W per CFM / Refrigerant Grade: III							
Thermostat Type	Programmable							
Duct Leakage to Outside (CFM per 100 sq. ft. of CFA)	0							
Duct Location	100% Cond. Space							
DHW								
Efficiency & Capacity (EF / Gal.)	Gas: 0.90 / 0 (Instantaneous); **Electric: 1.2 / 60**				**Gas: 0.95 / 0 (Instantaneous)**; **Electric: 1.2 / 60**			
Fixtures	**WaterSense**							
Lighting & Appliances								
Lighting	100% Tier 2, Per ANSI / RESNET / ICC 301							
Refrigerator (kWh/yr)	450							
Dishwasher	ENERGY STAR Defaults, Per ANSI / RESNET / ICC 301							

Proposed change to mandatory thermal backstop level

- For buildings certified using Version 1.2, we're proposing to increase the thermal backstop to the 2021 IECC prescriptive levels or UA equivalent.
- Keep in mind, Version 1.2 will only be implemented in states with 2021 IECC.

Heating, Cooling and Water Heating Equipment Efficiencies

National Rater Field Checklist [1]

ENERGY STAR Multifamily New Construction, Version 1 / 1.1 / 1.2 (Rev. 02)

HVAC System [37]		Must Correct	Rater Verified [4]	N/A [5]
5. Heating & Cooling Eqpt. Complete Track A - HVAC Grading by Rater OR Track B – HVAC Testing by FT Agent [38]				
Track A [39]	5a.1 Blower fan volumetric airflow is Grade I or II per ANSI / RESNET / ACCA Std. 310	☐	☐	☐
	5a.2 Blower fan watt draw is Grade I or II per ANSI / RESNET / ACCA Std. 310	☐	☐	☐
	5a.3 Refrigerant charge is Grade I per ANSI / RESNET / ACCA Std. 310. See Footnote 40 for exemptions. [40]	☐	☐	☐
Track B	5b.1 HVAC manufacturer & model number on installed equipment matches either of the following (check box): [41] ☐ National HVAC Design Report (4.6-4.9 & 4.25-4.26) ☐ Written approval received from designer	☐	☐	-
	5b.2 External static pressure measured by Rater at contractor-provided test locations and documented below: [42] Return-Side External Static Pressure: _____ IWC Supply-Side External Static Pressure: _____ IWC	☐	☐	☐
5.4 Prescriptive Path: Heating and cooling equipment serving dwelling units and common spaces meet the efficiency levels specified in the Exhibit X. Electric resistance space heating is not installed in dwelling units.		☐	☐	☐
5.5 ERI Path: Heating and cooling equipment serving common spaces, but not serving dwelling units, meet the efficiency levels specified in the Exhibit X. See Exhibit X for restrictions on electric resistance space heating.		☐	☐	☐
5.6 National HVAC Functional Testing Checklist(s) collected prior to certification, with all HVAC systems in the building / project fully documented. Exception: Where credentialed HVAC Contractor(s) are completing the National HVAC Functional Testing Checklist, the checklist is not required to be collected for the systems they verify. [43]		☐	☐	☐

National Rater Field Checklist [1]

ENERGY STAR Multifamily New Construction, Version 1 / 1.1 / 1.2 (Rev. 02)

Other	Must Correct	LP Verified [44]	Rater Verified [4]	N/A [5]
11. Domestic Hot Water				
11.1 Prescriptive Path: Hot water equipment rated in EF or UEF meet the efficiency levels specified in the ENERGY STAR Multifamily Reference Design. Otherwise, meet or exceed 85% Et. [76]	☐	-	☐	☐
11.2 ERI: For hot water equipment serving common spaces but not dwelling units nor shared laundry: where rated in EF or UEF, meet the efficiency levels specified in the ENERGY STAR Multifamily Reference Design. Otherwise, meet or exceed 85% Et. [76]	☐	-	☐	☐

Heating, Cooling and Water Heating Equipment Efficiencies

National Rater Field Checklist Footnotes

ENERGY STAR Multifamily New Construction Version 1 / 1.1 / 1.2 (Rev.02)

Exhibit X – Prescriptive Minimum Heating and Cooling Equipment Efficiencies †

Equipment Type	Minimum Efficiency
Room AC (window, through-wall, ductless mini-splits)	ENERGY STAR certified
Air conditioners, air cooled (<13 KBtu/h)	13 SEER
Air conditioners, air cooled (≥13 and <65 KBtu/h)	See Reference Design
Air conditioners, air cooled (≥65 and <240 KBtu/h)	11.5 EER/12.0 IEER
Air conditioners, air cooled (≥240 and < 760 KBtu/h)	10.0 EER/10.5 IEER
Electric resistance space heating	• Not permitted in any dwelling unit using the Prescriptive Path • Electric resistance heating specified in common spaces has a total heating capacity ≤ 12 kBtu/h (3.5 kW) per enclosed space and has automatic thermostatic controls
Warm-Air Furnace (<225 KBtu/h, common spaces)	78% AFUE or 80% Et
Warm-Air Furnace (<225 KBtu/h, dwelling units)	See Reference Design. For PTAC, use 80% Et
Warm-Air Furnace (≥225 KBtu/h)	80% Et (gas) or 81% Et (oil)
Packaged Terminal Air Conditioner (PTAC < 7 kBtu/h)	11.9 EER

Heating, Cooling and Water Heating Equipment Efficiencies

- Applicability
  - Prescriptive Path – all systems
  - ERI Path - Systems serving common spaces (but not dwelling units)
- Water Heating
  - Rater Field Item 11.1 (Prescriptive Path)
    - Systems serving dwelling units not rated in EF – 95%Et (gas) or 2.0 COP_h
- Exhibit X
  - Gas Furnace
    - Dwelling Units – See Reference Design
    - Common Spaces (<225 kBtu/h) – CZ 5-8 90% AFUE or Et
  - PTAC (0-7 kBtu/h) – 12.5 EER

What are we proposing?

- A new version of the ENERGY STAR Multifamily New Construction program requirements: **National Version 1.2**.
- The only differences between National v1.1 and v1.2 are:
  - More stringent Reference Design (i.e., lower ERI target),
  - A new thermal backstop,
  - More stringent HVAC/DHW efficiencies for MF systems for some Paths, and
  - ASHRAE target based on ASHRAE 90.1-2019.
- Only to be implemented in states that adopt the 2021 IECC or equivalent; implementation date one year after enforcement of new state code.
- Formal proposal and comment period will be held starting in a few weeks.

Pop quiz question #5:

- What's the key difference between Version 1.1 and proposed Version 1.2?
  - A. A more stringent ERI target.
  - B. A more stringent ERI target, a new thermal backstop, and, for some Paths, improved MF HVAC/DHW system efficiencies.
  - C. Battery storage required in every building.

Summary

Two new proposals discussed today

- In the next few weeks, we'll have a stakeholder feedback period for:

1. Transition from lowest tier of our national programs:
   - Single-Family National **Version 3.0** to **3.1**.
   - Multifamily National **Version 1.0** to **1.1**.

2. Definition of a new national Version for states that adopt the 2021 IECC:
   - Single-Family National **Version 3.2**
   - Multifamily National **Version 1.2**

- Disclaimer: Proposals are still being finalized, so subject to slight changes.

ENERGY STAR Residential New Construction

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