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Energy Savings Analysis: 2024 IECC for Residential Buildings

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By

V. Robert Salcido
Yan Chen
Yulong Xie
Yun Joon Jung
Fan Feng
Cary Faulkner
Michelle Niemeyer
Erik Metz

Nomenclature or List of Acronyms

ACH50	air changes per hour at 50 pascals
AFUE	annual fuel utilization efficiency
AHRI	Air Conditioning, Heating, and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
Btu	British thermal unit(s)
CABO	Council of American Building Officials
CFL	compact fluorescent lamp
cfm	cubic feet per minute
CH_4	methane
CO_2	carbon dioxide
DOE	U.S. Department of Energy
ECPA	Energy Conservation and Production Act
EF	energy factor
EIA	U.S. Energy Information Administration
EPA	U.S. Environmental Protection Agency
ERI	Energy Rating Index
ESS	energy storage system
ERV	energy recovery ventilator
EV	electric vehicle
EVSE	electric vehicle supply equipment
EUI	energy use intensity
°F	degree(s) Fahrenheit
ft^2	square foot(feet)
FP	thermal conductance of the on-grade slab
GEB	grid-interactive efficient building
hr	hour(s)
HPWH	heat pump water heater

HRV	heat recovery ventilator
HSPF2	heating season performance factor
HVAC	heating, ventilating, and air conditioning
IAM	integrated assessment models
ICC	International Code Council
IECC	International Energy Conservation Code
IRA	Inflation Reduction Act
IRC	International Residential Code
kBtu	thousand British thermal units
kWh	kilowatt-hour(s)
LED	light-emitting diode
MEC	Model Energy Code
N_20	Nitrous oxide
OPP	on-site power production
PNNL	Pacific Northwest National Laboratory
PV	photovoltaic
REC	Renewable Energy Certificate
RECS	Residential Energy Consumption Survey
SC-CO_2	social cost of carbon
SC-GHG	social cost of greenhouse gases
SEER2	seasonal energy efficiency rating
SWH	service water heating
TE	thermal emittance
TSD	Technical Support Document
UA	Thermal conductance
W	watt
yr	year(s)

Executive Summary

Section 304(a) of the Energy Conservation and Production Act, as amended, directs the U.S. Secretary of Energy to review the International Energy Conservation Code (IECC)[1] and make a *determination* as to whether updated editions would improve energy efficiency in residential buildings. The IECC is developed by the International Code Council (ICC) through an established industry review and consensus process with updated editions typically published every 3 years. The U.S. Department of Energy (DOE) reviews the energy saving impacts of updated code editions and publishes its findings in the *Federal Register*. The DOE determination and accompanying technical analysis serve as useful guidance to state and local governments as they review and update their building codes.

The most recent edition, the 2024 IECC, was published in August 2024, triggering the DOE review and determination process.[2] DOE and Pacific Northwest National Laboratory (PNNL) conducted a technical analysis to determine energy savings for the 2024 IECC (ICC 2024) residential provisions relative to the previous edition, the 2021 IECC (ICC 2021). This report documents the methodology used to conduct the analysis and summarizes the results.

Methodology

The determination analysis is based on an established DOE methodology (Salcido *et al*., 2024) and is consistent with the previously published determination (DOE 2021). The analysis entails a combination of *qualitative* and *quantitative* components to identify changes that have a direct impact on residential energy efficiency, and which can be reasonably quantified in estimating overall national average saving impacts. This process can be summarized as follows:

Qualitative Assessment: A compilation of all code changes approved by the ICC for inclusion in the IECC. Individual changes are characterized to identify those expected to have a direct impact on energy efficiency in a significant portion of typical residential buildings.

Quantitative Assessment: Code changes are filtered to retain those that could be reasonably quantified through energy modeling and analysis. The resulting collection is then further analyzed to estimate combined effects, with the results aggregated and weighted across the range of climates, building types, and foundation types to quantify the national average savings impacts of the updated code.

Results

A total of 273 approved code change proposals were identified and analyzed for the 2024 IECC. Analyses of those changes indicate the following.

Of these 273 approved changes:

- 54 were changes with a direct impact on energy use in residential buildings—48 of these are expected to reduce energy use while 6 are expected to increase energy use.
- 219 were additional changes—changes in this category are administrative, impact non-energy portions of the code, or are otherwise not expected to have a direct impact on energy savings under the applied methodology.

Of the 54 code changes having a direct impact on energy efficiency, eight are expected to impact a sufficient fraction of new homes to warrant further quantitative analysis to assess the overall magnitude of the 2024

[1] ECPA originally recognized the 1992 Council of American Building Officials (CABO) Model Energy Code and its successor editions. The IECC is the contemporary successor to the CABO Model Energy Code.
[2] The publication of the 2024 IECC was delayed several months due to appeals.

IECC's impact. Those eight changes are analyzed as part of the quantitative analysis, the results of which indicate that residential buildings meeting the 2024 IECC incur the following savings on a weighted national average basis:

- 7.80 percent annual site energy use intensity (EUI);
- 6.80 percent annual source EUI;
- 6.60 percent annual energy cost; and
- 6.51 percent carbon emissions.

Table ES.1 shows energy and resulting carbon savings results, tabulated by climate zone. Relative savings in terms of annual energy costs vary modestly across climate zones, ranging from 5.53 percent in climate zone 5 to 9.74 percent in climate zone 8. Table ES.2 and Table ES.3 summarize the estimated EUIs for the 2021 and 2024 IECC, respectively. Table ES.4, Table ES.5, and Table ES.6 show the results aggregated by building type.

Table ES.1. Energy Savings and CO_2 Emission Reductions of the 2024 IECC compared to the 2021 IECC by Climate Zone (percent)

Climate Zone	Weight (%)	Site EUI (%)	Source EUI (%)	Energy Costs (%)	CO_2 Emissions (%)
1	2.12	7.07	7.95	8.09	8.15
2	26.02	7.90	7.96	7.97	7.97
3	28.84	6.38	6.13	6.08	6.06
4	19.07	7.43	6.90	6.79	6.74
5	18.33	7.31	5.88	5.53	5.36
6	5.05	13.23	7.20	5.64	4.87
7	0.55	13.84	9.79	8.74	8.23
8	0.01	14.29	10.73	9.74	9.26
National	100.00	7.80	6.80	6.60	6.51

Table ES.2. Energy Use and CO_2 Emissions of the 2021 IECC by Climate Zone

Climate Zone	Weight (%)	Site EUI (kBtu/ft²-yr)	Source EUI (kBtu/ft²-yr)	Energy Costs ($/residence-yr)	CO_2 Emissions (tons/residence-yr)
1	2.12	26.7	69.4	2,236	9.73
2	26.02	27.0	67.4	2,391	10.37
3	28.84	26.4	63.9	2,307	9.98
4	19.07	31.3	68.1	2,604	11.16
5	18.33	38.7	71.7	2,793	11.77
6	5.05	47.0	83.6	3,231	13.55
7	0.55	52.0	93.1	3,525	14.80
8	0.01	65.8	111.8	3,884	16.20
National	100.00	31.3	68.5	2,526	10.84

Table ES.3. Energy Use and CO_2 Emissions of the 2024 IECC by Climate Zone

Climate Zone	Weight (%)	Site EUI (kBtu/ft²-yr)	Source EUI (kBtu/ft²-yr)	Energy Costs ($/residence-yr)	CO_2 Emissions (tons/residence-yr)
1	2.12	24.8	63.9	2,055	8.93
2	26.02	24.9	62.0	2,200	9.54
3	28.84	24.7	60.0	2,167	9.38
4	19.07	28.9	63.4	2,427	10.41
5	18.33	35.9	67.5	2,638	11.14
6	5.05	40.8	77.6	3,049	12.89
7	0.55	44.8	84.0	3,217	13.59
8	0.01	56.4	99.8	3,506	14.70
National	100.00	28.9	63.9	2,360	10.13

Table ES.4. Energy Savings and CO_2 Emission Reductions of the 2024 IECC compared to the 2021 IECC by Building Type (percent)

Building Type	Weight (%)	Site EUI (%)	Source EUI (%)	Energy Costs (%)	CO_2 Emissions (%)
Single-family	82.12	7.94	6.77	6.54	6.43
Multifamily Unit	17.88	6.60	7.05	7.14	7.18
National	100	7.80	6.80	6.60	6.51

Table ES.5. Energy Use and Carbon Emissions of the 2021 IECC by Building Type

Building Type	Weight (%)	Site EUI (kBtu/ft²-yr)	Source EUI (kBtu/ft²-yr)	Energy Costs ($/residence-yr)	CO_2 Emissions (tons/residence-yr)
Single-family	82.12	30.9	67.6	2,738	11.74
Multifamily Unit	17.88	34.9	76.9	1,556	6.68
National	100.00	31.3	68.5	2,526	10.84

Table ES.6. Energy Use and Carbon Emissions of the 2024 IECC by Building Type

Building Type	Weight (%)	Site EUI (kBtu/ft²-yr)	Source EUI (kBtu/ft²-yr)	Energy Costs ($/residence-yr)	CO_2 Emissions (tons/residence-yr)
Single-family	82.12	28.4	63.0	2,559	10.99
Multifamily Unit	17.88	32.6	71.5	1,444	6.20
National	100.00	28.9	63.9	2,360	10.13

In addition, several proposals supporting building decarbonization were approved by the IECC-Residential technical development committee, but were ultimately removed from the code by the ICC Board of Directors following appeals. Many of these proposals were relegated to optional appendices, as a result, and are no longer included in the standard provisions of the IECC. DOE encourages states and local governments to consider adopting these measures when updating and certifying their building energy codes in accordance with the 2024 IECC. Such proposals are discussed in Appendix E of this report.

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1 Introduction

The International Energy Conservation Code (IECC) is recognized by the U.S. Congress as the national model energy code for residential buildings under the Energy Conservation and Production Act (ECPA), as amended. 42 U.S.C. § 6833. Section 304(a) of ECPA, as amended, provides that whenever the 1992 Council of American Building Officials (CABO) Model Energy Code (MEC) or any successor to that code is revised, the U.S. Secretary of Energy must make a *determination*, not later than 12 months after such revision, whether the revised code would improve energy efficiency in residential buildings and must publish notice of such determination in the *Federal Register.* 42 U.S.C. § 6833(a)(5)(A). The IECC is the contemporary successor to the 1992 CABO MEC specified in the ECPA.

On July 28, 2021, the U.S. Department of Energy (DOE) issued an affirmative determination of energy savings for the 2021 IECC, the relevant successor to the 1992 CABO MEC at the time, that concluded that the 2021 IECC would achieve greater energy efficiency in residential buildings than the 2018 IECC. 86 FR 40529. Through this determination, the 2021 IECC became the national model energy code for residential buildings. Consequently, and consistent with previous determinations, the 2021 IECC also became the baseline to which future changes are compared, including the current review of the 2024 IECC.

To support DOE in fulfilling its statutory directive, Pacific Northwest National Laboratory (PNNL) conducted an analysis to determine energy savings for the 2024 IECC residential provisions compared to those of the 2021 IECC. This report documents the methodology used to conduct the analysis and summarizes the results and findings.

Section 2 of this report provides an overview of the analysis, which is based on a combination of both qualitative and quantitative components. Section 3 provides the qualitative and quantitative analysis results. A comprehensive list of all code change proposals approved for inclusion in the 2024 IECC is included in Appendix A. Appendix B and Appendix C detail weighting factors and updates to the energy savings calculation methodology related to *EnergyPlus* software updates. Appendix D details the modeling strategies used in the quantitative analysis. Appendix E shows the code change proposals approved by the residential consensus committee and later removed via appeals, but which remain available for state and local adoption via optional appendices in the 2024 IECC.

2 Methodology

2.1 Overview

The current analysis is based on an established DOE methodology (Salcido *et al*., 2024) and is consistent with previously published determinations (DOE 2021). The analysis is based on a combination of *qualitative* and *quantitative* components to identify changes that have a direct impact on residential energy efficiency that can be reasonably quantified in estimating overall savings impacts. This process can be summarized as follows:

- **Qualitative Assessment**: A compilation of all code changes approved by the International Code Council (ICC) for inclusion in the IECC. Individual changes are characterized to identify those expected to have a direct impact on energy efficiency in a significant portion of typical residential buildings.
- **Quantitative Assessment**: Code changes are filtered to retain those that could be reasonably quantified through energy modeling and analysis. The resulting collection is then further analyzed to estimate combined effects, with the results aggregated and weighted across the range of climates and building types to quantify the national average impacts of the 2024 IECC.

The proceeding sections provide additional detail on the analysis methodology. Several individual changes warrant additional consideration and are discussed in Section 3.1.1. Findings from the analysis are covered in Section 3.

2.2 Qualitative Assessment

The first step of the analysis is a qualitative assessment by which all approved code change proposals are categorized according to their effect on homes, with particular attention to their expected impact on energy use. Changes expected to have an impact on residential energy efficiency are characterized as follows:

1. *Decreases Energy Use*: The change is expected to have a beneficial efficiency impact on some or all homes complying with the code (increased energy efficiency and savings)
2. *Increases Energy Use*: The change is expected to have a detrimental efficiency impact on some or all homes complying with the code (decreased energy efficiency and savings).

Many changes do not have a direct impact on energy efficiency and therefore are not designated as falling into one of the above categories. Examples of such changes often include:

- Changes affecting only procedural aspects of complying with the code, such as those providing guidance on inspection protocols or modeling rulesets
- Changes where impacts are captured under a complementary code requirement, such as the relationship between air tightness testing, associated thresholds (e.g., 5 air changes per hour at 50 pascals (ACH50)), and component air sealing requirements, to avoid double-counting such changes in the quantitative analysis
- Changes targeting indirect energy aspects of the IECC, such as envelope efficiency requirements for performance or ERI compliance or any changes to individual energy credits.
- Administrative changes, including editorial corrections, new definitions, reordering or renumbering of code sections, clarifications, and reference updates.

Code changes characterized as increasing or decreasing energy use are further evaluated to determine whether they can be reasonably quantified through quantitative energy analysis. Appendix A contains a list of all code changes included in the 2024 IECC and their categorizations.

2.3 Quantitative Assessment

The current analysis is based on an established DOE methodology (Salcido *et al*., 2024) and builds on previous work by PNNL (DOE 2021). DOE has historically focused its review of model codes on changes that affect the *mandatory* and *prescriptive* requirements of the code because such changes are considered to have the most direct and quantifiable impact on energy efficiency in buildings and historically have been viewed as the predominant compliance option employed by users of the IECC. The 2024 IECC added requirements for additional efficiency in the form of energy credits to provide design flexibility while increasing energy efficiency. The prescriptive compliance path requires not less than 10 energy credits from not less than 2 energy credit measures. While all changes are reviewed individually and assessed for their anticipated impact during the qualitative analysis, only those changes with a direct and reasonably measurable energy impact are included in the quantitative assessment and therefore the final savings estimates.

Further, the 2024 IECC includes two performance-based compliance options (Total Building Performance and Energy Rating Index (ERI)). These are intended to increase flexibility while ensuring that the resulting building is designed to use less energy compared to the standard reference baseline. Performance-based alternatives have received increased attention and emphasis in recent code updates. However, these are

generally considered optional alternatives to the more traditional prescriptive requirements and in all cases remain subject to the mandatory code requirements.

Changes in the performance-based options can be difficult to reasonably quantify via commonly accepted methods or are speculative in terms of their expected uptake in practice (*i.e.*, have not been widely implemented in the field to date). For this reason, performance-based changes are generally excluded from the quantitative assessment, in which case DOE often defers to the qualitative assessment of the individual change.

The following sections describe the analysis procedures and simulation models relied on in the quantitative assessment.

2.3.1 Building Types and Model Prototypes

DOE's established methodology uses a suite of representative residential prototype buildings, including a single-family building and a low-rise multifamily residential building, each with four different foundation types (*i.e.*, slab-on-grade, vented crawlspace, heated basement, unheated basement) and four heating system types (*i.e.*, gas furnace, electric resistance, heat pump, fuel oil furnace). The entire set of configurations is designed to represent the majority of the new residential building construction stock in the United States and was created based on construction data from the U.S. Census (Census 2020) and the Residential Energy Consumption Survey (RECS 2020).

Thus, a total of 32 prototype buildings and configurations are represented (*i.e.*, 2 building types, 4 foundation types, and 4 fuel/equipment types). Detailed descriptions of the prototype building models, and their representative operational assumptions are documented by (Salcido *et al*., 2024).

2.3.2 Climate Zones

The U.S. climate zones and moisture regimes are shown in Figure 1.

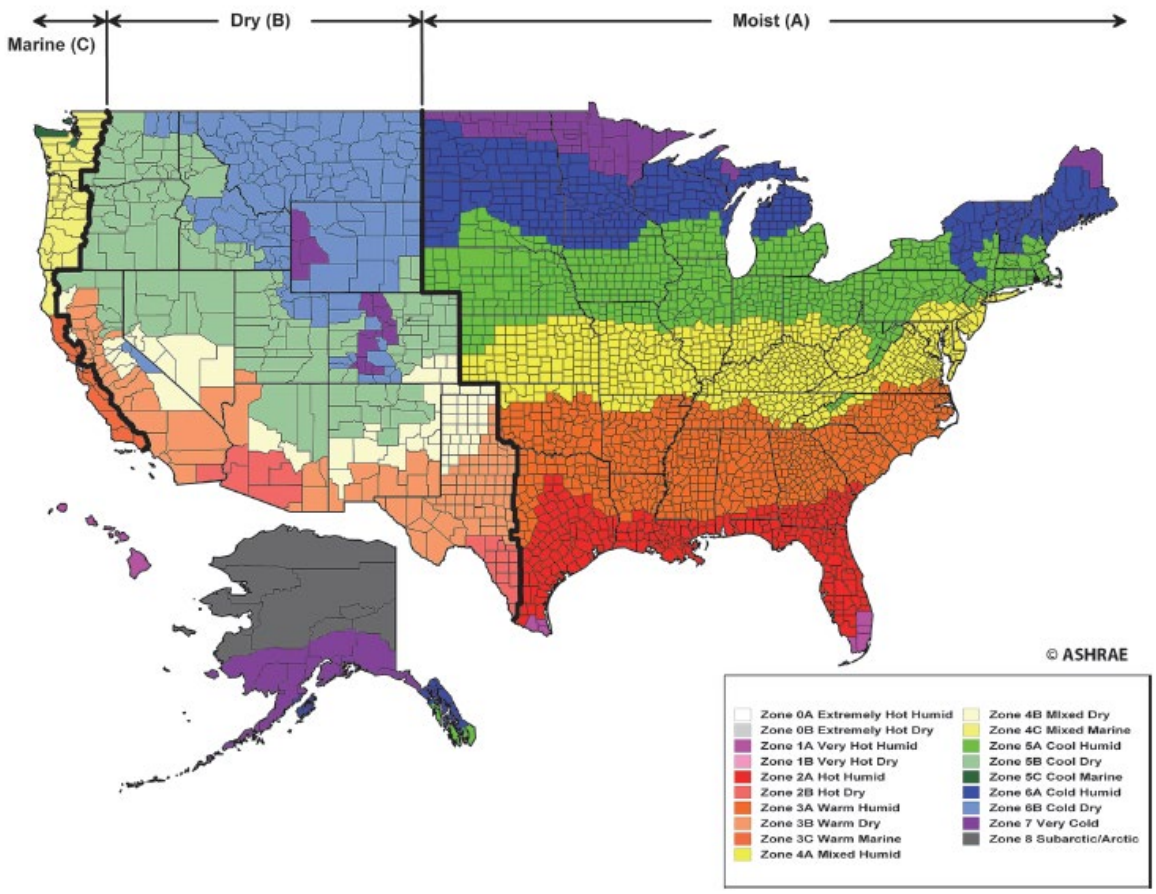

Figure 1. U.S. Climate Zone Map

Climate zones are divided into moist (A), dry (B), and marine (C) regions. However, not all the moisture regimes apply to all climate zones in the United States, and some zones have no moisture designations at all (zones 7 and 8 in the United States); thus, only 19 thermal-moisture zones exist in ASHRAE 169-2013, of which 16 are represented in the United States. In addition, the residential IECC includes a tropical climate designation with an alternative prescriptive compliance path for semi-conditioned buildings meeting certain criteria. Because the national analysis for DOE determinations looks only at the primary prescriptive compliance path, the alternative for tropical semi-conditioned buildings is not considered in this analysis. All homes in the tropical zone are modeled as complying with the prescriptive path. The appropriate state-level analyses will include the parameters of the tropical semi-conditioned prescriptive requirements.

The IECC further defines a warm-humid region in the southeastern United States. This region is defined by humidity levels, whereas the moist (A) regime is more closely associated with rainfall. The warm-humid distinction affects only whether basement insulation is required in climate zone 3. This brings the total number of representative cities analyzed to 18.

For the quantitative analysis, a specific climate location (*i.e.*, city) was selected as representative of each of the 18 climate/moisture zones found in the United States:

- 1A: Honolulu, Hawaii (tropical)
- 1A: Miami, Florida
- 2A: Tampa, Florida
- 4B: Albuquerque, New Mexico
- 4C: Seattle, Washington
- 5A: Buffalo, New York

- 2B: Tucson, Arizona
- 3A: Atlanta, Georgia
- 3A: Montgomery, Alabama (warm-humid)
- 3B: El Paso, Texas
- 3C: San Diego, California
- 4A: New York, New York
- 5B: Denver, Colorado
- 5C: Port Angeles, Washington
- 6A: Rochester, Minnesota
- 6B: Great Falls, Montana
- 7: International Falls, Minnesota
- 8: Fairbanks, Alaska

For the determination analysis, one set of the 32 prototype models was configured to represent construction practices as dictated by the 2021 IECC, another set was configured to represent the 2024 IECC, and then both sets (64 total models) were simulated in all 18 climate zones and moisture regimes defined in the IECC. A total of 1,152 energy simulations were configured and run using *EnergyPlus* version 23.1.1 (DOE 2024). The resulting energy use data were converted to annual energy costs using national average fuel prices, and the energy and energy cost results were weighted to the national level using weighting factors based on housing starts.

2.3.3 Weighting Factors

Weighting factors for each of the prototype buildings were developed for all U.S. climate zones using 2020 new residential construction starts[3] and residential construction details from the U.S. Census (Census 2020) and the Residential Energy Consumption Survey (RECS 2020). The weights were fine-tuned by the county-to-climate zone map based on ASHRAE 169 climate zones. Weighting factors are used to aggregate the results of each of the individual prototype/climate zone combinations into climate zone, building type, or national level results. Table 1 through Table 4 summarize the weights aggregated to building type, foundation type, heating system, and climate zone level. The detailed weighting factors for each prototype building are included in Appendix B.

Table 1. Weighting Factors by Building Type

Building Type	Weight (%)
Single-Family	82.12
Multifamily	17.88
Total	100.00

Table 2. Weighting Factors by Foundation Type

Foundation Type	Weight (%)
Crawlspace	15.53
Slab-on-Grade	59.20
Heated Basement	15.71
Unheated Basement	9.56
Total	100.00

[3] See the U.S. Census Bureau webpage at https://www.census.gov/construction/bps/stateannual.html.

Table 3. Weighting Factors by Heating System

Heating System Type	Weight (%)
Gas-Fired Furnace	55.60
Electric Furnace	7.88
Oil-Fired Furnace	0.15
Heat Pump	36.37
Total	100.00

Table 4. Weighting Factors by Climate Zone

Climate Zone	Weight (%)
1	2.12
2	26.02
3	28.84
4	19.07
5	18.33
6	5.05
7	0.55
8	0.01
Total	100.00

2.4 Conversion of Energy Units

The determination analysis is based on three metrics of energy consumption:

1. *Site Energy*: The energy consumed at the end of the generation cycle within the building site, sometimes referenced as "behind the meter" or as shown on the building's utility bill.
2. *Source Energy*: The energy required to power a building including generation and distribution.
3. *Energy Cost*: The total cost of energy required for building functions.

In addition, the analysis reports carbon emissions based on the amount of carbon released to the atmosphere from source energy consumption; however, estimates pertaining to emissions are provided only as supplemental information and are not considered as part of the final determination.

The annual site energy results for total building energy use were converted to annual site energy use intensities (EUIs) based on the conditioned floor area of the residential prototype models. This conversion includes heating, cooling, fans, domestic water heating, lighting, appliances, plug loads, and ventilation from the simulation analysis of the residential prototype models that minimally comply with the prescriptive and mandatory requirements of the 2021 and 2024 IECC. The site energy use was converted to source energy (or primary energy), which accounts for the inefficiencies of generation and losses involved in delivering energy to the site.

The source-site conversion ratios for electricity and natural gas were calculated from the 2023 values reported in Table 2 of the 2024 Annual Energy Outlook produced by the U.S. Energy Information Administration (EIA 2024a). Table 5 and Table 6 summarize the source-site conversion factor calculations for electricity and natural gas, respectively. The EIA does not report similar losses associated with fuel oil. In absence of these data, a source-site conversion ratio of 1.01 is used for fuel oil based on ENERGY STAR (2023).

Table 5. Calculation of the Source-Site Ratio for Electricity

Electricity (quadrillion Btu)	Electricity-Related Losses (quadrillion Btu)	Source-Site Ratio[(a)]
5.09	9.52	2.83
(a) Source-Site ratio= (5.09+9.52)/5.09 = 2.83		

Table 6. Calculation of the Source-Site Ratio for Natural Gas

Sum of Natural Gas Use, Pipeline, Lease and Plant Fuel (quadrillion Btu)	Delivered to Consumers (quadrillion Btu)	Source-Site Ratio[(a)]
30.48	27.82	1.10
(a) Source-Site ratio= 30.48/27.82 = 1.10		

Finally, the annual energy results from the simulation analysis were converted to annual energy costs using the 2020 national average fuel prices from the EIA. To avoid seasonal fluctuations and regional variations in the price of electricity, the analysis used the average annual residential electricity price of 15.98 ¢/kWh (EIA 2024b). The EIA reports a national annual average cost of \$14.406/1,000 ft^3 for natural gas and an average heat content of 1,036 Btu/ft^3 for natural gas delivered to consumers in 2016 (EIA 2024c, 2024d). The resulting national average price of \$1.391/therm for natural gas was used in this analysis. In addition, the EIA reports a national annual average cost of \$4.1392/gallon for No. 2 fuel oil (EIA 2024e). The heat content of No. 2 fuel oil is 138,500 Btu/gallon (EIA 2024c), resulting in a national average price of \$29.89/million Btu for fuel oil.

Carbon emissions in the quantitative analysis are based on the source energy consumption on a national scale. Carbon emission metrics are provided by the U.S. Environmental Protection Agency (EPA) Greenhouse Gas Equivalencies Calculator.[4] The Greenhouse calculator reports the national marginal carbon emission conversion factor for electricity at 6.99 x 10^{-4} metric tons CO_2/kWh. For natural gas, the carbon emission conversion factor is 0.0053 metric tons CO_2/therm. For oil, the carbon emission conversion factor is 10.243 x 10^{-3} metric tons CO_2/gallon. Table 7 summarizes the carbon emission factors.

Table 7. Carbon Emission Factors by Fuel Type

Fuel Source	Carbon Emission Factor
Electricity	6.99 x 10^{-4} metric tons CO_2/kWh
Natural Gas	0.0053 metric tons CO_2/therm
Fuel Oil	10.243 x 10^{-3} metric tons CO_2/gallon

[4] See the EPA webpage at https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator. Accessed February 2024.

3 Results

3.1 Qualitative Assessment

The 54 approved code changes incorporated into the 2024 IECC that have a direct effect on energy use are listed below in Table 8. The following information is shown for each change:

1. **Proposal Number**: Change proposal designation assigned by the ICC
2. **Code Section(s)**: Section numbers in the 2021 IECC that are affected by the code change.[5]
3. **Description of Change(s)**: Descriptive summary of the change
4. **Impact on Energy Efficiency:** Qualitative characterization of those changes expected to increase or decrease energy use
5. **Included in Energy Analysis:** Indication of whether the change can be reasonably assessed through further quantitative analysis
6. **Discussion:** A brief discussion expanding on the description providing additional rationale if appropriate.

[5] Because sections are often added or deleted, section numbers will often differ in the 2024 IECC.

Table 8. Qualitative Analysis of 2024 IECC Code Changes Affecting Energy Use

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
REPI-018-21	R401.2, R401.2.1, R401.2.5, R401.3, R405.2, SECTION R408, R408.1, R408.2, TABLE R408.2 (New), R408.2.1, R408.2.1.1 (New), R408.2.1.2 (New), TABLE R408.2.1.2 (New), R408.2.2, R408.2.3, R408.2.4, R408.2.5, R408.2.7 (New), TABLE R408.2.7 (New), R408.2.8 (New)	Changes the Section R408 additional efficiency packages to an energy credit methodology. Each residential building must select at least two energy credit measures to achieve 10 energy credits.	Reduces energy use	Yes	The energy credit methodology provides a path to increase the energy efficiency of a residential building while providing design flexibility. There are a total of 53 energy credit measures for envelope, heating, ventilating, and air conditioning (HVAC), service water heating (SWH), duct leakage and location, air leakage and ventilation, demand response, lighting, efficient appliances, and on-site renewable energy. Each energy credit represents a 1 percent reduction in total energy savings.
REPI-028-21	TABLE R402.1.2, TABLE R402.1.3	Reduced fenestration U-factors in climate zones 4 and 5 from 0.30 to 0.28 and reduced all skylight U-factor requirements to 0.6 in climate zones 0 through 2, 0.53 in climate zones 3, 4A, and 4B, and 0.50 in climate zones 4C through 8 in Table R402.1.2 and R402.1.3.	Reduces energy use	Yes	
REPI-063-21	R402.4.1.2, R402.4.1.3, TABLE R405.4.2(1)	Changes the prescriptive air leakage requirements in climate zones 0, 1, and 2 from 5.0 ACH50 to 4.0 ACH50. The air leakage of the standard reference home in Table R405.4.2(1) is set to 4.0 ACH50 in climate zones 0 through 2.	Reduces energy use	Yes	

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
REPI-064-21	R402.4.1.2, R402.4.1.3, TABLE R405.4.2(1), R408.2.5	Changes the prescriptive air leakage requirements in climate zones 3 through 8 from 3.0 ACH50 to 2.0 ACH50. The air leakage of the standard reference home in Table R405.4.2(1) is set to 2.0 ACH50 in climate zones 4 through 8.	Reduces energy use	Yes	The air leakage for this proposal was adjusted to keep the prescriptive air leakage requirements at 3.0 ACH50 for climate zones 3 through 5 and 2.5 ACH50 for climate zones 6 through 8.
REPI-089-21	R403.5.2, TABLE C403.12.3, TABLE R405.2, TABLE R406.2	Increases pipe insulation for hot water piping from R-3 to 1 inch of insulation, which applies to all sizes of piping.	Reduces energy use	Yes	One inch of pipe insulation will achieve an R-7 level of insulation.
REPI-093-21	R403.6.1	Dwelling units shall be provided with a heat recovery or energy recovery ventilation system in climate zones 6 through 8. The ventilation system shall be balanced with a minimum sensible recovery efficiency (SRE) of 65 percent at 32°F (0°C) at a flow greater than or equal to the design airflow.	Reduces energy use	Yes	HRV requirement for ventilation is added in climate zone 6 on top of the previous 2021 IECC requirement in climate zones 7 and 8.
RED1-110-22	R404.1.2, R404.1.3, R404.1.4, TABLE R404.1	Revises the exterior lighting sections and adds a new lighting power allowance table to match the equivalent requirements in IECC-C. Additional exceptions from IECC-C were added that could apply to the Group R occupancies.	Reduces energy use	Yes	Previously in 2021 IECC, the exterior lighting for low-rise multifamily buildings was required to comply with the commercial exterior lighting provisions.
REPI-033-21	TABLE R402.1.2, TABLE R402.1.3, R408.2, R408.2.1 (New), R408.2.1-R408.2.4	Ceiling insulation in Table R402.1.3 was reduced from R-49 to R-38 in climate zones 2 and 3 and reduced from R-60 to R-49 in climate zones 4 through 8. The associated ceiling U-factors were adjusted for the same climate zones in Table R402.1.2. The new U-factor is 0.030 for climate zones 2 and 3 and 0.026 for climate zones 4 through 8.	Increase energy use	Yes	This proposal adjusts the ceiling insulation in climate zones 2 through 8 back to the 2018 IECC levels.

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
CEPI-082-21 Part II	R403.9, R403.10 (New)	Requires controls for roof and gutter de-icing systems to shut off at temperatures above 40°F through moisture sensors or timer control.	Reduces energy use	No	Roof and gutter de-icing systems use energy and are often left running at times that are unnecessary for ice dam prevention. Provides automatic controls that limit the system from running when outdoor temperature is above 40°F. Roof and gutter de-icing systems are not included in the residential prototypes or the quantitative analysis.
RECD1-7-22	TABLE R406.5	Updates the newly added ERI with on-site power production (OPP) targets for Table R406.5.	Reduces energy use	No	The original ERI with OPP targets was set at 40 for all climate zones. The updated ERI with OPP targets was based on ERI analysis.
RECPI-10-21	R408.2.3, Table R408.2.3 (New)	Updates the SWH equipment list based on system type, fuel, and capacity as well as the format of Table R408.2.3 for the SWH energy credit measures.	Reduces energy use	No	
RED1-027-22	APPENDIX RG (New), RG101 (New), RG405.2 (New), RG406.5 (New), R406.5 (New), RG408.2 (New)	Adds optional Appendix RG for the 2024 IECC Stretch Code with three compliance paths: prescriptive, total building performance, and ERI.	Reduces energy use	No	Appendix RG would require an additional 10 percent efficiency (on average) to be designed into the home over the baseline 2024 IECC prescriptive requirements. Only reduces energy use if Appendix RG is adopted.
RED1-071-22	R408, R408.1, R408.2, TABLE R408.2, R408.2.1, R408.2.1.1, R408.2.1.2, R408.2.1.3, R408.2.1.4 (New)	Adds a new infiltration measure and language to clarify compliance methodology in Section R408 for additional efficiency requirements.	Reduces energy use	No	The added infiltration measure requires the air leakage rate to not be greater than 2.5 ACH50 across all climate zones. Credit can only be achieved in climate zones 0-5 as climate zones 6-8 have prescriptive air leakage requirements already at 2.5 ACH50. A cost-effective set of energy credits will be part of the quantitative analysis.

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
RED1-076-22	SECTION 202, TABLE R408.2, R408.2.7, R408.2.8 (New)	Adds off-site renewable power generation to the list of energy credit measure options in Table R408.2.	Reduces energy use	No	To receive energy credit for off-site renewable energy, a renewable energy power purchase agreement would need a 15-year contract at a minimum and offset 80 percent of the estimated whole-building electric use on an annual basis. The exact credits were determined based on simulation analysis which provided more than enough energy credits for compliance in all climate zones. A cost-effective set of energy credits will be part of the quantitative analysis.
RED1-079-22	TABLE R408.2, R408.2.1.1	Adds three additional envelope energy credit measures of the thermal conductance (UA) improvement options of 15, 20, and 30 percent as compared to the prescriptive baseline.	Reduces energy use	No	These new options allow additional energy credits for improved envelope design. There was an option in this proposal to remove some of the original envelope UA measures (2.5, 5, and 7.5 percent) since they were not differentiated enough. The final decision by committee was to keep the original UA measures and add the new three UA measures. A cost-effective set of energy credits will be part of the quantitative analysis.
RED1-091-22	Appendix RP (New), RP101 (New), RP102 (New), RP103 (New), RP103.1 (New), RP103.1.1 (New), RP103.1.1.1 (New), RP103.2 (New), RP103.1.3 (New), TABLE RP103.1.3 (New); IRCECC: RP103.1.1.1 (New)	Adds optional Appendix RP for on-site renewable energy with new definitions that describes the requirements for prescriptive solar photovoltaics (PV) to be installed at the time of construction.	Reduces energy use	No	Terms defined for solar zone area, annual solar access, and physical renewable energy power purchase agreement. Requires an on-site renewable energy system not less than 2.0 kW for single-family homes or not less than 0.75 watts/ft^2 for R-2 and R-4 occupancies. Exceptions are added based on shading, climate zone, or existing renewable energy power purchase agreements. Capacity requirements may

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
					differ for compliance demonstrated by R405 or R406 ERI compliance. A new set of ERI with OPP targets are defined for all climate zones. Only reduces energy use if Appendix RP is adopted.
RED1-166-22	R408, R408.1, R408.2, TABLE R408.2, R408.2.10 (New)	Adds an additional energy credit measure in Table R408.2 for whole home lighting control and a new Section R408.2.10 to determine the qualification for achieving the energy credits.	Reduces energy use	No	For whole home lighting control energy credit, a home or dwelling unit must have a switch at the main entrance to turn off all permanently installed interior lighting or the same operation with remote control. Lighting studies supplied with the proposal estimated that whole house lighting savings of 11 percent could be achieved with whole home lighting control. A cost-effective set of energy credits will be part of the quantitative analysis.
RED1-199-22	TABLE R402.1.2, TABLE R402.1.3; IRCECC: TABLE N1102.1.2, TABLE N1102.1.3	Modifies footnote for window U-factors for high elevation or windborne regions in Tables R402.1.3 and N1102.1.3 to align with other fenestration updates.	Reduces energy use	No	Requires a fenestration U-factor of 0.30 in climate zones 4C and 5-8 for elevations above 4,000 ft or in windborne regions. Prescriptive fenestration U-factors remain unchanged.
RED1-263-22	R202 (New), TABLE R408.2, R408.2.10 (New), R502.2.5, R503.1.5, R506.1	Adds new definition for substantial improvement, a new energy credit measure for high-efficacy lighting, and clarifying language for additional efficiency requirements for additions and substantial improvements.	Reduces energy use	No	Adapts the language for alterations and additions to make it compatible with the new energy credits methodology. Section 506, which references the additional efficiency packages, was no longer necessary and was removed. The energy credit requirements for additions is 5 credits and alterations need 1 credit. The energy credits allow more flexibility in alterations and additions for additional efficiency.

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
RED1-310-22	R403.5.1.1; IECC: R403.5.1.1.1	Adjusts language for circulation and demand recirculation hot water systems to minimize circulation pump operation by way of control strategies.	Reduces energy use	No	Adds a recirculation pump control variable for water temperature in the pipe to prevent activation of demand control recirculation pumps and minimize accidental triggers.
RED1-339-22	TABLE R405.4.2(1)	Adds provisions to Table R405.4.2(1) to require ducts to be placed in conditioned space for the standard reference design.	Reduces energy use	No	This change was in response to changes in duct location for the standard reference design in Table R405.4.2(1). The 2021 IECC and all previous editions placed the ducts in the standard reference design in the same location as the proposed design. A separate change modified the location to a combination of locations (conditioned and unconditioned) based on number of stories and foundation type. Through consensus, an agreement was made to adjust the duct locations for conditioned basements.
RED1-351-22	R408.2.2, TABLE R408.2	Adds additional HVAC energy credit measures to encourage homeowners and builders to install efficient HVAC products. More energy efficient product options by climate zones matched with potential credits.	Reduces energy use	No	Provides 14 energy credit measures for high-efficiency HVAC equipment and aligns the additional HVAC energy credits with the requirements in the Inflation Reduction Act (IRA) for tax credits for high-efficiency HVAC and water heating products.
RED1-358-22	TABLE R408.2.3	Provides more energy credits for higher-efficiency SWH equipment, which will encourage homeowners and builders to install efficient water heater products. ENERGY STAR product specifications and Consortium for Energy Efficiency are aligned with the efficiency levels for SWH options in Table R408.2.	Reduces energy use	No	Provides 11 energy credit measures for high-efficiency water heating equipment and aligns the additional water heating energy credits with the requirements in IRA for tax credits for high-efficiency HVAC and water heating products.

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
RED1-360-22	TABLE R408.2.6, R408.2.6; IECC: SECTION 202 (New)	Aligns the high-efficiency appliances energy credit measure with ENERGY STAR product specifications to achieve energy credits. This proposal removed all references to the ENERGY STAR program and utilized annual energy consumption requirements.	Reduces energy use	No	Adds an exemption for Group R-2 dwelling units where a dishwasher is not installed in the unit can still obtain high-efficiency appliance energy credit. Common areas need to fully comply with the energy credit requirements.
REPI-004-21	R102.1.1	Changed the envelope efficiency backstop requirement strategy from an earlier code edition (2009 IECC) to a UA methodology - 1.15 x UA of the prescriptive reference design for compliance using above code programs.	Reduces energy use	No	Through simulation analysis, the 1.15 UA of the standard reference design is considered equivalent to the 2006 IECC or the 2009 IECC in most climate zones.
REPI-020-21	R405.2, R408.2	Increases the stringency of R405 total building performance compliance by requiring that the proposed home have less than or equal to 90 percent of the annual energy costs of the standard reference design. For any home over 5,000 sq ft, another 5 percent reduction in energy costs is required. For prescriptive compliance, a home over 5,000 sq ft is required to obtain 15 energy credits.	Reduces energy use	No	Requires an additional 10 percent efficiency for the total building performance compliance and 15 percent more for any building over 5,000 sq ft in both prescriptive and performance compliance. ERI compliance includes a size adjustment factor in the RESNET 301 Standard.
REPI-039-21	R202 (New), R402.2.3 (N1102.2.3) (New), R402.2.3.1 (N1102.2.3.1) (New), TABLE R405.2	Adds new language to define and describe how to address attic knee walls. It also adds this assembly to the list of required assemblies that must be detailed in the requirements section of the IECC.	Reduces energy use	No	
REPI-050-21	TABLE R402.4.1.1	Adjusts the language for HVAC register boots in Table R402.4.1.1 for air barrier, air sealing, and insulation installation to require that all supply and return registers be sealed to the surface they are penetrating.	Reduces energy use	No	Aligns the air sealing requirement for HVAC register boots with ENERGY STAR requirements.

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
REPI-060-21	R402.4.1.2	Increases the maximum tested air leakage rate in Section R402.4.1.2 to 4.0 ACH50 or 0.22 CFM25 / sq ft of dwelling unit enclosure area.	Reduces energy use	No	The proposed air leakage rate change applies to the total building performance compliance and does not change the prescriptive air leakage rates. This change is not part of the quantitative analysis.
REPI-065-21	R402.4.2.1 (N1102.4.2.1) (New), ANSI Chapter 06 (New), CSA Chapter 06 (New)	Adds a new section to specify minimum efficiency levels for gas fireplace heaters at 50 percent. Also adds two references to Chapter 6 for ANSI and CSA as testing procedures.	Reduces energy use	No	
REPI-068-21	R202 (New), R402.6 (New), TABLE R402.6 (TABLE N1102.6) (New), R402.6.1 (N1102.6.1) (New), TABLE R405.4.2(1), R407.2, R503.1.1, ASTM Chapter 06 (New), CRRC Chapter 06 (New), TABLE R406.2	Adds new definitions for low/steep sloped roofs and a new Section R402.6 to define the requirements for a cool roof in climate zones 0 through 3 and provides methods to determine the aged solar reflectance. Adds these requirements for tropical climate regions and remodeled building envelope assemblies.	Reduces energy use	No	Reflectance and thermal emittance (TE) values degrade over time; hence, 3-year aged values are used for the performance benchmark referred to as aged solar reflectance and TE.
REPI-073-21	R403.1.2	Reconfigures heat pump supplementary heat requirements to prevent supplemental heating when the capacity of the heat pump compressor can serve the heating load and describes the times when supplementary heat operation is justified.	Reduces energy use	No	Prevents operation of electric resistance heaters installed in heat pumps that are configured to operate in conditions where sufficient heating capacity is available from the heat pump alone.
REPI-074-21	R202 (New), R403.1.3 (New), ANSI Chapter 06 (New)	Adds new definitions for pilot light operation and adds a new section for continuously burning pilot lights.	Reduces energy use	No	On-demand, intermittent or interrupted ignition pilot lights (as defined in ASNI Z21.20) are not considered to have a continuously burning pilot light.

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
REPI-086-21	R403.3, R403.3.5, R403.3.6, TABLE R403.3.6 (New), TABLE R405.2, TABLE R405.4.2(1), TABLE R405.4.2(2), TABLE R406.2	Adjusts duct leakage testing language to clarify the testing requirements and allows the duct leakage to outside metric can be used for compliance procedures of R405 or R406 but cannot be used for total duct leakage testing requirements. Also defines a new Table R403.3.6 defining maximum total duct leakage rates based on conditioned floor area and construction.	Reduces energy use	No	Table R403.3.6 shows the maximum duct leakage rates that existed in R403.3.6 for better clarity of the exact requirements based on air handler installation and construction period.
REPI-091-21	R403.5.4 (New), TABLE R403.5.4 (New)	Adds new code language to determine the water volume in ounces in hot water piping based on pipe length, pipe material, and nominal size (inches). New Table R403.5.4 provides the internal volume of various water distribution tubing.	Reduces energy use	No	The water volume determination in hot water piping is used in combination with the compact hot water design energy credit, which requires not more than 16 ounces of hot water from the source of hot water to the farthest fixture.
REPI-099-21	R202 (New), R403.7.1 (New), TABLE R405.2, TABLE R406.2	Adds a new definition for zonal heating and a new section for operational requirements of single-family homes with electric resistance zonal heating units in climate zones 4 through 8.	Reduces energy use	No	Adds a requirement for homes with zonal electric heating as the primary heating source to install an additional heat pump unit not less than 6.3 heating season performance factor (HSPF2) in the largest living zone.
REPI-115-21	R202 (New), R103.2.4 (New), R105.2.5 (New), R404.4 (New), R404.4.1 (New), R404.4.2 (New), R404.4.2.1 (New), R404.4.2.2 (New), R404.4.2.3 (New), R404.4.2.4 (New), TABLE R405.2, TABLE R406.2	Adds a new definition for energy storage system (ESS) and defines the electrical and inspection requirements for an ESS readiness and adds the requirements to the mandatory requirements tables in Sections R405 and R406.	Reduces energy use	No	ESSs such as battery energy storage systems charge during the peak PV generation hours and can discharge in late afternoon and evening as the sun sets. Considering these ESSs reduce the back feed into the grid, they help with grid management and provide a financial buffer for differing net energy metering policies by states and utilities. In an ideal case, a home with PV and ESS can be nearly "invisible" to the grid.

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
REPI-118-21	R405.2	Changes the methodology of the building thermal envelope backstop for total building performance compliance from meeting the provisions of an earlier energy code edition to meeting a specific UA level of the current energy code.	Reduces energy use	No	In the 2021 IECC, the building thermal envelope backstop for total building performance compliance was showing equivalency to the 2009 IECC. Now, a UA analysis must be performed where the design home UA must be not greater than 1.15 x UA of the standard reference design.
REPI-122-21	R401.2.5, R405.2, TABLE R405.4.2(1), TABLE R405.4.2(2), DOE Chapter 06 (New)	Removes the R408 additional efficiency requirements from R405 total building performance compliance, aligns the building thermal envelope backstop requirements to the new UA methodology, and changes the performance compliance for the proposed design to have not more than 80 or 85 percent of the standard reference home design costs for mixed fuel or all-electric homes, respectively. Changes the R405.4.2(1) tables to specify federal minimum efficiency HVAC and SWH systems and specific duct locations in the standard reference design.	Reduces energy use	No	The 2021 IECC Standard Reference Design specified HVAC and SWH equipment efficiency and duct location to be the same as the proposed design to prevent envelope trade-offs. This proposal returns the HVAC and SWH equipment efficiencies to the federal minimum efficiency standards and sets defined locations for ducts based on number of stories and foundation type. This change will allow trade-offs with other efficiency measures but does include more stringent compliance requirements to counter these changes for equipment efficiency and duct location.
REPI-126-21	R406.2, R406.3, R406.3.1, R406.3.2, R406.4, R406.5, TABLE R406.5	Adds an optional ERI target that includes OPP at 40 for all climate zones. The ventilation adjustment for the ERI Reference Home in Section R406.4 was removed. Provisions were set to specify which ERI target could be used for compliance and the envelope backstop was updated to the UA methodology as approved in previous proposals.	Reduces energy use	No	The ERI with OPP targets can be used for compliance for homes with on-site renewable energy systems. The ERI with OPP targets is optional where a home with a renewable energy section can choose to meet the ERI without OPP targets but cannot use the renewable energy generation as part of the proposed design ERI.

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
REPI-136-21	R408.2, R408.2.2	Adds additional efficiency package measures for Section R408.2.2 (N1108.2.2), More Efficient HVAC Equipment Performance Options, based on central ducted and ductless systems. Updates heat pump efficiency metrics to seasonal energy efficiency rating (SEER2) and HSPF2.	Reduces energy use	No	Change was based on the 2021 IECC Additional Efficiency Package Options and was later adapted to be part of the new energy credits measures.
REPI-142-21	408.2.6 (New)	Adds a new section R408.2.6 for compact hot water design energy credits. The sections requires not more than 16 ounces of water between the nearest source of heated water and the termination of the farthest fixture in order to gain energy credits.	Reduces energy use	No	This energy credit gives credit for reducing the overall footprint of the hot water piping system as a function of conditioned floor area to generate energy and construction cost savings.
REPI-143-21	R501.7 (New), R502.1, R502.2, R502.3.1, R502.3.2, R502.3.3, R502.3.4, R502.3	Adds new language for existing homes to clarify that any change in space conditioning (unconditioned or low-energy spaces become conditioned) requires full compliance with the code. Removes the old change in space conditioning language while renumbering subsequent sections based on these changes.	Reduces energy use	No	The position of the change in space conditioning language makes it apply to any addition or alteration.
REPI-144-21	R202 (New), R502.3, R502.3.5 (N1110.3.5) (New), R503.1, R503.1.5 (N1111.1.5) (New), SECTION R506 (N1114) (New), R506.1 (N1114.1) (New)	Adds two new definitions for exterior wall envelope and work area and adds new language to require additional efficiency packages for additions and alterations.	Reduces energy use	No	The additional efficiency measures were changed to energy credit requirements as a result of public comments.

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
REPI-145-21	R502.3.2, R503.1.2, R503.1.2.1 (N1111.1.2.1) (New)	Adds new requirements for existing ductwork serving new equipment in additions and alterations to have duct leakage tests. The code language for exceptions to duct leakage tests were modified for clarity.	Reduces energy use	No	Ensures that any existing duct system that is connected to new HVAC equipment as part of an addition or alteration must perform as required for insulation and total duct leakage based on the duct location.
REPI-150-21	R503.1.1, R503.1.1.1, R503.1.1.2 (N1111.1.1.2) (New), 503.1.1.3 (N1111.1.1.3) (New), R503.1.1.4 (N1111.1.1.4) (New), R503.1.1.5 (N1111.1.1.5) (New), R503.1.1.6 (N1111.1.1.6) (New), SECTION 202 (New), SECTION 202, TABLE R402.1.2, TABLE R402.1.3	Adds new definitions for approved source and construction documents, adds new sections for roof, above-grade wall, floor, below grade wall, and air barrier alterations. Updates language for building thermal envelope and fenestration alterations for a balance of practicality and cost-effectiveness.	Reduces energy use	No	Provides criteria to trigger or avoid requirements with flexibility.
REPI-151-21	R503.1.2, R503.1.2.2 (N1111.1.2.2) (New), R503.1.2.1 (N1111.1.2.1) (New)	Adds requirement for new heating and cooling equipment and a requirement that new HVAC ducts as part of an alteration must be sized in accordance with the provisions of Section R403.	Reduces energy use	No	Requires right-sizing of both HVAC and duct systems as part of any alteration.
REPI-152-21	R503.1.2.1 (N1111.1.2.1) (New)	Requires any new heating and cooling equipment as part of an alteration to be provided with controls as required in Section R403.1.	Reduces energy use	No	The new heating and cooling equipment must have a programmable thermostat and heat pumps must have supplemental heat pump control.
REPI-163-21	TABLE RC102.2	Reduces the ERI not including OPP targets to 42 for all climate zones.	Reduces energy use	No	Increases the energy efficiency of the proposed building to a higher level before renewable energy systems can be employed to meet the ERI target of 0.
RED1-309-22	TABLE R403.3.6	Adds a new duct leakage test level for duct systems located in conditioned space with	Increases energy use	No	At rough-in, a duct system without an air-handler installed was required to have total

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
		air-handler not installed at rough-in for both for all homes regardless of size.			duct leakage not more than 3 cfm/100 sq ft. This code change will allow a duct system inside conditioned space to have duct leakage not more than 6 cfm/100 sq ft. which will increase energy use in these circumstances.
REPI-021-21	R401.2.5, TABLE R406.2	Removes the R408 additional efficiency requirements from the R406 compliance path.	Increases energy use	No	Removes the requirement for a proposed design using the ERI compliance path to have 5 percent less energy than the ERI targets in Section R406.
REPI-080-21	R403.3.2	Streamlines the code requirements for ducts located in conditioned space by combining the earlier sections for ducts located in floor and wall assemblies.	Increases energy use	No	Combined the language for ducts located in wall or floor assemblies for easier understanding. Reduced insulation requirements from R-19 to R-10 and added an exception for building assembly cavities that contain ducts which have been air-sealed would not need to be insulated.
REPI-085-21	R403.3.5, R403.3.6, R403.3.7 (New), R403.3.7	Adds a new section to define a sampling methodology for duct leakage testing of dwelling units within a multifamily building with not less than eight dwelling units. Exceptions were added to the duct leakage requirements for sampled dwelling units.	Increases energy use	No	The concept of sampling for duct leakage testing can help save time and money over testing of every single dwelling unit duct system in a multifamily building. There is risk of missing poorly sealed duct systems that can show performance and comfort issues for the occupants if missed in the sampling process.
REPI-131-21	R406.4	Removes the ventilation rate adjustment for the ERI Reference Home in Section R406.4.	Increases energy use	No	Coordinates the ERI calculation procedure with the residential ventilation rates. This change aligns the IECC ERI with the RESNET ERI.

(a) Proposal numbers are as assigned by the ICC (https://energy.cdpaccess.com/live/cah/).
(b) Code sections refer to the 2021 IECC. Sections may be renumbered by the ICC in the 2024 IECC.

3.1.1 Summary of Individual Changes

Figure 2 summarizes the changes to the 2021 IECC by category. Among a total of 273 code changes, 54 were characterized as impacting energy use in residential buildings, 48 of which are expected to reduce energy use and 6 of which are expected to increase energy use. Eight of the energy-impacting changes were included in further quantitative analysis to assess the impact to national average energy savings that can be expected with the 2024 IECC. The remaining 45 changes that impact energy use are not included in the quantitative analysis because the impact on energy use is negligible or cannot be analyzed. Among the other remaining changes approved for inclusion in the 2024 IECC, 219 were identified as administrative.

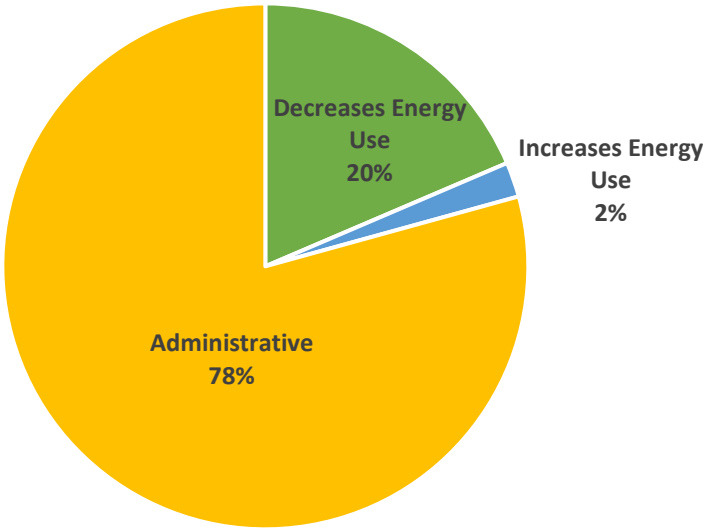

Figure 2. Categorization of Approved Code Changes

3.1.2 Additional Discussion of Significant Changes

This section provides some additional discussion on the most significant code changes. The approved code changes below warranted additional discussion based on complexity, workflow, energy savings or were found to be contentious in the Residential Consensus Committee. All section numbers listed in the discussion are from the 2021 IECC and may not align with section numbers from the 2024 IECC.

3.1.2.1 Envelope UA Backstop Methodology (REPI-004)

Proposal REPI-004 instituted a new strategy for setting the efficiency requirements of the building thermal envelope for above code programs by utilizing the overall heat transmission value (UA value). For compliance with above code programs, the proposed building thermal envelope total UA value (cumulative sum of the envelope component U-factors multiplied by the envelope component area) shall not be greater than 1.15 multiplied by the UA value based on the prescriptive requirements of the 2024 IECC. In the 2021 IECC and earlier code editions, the building thermal envelope of the proposed home complying with an above code program shall meet the levels of efficiency and solar heat gain coefficients in Tables R402.1.1 and R402.1.3 of the 2009 IECC. This code change aligns the building thermal envelope backstop efficiency methodology for above code programs with that of the R406 ERI compliance path.

Proposal REPI-026, described in Section 3.1.2.4, adjusts the overall heat transmission UA calculations to explicitly account for the thermal conductance of the slab on-grade construction (FP) by incorporating the slab

F-factor multiplied by the slab perimeter in linear feet to be equivalent to the UA value. The overall average heat transmission value of the thermal envelope in the proposed and reference designs is UA + FP. In response to the UA + FP code change, proposal RED1-186 re-defined the equation for UA + FP as the thermal conductance (TC) for the building thermal envelope. Further adjustments were made to the proposed building thermal envelope backstop for above code programs to require the TC value to not be greater than 1.08 of the standard reference design TC value in climate zones 0 through 2. Proposed building thermal envelope TC values could not be greater than 1.15 multiplied by the standard reference design TC value in climate zones 3 through 8. All compliance paths aligned the proposed building thermal envelope backstop requirements with the above codes program methodology.

3.1.2.2 Building Thermal Envelope UA Adjustments for Slabs (REPI-026)

In previous editions of the IECC, R402.1.5 provided the requirements for the overall average heat transmission (UA) compliance where the proposed home total UA value must not be greater than the UA value of the standard reference design using U-factors from Table R402.1.2 for the maximum assembly U-factors. One notable omission from Table R402.1.2 was slab on-grade U-factors/F-factors. The IECC was silent on whether the slab on-grade UA value should be part of the UA compliance. Code compliance software providers for many years included slab on-grade UA values in the UA compliance analysis by using the calculated slab U-factors multiplied by the slab perimeter (FP value) and not the slab area. There were many interpretations of using slabs in the UA analysis. REPI-026 clarified the issue of slabs on-grade within the UA analysis by specifically adding slab on-grade F-factors to Table R402.1.2 and adjusting the equation to calculate the total UA by adding the F-factor multiplied by the slab perimeter in linear feet. This code change removed the confusion with slabs in the original overall average heat transmission (UA) compliance path and provided clarity with slab on-grade construction. The total UA value was replaced with thermal conductance (TC), which is defined as the sum of the envelope component UA values and slab on-grade FP values. TC values are used for both overall average heat transmission compliance as well as thermal envelope backstop requirements for the 2024 IECC.

3.1.2.3 Prescriptive Ceiling Insulation Reduction (REPI-033)

REPI-033 reduced prescriptive ceiling insulation R-values in climate zones 2 through 8 back to the levels in the 2018 IECC. Ceiling insulation R-values for climate zones 2 and 3 were adjusted from R-49 to R-38 while in climate zones 4 through 8, prescriptive ceiling insulation was reduced from R-60 to R-49. REPI-033 proposed new code language for R408 additional efficiency requirements to allow a maximum above-grade wall U-factor of 0.060 (equivalent to R-20 cavity insulation) in climate zones 4 and 5 in exchange for the installation of heat pumps as the primary heat source, heat pump water heaters, implementation of three additional energy credits or a renewable energy system installed. The prescriptive requirements for above-grade walls in climate zones 4 and 5 are R-20 with R-5 continuous insulation. Both code changes allow for a reduction in building thermal envelope efficiency because the additional efficiency opaque wall option allows trade-offs with measures with much shorter life spans. When building thermal envelope measures with a life of over 60 years are traded with efficiency measures of shorter life spans, first-year energy savings may not change, but over the lifetime of the building thermal envelope, energy savings are lost.

3.1.2.4 Updates to R405 Standard Reference Design (REPI-122)

REPI-122 contains several code changes related to the R405 performance-based compliance path with contrasting results in efficiency. The requirement for additional efficiency for the R405 compliance path in the 2021 IECC was removed, which reduces overall efficiency in the performance path by 5 percent. HVAC and SWH efficiency levels as part of the R405 standard reference design in Table R405.4.2(1) are changed from being equal to the efficiency levels in the proposed design to now equivalent with federal minimum efficiency requirements. The duct location of the R405 standard reference design has also changed from being in the same location as the proposed design to now have specified locations based on the foundation type and the number of stories. These listed code changes primarily reduce the stringency for R405 performance-based compliance by removing the additional efficiency requirement and reducing the stringency in the R405 standard reference design by way of HVAC/SWH efficiency and duct location.

To counteract the reduced R405 compliance stringency resulting from these code changes, the performance path compliance requires an all-electric proposed design to not have more than 85 percent of the annual energy cost of the standard reference design. A mixed fuel proposed design cannot have more than 80 percent of the annual energy cost of the standard reference design. In past code editions, the proposed home required annual energy costs less than 100 percent of the standard reference design. The compliance factors of 80/85 percent are an effort to counteract the reduced efficiency in the standard reference design. The building thermal envelope backstop requirement follows the TC methodology to align with previous code change proposals.

The REPI-122 code change proposal effectively moved the HVAC and SWH efficiency in the R405 standard reference design back to the 2006 IECC, which was the federal minimum efficiency that allowed compliance credit for higher efficiency equipment. In addition, equipment efficiency with a short lifetime can once again be traded with envelope efficiency measures lasting the life of the building. Ducts within the conditioned space in the past did not gain any credit over the standard reference design but can now do so and be used to trade with other efficiency measures. While ducts in conditioned space is a good design practice, homes that design the ducts in conditioned space can now trade this extra compliance credit for reducing efficiency in other areas of the home. The code changes within REPI-122 both strengthen and weaken the R405 compliance path, and it is difficult to determine the overall impact on efficiency. What is clear is the use of federal minimum efficiency for the standard reference design HVAC/SWH systems and the specified duct locations allows a proposed design to trade high-efficiency equipment and short life spans with envelope efficiency measures that can last the life of the building. While first year energy savings may show equivalency in efficiency, lifetime energy savings will be reduced as there is no guarantee that replaced HVAC will be of the same efficiency as the initially installed equipment.

3.1.2.5 Appendix RD for Electric Energy Storage Provisions (REPI-115)

REPI-115 adds code language for a new appendix to the 2024 IECC to define an ESS and the requirements to make the proposed residential building energy storage ready. The new code language specifies the requirements for construction documents and electrical inspections. One- and two-family dwellings and townhouses must either be energy storage ready with the appropriate space and electrical requirements or install an ESS with a minimum rated energy capacity of 5 kWh and four ESS-supplied branch circuits. The branch circuits must serve the refrigerator, one lighting circuit near the primary egress and a sleeping unit receptacle. This code edition requires every single-family dwelling to have an ESS or be ESS ready. Buildings with R-2 or R-4 occupancies require compliance with the commercial provisions for energy storage. This section is not required for compliance with the 2024 IECC unless the jurisdiction specifically adopts Appendix RD to require electric energy storage in new construction.

3.1.2.6 Appendix RG for 2024 IECC Stretch Energy Code (RED1-027)

RED1-027 adds a new appendix to the 2024 IECC to become the 2024 IECC Stretch Energy Code. Appendix RG: 2024 IECC Stretch Code outlines the requirements for an additional 10 percent efficiency in the proposed home design. The stretch code contains all three compliance paths (prescriptive, simulated building performance, and ERI), where each requires an additional 10 percent efficiency requirement over the baseline 2024 IECC compliance paths. This glide path appendix is offered as an option for jurisdictions to exceed the energy performance of the 2024 IECC on a path to net zero energy. This section is not required for compliance with the 2024 IECC unless the jurisdiction specifically adopts Appendix RB to define the requirements for a net zero energy home. A cautionary note was added by the International Code Council (ICC) to Appendix RG regarding limited compliance options for minimum efficiency equipment in specific climate zones.

3.1.2.7 Appendix RH for Operational Carbon Rating and Energy Reporting (RED1-028)

RED1-028 adds a new appendix to the 2024 IECC for operational carbon rating and energy reporting. Appendix RH: Operational Carbon Rating and Energy Reporting outlines the requirements for homes complying with the ERI compliance path to report both the ERI and the CO_{2e} Index determined in accordance with ANSI/RESNET/ICC 301 Standard. For all-electric dwelling units, a maximum CO_{2e} Index of 65 is required. Mixed-fuel dwellings shall meet a target CO_{2e} index set during adoption of the appendix by the

authority having jurisdiction based on emissions data specific to the jurisdiction. RESNET accredited home energy rating (HERS) software tools provide the CO_{2e} index as part of the normal functionality, so it will not require any additional effort by the energy rating provider. This section is not required for compliance with the 2024 IECC unless the jurisdiction specifically adopts Appendix RG to define the operational carbon and energy reporting requirements.

3.1.2.8 Appendix RI for On-Site Renewable Energy (RED1-091)

RED1-091 adds a new appendix to the 2024 IECC which describes requirements for prescriptive solar PV that must be installed at the time of construction. Appendix RI: On-Site Renewable Energy outlines the requirements for the installed capacity of the renewable energy system based on building type. Single-family dwelling units shall contain an on-site renewable energy system with an installed capacity not less than 2 kW. Group R-2 or R-4 residential buildings shall install on-site renewable energy systems with an installed capacity not less than 0.75 watts per square foot (W/ft^2) of gross conditioned floor area. For R405 simulated building performance compliance, the appendix specifies the on-site renewable capacities to be simulated in both the proposed and standard reference design buildings. On-site renewable energy systems in the proposed design with installed capacity over the required 2 kW or 0.75 W/ft^2 requirements will obtain compliance credit over the standard reference design. For compliance with the ERI with OPP, the rated proposed design and confirmed built dwelling must show an ERI not more than the ERI targets listed in Table RI103.1.3 ERI with OPP. The ERI with OPP targets in Table RI103.1.3 are based on the home meeting the ERI without OPP targets with an installed 2 kW PV system. This section is not required for compliance with the 2024 IECC unless the jurisdiction specifically adopts Appendix RI to define the on-site renewable energy requirements. On-site electricity generation using PV is a key technology for reducing greenhouse gas emissions associated with commercial and residential buildings.

3.1.2.9 Appendix RF for Alternative Building Thermal Envelope Insulation R-Value Options (RED1-261)

RED1-261 adds a new appendix to the 2024 IECC as a basis to determine alternative building assembly and insulation component R-value solutions for compliance with maximum U-factors and F-factors in Table R402.1.2. Appendix RF: Alternative Building Thermal Envelope Insulation R-Value Options provides above-grade wood frame wall assembly U-factors based on cavity and continuous insulation R-values as well as wood stud size and spacing. For assemblies not addressed by the conditions in the appendix, U-factors are determined by using accepted engineering practice or by testing in accordance with ASTM C1363 and shall be subject to approval by the code official. Space is provided in Appendix RF for future ceiling/roof, floor, basement wall, crawlspace wall assemblies, and slab on-grade floors. Appendix RF is used as a resource for determining envelope assembly U-factors or F-factors and does not require adoption by any jurisdiction to be utilized.

3.2 Quantitative Assessment

Table 11 and Table 12 below show the results in terms of relative energy savings (percent) of the 2024 IECC compared to the 2021 IECC by climate zone and by building type. These results are based on changes identified as impacting energy efficiency through the qualitative component of the analysis, and that could also be reasonably measured via the established energy modeling and simulation methodology. The 2024 IECC includes the following eight changes that fit this classification:

- REPI-018 – Energy Credits (10 energy credits required)
- REPI-028 – Fenestration U-Factors
- REPI-033 – Ceiling Insulation R-Values/U-Factors
- REPI-063 – Prescriptive Air Leakage (4.0 ACH50, climate zones 0 – 2)
- REPI-064 – Prescriptive Air Leakage (2.5 ACH50, climate zones 6 – 8)

- REPI-089 – R-7 Pipe Insulation
- REPI-093 – Heat Recovery Ventilation (CZ 6)
- RED1-110 – Exterior Lighting Power Allowance

Recent energy codes have included provisions for additional efficiency measures above and beyond the prescriptive code requirements that must be included in the building design and construction. The additional efficiency in the 2024 IECC (REPI-18) comes in the form of energy credits where energy efficiency measures are assigned energy credits based on the percentage of annual total site energy savings achieved over the baseline prescriptive energy code. Energy credit savings could be expressed in terms of site energy, energy cost, or greenhouse gas emissions depending on the emphasized metric. The higher the savings, the more energy credits assigned. The energy credits are divided into traditional efficiency measures (envelope, HVAC, service water heating, thermal distribution systems, air leakage, and appliances). The amount of energy credits for each measure was determined based on simulation analysis of the energy measure over the prescriptive code for each climate zone. The 2024 IECC stipulates that a typical residential building must achieve 10 energy credits (by selecting not less than two energy credit measures) for prescriptive compliance while dwelling units over 5,000 sq ft must achieve an additional 5 energy credits. The energy credits provide flexibility for meeting the required credit amount, by allowing various combinations of measures to meet the requirement. For the 2024 IECC quantitative analysis, energy credit measures were selected to meet the required 10 energy credits based on several factors including standard practice, cost effectiveness, and the ability to quantify savings using the methodology described in this report. Table 9 and Table 10 show the energy credit measures selected for the quantitative analysis for the electric prototypes and fossil fuel prototypes respectively.

Table 9. Energy Credit Measures for Quantitative Analysis for All-Electric Buildings (Heat Pump and Electric Furnace)

		Credit Value								
Measure	Measure Description	CZ 1	CZ 2	CZ 3	CZ 4	CZ 4C	CZ 5	CZ 6	CZ 7	CZ 8
R408.2.1.2(1)	U-factor and SHGC for windows						1			
R408.2.3(3)	Integrated HPWH: UEF = 3.30	10	9	9	7	6	4	3	3	2
R408.2.3(8)	Compact Hot Water Distribution				2	2	2			
R408.2.4(3)	80% of Ducts in Conditioned Space							7	7	9
R408.2.5(1)	HRV installed					1	3			
R408.2.6	Energy Efficient Appliances	1	1	1	1	1				
Total Credits		11	10	10	10	10	10	10	10	11

Table 10. Energy Credit Measures for Quantitative Analysis for Mixed Fuel Buildings (Gas and Oil Furnaces)

		Credit Value								
Measure	Measure Description	CZ 1	CZ 2	CZ 3	CZ 4	CZ 4C	CZ 5	CZ 6	CZ 7	CZ 8
R408.2.1.2(1)	U-factor and SHGC for windows						1			
R408.2.2(2)	High Performance Cooling 15.2 SEER2	5	4	3	2					
R408.2.2(5)	High Performance Furnace 95 AFUE					3		6	7	8
R408.2.3(2)(b)	Gas Instant Water Heater UEF = 0.95						6			
R408.2.3(8)	Compact Hot Water Distribution	2	2	2	2		2	2	2	2
R408.2.4(2)	100% of Ducts in Conditioned Space	2	3	4	6	7				
R408.2.5(1)	HRV installed							2	2	
R408.2.6	Energy Efficient Appliances	1	1	1			1			
Total Credits		10	10	10	10	10	10	10	11	10

Results are shown in terms of three metrics—site EUI, source EUI, and energy cost. The site EUI metric is used by DOE in reporting its determinations of the energy savings associated with updated energy codes. In addition, metrics for source energy, energy cost, and carbon dioxide emissions are included for reference.

Relative savings in terms of annual energy costs vary from 5.53 percent in climate zone 5 to 9.74 percent in climate zone 8. The energy cost savings are lower at 5.53 percent relative to the site energy savings, reflecting the greater impact of reduced heating loads when conversion costs of electricity are considered.

Recent editions of the IECC require meeting the prescriptive code requirements and then selecting an "Additional Efficiency Requirement" from a range of available measures. In the 2021 IECC determination analysis, the high-performance hot water heating was selected as the additional efficiency option by adding a heat pump water heater. For the 2024 analysis, only the electric prototypes utilized a heat pump water heater as an energy credit measure. The combination of energy credit measures simulated for the 2024 IECC showed negative electric energy savings in climate zones 5 and 6 when compared to the 2021 IECC but showed overall energy savings due to reduced heating loads. The variations by climate zone reflect differences in the relative magnitudes of heating and cooling loads as well as nuances in the relative prevalence of building types, foundation types, and system types.

Table 13 through Table 16 show the raw energy savings values from which the percentages in Table 11 and Table 12 were calculated. The tables show the sum of the total building energy end uses (regulated and non-regulated) as calculated from the whole-building energy simulations.

Table 11. Energy Savings and CO_2 Emission Reductions of the 2024 IECC compared to the 2021 IECC by Climate Zone (percent)

Climate Zone	Weight (%)	Site EUI (%)	Source EUI (%)	Energy Costs (%)	CO_2 Emissions (%)
1	2.12	7.07	7.95	8.09	8.15
2	26.02	7.90	7.96	7.97	7.97
3	28.84	6.38	6.13	6.08	6.06
4	19.07	7.43	6.90	6.79	6.74
5	18.33	7.31	5.88	5.53	5.36
6	5.05	13.23	7.20	5.64	4.87
7	0.55	13.84	9.79	8.74	8.23
8	0.01	14.29	10.73	9.74	9.26
National	100.00	7.80	6.80	6.60	6.51

Table 12. Energy Savings and CO_2 Emission Reductions of the 2024 IECC compared to the 2021 IECC by Building Type (percent)

Building Type	Weight (%)	Site EUI (%)	Source EUI (%)	Energy Costs (%)	CO_2 Emissions (%)
Single-family	82.12	7.94	6.77	6.54	6.43
Multifamily Unit	17.88	6.60	7.05	7.14	7.18
National	100.00	7.80	6.80	6.60	6.51

Table 13. Energy Use and CO_2 Emissions of the 2021 IECC by Climate Zone

Climate Zone	Weight (%)	Site EUI (kBtu/ft²-yr)	Source EUI (kBtu/ft²-yr)	Energy Costs ($/residence-yr)	CO_2 Emissions (tons/residence-yr)
1	2.12	26.7	69.4	2,236	9.73
2	26.02	27.0	67.4	2,391	10.37
3	28.84	26.4	63.9	2,307	9.98
4	19.07	31.3	68.1	2,604	11.16
5	18.33	38.7	71.7	2,793	11.77
6	5.05	47.0	83.6	3,231	13.55
7	0.55	52.0	93.1	3,525	14.80
8	0.01	65.8	111.8	3,884	16.20
National	100.00	31.3	68.5	2,526	10.84

Table 14. Energy Use and CO_2 Emissions of the 2021 IECC by Building Type

Building Type	Weight (%)	Site EUI (kBtu/ft²-yr)	Source EUI (kBtu/ft²-yr)	Energy Costs ($/residence-yr)	CO_2 Emissions (tons/residence-yr)
Single-family	82.12	30.9	67.6	2,738	11.74
Multifamily Unit	17.88	34.9	76.9	1,556	6.68
National	100.00	31.3	68.5	2,526	10.84

Table 15. Energy Use and CO_2 Emissions of the 2024 IECC by Climate Zone

Climate Zone	Weight (%)	Site EUI (kBtu/ft²-yr)	Source EUI (kBtu/ft²-yr)	Energy Costs ($/residence-yr)	CO_2 Emissions (tons/residence-yr)
1	2.12	24.8	63.9	2,055	8.93
2	26.02	24.9	62.0	2,200	9.54
3	28.84	24.7	60.0	2,167	9.38
4	19.07	28.9	63.4	2,427	10.41
5	18.33	35.9	67.5	2,638	11.14
6	5.05	40.8	77.6	3,049	12.89
7	0.55	44.8	84.0	3,217	13.59
8	0.01	56.4	99.8	3,506	14.70
National	100.00	28.9	63.9	2,360	10.13

Table 16. Energy Use and CO_2 Emissions of the 2024 IECC by Building Type

Building Type	Weight (%)	Site EUI (kBtu/ft²-yr)	Source EUI (kBtu/ft²-yr)	Energy Costs ($/residence-yr)	CO_2 Emissions (tons/residence-yr)
Single-family	82.12	28.4	63.0	2,559	10.99
Multifamily Unit	17.88	32.6	71.5	1,444	6.20
National	100.00	28.9	63.9	2,360	10.13

3.3 Conclusion

A total of 273 approved code change proposals were analyzed for the 2024 IECC. The qualitative component of the analyses identified 54 changes with a direct impact on energy use in residential buildings—48 of which are expected to reduce energy use and 6 of which are expected to increase energy use. Further assessment of the eight code changes included in the quantitative analysis are:

- REPI-018 – Energy Credits (10 energy credits required)
- REPI-028 – Fenestration U-Factors
- REPI-033 – Ceiling Insulation R-Values/U-Factors
- REPI-063 – Prescriptive Air Leakage (4.0 ACH50, climate zones 0 – 2)
- REPI-064 – Prescriptive Air Leakage (2.5 ACH50, climate zones 6 – 8)
- REPI-089 – Pipe Insulation
- REPI-093 – Heat Recovery Ventilation
- RED1-110 – Exterior Lighting Power Allowance

Suggest national average savings of approximately:

- 7.80 percent of annual site EUI
- 6.80 percent of annual source EUI
- 6.60 percent of annual energy cost
- 6.51 percent of carbon emissions

Based on these results, the 2024 IECC is expected to improve energy efficiency in residential buildings.

4 Monetized Emissions Benefits from Adoption of Improved Residential Model Energy Codes

DOE's Building Energy Codes Program (BECP) periodically evaluates national and state-level emissions impacts associated with the IECC and Standard 90.1, the national model energy codes for residential and commercial buildings, respectively. A comprehensive evaluation is undertaken following the publication of the

updated model codes and published by the BECP.[6] However, because Standard 90.1 and the IECC are published by independent organizations and at different times, the comprehensive results and full impact analysis were not available at the time that DOE conducted its model energy codes determinations.

However, recognizing that states, local governments, and other stakeholders may wish to understand the impacts of the latest building energy codes on emissions, DOE conducted this preliminary assessment of the impacts of adopting the 2024 IECC compared to the 2021 IECC. However, this emissions analysis has no bearing on DOE's determination decision and is provided solely for informational purposes. Although these results are not yet published elsewhere, the analysis methodology is described in prior reports.[7]

4.1 Methodology

In quantifying the expected emissions impacts, DOE considered the estimated monetary benefits likely to result from the reduced emissions of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) that are expected to result from adoption of new energy codes.

To monetize the climate benefits of reducing GHG emissions, the prior determination's analysis used the interim social cost of greenhouse gases (SC-GHG) estimates presented in the Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates Under Executive Order 13990 published in February 2021 by the Interagency Working Group on the SC-GHG (IWG) (2021 interim SC-GHG estimates). As a member of the IWG involved in the development of the February 2021 SC-GHG TSD, DOE agreed that the interim SC-GHG estimates represented the most appropriate estimate of the SC-GHG until revised estimates were developed reflecting the latest, peer-reviewed science. *See* 87 FR 78382, 78406-78408 for discussion of the development and details of the IWG SC-GHG estimates. The IWG has continued working on updating the interim estimates but has not published final estimates.

Accordingly, in the regulatory analysis of its December 2023 Final Rule, "Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review," the Environmental Protection Agency (EPA) estimated climate benefits using a new, updated set of SC-GHG estimates (2023 SC-GHG estimates). EPA documented the methodology underlying the new estimates in the regulatory impact analysis (RIA) for the December 2023 Final Rule and in greater detail in a technical report entitled "Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances" that was presented as Supplementary Material to the RIA.[8] The 2023 SC-GHG estimates incorporate recent research addressing recommendations of the National Academies of Science, Engineering, and Medicine (National Academies), responses to public comments on an earlier sensitivity analysis using draft SC-GHG estimates included in EPA's December 2022 proposal in the oil and natural gas sector standards of performance rulemaking, and comments from a 2023 external peer review of the accompanying technical report.[9]

On December 22, 2023, the IWG issued a memorandum directing that when agencies "consider applying the SC-GHG in various contexts . . . agencies should use their professional judgment to determine which estimates of the SC-GHG reflect the best available evidence, are most appropriate for particular analytical contexts, and best facilitate sound decision-making" consistent with OMB Circular No. A-4 and applicable law.[10]

DOE has been extensively involved in the IWG process and related work on the SC-GHGs for over a decade. This involvement includes DOE's role as the Federal technical monitor for the seminal 2017 report on the SC-

[6] https://www.energycodes.gov/impact-analysis
[7] https://www.energycodes.gov/impact-analysis
[8] https://www.epa.gov/system/files/documents/2023-12/eo12866_oil-and-gas-nsps-eg-climate-review-2060-av16-final-rule-20231130.pdf; https://www.epa.gov/system/files/documents/2023-12/epa_scghg_2023_report_final.pdf (last accessed July 3, 2024)
[9] EPA, "EPA's 'Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances'," December 2023. Available at *https://www.epa.gov/environmental-economics/scghg#:~:text=(Washington%2C%20December%202%2C%202023,using%20a%20new%20set%20of.*
[10] https://www.whitehouse.gov/wp-content/uploads/2023/12/IWG-Memo-12.22.23.pdf (last accessed July 3, 2024)

GHG issued by the National Academies, which provided extensive recommendations on how to strengthen and update the SC-GHG estimates.[11] DOE has also participated in the IWG's work since 2021. DOE technical experts involved in this work reviewed the 2023 SC-GHG methodology and report in light of the National Academies' recommendations and DOE's understanding of the state of the science.

Based on this review, DOE preliminarily determined that the updated 2023 SC-GHG estimates, including the approach to discounting, represent a significant improvement in estimating the SC-GHG through incorporating the most recent advancements in the scientific literature and by addressing recommendations on prior methodologies. DOE explained the basis for its preliminary determination and made it available for public comment in a July notification of data availability (July 2024 NODA) for consumer gas-fired instantaneous water heaters. 89 FR 59692, 59700. In this determination, DOE is presenting estimates using the updated 2023 SC-GHG values and the 2021 interim SC-GHG estimates.

The overall climate benefits are generally greater when using the updated 2023 SC-GHG estimates, compared to the climate benefits calculated using the 2021 interim SC-GHG estimates.

Social Cost of Carbon

The SC-CO_2 values used for this determination are presented using two sets of SC-GHG estimates. One set is the 2023 SC-GHG estimates published by the EPA, which are shown in Table 17 in 5-year increments from 2020 to 2050.[12]

Table 17. Annual SC-CO_2 Values Based on 2023 SC-GHG Estimates, 2020–2050 (2020$ per Metric Ton CO_2)

Emissions Year	Near-term Ramsey Discount Rate		
	2.5%	2.0%	1.5%
2020	117	193	337
2025	130	212	360
2030	144	230	384
2035	158	248	408
2040	173	267	431
2045	189	287	456
2050	205	308	482

DOE also presents results using interim SC-CO_2 values based on the values developed for the February 2021 interim SC-GHG TSD, which are shown in Table 18 in 5-year increments from 2020 to 2050.

[11] Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide | The National Academies Press. (available at: https://nap.nationalacademies.org/catalog/24651/valuing-climate-damages-updating-estimation-of-the-social-cost-of) (last accessed July 3, 2024)
[12] https://www.epa.gov/system/files/documents/2023-12/eo12866_oil-and-gas-nsps-eg-climate-review-2060-av16-final-rule-20231130.pdf; https://www.epa.gov/system/files/documents/2023-12/epa_scghg_2023_report_final.pdf (last accessed July 3, 2024)

Table 18. Annual SC-CO_2 Values Based on 2021 Interim SC-GHG Estimates, 2020–2050 (2020$ per Metric Ton CO_2)

Emissions Year	Discount Rate and Statistic			
	5% Average	3% Average	2.5% Average	3% 95th percentile
2020	14	51	76	152
2025	17	56	83	169
2030	19	62	89	187
2035	22	67	96	206
2040	25	73	103	225
2045	28	79	110	242
2050	32	85	116	260

DOE multiplied the CO_2 emissions reduction estimated for each year by the SC-CO_2 value for that year for both sets of SC-CO_2. To calculate a present value of the stream of monetary values, DOE discounted the values for both sets of SC-CO_2 using the specific discount rate that had been used to obtain the SC-CO_2 values in each case.

Social Cost of Methane and Nitrous Oxide

The SC-CH_4 and SC-N_2O values used for this determination are presented using two sets of SC-GHG estimates. One set is the 2023 SC-GHG estimates published by the EPA. Table19 shows the updated sets of SC-CH_4 and SC-N_2O estimates in 5-year increments from 2020 to 2050.

Table 19. Annual SC-CH4 and SC-N2O Values Based on 2023 SC-GHG Estimates, 2020–2050 (2020$ per Metric Ton)

Emissions Year	SC-CH_4			SC-N_2O		
	Near-term Ramsey Discount Rate			Near-term Ramsey Discount Rate		
	2.5%	2.0%	1.5%	2.5%	2.0%	1.5%
2020	1,257	1,648	2,305	35,232	54,139	87,284
2025	1,590	2,025	2,737	39,972	60,267	95,210
2030	1,924	2,403	3,169	44,712	66,395	103,137
2035	2,313	2,842	3,673	49,617	72,644	111,085
2040	2,702	3,280	4,177	54,521	78,894	119,032
2045	3,124	3,756	4,718	60,078	85,945	127,916
2050	3,547	4,231	5,260	65,635	92,996	136,799

DOE also presents results using interim SC-CH_4 and SC-N_2O values based on the values developed for the February 2021 SC-GHG TSD. Table 19 shows the updated sets of SC-CH_4 and SC-N_2O estimates from the latest interagency update in 5-year increments from 2020 to 2050.

Table 19. Annual SC-CH4 and SC-N2O Values Based on 2021 Interim SC-GHG Estimates, 2020–2050 (2020$ per Metric Ton)

Emissions Year	$SC\text{-}CH_4$				$SC\text{-}N_2O$			
	Discount Rate and Statistic				Discount Rate and Statistic			
	5% Average	3% Average	2.5% Average	3% 95th percentile	5% Average	3% Average	2.5% Average	3% 95th percentile
2020	670	1,500	2,000	3,900	5,800	18,000	27,000	48,000
2025	800	1,700	2,200	4,500	6,800	21,000	30,000	54,000
2030	940	2,000	2,500	5,200	7,800	23,000	33,000	60,000
2035	1,100	2,200	2,800	6,000	9,000	25,000	36,000	67,000
2040	1,300	2,500	3,100	6,700	10,000	28,000	39,000	74,000
2045	1,500	2,800	3,500	7,500	12,000	30,000	42,000	81,000
2050	1,700	3,100	3,800	8,200	13,000	33,000	45,000	88,000

4.2 Results

Table21 provides estimates of the GHG emissions expected to result from residential model code adoption of 2024 IECC compared to 2021 IECC. Table22 provides estimates of the monetized GHG emissions expected to result from residential model code adoption using all three SC-GHG estimate scenarios using the 2023 SC-GHG estimates. Table 23 provides estimates of the monetized GHG emissions expected to result from residential model code adoption using all four SC-GHG estimate scenarios using the 2021 interim SC-GHG estimates. Table24 provides estimates of the monetized energy cost savings expected to result from residential model code adoption using a 3-percent, 5-percent, and 7-percent discount rate. All these results are based on gross savings and improvements in energy efficiency, which exclude the impact of on-site energy generation through renewable energy systems.

Table 21. Cumulative Emissions Reduction from 2024 IECC

Analysis Time Frame	CO_2 Reduction (million metric tons)	CH_4 Reduction (thousand short tons)	N_2O Reduction (thousand short tons)
Cumulative 2024-2053	2,578.0	27,080	14.410

Table 22. Present Value of Emissions Reduction from 2024 IECC, Based on 2023 SC-GHG Estimates (2022$ millions)

GHG	Near-Term Ramsey Discount Rate		
	2.5%	2.0%	1.5%
Annual (2030)			
CO_2	2,070	3,400	5,850
CH_4	233	300	407

N_2O	4.01	6.13	9.81
Total	**2,300**	**3,710**	**6,270**
Annual (2040)			
CO_2	9,470	15,800	27,600
CH_4	1,370	1,800	2,480
N_2O	16	25	41
Total	**10,900**	**17,600**	**30,100**
Cumulative 2024 - 2053			
CO_2	320,900	542,500	958,200
CH_4	50,670	67,920	95,170
N_2O	519.2	825	1365
Total	**372,000**	**611,000**	**1,050,000**

Table 20. Present Value of Emissions Reduction from 2024 IECC, Based on 2021, Interim SC-GHG Estimates (2022$ millions)

GHG	Discount Rate and Statistics			
	5% Average	3% Average	2.5% Average	3% 95th percentile
Annual (2030)				
CO_2	236	863	1,280	2,590
CH_4	98	229	302	608
N_2O	0.603	1.97	2.92	5.23
Total	**334**	**1,090**	**1,580**	**3,200**
Annual (2040)				
CO_2	930	3,690	5,630	11,300
CH_4	440	1,170	1,590	3,140
N_2O	2	8	12	20
Total	**1,370**	**4,870**	**7,230**	**14,500**
Cumulative 2024 - 2053				
CO_2	27,150	115,500	179,600	354,900
CH_4	13,190	38,740	53,780	103,400
N_2O	57.21	226.8	350.4	605.3
Total	**40,400**	**154,000**	**234,000**	**459,000**

Table 24. Energy Cost Savings from 2024 IECC (2022$ billions)

	Monetized Consumer Energy Savings		
Analysis Time Frame	3% Discount Rate	5% Discount Rate	7% Discount Rate
Annual (2030)	4.4	3.9	3.4
Annual (2040)	21.7	16.9	13.2
Cumulative 2024-2053	712.1	514.4	380.7

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Appendix A – Comprehensive List of Code Change Proposals Approved for Inclusion in the 2021 IECC

There were 273 formal code change proposals resulting in 54 classifiable changes to the International Energy Conservation Code (IECC), as summarized in Table A.1. Of the 54 changes impacting energy use (48 decreasing, 6 increasing), 8 were further analyzed by energy simulation to quantify their impact.

Table A.1. Summary of Approved Code Changes in the 2024 IECC

Category of Change	Number
Decreases Energy Use	48
Increases Energy Use	6
Administrative	219
Total	273

Table A.2 below lists all the 273 successful code change proposals incorporated into the 2024 IECC. For each proposal, the following six columns of information are shown:

1. **Proposal Number**: the change proposal designation assigned by the International Code Council (ICC)
2. **Code Section(s)**: a list of the section numbers in the 2021 IECC that are affected by the code change. Because sections are often added or deleted, section numbers will often differ in the 2024 IECC
3. **Description of Change(s)**: a brief summary of the changes made by the proposal
4. **Category of Change**: the qualitative categorization of the nature of the change
5. **Included in Energy Analysis**: an indication whether the change was subjected to an additional energy analysis in the subsequent quantitative analysis
6. **Discussion**: a brief discussion expanding on the change categorization and providing additional rationale, for changes that impact energy use, explaining whether the change is to be included in the subsequent quantitative analysis.

Table A.2. Qualitative Analysis of All 2024 IECC Code Changes

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
REPI-018-21	R401.2, R401.2.1, R401.2.5, R401.3, R405.2, SECTION R408, R408.1, R408.2, TABLE R408.2 (New), R408.2.1, R408.2.1.1 (New), R408.2.1.2 (New), TABLE R408.2.1.2 (New), R408.2.2, R408.2.3, R408.2.4, R408.2.5, R408.2.7 (New), TABLE R408.2.7 (New), R408.2.8 (New)	Changes the Section R408 additional efficiency packages to an energy credit methodology. Each residential building must select at least two energy credit measures to achieve 10 energy credits.	Reduces energy use	Yes	The energy credit methodology provides a path to increase the energy efficiency of a residential building while providing design flexibility. There are a total of 53 energy credit measures for envelope, HVAC, service water heating, duct leakage and location, air leakage and ventilation, demand response, lighting, efficient appliances and on-site renewable energy. Each energy credit represents 1 percent reduction in total energy savings.
CEPI-082-21 Part II	R403.9, R403.10 (New)	Requires controls for roof and gutter de-icing systems to shut off at temperatures above 40°F through moisture sensors or timer control.	Reduces energy use	No	Roof and gutter deicing systems use energy and are often left running at times that are unnecessary for ice dam prevention. Provides automatic controls that limit the system from running when outdoor temperature is above 40°F. Roof and gutter deicing systems are not included in the residential prototypes and not included in the quantitative analysis.
RECD1-7-22	TABLE R406.5	Updates the newly added Energy Rating Index (ERI) with on-site power production (OPP) targets for Table R406.5.	Reduces energy use	No	The original ERI with OPP targets were set at 40 for all climate zones. The updated ERI with OPP targets were based on ERI analysis.
REPI-028-21	TABLE R402.1.2, TABLE R402.1.3	Reduced fenestration U-factors in climate zones 4 and 5 to from 0.30 to 0.28 and reduced all skylight U-factor requirements to 0.6 in climate zones 0-2, 0.53 in climate zones 3, 4A, and 4B, and 0.50 in climate zones 4C - 8 in Table R402.1.2 and R402.1.3.	Reduces energy use	Yes	
REPI-063-21	R402.4.1.2, R402.4.1.3, TABLE R405.4.2(1)	Changes the prescriptive air leakage requirements in climate zones 0, 1, and 2 from 5.0 ACH50 to 4.0 ACH50. The air leakage of the standard reference home in Table R405.4.2(1) is set to 4.0 ACH50 in climate zones 0 through 2	Reduces energy use	Yes	
REPI-064-21	R402.4.1.2, R402.4.1.3, TABLE R405.4.2(1), R408.2.5	Changes the prescriptive air leakage requirements in climate zones 3 through 8 from 3.0 ACH50 to 2.0 ACH50. The air leakage of the standard reference home in Table R405.4.2(1) is set to 2.0 ACH50 in climate zones 4 through 8.	Reduces energy use	Yes	The air leakage for this proposal was adjusted to keep the prescriptive air leakage requirements at 3.0 ACH50 for climate zones 3 through 5 and 2.5 ACH50 for climate zones 6 through 8.

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
REPI-089-21	R403.5.2, TABLE C403.12.3, TABLE R405.2, TABLE R406.2	Increases pipe insulation for hot water piping from R-3 to 1 inch of insulation which applies to all sizes of piping.	Reduces energy use	Yes	One inch of pipe insulation will achieve an R-7 level of insulation.
REPI-093-21	R403.6.1	Dwelling units shall be provided with a heat recovery or energy recovery ventilation system in climate zones 5 through 8. The ventilation system shall be balanced with a minimum sensible recovery efficiency (SRE) of 65 percent at 32°F (0°C) at a flow greater than or equal to the design airflow.	Reduces energy use	Yes	The proposal was modified to remove the heat recovery ventilator (HRV) requirement for climate zone 5 so the final adjustment is to add HRV requirement for ventilation in climate zone 6 on top of the 2021 IECC requirement of HRVs in climate zones 7 and 8.
RED1-110-22	R404.1.2, R404.1.3, R404.1.4, TABLE R404.1	Revises the exterior lighting sections and adds a new lighting power allowance table to match the equivalent requirements in IECC-C. Additional exceptions from IECC-C were added that could apply to the Group R occupancies.	Reduces energy use	Yes	Previously in 2021 IECC, the exterior lighting for low-rise multifamily buildings was required to comply with the commercial exterior lighting provisions.
REPI-033-21	TABLE R402.1.2, TABLE R402.1.3, R408.2, R408.2.1 (New), R408.2.1-R408.2.4	Ceiling insulation in Table R402.1.3 was reduced from R-49 to R-38 in climate zones 2 and 3 and reduced from R-60 to R-49 in climate zones 4 through 8. The associated ceiling U-factors were adjusted for the same climate zones in Table R402.1.2. The new U-factor for climate zones 2 and 3 is 0.030 and 0.026 for climate zones 4 through 8.	Increase energy use	Yes	This proposal adjusts the ceiling insulation in climate zones 2 through 8 back to the 2018 IECC levels.
RECPI-10-21	R408.2.3, Table R408.2.3 (New)	Updates the service water heating (SWH) equipment list based on system type, fuel and capacity as well as the format of Table R408.2.3 for the SWH energy credit measures.	Reduces energy use	No	This proposal was disapproved by subcommittee and the version of table proposed by AHRI was approved.
RED1-027-22	APPENDIX RG (New), RG101 (New), RG405.2 (New), RG406.5 (New), R406.5 (New), RG408.2 (New)	Adds optional Appendix RG for the 2024 IECC Stretch Code with three compliance paths; prescriptive, total building performance, and ERI.	Reduces energy use	No	Appendix RG would require an additional 10 percent efficiency (on average) to be designed into the home over the baseline 2024 IECC prescriptive requirements. Only reduces energy use if Appendix RG is adopted.
RED1-071-22	R408, R408.1, R408.2, TABLE R408.2, R408.2.1, R408.2.1.1, R408.2.1.2, R408.2.1.3, R408.2.1.4 (New)	Adds a new infiltration measure and language to clarify compliance methodology in Section R408 for additional efficiency requirements.	Reduces energy use	No	The added infiltration measure requires the air leakage rate to not be greater than 2.5 ACH50 across all climate zones. Credit can only be achieved in climate zones 0-5 as climate zones 6-8 have prescriptive air leakage requirements already at 2.5 ACH50. A cost-effective set of energy credits will be part of the quantitative analysis.

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
RED1-076-22	SECTION 202, TABLE R408.2, R408.2.7, R408.2.8 (New)	Adds off-site renewable power generation to the list of energy credit measure options in Table R408.2.	Reduces energy use	No	To receive energy credit for off-site renewable energy, a renewable energy power purchase agreement would need a 15-year contract at a minimum and offset 80 percent of the estimated whole-building electric use on an annual basis. The exact credits were determined based on simulation analysis which provided more than enough energy credits for compliance in all climate zones. A cost-effective set of energy credits will be part of the quantitative analysis.
RED1-079-22	TABLE R408.2, R408.2.1.1	Adds three additional envelope energy credit measures of the thermal conductance (UA) improvement options of 15, 20, and 30 percent as compared to the prescriptive baseline.	Reduces energy use	No	These new options allow additional energy credits for improved envelope design. There was an option in this proposal to remove some of the original envelope UA measures (2.5, 5, and 7.5 percent) since they were not differentiated enough. The final decision by committee was to keep the original UA measures and add the new three UA measures. A cost-effective set of energy credits will be part of the quantitative analysis.
RED1-091-22	Appendix RP (New), RP101 (New), RP102 (New), RP103 (New), RP103.1 (New), RP103.1.1 (New), RP103.1.1.1 (New), RP103.2 (New), RP103.1.3 (New), TABLE RP103.1.3 (New); IRCECC: RP103.1.1.1 (New)	Adds optional Appendix RP for on-site renewable energy with new definitions that describes the requirements for prescriptive solar photovoltaics (PV) to be installed at the time of construction.	Reduces energy use	No	Terms defined for solar zone area, annual solar access and physical renewable energy power purchase agreement. Requires an on-site renewable energy system not less than 2.0 kW for single-family homes or not less than 0.75 watts/ft2 for R-2 and R-4 occupancies. Exceptions are added based on shading, climate zone or existing renewable energy power purchase agreements. Capacity requirements may differ for compliance demonstrated by R405 or R406 ERI compliance. A new set of ERI with OPP targets are defined for all climate zones. Only reduces energy use if Appendix RP is adopted.
RED1-166-22	R408, R408.1, R408.2, TABLE R408.2, R408.2.10 (New)	Adds an additional energy credit measure in Table R408.2 for whole home lighting control and a new Section R408.2.10 to determine the qualification for achieving the energy credits.	Reduces energy use	No	For whole home lighting control energy credit, a home or dwelling unit must have a switch at the main entrance to turn off all permanently installed interior lighting or the same operation with remote control. Lighting studies supplied with the proposal estimated that whole house lighting savings of 11 percent could be achieved with whole home lighting control. A cost-effective set of energy credits will be part of the quantitative analysis.

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
RED1-199-22	TABLE R402.1.2, TABLE R402.1.3; IRCECC: TABLE N1102.1.2, TABLE N1102.1.3	Modifies footnote for window U-factors for high elevation or windborne regions in Tables R402.1.3 and N1102.1.3 to align with previously adopted proposals.	Reduces energy use	No	Requires a fenestration U-factor of 0.30 in climate zones 4C and 5-8 for elevations above 4,000 ft or in windborne regions. Prescriptive fenestration U-factors remain unchanged so will not be part of the quantitative analysis.
RED1-263-22	R202 (New), TABLE R408.2, R408.2.10 (New), R502.2.5, R503.1.5, R506.1	Adds new definition for Substantial Improvement, a new energy credit measure for high-efficacy lighting and clarifying language for additional efficiency requirements for additions and substantial improvements.	Reduces energy use	No	Adapts the language for alterations and additions to make it compatible with the new energy credits methodology. Section 506 which references the additional efficiency packages was no longer necessary and removed. The energy credit requirements for additions is 5 credits and alterations need 1 credit. The energy credits allow more flexibility in alterations and additions for additional efficiency.
RED1-310-22	R403.5.1.1; IECC: R403.5.1.1.1	Adjusts language for circulation and demand recirculation hot water systems to minimize circulation pump operation by way of control strategies.	Reduces energy use	No	Adds water temperature in the pipe to prevent activation of demand control recirculation pumps to minimize accidental triggers.
RED1-339-22	TABLE R405.4.2(1)	Adds provisions to Table R405.4.2(1) to require ducts to be placed in conditioned space for the standard reference design.	Reduces energy use	No	This proposal was in response to changes in duct location for the standard reference design in Table R405.4.2(1). The 2021 IECC and all previous editions placed the ducts in the standard reference design in the same location as the proposed design. An adopted proposal changed the location to a combination of locations (conditioned and unconditioned) based on number of stories and foundation type. Through consensus, an agreement was made to adjust the duct locations for conditioned basements.
RED1-351-22	R408.2.2, TABLE R408.2	Adds additional HVAC energy credit measures to encourage homeowners and builders to install efficient HVAC products. More energy efficient product options by climate zones matched with potential credits.	Reduces energy use	No	This proposal provides 14 energy credit measures for high-efficiency HVAC equipment and aligns the additional HVAC energy credits with the requirements in the Inflation Reduction Act (IRA) for tax credits for high-efficiency HVAC and water heating products.
RED1-358-22	TABLE R408.2.3	Provides more energy credits for higher-efficiency SWH equipment which will encourage homeowners and builders to install efficient water heater products. ENERGY STAR product specifications and Consortium for Energy Efficiency are aligned with the efficiency levels for SWH options in Table R408.2.	Reduces energy use	No	This proposal provides 11 energy credit measures for high-efficiency water heating equipment and aligns the additional water heating energy credits with the requirements in the IRA for tax credits for high-efficiency HVAC and water heating products.

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
RED1-360-22	TABLE R408.2.6, R408.2.6; IECC: SECTION 202 (New)	Aligns the high-efficiency appliances energy credit measure with ENERGY STAR product specifications to achieve energy credits. This proposal removed all references to the ENERGY STAR program and utilized annual energy consumption requirements.	Reduces energy use	No	Adds an exemption for Group R-2 dwelling units where a dishwasher is not installed in the unit can still obtain high-efficiency appliance energy credit. Common areas need to fully comply with the energy credit requirements.
REPI-004-21	R102.1.1	Changed the envelope efficiency backstop requirement strategy from an earlier code edition (2009 IECC) to a UA methodology - 1.15 x UA of the prescriptive reference design for compliance using above code programs.	Reduces energy use	No	Through simulation analysis, the 1.15 UA of the standard reference design is equivalent to the 2006 IECC or the 2009 IECC in most climate zones.
REPI-020-21	R405.2, R408.2	Increases the stringency of R405 total building performance compliance by requiring that the proposed home have less than or equal to 90 percent of the annual energy costs of the standard reference design. For any home over 5,000 sq ft, another 5 percent reduction in energy costs is required. For prescriptive compliance, a home over 5,000 sq ft is required to obtain 15 energy credits.	Reduces energy use	No	This proposal requires an additional 10 percent efficiency for the total building performance compliance and 15 percent more for any building over 5,000 sq ft in both prescriptive and performance compliance. ERI compliance includes a size adjustment factor in the RESNET 301 Standard.
REPI-039-21	R202 (New), R402.2.3 (N1102.2.3) (New), R402.2.3.1 (N1102.2.3.1) (New), TABLE R405.2	Adds new language to define and describe how to address attic knee walls. It also adds this assembly to the list of required assemblies that must be detailed in the requirements section of the IECC.	Reduces energy use	No	
REPI-050-21	TABLE R402.4.1.1	Adjusts the language for HVAC register boots in Table R402.4.1.1 for air barrier, air sealing and insulation installation to require that all supply and return registers be sealed to the surface they are penetrating.	Reduces energy use	No	This proposal aligns the air sealing requirement for HVAC register boots with ENERGY STAR requirements.
REPI-060-21	R402.4.1.2	Increases the maximum tested air leakage rate in Section R402.4.1.2 to 4.0 ACH50 or 0.22 CFM25 / sq ft of dwelling unit enclosure area.	Reduces energy use	No	The proposed air leakage rate change applies to the total building performance compliance and does not change the prescriptive air leakage rates. This change is not part of the quantitative analysis.
REPI-065-21	R402.4.2.1 (N1102.4.2.1) (New), ANSI Chapter 06 (New), CSA Chapter 06 (New)	Adds a new section to specify minimum efficiency levels for gas fireplace heaters at 50 percent. Also adds two references to Chapter 6 for ANSI and CSA as testing procedures.	Reduces energy use	No	

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
REPI-068-21	R202 (New), R402.6 (New), TABLE R402.6 (TABLE N1102.6) (New), R402.6.1 (N1102.6.1) (New), TABLE R405.4.2(1), R407.2, R503.1.1, ASTM Chapter 06 (New), CRRC Chapter 06 (New), TABLE R406.2	Adds new definitions for low/steep sloped roofs and a new Section R402.6 to define the requirements for a cool roof in climate zones 0 - 3 and provides methods to determine the aged solar reflectance. Adds these requirements for tropical climate regions and remodeled building envelope assemblies.	Reduces energy use	No	Reflectance and thermal emittance (TE) values degrade over time; hence, 3-year aged values are used for the performance benchmark referred to as aged solar reflectance and TE
REPI-073-21	R403.1.2	Reconfigures heat pump supplementary heat requirements to prevent supplemental heating when the capacity of the heat pump compressor can serve the heating load and describes the times when supplementary heat operation is justified.	Reduces energy use	No	This proposal will prevent operation of electric resistance heaters installed in heat pumps that are configured to operate in conditions where sufficient heating capacity is available from the heat pump alone.
REPI-074-21	R202 (New), R403.1.3 (New), ANSI Chapter 06 (New)	Adds new definitions for pilot light operation and adds a new section for continuously burning pilot lights.	Reduces energy use	No	On-demand, intermittent or interrupted ignition pilot lights (as defined in ASNI Z21.20) are not considered to have a continuously burning pilot light.
REPI-086-21	R403.3, R403.3.5, R403.3.6, TABLE R403.3.6 (New), TABLE R405.2, TABLE R405.4.2(1), TABLE R405.4.2(2), TABLE R406.2	Adjusts duct leakage testing language to clarify the testing requirements and allows the duct leakage to outside metric can be used for compliance procedures of R405 or R406 but cannot be used for total duct leakage testing requirements. Also defines a new Table R403.3.6 defining maximum total duct leakage rates based on conditioned floor area and construction.	Reduces energy use	No	Table R403.3.6 shows the maximum duct leakage rates that existed in R403.3.6 for better clarity of the exact requirements based on air handler installation and construction period.
REPI-091-21	R403.5.4 (New), TABLE R403.5.4 (New)	Adds new code language to determine the water volume in ounces in hot water piping based on pipe length, pipe material and nominal size (inches). New Table R403.5.4 provides the internal volume of various water distribution tubing.	Reduces energy use	No	The water volume determination in hot water piping is used in combination with the compact hot water design energy credit which requires not more than 16 ounces of hot water from the source of hot water to the farthest fixture.
REPI-099-21	R202 (New), R403.7.1 (New), TABLE R405.2, TABLE R406.2	Adds a new definition for zonal heating and a new section for operational requirements of single-family homes with electric resistance zonal heating units in climate zones 4 - 8.	Reduces energy use	No	This proposal adds a requirement for homes with zonal electric heating as the primary heating source to install an additional heat pump unit not less than 6.3 HSPF2 in the largest living zone.

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
REPI-115-21	R202 (New), R103.2.4 (New), R105.2.5 (New), R404.4 (New), R404.4.1 (New), R404.4.2 (New), R404.4.2.1 (New), R404.4.2.2 (New), R404.4.2.3 (New), R404.4.2.4 (New), TABLE R405.2, TABLE R406.2	Adds a new definition for energy storage system (ESS) and defines the electrical and inspection requirements for an ESS readiness and adds the requirements to the mandatory requirements tables in Sections R405 and R406.	Reduces energy use	No	ESSs such as Battery Energy Storage Systems charge during the peak PV generation hours and can discharge in late afternoon and evening as the sun sets. Considering these ESSs reduce the back feed into the grid, they help with grid management, as well as provide a financial buffer for differing net energy metering policies by states and utilities. In an ideal case, a home with PV and ESS can be nearly "invisible" to the grid.
REPI-118-21	R405.2	Changes the methodology of the building thermal envelope backstop for total building performance compliance from meeting the provisions of an earlier energy code edition to meeting a specific UA level of the current energy code.	Reduces energy use	No	In the 2021 IECC, the building thermal envelope backstop for total building performance compliance was showing equivalency to the 2009 IECC. Now, a UA analysis must be performed where the design home UA must be not greater than 1.15 x UA of the standard reference design.
REPI-122-21	R401.2.5, R405.2, TABLE R405.4.2(1), TABLE R405.4.2(2), DOE Chapter 06 (New)	Removes the R408 additional efficiency requirements from R405 total building performance compliance, aligns the building thermal envelope backstop requirements to the new UA methodology, and changes the performance compliance for the proposed design to have not more than 80 or 85 percent of the standard reference home design costs for mixed fuel or all-electric homes respectively. Changes to the R405.4.2(1) tables to specify federal minimum efficiency HVAC and SWH systems and specific duct locations in the standard reference design.	Reduces energy use	No	The 2021 IECC Standard Reference Design specified HVAC and SWH equipment efficiency and duct location to be the same as the proposed design to prevent envelope trade-offs. This proposal returns the HVAC and SWH equipment efficiencies to the federal minimum efficiency standards and sets defined locations for ducts based on number of stories and foundation type. This change will allow trade-offs with other efficiency measures but does include more stringent compliance requirements to counter these changes for equipment efficiency and duct location.
REPI-126-21	R406.2, R406.3, R406.3.1, R406.3.2, R406.4, R406.5, TABLE R406.5	Adds an optional ERI target that includes OPP at 40 for all climate zones. The ventilation adjustment for the ERI Reference Home in Section R406.4 was removed. Provisions were set to specify which ERI target could be used for compliance and the envelope backstop was updated to the UA methodology as approved in previous proposals.	Reduces energy use	No	The ERI with OPP targets can be used for compliance for homes with on-site renewable energy systems. The ERI with OPP targets are optional where a home with a renewable energy section can choose to meet the ERI without OPP targets but cannot use the renewable energy generation as part of the proposed design ERI.
REPI-136-21	R408.2, R408.2.2	Adds additional efficiency package measures for Section R408.2.2 (N1108.2.2) More Efficient HVAC Equipment Performance Options based on central ducted and ductless systems. Updates heat pump efficiency metrics to SEER2 and HSPF2.	Reduces energy use	No	This proposal worked off the 2021 IECC Additional Efficiency Package Options and was approved before the energy credits methodology was considered and approved. The existing measures became part of the new energy credits measures.

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
REPI-142-21	408.2.6 (New)	Adds a new section R408.2.6 for compact hot water design energy credits. The sections requires not more than 16 ounces of water between the nearest source of heated water and the termination of the farthest fixture in order to gain energy credits.	Reduces energy use	No	This energy credit gives credit for reducing the overall footprint of the hot water piping system as a function of conditioned floor area to generate energy and construction cost savings.
REPI-143-21	R501.7 (New), R502.1, R502.2, R502.3.1, R502.3.2, R502.3.3, R502.3.4, R502.3	Adds new language for existing homes to clarify that any change in space conditioning (unconditioned or low-energy spaces become conditioned) requires full compliance with the code. Removes the old change in space conditioning language while renumbering subsequent sections based on these changes.	Reduces energy use	No	The position of the change in space conditioning language makes it apply to any addition or alteration.
REPI-144-21	R202 (New), R502.3, R502.3.5 (N1110.3.5) (New), R503.1, R503.1.5 (N1111.1.5) (New), SECTION R506 (N1114) (New), R506.1 (N1114.1) (New)	Adds two new definitions for exterior wall envelope and work area and adds new language to require additional efficiency packages for additions and alterations.	Reduces energy use	No	The additional efficiency measures were changed to energy credit requirements as a result of public comments.
REPI-145-21	R502.3.2, R503.1.2, R503.1.2.1 (N1111.1.2.1) (New)	Adds new requirements for existing ductwork serving new equipment in additions and alterations to have duct leakage tests. The code language for exceptions to duct leakage tests were modified for clarity.	Reduces energy use	No	This proposal ensures that any existing duct system that is connected to new HVAC equipment as part of an addition or alteration must perform as required for insulation and total duct leakage based on the duct location.
REPI-150-21	R503.1.1, R503.1.1.1, R503.1.1.2 (N1111.1.1.2) (New), 503.1.1.3 (N1111.1.1.3) (New), R503.1.1.4 (N1111.1.1.4) (New), R503.1.1.5 (N1111.1.1.5) (New), R503.1.1.6 (N1111.1.1.6) (New), SECTION 202 (New), SECTION 202, TABLE R402.1.2, TABLE R402.1.3	Adds new definitions for approved source and construction documents, adds new sections for roof, above-grade wall, floor, below grade wall and air barrier alterations. Updates language for building thermal envelope and fenestration alterations for a balance of practicality and cost-effectiveness.	Reduces energy use	No	Provides criteria to trigger or avoid requirements with flexibility.
REPI-151-21	R503.1.2, R503.1.2.2 (N1111.1.2.2) (New), R503.1.2.1 (N1111.1.2.1) (New)	Adds requirement for new heating and cooling equipment as well as new HVAC ducts as part of an alteration must be sized in accordance with the provisions of Section R403.	Reduces energy use	No	This proposal requires right sizing of both HVAC and duct systems as part of any alteration.

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
REPI-152-21	R503.1.2.1 (N1111.1.2.1) (New)	Requires any new heating and cooling equipment as part of an alteration to be provided with controls as required in Section R403.1.	Reduces energy use	No	The new heating and cooling equipment must have a programmable thermostat and heat pumps must have supplemental heat pump control.
REPI-163-21	TABLE RC102.2	Reduces the ERI not including OPP targets to 42 for all climate zones.	Reduces energy use	No	This proposal increases the energy efficiency of the proposed building to a higher level before renewable energy systems can be employed to meet the ERI target of 0.
RED1-309-22	TABLE R403.3.6	Adds a new duct leakage test level for duct systems located in conditioned space with air-handler not installed at Rough-In for both for all homes regardless of size.	Increases energy use	No	At rough-in, a duct system without an air-handler installed was required to have total duct leakage not more than 3 cfm/100 sq ft. This code change will allow a duct system inside conditioned space to have duct leakage not more than 6 cfm/100 sq ft which will increase energy use in these circumstances.
REPI-021-21	R401.2.5, TABLE R406.2	Removes the R408 additional efficiency requirements from the R406 compliance path.	Increases energy use	No	This proposal removes the requirement for a proposed design using the ERI compliance path to have 5 percent less energy than the ERI targets in Section R406.
REPI-080-21	R403.3.2	Streamlines the code requirements for ducts located in conditioned space by combining the earlier sections for ducts located in floor and wall assemblies.	Increases energy use	No	This proposal combined the language for ducts located in wall or floor assemblies for easier understanding. The proposal reduced insulation requirements from R 19 to R-10 and added an exception for building assembly cavities that contain ducts which have been air-sealed would not need to be insulated.
REPI-085-21	R403.3.5, R403.3.6, R403.3.7 (New), R403.3.7	Adds a new section to define a sampling methodology for duct leakage testing of dwelling units within a multifamily building with not less than eight dwelling units. Exceptions were added to the duct leakage requirements for sampled dwelling units.	Increases energy use	No	The concept of sampling for duct leakage testing can help save time and money over testing of every single dwelling unit duct system in a multifamily building. There is risk of missing poorly sealed duct systems that can show performance and comfort issues for the occupants if missed in the sampling process.

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
REPI-131-21	R406.4	Removes the ventilation rate adjustment for the ERI Reference Home in Section R406.4.	Increases energy use	No	The purpose of this proposal is to fix an error that was introduced in the 2018 IECC during an effort to coordinate the ERI calculation procedure with the residential ventilation rates. The change in 2018 IECC resulted in a significant increase in the ERI scores. That was never the intent of the change as was confirmed by the original proponent, and it was the result of using terms that were not fully coordinated with the specific terms in Standard 301. Proposals and public comments attempted to fix this issue in 2021 IECC, but in the end none of them were approved. This change aligns the IECC ERI with the RESNET ERI.
CE2D-78-23 Part II	NEMA (New)	Adds NEMA to references for air-sealed boxes for electrical and communication applications.	Administrative	No	
CE2D-95-23-23 Part II	R403.9, R405.5.4.1, R405.5.4.2	Replaces thermal envelope to building thermal envelope to align with commercial code.	Administrative	No	
CEC2D-4-23 Part II	R110 (New)	Editorial change to align ordering of Chapter 1 sections with other I-Codes	Administrative	No	
CEPI-008-21 Part II	R104.1, R104.2, R104.3 (New), R104.3, R104.4, R104.5	Adds editorial changes for the payment of fees and adds a new section for permit valuations.	Administrative	No	
CEPI-015-21 Part II	R202 (New)	Adds a new definition for emittance in IECC	Administrative	No	
CEPI-015-21 Part III	N1101.6, R202 (New)	Adds a new definition for emittance in the International Residential Code (IRC)	Administrative	No	
CEPI-019-21 Part II	R303.1.1, R303.1.2	Adds an exception for insulation mark installation for roof insulation installed above the deck.	Administrative	No	
CEPI-024-21 Part II	SECTION 202, SECTION 202 (New), R401.2.2, R403.3.3.1, SECTION R405, R405.1, R405.2, TABLE R405.2, R405.3, R405.3.2.2, R405.4, R502.2, R505.1	Editing definitions of proposed and standard reference designs for R405 performance compliance and adds a new definition for simulated building performance. Updates R405 title to Simulated Building Performance and updates language to reflect new definitions.	Administrative	No	
IRCED1-10-22	N1103.2	Replaces oil with liquid fuel for hot water boiler outdoor temperature reset.	Administrative	No	
IRCED1-7-22	N1102.5.1.2	Removes third exception for testing in accordance with N1102.5.1.2 due to circular logic.	Administrative	No	

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
IRCED1-8-22	N1108.2.1.3 table	Updates language in Table N1108.2.1.3 for minimum roof reflectance to use Solar Reflectance Index (SRI) and updates the ASTM Standards to determine SRI.	Administrative	No	
IRCEPI-1-21	N1102.2.6, TABLE N1102.2.6, Chapter 44 (New)	Re-write of Section N1102.2.6 to require steel-frame ceilings, walls and floor U-factors to be determined by AISI S250 and removes TABLE N1102.2.6 for steel and metal framed walls.	Administrative	No	
IRCEPI-3-21	N1101.6	Adds a new definition for duct airflow balancing.	Administrative	No	
IRCEPI-4-21	N1103.3.6, N1108.2.4	Adds language for an exception to duct leakage testing for ducts in conditioned space if duct airflow balancing in accordance with ANSI/ACCA 5 QI or other methods shows that individual room airflows are be within the greater of ± 20 percent, or 25 cfm of the design/application requirements for the supply and return ducts.	Administrative	No	
IRCEPI-6-21	N1103.3, N1103.3.1 (R403.3.1) (New)	Adds language to require duct systems to be designed according to ACCA Manual D	Administrative	No	
IRCEPI-7-21	N1103.3.2	Adds requirements for diffusion ports in unvented attics for ducts in the sealed attic to reduce the risk of condensation on duct work.	Administrative	No	
RE2D-02-23	R110.4	Removes "without delay" in the administration section for the action a code official must take in accordance with a decision from the board.	Administrative	No	
RE2D-03-23	R202	Updates emittance definition to replace "emission" with "release of thermal radiation".	Administrative	No	
RE2D-06-23	R202	Adjusts the definitions of Alteration and Repair to align with approved code changes.	Administrative	No	
RE2D-08-23	R202	Adjusts the language in the definition for substantial alteration for clarity.	Administrative	No	
RE2D-10-23	R402.1	Corrects section numbers for general building thermal envelope based on earlier approved code proposals.	Administrative	No	
RE2D-20-23	R404.7.1, R404.7.2, R404.7.5, R404.7.6	Code language updates for EV charging and removes section R404.7.6 based on it being redundant.	Administrative	No	
RE2D-21-23	R404.7.6	Rewrite of section R404.7.6 for EVSE installation for clarity on NFPA 70.	Administrative	No	This code proposal was superseded by RE2D-20-23.
RE2D-24-23	R405.2	Updates R405.2 code language to specify the source energy multipliers based on ASHRAE Standards 1056, 189.1 and 240P.	Administrative	No	
RE2D-25-23	R405.3	Adjusts language in section R405.3 for compliance documentation to account for the proposed design and the as-built design.	Administrative	No	The "As-Built" design is the intent behind the proposed design based on inspection testing.

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
RE2D-26-23	R405.4.2	Adds Appendix RF for proposed building envelope U-factors and slab F-factors for compliance in R405.4.2	Administrative	No	
RE2D-28-23	R405.5.2	Modification to the language for software vendor testing.	Administrative	No	
RE2D-31-23	TABLE R407.1; IRCECC: TABLE N1107.1	Rewrite of low slope roof reflectance and emittance requirements.	Administrative	No	
RE2D-32-23	R407.2; IRCECC: N1107.2	Adds "low slope" language to roof requirements for the tropical climate region.	Administrative	No	
RE2D-33-23	TABLE R407.1	Replaces reference to the commercial code with internal reference to the residential code for roof reflectance requirements.	Administrative	No	
RE2D-37-23	TABLE R408.2, R408.2.1, R408.2.1.1, R408.2.1.4, R408.2.2, R408.2.3, R408.2.4, R408.2.5	Editorial changes to Table R408.2 and envelope, HVAC, SWH, duct systems and air sealing energy credit measures.	Administrative	No	
RE2D-38-23	TABLE R408.2, R408.2.1.3, TABLE R408.2.1.3, R408.2.1.3.1	Updates language for roof reflectance measures in Table R408.2 and updates the solar reflectance requirements (SRI) for energy credits.	Administrative	No	
RE2D-40-23	R408.2.11	Changed "switch" to "manual control" for R408.2.11 whole home lighting measure.	Administrative	No	
RE2D-42-23	TABLE R408.2.3	Removed redundant hot water heaters in Table R408.2.3 for service water-heating efficiencies.	Administrative	No	
RE2D-43-23	R408.2.3.1	Clarifies requirements for demand recirculation water systems for the compact hot water design energy credit measure.	Administrative	No	
RE2D-44-23	R408.2.6, TABLE R408.2.6	Adjusts language for R408.2.6 energy efficient appliances to close loopholes from previous approvals.	Administrative	No	
RE2D-46-23	R503.1.1.3	Editorial adjustments for above grade wall alterations.	Administrative	No	
RE2D-59-23	TABLE R408.2, TABLE R408.2.3	Added all energy credit values in Table R408.2 from PNNL simulation analysis.	Administrative	No	
RE2D-66-23	TABLE R408.2 (New), R408.2.2.1 (New)	Updates the energy credits for the high-performance gas furnace and heat pump credits in Table R408.2 and adds new efficiency requirements for gas furnace and heat pump option and the heat pump in Section R408.2.2.1.	Administrative	No	
RE2D-67-23	TABLE R408.2 (New)	Reduced the ground source heat pump energy credits in all climate zones in Table R408.2 based on spreadsheet analysis of original GSHP results.	Administrative	No	

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
REC2D-1-23	TABLE R402.1.2, R402.1.3, R402.2.10.2, R402.2.11.2, RF105, RF105.1 (New), TABLE RF105.1 (New), RF106, RF107, RF106.1 (New), TABLE RF106.1 (New)	Adds necessary language and tables that coordinate the proper calculation of F-factors for slabs and ground coupling for crawl space walls and basement walls.	Administrative	No	
REC2D-3-23	ACCA (New)	Adding ACCA Manual D-2023 Standard to the Chapter 6 references.	Administrative	No	
REC2D-4-23	TABLE R405.4.2(1)	Corrects an error in the reference design for foundation geometry condition and restores to the 2021 code language in Table R405.4.2(1).	Administrative	No	
REC2D-6-23	R402.2.1 (New)	Updates ceilings with attics language to align with changes made in Table R402.1.3 in previous code changes.	Administrative	No	
REC2D-7-23	R403.6.2, TABLE R403.6.2	Replaces "balanced" with "balanced ventilation system" for whole-dwelling mechanical ventilation system fan efficacy to align with new definition for balanced ventilation system.	Administrative	No	
REC2D-8-23	R202 (New), R402.5.1.2, R402.5.1.2.1, R402.5.1.3, R403.3.1, R403.3.9, R403.6.4, TABLE R405.4.2(1)	Adds a new definition for sleeping unit and revised the definition for testing unit enclosure area while adding these definitions to the section on air leakage testing.	Administrative	No	
REC2D-10-23	R402.5.1.3, R408.2.1.4, R403.3.7, R503.1.2.3, R403.6.2	Editorial clean up to correct SI units for the updated air leakage requirements.	Administrative	No	
RECD1-1-22	N1103.6.4, (R403.6.4) (New)	Adds a new section for intermittent exhaust control for bathrooms and toilet rooms to align IECC-R with Section C403.8.6.2 in IECC-C.	Administrative	No	
RECD1-2-22	6 AAMA, AAMA Chapter 06, CSA Chapter 06, 6 WDMA, WDMA Chapter 06	Chapter 6 reference updates	Administrative	No	
RECD1-3-22	TABLE R402.5.1.1	Reconciles language in Table R402.5.1.1 with previously approved code proposals.	Administrative	No	

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
RECD1-4-22	R404.6.1 (New), R404.6.2 (New), R404.6.2.1 (New), R404.6.2.2 (New), R404.6.2.3 (New), R404.6.2.4 (New), R404.6.2.5 (New), R404.6.2.6 (New), R404.6.2.7 (New), R404.6.2.8 (New)	Moves the solar ready requirements from the referenced Appendix CB and copies them into the R404.6.2 section.	Administrative	No	
RECD1-6-22	R405.2	Adjusts the Exception 2 for using annual energy costs for performance compliance to use source energy and restores a single multiplier to be used rather than multiple sections of ASHRAE 105.	Administrative	No	The original ASHRAE 105 Table references offered 6 different site-to-source multipliers for electricity which could lead to unnecessary complexity for the code official and software implementers.
RECD1-8-22	R405.3, R405.3.1, R405.3.2, R405.3.2.1, R405.3.2.2, R405.4, R405.4.1, R405.4.2; IECC: R405.4.3 (New); IECC: R405.5, R405.5.1, R405.5.2, R405.5.3; IECC: R405.5.2 (New), R405.5.3 (New), R405.5.4 (New), R405.5.4.1 (New), R405.5.4.2 (New)	Adds language to align the software requirements for R405 with the requirements in R406.	Administrative	No	
RECD1-10-22	R503.1.2, R503.1.2.1	Removes the language from the exceptions that applies to an addition as these sections apply to alterations.	Administrative	No	
RECD1-11-22	R402.2.8	Updates language for floors to specify installation requirements for both cavity and continuous insulation.	Administrative	No	
RECPI-2-21	TABLE N1105.4.2(1)	Adjusts footnote (h) for Table N1105.4.2(1) to replace "townhouses" with "townhouse units".	Administrative	No	
RECPI-8-21	R401.3, R406.7.2.2, ICC Chapter 06	Adds the RESNET CO2 Index to the compliance certificate (R401.3) and the ERI compliance reports.	Administrative	No	

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
RECPI-11-21	R202 (New), APPENDIX RC, SECTION RC101, SECTION RC202 (New), RC101.1, RC102.1, RC401.2 (New), RC401.3 (New), SECTION RC102, RC406.1 (New), RC406.2 (New), RC406.3 (New), RC102.2, RC406.4.1 (New), RC406.5 (New), TABLE RC102.2, RC406.6 (New), RC406.7 (New), ASHRAE Chapter 06 (New)	Adds a general definition for ERI and adds new definitions for renewable energy agreements and clarity for Appendix RC ERI analysis to align with definitions.	Administrative	No	
RED1-001-22	APPENDIX RC, SECTION RC101, RC101.1, RC101.2, RC101.3, RC101.4, SECTION RC 102 (New), RC102, RC103, RC103.1 (New), RC103.1, RC103.2, RC103.3, RC103.3.1, RC103.4, TABLE RC103.3, RC103.5, RC103.6	Adds clean-up language to ensure Appendix RC is using earlier approved proposal for Appendix RC.	Administrative	No	
RED1-003-22	R202	Modifies grade plane definition to remove requirements.	Administrative	No	
RED1-006-22	AISI Chapter 06	Adds AISI S250 to Chapter 6 References.	Administrative	No	
RED1-007-22	RESNET Chapter 06	Updates RESNET 301 Standard to ANSI/RESNET/ICC 301-2022 version in Chapter 6.	Administrative	No	
RED1-008-22	R101, R101.1, R101.2, 101.2.1 (New)	Adds a new section R101.2.1 for Appendices to clarify that appendices do not apply unless specifically adopted.	Administrative	No	
RED1-009-22	R101, R101.1, R101.2, R101.3, R101.5, R101.5.1, SECTION R102 (New), R101.4, R101.4.1, R108.3, R108.2, R108.1, R108.1.1, R108.1.2, R107.1, SECTION R107, SECTION R108	Adds provisions in Section 101 Scope and General Requirements and Section 102 Applicability to contain the same basic points for better clarity and ease of use.	Administrative	No	

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
RED1-010-22	R103 (New), 103.1 (New), 103.2 (New), 103.3 (New)	Adds new section R103 for the creation of the code compliance agency.	Administrative	No	
RED1-011-22	R103.2.2	Adds a provision to section R103.2.2 for a solar ready zone to require the solar-ready system.	Administrative	No	
RED1-012-22	R105.2.2, R105.2.3	Removes redundant code provisions for framing and air-barrier rough-in inspections.	Administrative	No	
RED1-013-22	R105.2.3, R105.2.4, R105.2.5, R105.2.6	Reorders the inspections so as to remain consistent with the logical order of inspections currently being done by inspectors.	Administrative	No	
RED1-014-22	R105.2.4	Adds language to plumbing rough-in inspection for solar-ready zones.	Administrative	No	
RED1-016-22	R105.4, R105.4.1 (New); IECC: R105.4.1.1 (New), R105.4.1.2 (New), R105.4.1.3 (New), R105.4.1.4 (New); IECC: R105.4.2 (New)	Adds new sections and language for approved third party inspection agencies in section R105.	Administrative	No	
RED1-017-22	R110, R110.1, R110.2, R110.3, R110.4	Adds provisions to coordinate the means of appeals within the I-codes.	Administrative	No	
RED1-028-22	APPENDIX RH (New), RH101 (New), SECTION 202 (New), RH102 (New), RH401.2 (New), RH401.3 (New), RH406.2 (New), RH406.7.2.2 (New)	Adds a new definition for CO2e Index based on the RESNET 301 Standard and adds Appendix RH for operational carbon rating and energy reporting.	Administrative	No	
RED1-031-22	R202	Revises the definition for simulated building performance to remove language about using a baseline rather than the standard reference design.	Administrative	No	
RED1-032-22	TABLE R402.4.1.1 (New)	Modifies the requirements for HVAC register boots in Table R402.4.1.1 to align with earlier proposals.	Administrative	No	
RED1-035-22	R405.1, R405.2	Aligns language in R405.1 and R405.2 to align with new definitions for approved sources.	Administrative	No	
RED1-043-22	R405.2	Editorial changes to clarify building performance compliance requirements for mixed fuel and all-electric homes.	Administrative	No	
RED1-054-22	TABLE R405.2, R408.1, RE103.1	Removes additional efficiency requirements from Table R401.2.5 to align with approved code proposals.	Administrative	No	

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
RED1-056-22	TABLE R405.2, TABLE R406.2	Removed the dedicated row for HW pipe insulation and also removed the text "except Section R403.5.2" due to conflict in approved proposals.	Administrative	No	
RED1-065-22	R202, R406, R406.1, R406.2, TABLE R406.2, R406.3, R406.4, R406.5, TABLE R406.5, R406.6, R406.7, R406.7.1, R406.7.2, R406.7.2.1, R406.7.2.2, R406.7.3, R406.7.4, R406.7.5, R406.7.6, CHAPTER 6 [RE], 6 ANSI, ANSI Chapter 06 (New)	Editorial changes for R405 and R406 for clarity that multifamily ERIs are only performed on a dwelling unit and that common spaces are still subject to the other code requirements in R402 through R404. Some edits maintain consistency, use defined terms, and underscore that the as-built dwelling unit is also required to be compliant, not just the 'rated design' ERI.	Administrative	No	For large MF, the average ERI of all dwelling units in the building should be permitted to be used to demonstrate compliance with the maximum ERI (rather than each individual dwelling unit being required to meet the max ERI).
RED1-067-22	R406.5	Editorial changes to replace "appropriate" with "applicable".	Administrative	No	
RED1-073-22	R408.1; IECC: R408.2; IECC: TABLE R408.2, R408.2.3, R408.2.3 (New)	Provides editorial changes for clarity for compliance with R408 requirements and adds an addition electric hot water heating measure to Table R408.2.	Administrative	No	
RED1-089-22	RC103.3, RC103.3.1	Adjusts the renewable energy contract duration from 10 to 15 years.	Administrative	No	
RED1-094-22	R103.2.2	Editorial changes to clarify the provisions and align structural load documentation requirements with other ICC codes.	Administrative	No	
RED1-107-22	R403.10	Aligns language for roof and gutter deicing controls with the commercial section C403.14.3 which is to have the system off between sunset and sunrise.	Administrative	No	
RED1-111-22	R404.2, R404.2.1, R404.2.2	Editorial changes for interior lighting control for clarity and to correct the defined terms.	Administrative	No	
RED1-112-22	R404.3	Editorial change to require residential exterior lighting controls comply with IECC-R rather than IECC-C.	Administrative	No	
RED1-116-22	R404.5	Editorial change to electric readiness for clarity.	Administrative	No	
RED1-128-22	R404.5.1	Editorial change from cooking products to cooking appliances for electric readiness.	Administrative	No	
RED1-131-22	R404.5.2	Editorial changes to simplify electric readiness requirements for clothes dryers.	Administrative	No	
RED1-137-22	R404.6.1.3	Editorial change to replace future solar electric with future renewable electric for electrical service reserve space for electric readiness requirements.	Administrative	No	

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
RED1-138-22	R404.6.1.4	Editorial changes for electrical interconnections to allow any renewable connection.	Administrative	No	
RED1-145-22	R404.7, R404.7.1, R404.7.2, R404.7.3, R404.7.4.1, R404.7.4, R404.7.5.1	Editorial changes to Electric Vehicle Power Transfer Infrastructure for clarity, usability and enforceability.	Administrative	No	
RED1-154-22	R404.7.1, R404.7.4	Moves the exceptions for the electric utility's lack of capacity to the quantity section.	Administrative	No	
RED1-157-22	R404.7.4	Adjusts the EVSE circuit capacity exception based on installed cost to account for projected inflation in 2023 and 2024.	Administrative	No	
RED1-182-22	R202, TABLE R408.2.1.3; IRCECC: SECTION 202, TABLE N1108.2.1.3	Editorial changes for the new defined terms "low-sloped roof" and "steep-sloped roof" to "low slope" and "steep slope".	Administrative	No	
RED1-184-22 PI	N1102.5.1.2	Editorial change to move the details of the air leakage testing conditions before the exceptions for air leakage testing.	Administrative	No	
RED1-184-22 PII	R402.5.1.2	Editorial change to move the details of the air leakage testing conditions before the exceptions for air leakage testing.	Administrative	No	
RED1-185-22	R102.1.1, SECTION 202, R401.3, R402.1.5, R402.2.7, R402.2.9, TABLE R402.5.1.1, R402.5.1.2, R402.5.4, R402.5.6, R403.3.2, R405.2, R405.3.2.1, R405.3.2.2, TABLE R405.4.2(1), TABLE R406.2, R406.3, R406.7.2.1, R406.7.2.2, R408.2.1, R408.2.1.1, R502.2.1, R503.1.1, R503.1.1.4, R503.1.1.6, R503.1.5, R506.1; IRCECC: N1101.4, SECTION 202, N1101.14, N1102.1.5, N1102.2.7, N1102.2.9, N1102.4.5, TABLE N1102.5.1.1, N1102.5.1.2, N1102.5.4, N1102.5.6, N1105.2,	Editorial changes to the residential provisions by replacing instances of "building envelope", "thermal envelope" and "envelope" with the defined term "building thermal envelope".	Administrative	No	

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
	N1105.3.2.1, N1105.3.2.2, TABLE N1105.4.2(1), TABLE N1106.2, N1106.3, N1106.7.2.1, N1106.7.2.2, N1108.2.1, N1108.2.1.1, N1108.2.4, N1110.2.1, N1111.1.1, N1111.1.1.4, N1111.1.1.6, N1111.1.5, N1114.1				
RED1-186-22	R102, R102.1.1, SECTION R402, R402.1.5, R402.2.1, R402.2.2, R402.2.5, R402.4.3, R402.4.4, SECTION R405, R405.2, SECTION R406, R406.3, SECTION R408, R408.2, TABLE R408.2, R408.2.1.1	Editorial change to replace Total UA with thermal conductance (TC).	Administrative	No	
RED1-189-22	R202	Editorial change to remove "black body" with an emissions scale for the definition of emittance.	Administrative	No	
RED1-191-22 PI	R202	Editorial change to account for "non-structural" exterior wall elements in the definition for exterior wall envelope.	Administrative	No	
RED1-191-22 PII	R202	Editorial change to account for "non-structural" exterior wall elements in the definition for exterior wall envelope.	Administrative	No	
RED1-194-22	R303.1.5 (New), R303.1.1, R303.2.2	Adds a new section for air spaces to ensure air space R-values are properly specified and applied for both reflective and non-reflective air spaces.	Administrative	No	Air space R-values can vary by as much as a factor of 8 depending on various conditions of use (see ASHRAE 90.1 Appendix A).
RED1-196-22	R402.1	Editorial change to clarify that there are two options that can be used to demonstrate compliance with the residential prescriptive building thermal envelope provisions.	Administrative	No	
RED1-204-22	TABLE R402.1.2; IECC: TABLE R402.1.3	Editorial change to the footnotes for fenestration U-factors to clarify the conditions based on rows instead of columns and remove the exceptions.	Administrative	No	Footnotes should not contain requirements; they should be explanatory. Since there should be no requirements in footnotes there should be no exceptions. There are no columns for fenestration u-factors or solar heat gain coefficient; there are rows.

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
RED1-208-22	R402.1.5, R405.2, R405.4.2, TABLE R405.4.2(1), R406.3; IECC: R402.2.10	Editorial changes in the performance and ERI compliance sections to account for the changes in the UA calculation to Thermal Conductance (TC) and updated Table R405.4.2(1) to account for slab-on-grade U-factor and perimeter.	Administrative	No	
RED1-210-22	R402.2.10	Editorial change to remove the language "in contact with the ground" from the section for slab-on grade floors as it was redundant.	Administrative	No	
RED1-211-22	R402.2.11.1	Editorial changes to reformat and clarify crawl space wall insulation installation requirements to align better with the basis of the R-value requirements for crawl space walls.	Administrative	No	
RED1-212-22	R402.2.3, R402.2.3.1	Editorial changes to differentiate between wood and steel framing. The title of R402.2.3.1 is changed to differentiate between roof/floor trusses and attic knee-walls	Administrative	No	
RED1-217-22	R402.2.9.1	Editorial change to the prescriptive basement wall insulation installation to account for the wall insulation depth of the proposed or rated design in the performance compliance paths.	Administrative	No	
RED1-218-22	R402.3	Editorial change to remove the commentary as part of the definition for radiant barriers.	Administrative	No	
RED1-222-22	R402.5.1.2, R402.5.1.4	Editorial changes to section on air leakage testing for clarity and to improve organization as well as establishes a cfm/ft2 metric as an alternative to ACH50.	Administrative	No	
RED1-224-22 PI	R402.5.1, R402.5.1.2, R402.5.1.3 (New), R402.5.1.3, R402.5.1.4; IECC: TABLE R405.2, TABLE R406.2	Editorial updates to separate the mandatory maximum air leakage rate from the test method section by moving the existing language into a separate section identified as mandatory. This is intended to improve the code readability and the ease of understanding the code.	Administrative	No	
RED1-224-22 PII	N1102.5.1, N1102.5.1.2, N1102.5.1.3 (New), N1102.5.1.3, N1102.5.1.4 (New), TABLE N1105.2, TABLE N1106.2	Editorial updates to separate the mandatory maximum air leakage rate from the test method section by moving the existing language into a separate section identified as mandatory. This is intended to improve the code readability and the ease of understanding the code.	Administrative	No	
RED1-226-22	TABLE R402.5.1.1	Editorial change to remove "sealed" from "sealed air barrier" as part of the air barrier, air sealing and insulation installation requirements.	Administrative	No	

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
RED1-229-22	TABLE R402.5.1.1	Editorial changes to the common walls as part of the air barrier, air sealing and insulation installation requirements.	Administrative	No	
RED1-230-22	TABLE R402.5.1.1	Editorial changes to the floors as part of the air barrier, air sealing and insulation installation requirements.	Administrative	No	
RED1-231-22	TABLE R402.5.1.1	Editorial changes to the electrical, communication and other equipment boxes as part of the air barrier, air sealing and insulation installation requirements.	Administrative	No	
RED1-233-22	TABLE R402.5.1.1	Editorial changes to the showers, tubs and fireplaces as part of the air barrier, air sealing and insulation installation requirements.	Administrative	No	
RED1-235-22	TABLE R402.5.1.1	Editorial changes to the knee walls as part of the air barrier, air sealing and insulation installation requirements.	Administrative	No	
RED1-237-22	R402.5.1.2	Editorial change relating to water gauge to keep the units consistent with other units in the code section. Also changed the “dwelling unit enclosure area” to italic font is to inform the user that “dwelling unit enclosure area” is a defined term in Chapter 2.	Administrative	No	
RED1-243-22 PI	R402.5.4	Relocates section for rooms containing fuel burning appliances.	Administrative	No	
RED1-243-22 PII	N1102.5.4	Relocates section for rooms containing fuel burning appliances.	Administrative	No	
RED1-249-22	R405, R405.1, R405.2, R405.3, R405.3.1, R405.3.2, R405.3.2.1, R405.3.2.2, R405.4, R405.4.1, R405.4.2, TABLE R405.4.2(1), R405.5.1	Editorial changes to clarify that R-2 buildings show compliance at the dwelling unit level where common spaces shall follow the requirements of R401 through R404 and updates HVAC efficiencies to SEER2, HSPF2 and UEF.	Administrative	No	
RED1-250-22	TABLE R405.2, TABLE R406.2; IECC: R402.2.10, R402.2.10.1, R402.2.10.2 (New), R402.2.11, R402.2.11.2 (New)	Editorial changes to the slab-on-grade floors and crawl space walls requirements to work better with performance paths to provide flexibility in design while still meeting the mandatory requirements.	Administrative	No	
RED1-251-22	TABLE R405.4.2(1)	Adds a 0.25 cfm50/ft2 metric for the air leakage threshold for attached units and smaller homes when using the prescriptive compliance option and adds those same metrics/thresholds to the Standard Reference Design (SRD).	Administrative	No	

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
RED1-252-22	TABLE R405.4.2(1); IRCECC: TABLE N1105.4.2(1)	Editorial change to replace two instances of "solar absorptance" with "solar reflectance" and the associated values to make all uses consistent throughout the residential provisions.	Administrative	No	
RED1-253-22	R407.2; IECC: TABLE C402.4	Replaces the IECC-C requirement for Table C402.3 with options from the new Table R407.1.	Administrative	No	
RED1-254-22	R408.2	Editorial changes in section R408 for fenestration in order to make the section more usable, improve the accuracy of credits allocated, and improve clarity and consistency.	Administrative	No	
RED1-255-22	R408.2.1.3, TABLE R408.2; IRCECC: N1108.2.1.3, TABLE N1108.2	Editorial changes to the cool roof/solar reflectance energy credits to ensure that, when a cool roof is selected, it can be expected to improve energy efficiency.	Administrative	No	
RED1-256-22	R408.2.1.3; IRCECC: N1108.2.1.3	Editorial changes to further clarify the roof reflectance criteria options are only required in specific climate zones based upon the "TBD" credits in Table R408.2 (N1108.2).	Administrative	No	
RED1-257-22	TABLE R408.2.1.3, R408.2.1.3.1; IRCECC: TABLE N1108.2.1.3, N1108.2.1.3.1; IECC: ASTM Chapter 06 (New)	Editorial changes to clean up the roof reflectance provisions in Section R408 and Section N1108.	Administrative	No	
RED1-260-22	R503.1.1	Editorial change to replace “building envelope” to the defined term in Chapter 2, “building thermal envelope”, and to italicize the defined terms “building” and “roof recover” in the same code section.	Administrative	No	
RED1-261-22	APPENDIX RF, RF 101 (New), RF101	Adds new sections to Appendix RF for the scope and purpose of the appendix and related general requirements important to proper application of the appendix in coordination with the IECC standard and also related IRC building code provisions.	Administrative	No	
RED1-264-22	R501.2, R501.4, R501.5, R501.6, R501.7, R503.1.1.2, R503.1.1.3, R503.1.1.5, R505.1, R505.1.1	Editorial changes to clarify the existing chapter 5 language and the new chapter 5 language from public comment draft #1.	Administrative	No	

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
RED1-268-22	R503.1.1, R503.1.1.1, R503.1.1.2, R503.1.1.3, R503.1.1.4, R503.1.1.5, R503.1.1.6, TABLE R402.1.2, TABLE R402.1.3	Coordinates with changes made to Section C503.1 of the commercial provisions based on additional input and review by the commercial subcommittee that occurred after the residential existing buildings and main committees had completed action these sections. The two proposals intended to make the two codes consistent. Primarily editorial and formatting coordination between the IECC-C and IECC-R for alterations.	Administrative	No	
RED1-271-22	R503.1.1.3	Editorial changes to improve clarity for use of the IRC for R-2, R-3, and R-4 buildings three stories or less that are regulated by the IECC-Residential Provisions and the IBC.	Administrative	No	
RED1-273-22	R503.1.1.3	Editorial changes for above grade wall alterations to address conflicts with vapor retarder and wind resistance requirements.	Administrative	No	
RED1-277-22	R503.1.5	Removes the exterior wall envelope definition and replaced with building thermal envelope. Exterior wall envelope was used only once in Section R503.1.5 in the entire IECC-R code.	Administrative	No	
RED1-280-22 PI	R202	Removes the zonal heating definition.	Administrative	No	
RED1-280-22 PII	N1101.6	Removes the zonal heating definition.	Administrative	No	
RED1-281-22	Chapter 6	Updates the reference standards related to air leakage assessment in order to keep the references current.	Administrative	No	
RED1-283-22	R202	Changes pilot light definitions with industry terms consistent with the source of the definition.	Administrative	No	
RED1-284-22 PI	R202	Changes pilot light definitions with industry terms consistent with the source of the definition.	Administrative	No	
RED1-284-22 PII	R202	Changes pilot light definitions with industry terms consistent with the source of the definition.	Administrative	No	
RED1-285-22	SECTION 202 (New), SECTION 202, R401.3, R402.2.9, TABLE R402.5.1.1, SECTION R403, R403.3, R403.3.1, R403.3.2, R403.3.3, R403.3.3.1, R403.3.4, R403.3.4.1, R403.3.5, R403.3.6, TABLE	Updates the duct sections for new construction and existing buildings to better define what is meant with ducts, ductwork and duct systems so to better clarify ducts in conditioned space and components in total duct leakage tests. Reduces use of "rough-in" and "post construction" phrases, adds a test exemption for ductless systems or ducted systems with not more than 10 ft of ductwork when in conditioned space and	Administrative	No	This proposal was a massive re-write of sections pertaining to duct systems to clarify definitions and requirements to determine duct location and total duct leakage.

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
	R403.3.6, R403.3.7, R403.3.8, TABLE R403.6.2, SECTION R405, R405.3.2.1, TABLE R405.4.2(1), TABLE R405.4.2(2), SECTION R408, TABLE R408.2, R408.2.4, SECTION R502, R502.2.2, SECTION R503, R503.1.2, R503.1.2.1, R503.1.2.3; IECC: R403.3.1 (New)	provides a greater duct leakage allowance with a greater amount of return ductwork.			
RED1-286-22	R402, R402.5.1, R402.5.2, R402.5.2.1, SECTION R403, R403.1, R403.1.1, R403.1.2, R403.1.3, R403.14 (New), R403.14.1 (New), SECTION R405, TABLE R405.2, SECTION R406, TABLE R406.2, CHAPTER 6 [RE], CSA Chapter 06, ANSI Chapter 06, R404.1.5 (New)	Moves the gas fireplace efficiency requirement from the R402.5 Building Thermal Envelope section, into the R403 (Systems) section. The gas fireplace efficiency was also combined with the continuously burning pilot light requirements into a new section.	Administrative	No	
RED1-287-22	R402.5.2.1	Editorial changes for the section to use the full designation of the referenced standards.	Administrative	No	
RED1-290-22	R403.1.2	Editorial change for clarity for heat pump supplementary heat.	Administrative	No	
RED1-292-22	R403.1.2; IRCECC: N1103.1.2	Expands the fuel types possible for heat pump supplementary heat.	Administrative	No	
RED1-296-22	R403.1.3	Makes editorial changes for continuously burning pilot lights and adds an exception for gas-fired appliances using pilots within a listed combustion safety device.	Administrative	No	
RED1-298-22	R403.1.3	Editorial changes to the code language to use proper designation of the referenced standard.	Administrative	No	
RED1-299-22	R403.11.2	Editorial updates to the exception language to be consistent with other changes in the code for multiple types of renewable energy systems that can be used for pool heating.	Administrative	No	

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
RED1-302-22	R403.3.2	Editorial change to clarify that the exception applies to duct insulation. The building assembly insulation requirements of Item 3.3 must be met.	Administrative	No	
RED1-305-22	R403.3.3	Editorial changes to clarify duct location in ceiling.	Administrative	No	
RED1-313-22	R403.5.4, R408.2.3, R408.2.3.1, R408.2.3.1.1 (New); IECC: TABLE R403.5.4	Editorial changes to the language for compact hot water design which clarify the requirements and moves section for water volume determination to the energy credits section.	Administrative	No	
RED1-315-22	R403.5.5; IECC: Table R403.5.5 (New); IECC: 6 AHRI	Adds AHRI Standard 1430 for demand flexible electric resistance storage and electric heat pump water heaters (HPWH)s capable of load management that policymakers can use, state government, electric utilities, authorized third parties, manufacturers, designers, installers, contractors, and users.	Administrative	No	By providing standardized requirements for Demand Flexible Electric Storage Water Heaters (DFWH), utilities and load management program managers can be assured that DFWHs can communicate using standard hardware and software.
RED1-318-22	R403.6; IRCECC: N1103.6	Editorial changes for mechanical ventilation to include dwelling units.	Administrative	No	
RED1-321-22	TABLE R403.6.2	Editorial modifications to the fan efficacy table to improve clarity and improve alignment with the IECC-C fan efficacy table.	Administrative	No	
RED1-322-22	TABLE R403.6.2	Editorial changes to remove the commercial reference with a residential code reference for the mechanical ventilation system fan efficacy table.	Administrative	No	
RED1-324-22	R403.6.3	Editorial change to remove language for programmable airflow settings in airflow measurement tools since testing is in accordance with ANSI/RESNET/ICC 380 which does not have these limitations.	Administrative	No	
RED1-325-22	R403.7, R403.7.1	Editorial changes for clarity with electric resistance space heating and removal of exceptions.	Administrative	No	
RED1-329-22	R403.8; IECC: R403.5.2 (New), R403.9 (New), R403.9.1 (New), R403.9, R403.10, R403.9.4 (New)	Revisions to systems serving multiple units, space heating outside building thermal envelope, and snow and deicing controls to remove all IECC-C references.	Administrative	No	
RED1-330-22	R404.1	Editorial changes to lighting equipment to clarify that range hoods are exempt based on concerns for durability and viability of high-efficacy lighting exposed to the elevated temperatures associated with residential cooking.	Administrative	No	
RED1-335-22	R404.5.3	Editorial changes intended to make all the sections under R404.5 consistent.	Administrative	No	

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
RED1-336-22	R405.4, R405.4.1, R405.4.2, TABLE R405.4.2(1)	Editorial changes to the Standard Reference Design should be modeled with a 40 gallon electric resistance storage water heater when the Proposed Design is a heat pump water heater. This approach is also the same as that used in the ERI Path and similar to the approach used to calculate points for HPWHs in R408.2.3.	Administrative	No	
RED1-337-22	TABLE R405.4.2(1)	Editorial clarification and reorganization to improve usability for air leakage rate, mechanical ventilation rate and fan energy.	Administrative	No	
RED1-340-22	TABLE R405.4.2(1)	Editorial changes to use proper terminology for the non-electric energy sources for these space heating appliances.	Administrative	No	
RED1-343-22	TABLE R408.2, R408.2.5	Editorial changes for improved air sealing and efficient ventilation measures and adds a fifth efficiency measure for HRV / energy recovery ventilator (ERV) for buildings meeting prescriptive air leakage rates.	Administrative	No	
RED1-365-22	R403.6.3, R403.6.4 (New)	Adds a methodology for sampling testing of mechanical ventilation systems in dwelling units.	Administrative	No	
REPI-009-21	R105.2, R105.2.1, R105.2.2, R105.2.3 (New), R105.2.3, R105.2.4, R105.2.5	Editorial changes for inspections to separate the inspection of the framing and air-barrier from the insulation and fenestration during rough-in.	Administrative	No	
REPI-011-21	R202 (New), R303.1.1	Adds new definitions for reflective insulation and enclosed reflective air space to define conditions in the building thermal envelope insulation.	Administrative	No	The proposal adds specific requirements similar to those for the other insulation materials (as well as appropriate definitions) for a type of material, (reflective insulation) that has been in the marketplace for over 35 years and has had nationwide distribution and installation. These products are well established and have two associated ASTM Standards, ASTM C727, Standard Practice for Installation and Use of Reflective Insulation in Building Constructions, and ASTM C1224,Standard Specification for Reflective Insulation for Building Applications.
REPI-013-21	R202 (New), R303.2.2 (N1101.11.2) (New), ASTM Chapter 06 (New)	Adds a definition for radiant barrier and adjusts requirements to clarify that radiant barriers are not required but only when installed.	Administrative	No	

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
REPI-026-21	R202 (New), TABLE R402.1.2, R402.2.9, R402.1.2, R402.1.3, R402.1.5	Adds new definition for slab F-Factor, clarifies slab on-grade requirements and modifies the equation to the overall UA compliance equation to include slab perimeter multiplied by the F-Factor.	Administrative	No	Residential building energy codes that are based on any version of the International Energy Conservation Code (IECC) typically allow compliance to be demonstrated in several ways, one of which is a component tradeoff approach whereby prescriptive requirements for some building components may be relaxed in trade for corresponding improvements in other components. Calculations for this component tradeoff are based on maintaining a maximum overall building UA value, which is the sum across all building envelope components of the product of each component's U-factor (conductance) and area. For slabs on grade, the component UA is based on an F-factor rather than a U-factor and is multiplied by the slab-edge perimeter length rather than slab area.
REPI-030-21	TABLE R402.1.2, TABLE R402.1.3	Transposes the rows and columns of Tables R402.1.2 and R402.1.3 for consistency with IECC-C format.	Administrative	No	
REPI-035-21	TABLE R402.1.3, R402.2.7	Adds prescriptive R-value options to Table R402.1.3 for floors above unconditioned spaces (e.g., crawlspaces, floor overhangs, etc.) to align with the primary insulation options as done for above-grade walls. The options are cavity insulation only, cavity plus continuous insulation, and continuous insulation only.	Administrative	No	
REPI-037-21	R402.2.10, R402.2.10.1	Offers direction for installation of crawlspace wall insulation installation for performance, clarity and ease of compliance. The standing language does not address insulating from the outside and ambiguously speaks to insulating the rim joist or "the depth of the floor".	Administrative	No	
REPI-040-21	R402.2.6, TABLE R402.2.6, AISI (New)	Requires the U-factors for steel-framed ceilings, walls and floor assemblies determined in accordance with AISI S250 but still meet the requirements of Table R402.1.2.	Administrative	No	
REPI-042-21	Definition, R402.3 (N1102.3) (New), ASTM Chapter 06	Adds a definition for radiant barrier and adjusts requirements to clarify that radiant barriers are not required but only when installed.	Administrative	No	

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
REPI-043-21	R402.4, R402.4.1.2, ASTM Chapter 06 (New)	Adds an additional reference test method, ASTM E3158 for air leakage testing requirements. This test method has already been included in the list of acceptable test methods for whole building air leakage testing in the IECC-C but was not added to the parallel section of the IECC-R.	Administrative	No	
REPI-047-21	TABLE R402.4.1.1	Updates the language for air barrier and insulation installation criteria for ceilings/attics in Table R402.4.1.1	Administrative	No	
REPI-051-21	TABLE R402.4.1.1	Updates the language for air barrier and insulation installation criteria for common walls in Table R402.4.1.1	Administrative	No	
REPI-052-21	TABLE R402.4.1.1	Updates the language for air barrier and insulation installation criteria for showers, tubs and fireplaces in Table R402.4.1.1	Administrative	No	
REPI-053-21	TABLE R402.4.1.1	Updates the language for air barrier and insulation installation criteria for electrical communication and other equipment boxes, housings and enclosures in Table R402.4.1.1	Administrative	No	
REPI-054-21	TABLE R402.4.1.1	Updates the language for air barrier and insulation installation criteria for windows, skylights and doors in Table R402.4.1.1	Administrative	No	
REPI-055-21	R402.4.1.1, TABLE R402.4.1.1	Clarifies the language for air barrier and insulation installation criteria for rim joists in Table R402.4.1.1	Administrative	No	
REPI-057-21	R402.4.1.2	Updates the language for air leakage testing by adjusting the air leakage units and to clarify the code intent and align terminology with the commercial air barrier testing provisions.	Administrative	No	
REPI-058-21	R402.4.1.2	Moves the exceptions for dwelling unit air leakage testing within the main exceptions for overall air leakage testing.	Administrative	No	
REPI-061-21	R402.4.1.4	Aligns residential code language for dwelling unit sampling with the commercial provisions of the 2021 IECC and RESNET sampling guidelines so that envelope leakage testing requirements for a multifamily (R2 classification) project that is 3 stories or lower in height (and that falls under the Residential provisions of the IECC) will be tested at the same rate as apartment building that is 4 stories or taller in height (and falls under the Commercial provisions of the IECC).	Administrative	No	

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
REPI-066-21	CHAPTER 4 [RE], R402.4.6	Editorial revision to air-sealed electrical and communication boxes by clarifying the requirements only apply where air-sealed boxes are selected as permitted by the table and applies to those boxes that penetrate the thermal envelope thus necessitating the need for an air barrier or air-sealed box.	Administrative	No	
REPI-069-21	R202 (New), R403.1 (N1103.1) (New), R403.1, R403.6.1, R403.8, R404.2 (N1104.2) (New), R404.2, R404.3 (N1104.3) (New), R404.3, R404.4 (N1104.4) (New)	Aligns the requirements of multifamily dwelling units between the IECC-R and the IECC-C in terms of system design, control and stringency between a 3-story MF building and a 4-story MF building.	Administrative	No	
REPI-078-21	SECTION 202, R403.3.1, TABLE R405.4.2(1)	Adds a new definition for Distribution System Efficiency (DSE) for consistency with language in Table R405.4.2(1).	Administrative	No	
REPI-079-21	R403.3.2	Adds requirement for ducts located in sealed attics to contain vapor diffusion ports to reduce condensation on ductwork. The existing IRC language allows sealed attics with vapor diffusion ports.	Administrative	No	
REPI-082-21	R403.3.3	Adds requirement for ducts buried within ceiling insulation to have vapor diffusion ports and be in compliance with vapor retarder requirements for climate zones 0A, 1A, 2A and 3A.	Administrative	No	
REPI-083-21	R403.3.3.1	Adjusts language to allow any framing dimensions for effective R-Value of deeply buried ducts given the language in R403.3.3 is sufficient to fully insulate the ducts.	Administrative	No	
REPI-087-21	R403.4.1	Clarifies the intent for protection of pipe insulation from weather and to ensure the insulations thermal conductivity energy savings integrity lasts the life of the mechanical system as per the intent of the code.	Administrative	No	
REPI-094-21	R403.6.1	Clarifies the requirements for heat or energy recovery ventilation to use the new definition for balanced ventilation system and the term sensible recovery efficiency.	Administrative	No	
REPI-095-21	R403.6.2, TABLE R403.6.2, CSA Chapter 06 (New), ASHRAE Chapter 06 (New)	Aligns residential fan efficacy table with the commercial fan efficacy table, the ASHRAE 90.1 fan efficacy table and the ENERGY STAR Ventilation Fans v4.1 specifications.	Administrative	No	

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
REPI-096-21	R403.6.3	Adds new requirement for mechanical ventilation system testing to use the ANSI/RESNET/ICC 380 Standard and updates the exception for kitchen range hoods or for testing where the ventilation system has integrated diagnostic tools used for airflow measurement.	Administrative	No	
REPI-101-21	R404.1	Adds an exception for lighting equipment that clarifies the section's intent in regard to lighting that is used for germicidal or antimicrobial purposes and is aligned with the IECC-C Section C405.3.1 exception for antimicrobial lighting.	Administrative	No	
REPI-102-21 Part I	R202, R404.1	Editorial change to correct the terminology used to describe lightning equipment and relocates the efficacy criteria from the definition of “high-efficacy light sources” to R404.1 to improve clarity.	Administrative	No	
REPI-102-21 Part II	R202, N1104.1	Editorial change to correct the terminology used to describe lightning equipment and relocates the efficacy criteria from the definition of “high-efficacy light sources” to R404.1 to improve clarity.	Administrative	No	
REPI-105-21	TABLE R404.1 (TABLE N1104.1) (New), R404.1.1, R404.1.2 (N1104.1.1) (New), R404.1.3 (N1104.1.2) (New), R404.1.4 (N1104.1.3) (New), R404.1.5 (N1104.1.4) (New)	Adds the requirements for exterior lighting power allowance applicable to residential occupancies from the commercial energy provisions and places these requirements directly within the residential code language. Also adds an additional exception intended to cover one- and two-unit R-2 buildings that may fall outside of the scope of the IRC.	Administrative	No	
REPI-106-21	R202 (New), R404.2, R404.2.1 (N1104.2.1) (New), R404.2.2 (N1104.2.2) (New)	Adds new definition for Automatic Shut-Off Control and clarifies application of lighting controls in residential occupancies. The revised rule adds a separate lighting control requirement for habitable spaces that includes both automatic and non-automatic control function and adds automatic occupant sensor control only to specific, non-habitable spaces of a residence. The revised language includes provisions to ensure the occupants can manually turn the lighting on and off independently of the occupant sensor control.	Administrative	No	
REPI-108-21	R404.2	Clarifies that the control requirements only apply to interior lighting fixtures and removes the language about exterior lighting fixtures to prevent confusion.	Administrative	No	

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
REPI-117-21	R405.2	Adds exception for the use of energy costs to determine R405 performance-based compliance to use site energy in Btu or Btu/sq ft could be used for all-electric buildings with on-site renewable energy installed.	Administrative	No	
REPI-120-21	TABLE R405.2, TABLE R406.2	Updates the mandatory requirements Tables R405.2 and R406.2 to ensure parity between the performance compliance paths.	Administrative	No	
REPI-121-21	R405.2, CHAPTER 6 [RE], ASHRAE Chapter 06 (New)	Updates the source energy multiplier/conversion factors based on ASHRAE Standard 105 or a data source approved by the code official.	Administrative	No	
REPI-124-21	TABLE R405.4.2(1)	Updates the mechanical ventilation rate for the R405 Standard Reference Design to be adjusted by the design home air leakage rate. Performance Path Ventilation Rate adjustment to B x M in the Standard Reference Design.	Administrative	No	This proposal permits builders and homeowners to increase mechanical ventilation rates to a more reasonable level without imposing an IECC performance path penalty.
REPI-129-21	R406.3.2	Updates the ERI compliance path in the IECC by updating the mandatory thermal envelope backstop for projects with on-site generation by incorporating a UA trade-off and basing the requirements on the current IECC.	Administrative	No	
REPI-140-21	R408.2.5	Removes a conflict between the HRV/ERV fan efficacy of this section and that of Table R403.6.2 and clarifies that performance values should be the listed values, uses the same sensible recover efficiency reference temperature as is required in Section R403.6.1) and permits recirculation defrost to be used in all climate zones but Climate Zone 8.	Administrative	No	
REPI-153-21	APPENDIX RC, SECTION RC101, RC101.1	Simplifies the scope statement of Appendix RC - Zero Energy Appendix.	Administrative	No	
REPI-154-21	APPENDIX RC, SECTION RC102, RC102.2	Changes title of Appendix RC from Zero Energy Residential Buildings to Zero Net Energy Residential Buildings.	Administrative	No	
REPI-156-21	APPENDIX RC, SECTION RC102, RC102 (New), SECTION RC103 (New), RC102.1, RC102.2, TABLE RC102.2	Reorganizes Appendix RC to improve readability and structure of the language by moving defined words to a definitions portion within the Appendix. Editorial changes to renumber sections based on these changes.	Administrative	No	

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Impact on Energy Efficiency	Included in Energy Analysis	Discussion
REPI-157-21	APPENDIX RC, SECTION RC102, R102.2 (New), RC102.2, TABLE RC102.2, ASHRAE Chapter 06 (New)	Adds a reference to ASHRAE Standard 90.2 to allow ERI requirements from ASHRAE 90.2 Table 6-1 for compliance with Appendix RC. Also adjusts the language for OPP.	Administrative	No	
REPI-158-21	R202, SECTION R404, R404.4 (N1104.4) (New), R406.7.3, RC102.3 (AX102.3) (New)	Adds a definition for Renewable Energy Certificate (REC) and new language to Section R404 to require REC documentation where renewable energy power production is used for compliance.	Administrative	No	
REPI-160-21	RC102.2	Changes the renewable energy purchase contract from 15 to 10 years and utilizes the defined term for renewable energy resources.	Administrative	No	
REPI-161-21	RC102.2	Adds new definitions for use in Appendix RC and adds options for financial renewable energy power purchase agreement and using the newly defined terms for the off-site renewable power.	Administrative	No	
REPI-165-21	TABLE R402.1.2, R402.1.3, APPENDIX RD (New), RD101 (New), RD101.1 (New), TABLE RD101.1 (New), RD101.2 (New), RD101.3 (New), RD102 (New), RD103 (New), RD104 (New), RD105 (New), RD106 (New)	Establishes Appendix RD to expand R-value options for determining compliance with the U-factor criteria prescribed in Section R402.1.2 of the IECC residential provisions.	Administrative	No	

(a) Proposal numbers are as assigned by the ICC (https://energy.cdpaccess.com/live/cah/).
(b) Code sections refer to the 2021 IECC. Sections may be renumbered by the ICC in the 2024 IECC.

Appendix B – Detailed Weighting Factors for Each Residential Prototype

Building Type	Foundations	Heating Systems	CZ1 (%)	CZ2 (%)	CZ3 (%)	CZ4 (%)	CZ5 (%)	CZ6 (%)	CZ7 (%)	CZ8 (%)	Weights by Prototype
Single-Family	Crawlspace	Gas-fired Furnace	0.16	0.28	1.38	2.20	2.01	0.38	0.11	0.00	6.52
Single-Family	Crawlspace	Electric Furnace	0.01	0.06	0.25	0.26	0.11	0.03	0.01	0.00	0.73
Single-Family	Crawlspace	Oil-fired Furnace	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Single-Family	Crawlspace	Heat Pump	0.05	0.45	2.82	1.73	0.34	0.06	0.02	0.00	5.48
Single-Family	Slab-on-grade	Gas-fired Furnace	0.46	8.97	8.16	2.42	2.99	0.80	0.11	0.00	23.91
Single-Family	Slab-on-grade	Electric Furnace	0.13	2.42	1.53	0.35	0.16	0.08	0.01	0.00	4.68
Single-Family	Slab-on-grade	Oil-fired Furnace	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.03
Single-Family	Slab-on-grade	Heat Pump	0.65	9.26	8.02	1.82	0.44	0.12	0.02	0.00	20.33
Single-Family	Heated Basement	Gas-fired Furnace	0.01	0.03	0.48	2.45	4.56	1.26	0.10	0.00	8.89
Single-Family	Heated Basement	Electric Furnace	0.00	0.01	0.07	0.24	0.24	0.11	0.01	0.00	0.69
Single-Family	Heated Basement	Oil-fired Furnace	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.03
Single-Family	Heated Basement	Heat Pump	0.00	0.08	0.64	1.58	0.51	0.16	0.02	0.00	2.98
Single-Family	Unheated Basement	Gas-fired Furnace	0.00	0.07	0.20	1.22	3.30	0.96	0.07	0.00	5.81
Single-Family	Unheated Basement	Electric Furnace	0.00	0.02	0.04	0.10	0.14	0.06	0.01	0.00	0.36
Single-Family	Unheated Basement	Oil-fired Furnace	0.00	0.00	0.00	0.01	0.02	0.01	0.00	0.00	0.04
Single-Family	Unheated Basement	Heat Pump	0.00	0.08	0.50	0.55	0.36	0.11	0.01	0.00	1.60

Building Type	Foundations	Heating Systems	CZ1 (%)	CZ2 (%)	CZ3 (%)	CZ4 (%)	CZ5 (%)	CZ6 (%)	CZ7 (%)	CZ8 (%)	Weights by Prototype
Multifamily	Crawlspace	Gas-fired Furnace	0.04	0.04	0.31	0.73	0.37	0.08	0.01	0.00	1.58
Multifamily	Crawlspace	Electric Furnace	0.00	0.01	0.05	0.07	0.02	0.01	0.00	0.00	0.16
Multifamily	Crawlspace	Oil-fired Furnace	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Multifamily	Crawlspace	Heat Pump	0.02	0.06	0.50	0.38	0.06	0.01	0.00	0.00	1.04
Multifamily	Slab-on-grade	Gas-fired Furnace	0.14	1.87	1.87	0.63	0.57	0.21	0.02	0.00	5.31
Multifamily	Slab-on-grade	Electric Furnace	0.03	0.55	0.27	0.07	0.03	0.03	0.00	0.00	0.99
Multifamily	Slab-on-grade	Oil-fired Furnace	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Multifamily	Slab-on-grade	Heat Pump	0.39	1.70	1.35	0.37	0.08	0.03	0.00	0.00	3.93
Multifamily	Heated Basement	Gas-fired Furnace	0.00	0.00	0.12	0.78	1.06	0.28	0.02	0.00	2.26
Multifamily	Heated Basement	Electric Furnace	0.00	0.00	0.01	0.06	0.06	0.03	0.00	0.00	0.17
Multifamily	Heated Basement	Oil-fired Furnace	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Multifamily	Heated Basement	Heat Pump	0.00	0.01	0.12	0.39	0.12	0.04	0.00	0.00	0.68
Multifamily	Unheated Basement	Gas-fired Furnace	0.00	0.02	0.03	0.45	0.65	0.15	0.01	0.00	1.31
Multifamily	Unheated Basement	Electric Furnace	0.00	0.01	0.01	0.03	0.03	0.02	0.00	0.00	0.09
Multifamily	Unheated Basement	Oil-fired Furnace	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Multifamily	Unheated Basement	Heat Pump	0.00	0.01	0.08	0.15	0.07	0.02	0.00	0.00	0.33
Totals by Climate Zone			2.12	26.02	28.84	19.07	18.33	5.05	0.55	0.01	100.00

Appendix C – Updates to the Energy Savings Calculation Methodology

Although the present analysis of the 2024 IECC builds on the previous 2021 IECC energy savings analysis, the methodology differs in a few ways:

1. Used a newer version of DOE's *EnergyPlus* building energy simulation software. This was done to accommodate the software update process and to incorporate software improvements.
2. Addition of two car garage for single-family prototypes
3. Updated HVAC equipment efficiency to new federal minimum efficiency levels (SEER2, HSPF2)
4. Updated modeling strategy for air leakage, duct leakage, and ventilation.
5. Domestic hot water modeling, hot water piping layout and updates
6. Updated construction weights.
7. Bug fixes and other improvement were made to the prototype models.

These changes are important because they impact the 2021 IECC models, which are the baseline for this analysis. To ensure that the current analysis was both up-to-date and the comparison between the 2021 and 2024 IECC versions was valid, all 2021 models were re-run incorporating these changes.

EnergyPlus Version Upgrade

DOE regularly updates the *EnergyPlus* software program twice a year. The 2021 determination of energy savings was accomplished using *EnergyPlus* V9.5. The determination of energy savings for the 2024 IECC was conducted using an adaptation of *EnergyPlus* version 23.1.

Single-Family Prototype Geometry Enhancement

A two-car garage was added to the single-family prototype model. The impact on energy was relatively small since the garage is unconditioned, and only the water heaters (based on climate zone) are now placed in the garage. Table C.1 shows the location of the water heater based on climate zone and foundation type.

Table C.1. Water Heater Location for Residential Prototypes by Climate Zone and Foundation

Crawlspace	Slab	Heated Basement	Unheated Basement
Garage	Garage	Garage	Garage
Garage	Garage	Garage	Garage
Garage	Garage	Basement	Basement
Garage	Garage	Basement	Basement
Living	Living	Basement	Basement
Living	Living	Basement	Basement
Living	Living	Basement	Basement
Living	Living	Basement	Basement

Updated HVAC Equipment Efficiency

Updated the residential prototype models' equipment efficiency to the federal minimum requirement in 2023. Changes are relatively small but are higher for prototypes with heat pump system because heating and cooling are impacted. Nationally, EUIs went down, and savings increased slightly compared to the previous version. Table C.2 shows the previous and new federal minimum efficiency levels and units.

Table C.2. Updates of equipment efficiency based on the federal minimum requirement (10 CFR 429.16)

	Pre-2023		Post-2023	
Product class	Seasonal energy efficiency ratio (SEER)	Heating seasonal performance factor (HSPF)	Seasonal energy efficiency ratio (SEER2)	Heating seasonal performance factor (HSPF2)
Split system air conditioners	13/14*	NA	13.4/14.3*	NA
Split system heat pumps	14	8.2	14.3	7.5
* Southern states have an efficiency requirement of 14 SEER/14.3 SEER2				

Air Leakage, Duct Work, and Ventilation Enhancement and updates

In the 2021 determination, the exhaust-only ventilation was represented by a dual-fan system with equivalent fan energy consumption, disregarding the pressure differentials between balanced ventilation and exhaust-only ventilation. To further capture the pressure impact, in the 2024 determination, exhaust-only ventilation has been incorporated into the airflow network model for the single-family prototype.

The assumption of duct location was updated for the multifamily prototype based on the finding from Ecotope (2020)[13] that the ductwork for low-rise multifamily buildings is typically in the conditioned space. Therefore, we decided to remove the duct leakage adjustment for MF models and assume that MF buildings have all ducts in the conditioned space. This has a larger impact on the absolute energy consumption of MF prototypes. This update resulted in energy reduction in most of the MF cases (ranging from -11.9 to 0.06%), while the impact on the saving ratio (between two code versions) is relatively small. It is more noticeable in older codes, while the impact on new codes was relatively small. This update simplifies the simulation (by removing the duct leakage adjustment) and enables us to have one single set of models for MF instead of three models, as was previously required.

The baseline prototype duct locations were updated for the single-family prototype based on code change proposal (REPI-122) submitted by the National Association of Home Builders (NAHB). In Table R405.4.2(1) of the 2021 IECC, duct location of the standard reference design was the same as the proposed design. For the 2024 IECC, NAHB proposed specific duct locations for the standard reference design in Table R405.4.2(1) based on number of stories and foundation type of the building. The duct locations for the heated basement were adjusted based on discussions between DOE and NAHB. The proposal changes the duct location from 0 percent located in the conditioned space to 25 percent located in conditioned space (foundation type: slab, crawlspace, unheated basement), and 75 percent located in conditioned space (foundation type: heated basement). The HVAC duct system in the prototype buildings consists of supply ducts accounting for 65 percent of the total duct length and return ducts accounting for 35 percent of the total duct length. This update resulted in significant energy reduction for all the single-family models, especially for the prototypes with heated basements.

[13] https://www.energycodes.gov/sites/default/files/2021-07/LRMF_Studies_final_report_2020-06-24.pdf

Domestic Water Heating, Pipe Design Enhancement and Updates

In previous versions of the residential prototype models, the hot water distribution assumed adiabatic pipes for the domestic hot water systems. Domestic hot water energy consumption was a function of simulating a basic hot water usage schedule and pipe losses estimated via pre-processed savings factors. In this analysis, the heat losses from the hot water piping are modeled to determine the impacts of the heat losses on energy consumption. By simulating the heat losses in the hot water piping, reductions in the domestic hot water energy consumption resulting from changes in the hot water piping layout can be quantified. The new modeling strategy allows for analysis of the hot water system design and comparison with compact design strategies. Finally, the heat losses from the pipes not only impact the domestic hot water energy consumption, but also has a small effect on the heating and cooling energy because of the heat dissipated to the indoor air.

The modeled heat transfer from the hot water distribution system is calculated based on pipe material, pipe insulation R-value, pipe diameter, pipe length and the indoor air temperature. Hot water piping layouts for the single-family and multifamily prototypes were created based on the floor plans which specifically located the water heater and hot water fixtures to determine the necessary pipe lengths required for the hot water distribution. The hot water fixtures are in the bathrooms (each with a sink and shower/tub), the kitchen (sink and dishwasher) and laundry room (clothes washer). The single-family prototypes have three bathrooms while the multifamily prototype dwelling units have two bathrooms. Other than the bathroom fixtures, the two prototypes share the same hot water fixtures (per unit). The water heater is placed in the basement for single-family prototypes with a basement and is otherwise in the garage for the remaining single-family prototypes. The multi-family prototypes have the water heaters located in a closet unit within conditioned space. Using these layouts, the pipe length from the water heater to each hot water fixture is added to the models.

Updated Weights and Fuel Costs

Weighting factor and fuel cost changes have been updated to reflect current building permits and economic conditions. Previously, the permit from the latest one year was used for weight analysis, and now a 15-year based average is used for as the updated the construction weight. Weighting factors and fuel cost adjustments were summarized in Sections 2.3 and 2.4 in the report.

Bug Fixes

During the 2024 IECC determination analysis, various bugs in the prototype models were fixed such as: corrected the floor area calculation for heated basement for prototype models; fixed a bug in the slab edge insulation implementation; fixed a bug in the basement insulation implementation. Previously, basement insulation was incorrectly put in climate zone 3A Warm-Humid (WH). Climate zone 3A WH climates do not require basement insulation, so this change removes that insulation. The heat pump water heaters in the oil furnace prototypes as part of the reduced energy use in service water heating additional efficiency for the 2021 IECC were set to use oil as a backup fuel source which have been corrected to electricity. Those corrections had a minor impact on total energy consumption.

Other Updates

A few minor updates were implemented to enhance the overall residential infrastructure simulation capabilities: added interior lights in the heated basement and moved the IECC adjusted load originally distributed in 18 living units in MF to a single load object in the heated basement; updated the HPWH sizing strategies from auto-size to hardcoded capacity based on the market products database from AHRI; updated the system sizing parameters: *Cooling Design Capacity Method* and *Heating Design Capacity Method* to *FractionOfAutosizedCoolingCapacity* and *FractionOfAutosizedHeatingCapacity*

Appendix D – Modeling of Individual Code Changes

This section describes the modeling strategies used for modeling the eight code changes in the quantitative analysis.

REPI-018 Energy Credits

Recent energy codes have included provisions for additional efficiency measures above and beyond the prescriptive code requirements that must be included in the building design and construction. The additional efficiency in the 2024 IECC (REPI-18) comes in the form of energy credits where energy efficiency measures are assigned energy credits based on the percentage of annual total site energy savings achieved over the baseline prescriptive energy code. Energy credit savings could be expressed in terms of site energy, energy cost, or greenhouse gas emissions depending on the emphasized metric. The higher the savings, the more energy credits assigned. The energy credits are divided into traditional efficiency measures (envelope, HVAC, service water heating, thermal distribution systems, air leakage, and appliances). The amount of energy credits for each measure was determined based on simulation analysis of the energy measure over the prescriptive code for each climate zone. The 2024 IECC stipulates that a typical residential building must achieve 10 energy credits (by selecting not less than two energy credit measures) for prescriptive compliance while dwelling units over 5,000 sq ft must achieve an additional 5 energy credits. The energy credits provide flexibility for meeting the required credit amount, by allowing various combinations of measures to meet the requirement. For the 2024 IECC quantitative analysis, energy credit measures were selected to meet the required 10 energy credits based on several factors including standard practice, cost effectiveness, and the ability to quantify savings using the methodology described in this report. Tables D.1 and D.2 show the energy credit measures selected for the quantitative analysis for the electric prototypes and fossil fuel prototypes respectively.

Table D.1. 2024 IECC Energy Credit Measures for Quantitative Analysis for All-Electric Buildings (Heat Pump and Electric Furnace)

		Credit Value								
Measure	Measure Description	CZ 1	CZ 2	CZ 3	CZ 4	CZ 4C	CZ 5	CZ 6	CZ 7	CZ 8
R408.2.1.2(1)	U-factor and SHGC for windows						1			
R408.2.3(3)	Integrated HPWH: UEF = 3.30	10	9	9	7	6	4	3	3	2
R408.2.3(8)	Compact Hot Water Distribution				2	2	2			
R408.2.4(3)	80% of Ducts in Conditioned Space							7	7	9
R408.2.5(1)	HRV installed					1	3			
R408.2.6	Energy Efficient Appliances	1	1	1	1	1				
Total Credits		11	10	10	10	10	10	10	10	11

Table D.2. 2024 IECC Energy Credit Measures for Quantitative Analysis for Mixed Fuel Buildings (Gas and Oil Furnaces)

		Credit Value								
Measure	Measure Description	CZ 1	CZ 2	CZ 3	CZ 4	CZ 4C	CZ 5	CZ 6	CZ 7	CZ 8
R408.2.1.2(1)	U-factor and SHGC for windows						1			
R408.2.2(2)	High Performance Cooling 15.2 SEER2	5	4	3	2					
R408.2.2(5)	High Performance Furnace 95 AFUE					3		6	7	8
R408.2.3(2)(b)	Gas Instant Water Heater UEF = 0.95						6			
R408.2.3(8)	Compact Hot Water Distribution	2	2	2	2		2	2	2	2
R408.2.4(2)	100% of Ducts in Conditioned Space	2	3	4	6	7				
R408.2.5(1)	HRV installed							2	2	
R408.2.6	Energy Efficient Appliances	1	1	1			1			
Total Credits		10	10	10	10	10	10	10	11	10

Energy Credits (Electric Prototypes) – Heat Pump Water Heater (HPWH)

The water heater type for the electric prototype buildings (heat pump and electric furnace) is a 40-gallon electric storage hot water heater with a UEF of 0.93. This credit replaces the electric water heater with an integrated heat pump water heater (HPWH) rated with a UEF of 3.30 as specified with energy credit R408.2.3(3). The tank sizes are 80-gallon for single-family prototypes and 50-gallons for the multifamily dwelling units. The HPWH replaces the electric water heaters in all electric prototype buildings across all climate zones.

Energy Credits (Electric & Fossil Fuel Prototypes) – Compact Hot Water Design

The quantitative analysis of the compact hot water design energy credit is feasible due to the added functionality described in Appendix C for hot water energy modeling and pipe design. For the single-family and multifamily prototype floor plans, typical hot water piping layouts were estimated based on foundation type and location of the hot water heater. These hot water piping layouts covered approximately 80 percent of the conditioned floor area. For the compact hot water design (R408.2.3(8)), a new floor layout was assumed that created a new hot water piping layout to meet the 16-ounce volumetric requirements in the pipe length between the hot water heater and farthest hot water fixture. The compact hot water layout utilizes shared walls for hot water fixtures (e.g., a kitchen sink and dishwasher on the opposite side of a shared wall with a bathroom) and places the water heater as close to these fixtures as possible to create the compact design. The compact hot water piping layout covered approximately 3 percent of the conditioned floor area. The compact hot water system design energy credit is modeled by estimating the reduction in pipe lengths from the water heater to the hot water fixtures. The heat loss savings are simulated based on the pipe lengths in the baseline and compact hot water designs. Ultimately, the reduction in hot water usage for the compact design is estimated based on the "time to tap" (estimated time for hot water to arrive at fixtures from the water heater) and the average number of cold start events per day (15 in this analysis). The quantitative analysis for this report found reducing the pipe length by 70 percent resulted in about 33 percent reduction in daily hot water usage. The compact design credit is applied to the electric prototypes in climate zone 4 and all climate zones except 4C for the fossil fuel prototypes.

Energy Credits (Electric Prototypes) – 80% of Ducts in Conditioned Space

The ducts in conditioned space energy credit involves the relocation of the HVAC ductwork from unconditioned space to the conditioned space. Initially, 75 percent of the ducts are situated within unconditioned space, specifically in slab, crawlspace, and unheated basement prototypes. For the heated basement prototype, ducts within conditioned space are increased by 5 percent, since the baseline prototype contains 75 percent of ducts in the conditioned space. The primary objective of this energy credit measure is to increase the proportion of ducts within conditioned space to 80 percent. The prototype model HVAC duct systems consist of 65 percent supply ducts and 35 percent return ducts by total duct length. For the modeling of this energy credit, HVAC ducts were relocated proportionally so that 80% of the supply ducts and 80% of the return ducts were set into the conditioned space. This strategic adjustment is intended to increase the overall efficiency of HVAC systems by reducing heat loss or gain associated with ducts exposed to extreme temperatures in unconditioned areas. The 80 percent of ducts in conditioned space energy credit measure applies only to the electric furnace and heat pump prototypes in climate zones 5 through 8.

Energy Credits (Electric & Fossil Fuel Prototypes) – Heat Recovery Ventilator

The introduction of the heat recovery ventilator credit brings forth significant advancements, incorporating two pivotal changes to the existing framework: i) the integration of a highly efficient heat recovery ventilator specifically tailored for climate zone 4C for the electric prototypes and climate zone 5 for fossil fuel prototypes, and ii) the enhancement of sensible recovery efficiency (SRE) standards from the prior threshold of 0.65 to a more robust and sustainable level of 0.75, demonstrating a concerted effort towards enhancing environmental sustainability.

Energy Credits (Electric & Fossil Fuel Prototypes) – ENERGY STAR Appliances

Energy credit R408.2.6 for the installation of ENERGY STAR rated appliances applies to refrigerators, dishwashers and clothes washers/dryers. The current prototypes utilize standard appliance consumption values are based on the 2014 Building America House Simulation Protocols developed by the National Renewable Energy Laboratory (NREL).[14] The appliance consumptions align closely with the RESNET default appliances in the RESNET Standard 301. Table D.3 shows the annual consumption values of the standard efficiency and ENERGY STAR appliances that are modeled to determine the energy savings. The ENERGY STAR appliance credit is applied to the electric prototypes in climate zones 1 through 4 and for the fossil fuel prototypes in climate zones 1 through 3.

Table D.3. 2024 IECC Energy Credit Measures for ENERGY STAR Appliances

Appliance	Standard Efficiency	ENERGY STAR
Refrigerator	669 kWh/yr	620 kWh/yr
Dishwasher	206 kWh/yr	116 kWh/yr
Clothes Washer	105 kWh/yr	47kWh/yr
Clothes Dryer	835 kWh/yr	835 kWh/yr

Energy Credits (Fossil Fuel Prototypes) – High Performance Cooling

The central air-conditioner in the fossil fuel prototype buildings (gas and oil furnaces) is a split-system, forced-air ducted unit. This unit is automatically sized by EnergyPlus in the models based on the building specifications and climate zone and rated at the federal minimum efficiency of 13 SEER or 14 SEER based on location. Split system air conditioners require a seasonal cooling efficiency of 14 SEER in the southern states. After January 1, 2023, the federal minimum split system air-conditioner efficiency is now rated at 13.4 SEER2 across all states. The R408.2.2(2) energy credit for high performance cooling replaces the federal minimum efficiency air-conditioner with a similar sized unit at a seasonal efficiency of 15.2 SEER2. The high-performance cooling energy credit is applied to the fossil fuel prototypes in climate zones 1 through 4A/4B.

Energy Credits (Gas Prototypes) – High Performance Natural-Gas Furnace

The natural-gas furnace in the gas prototype buildings is a federal minimum efficiency, forced-air ducted system. This gas furnace is automatically sized by EnergyPlus in the models based on the building specifications and climate zone and rated at the federal minimum efficiency of 80 AFUE. The R408.2.2(5) energy credit for high performance gas furnace replaces the federal minimum efficiency gas furnace with a similar sized unit at a seasonal efficiency of 95 AFUE. The high-performance gas furnace energy credit is applied to the gas furnace prototypes in climate zones 4C through 8.

Energy Credits (Fossil Fuel Prototypes) – 100% of Ducts in Conditioned Space

The energy credit for 100 percent of ducts in conditioned space entails the strategic relocation of all ductwork previously situated within unconditioned areas, such as crawlspaces, unheated basements and attics, into the conditioned space. All ductwork is located completely inside the continuous air barrier and within the building thermal envelope. The 100 percent of ducts in conditioned space energy credit applies only in climate zones 1 through 4 for the fossil fuel prototypes. This process aims to optimize the efficiency and performance of HVAC systems by mitigating heat loss or gain associated with ducts exposed to extreme temperatures in

14 https://www.nrel.gov/docs/fy14osti/60988.pdf#:~:text=The%20House%20Simulation%20Protocols%20(HSP)%20document%20provides,in%20investigating%20the%20energy%20use%20of%20advanced

unconditioned spaces. By transferring ducts to conditioned areas, the credit not only enhances energy conservation but also promotes improved comfort levels for occupants.

REPI-028 Fenestration U-Factors

REPI-028 introduces improvements to fenestration U-factors across multiple climate zones in the transition from the 2021 IECC to the 2024 IECC. Notably, U-factor reductions from 0.30 to 0.28 for zones 4C, 5, and 6, and to 0.27 for zones 7 and 8. Table D.4 provides a comparison of these changes.

Table D.4. Fenestration U-factors for Climate Zones 4C-8 for the 2021 IECC and 2024 IECC

Climate Zone	2021 IECC	2024 IECC
4C, 5 & 6	0.30	0.28
7 & 8	0.30	0.27

REPI-033 Ceiling Insulation R-Values

REPI-033 mandates adjustments to ceiling R-values across various climate zones in the transition from the 2021 IECC to the 2024 IECC. Notably, R-values decrease to R-38 from R-49 in climate zones 2 and 3, and from R-60 to R-49 in climate zones 4 through 8. This code changes moves the ceiling insulation levels back to the 2018 IECC. Table D.5 illustrates the changes between the ceiling insulation values between 2021 IECC and 2024 IECC.

Table D.5. Ceiling Insulation R-Values for climate Zones 2-8 for the 2021 IECC and 2024 IECC

Climate Zone	2021 IECC	2024 IECC
2 & 3	R-49	R-38
4 - 8	R-60	R-49

REPI-063 Prescriptive Air Leakage (4.0 ACH50, climate zones 0 – 2)

REPI-063 enhances energy efficiency by reducing infiltration rates in climate zones 1 and 2 from 5.0 ACH50 to 4.0 ACH50 through improved air sealing techniques. Table D.6 illustrates the changes in air changes per hour values between 2021 and 2024 IECC.

Table D.6. Air Leakage Rate for climate Zones 1-2 for the 2021 IECC and 2024 IECC

Climate Zone	2021 IECC	2024 IECC
1 & 2	5.0 ACH50	4.0 ACH50

REPI-064 Prescriptive Air Leakage (2.5 ACH50, climate zones 6 – 8)

REPI-064 maintains IECC 2021 infiltration rates for climate zones 3, 4, and 5, while reducing rates from 3.0 ACH50 to 2.5 ACH50 for climate zones 6, 7, and 8. Table D.7 highlights the updates in air changes per hour values between the 2021 and 2024 IECC.

Table D.7. Air Leakage Rate for climate Zones 3-8 for the 2021 IECC and 2024 IECC

Climate Zone	2021 IECC	2024 IECC
3, 4 & 5	3.0 ACH50	3.0 ACH50
6 - 8	3.0 ACH50	2.5 ACH50

REPI-089 R-7 Pipe Insulation

REPI-089 increases pipe insulation requirements for domestic hot water systems. The insulation requirement increases from R-3 to R-7 for ¾ inch piping across all climate zones. This change is applied to the prototypes using the hot water modeling strategy described in Appendix C.

REPI-093 Heat Recovery Ventilation (HRV)

REPI-093 introduces new language in the 2024 IECC mandating that dwelling units in climate zone 6 must be equipped with a heat recovery or energy recovery ventilator. The ventilation system is to be balanced, with a sensible heat recovery efficiency of not less than 65 percent.

For the quantitative analysis, a heat recovery ventilator with an SRE of 0.65 replaced the exhaust fan in both single family and multifamily prototypes, forming a balanced air system consisting of one supply and one exhaust fan. Table D.8 displays the recovery efficiency for the heat recovery ventilator.

Table D.8. Heat Recovery Ventilator Recovery Efficiency for the 2021 IECC and 2024 IECC

Climate Zone	2021 IECC	2024 IECC
5	NA	65%

RED1-110 Exterior Lighting Power Allowance

RED1-110 adds a new lighting power allowance table to match the lighting power allowances in the commercial IECC for multifamily buildings. The lighting power allowance table reduced the base lighting wattage, the lighting power densities for parking and landscape areas, while maintaining the façade lighting power density. The base lighting wattage is decreased from 400W to 280W. Additionally, the power densities for parking areas and landscape lighting are reduced from 0.04 W/ft^2 to 0.026 W/ft^2 and from 0.05 W/ft^2 to 0.025 W/ft^2, respectively. These power allowances were applied to the multifamily prototype models only. Table D.9 highlights the exterior lighting areas for the multifamily prototypes and the exterior lighting power allowance differences between the 2021 and 2024 IECC.

Table D.9. Exterior Lighting Allowances for the 2021 IECC and 2024 IECC

Lighting Area	Area (ft^2)	2021 IECC Allowance	2021 IECC Total Wattage	2024 IECC Allowance	2024 IECC Total Wattage
Base Wattage	NA	400 W	400	280 W	280
Parking Area	19,483	0.04 W/ft^2	779	0.026 W/ft^2	507
Façade Lighting	853	0.075 W/ft^2	64	0.075 W/ft^2	64
Landscape Lighting	3,000	0.04 W/ft^2	120	0.025 W/ft^2	75

Appendix E – Additional Measures Available for State and Local Adoption

This appendix highlights the code change proposals that were approved by the residential consensus committee but later removed by the ICC Board of Directors due to appeals. Table F.1 lists the proposals that were removed from the 2024 IECC by appeal, but which remain available for adoption. DOE encourages states and local governments to consider adopting these measures when updating and certifying their building energy codes in accordance with the 2024 IECC.

Table E.1. 2024 Additional Decarbonization Measures Available for State and Local Adoption

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Discussion
RECPI-006-21	R202 (New), R404.4 (New), R404.4.1 (New), R404.4.2 (New), R404.4.3 (New), R404.4.4 (New), R404.4.5 (New), UL Chapter 06 (New)	Committee proposal to take into account Proposals CEPI-146 Part II, CEPI-258-21 Parts II & III, REPI-15-21, which address electric vehicle supply equipment (EVSE) installations in one- and two-family dwellings and townhomes with their associated parking facilities.	Inclusion of this proposal in the text of the IECC would ensure that 100 percent of these types of occupancies will either have EVSE installed or be able to have EVSE installed at minimal cost at a future date.
RECPI-007-21	R202 (New), R404.4 (New), R404.4.1 (New), R404.4.2 (New), R404.4.3 (New), R404.4.4 (New), R404.4.4.1 (New), R404.4.5 (New), R404.4.5.1 (New), UL Chapter 06 (New)	Committee proposal that takes into account Proposals CEPI-146 Part II, CEPI-258-21 Parts II & III, REPI-15-21, which address EVSE installations in R-2 occupancies.	Inclusion of this proposal in the text of the IECC would ensure that 100 percent of these types of occupancies will either have EVSE installed or be able to have EVSE installed at minimal cost at a future date.
REPI-007-21	R202 (New), R103.2.2 (New), R105.2.3, R105.2.5 (New), R105.2.5, R401.3, R404.4 (N1104.4) (New), R404.4.1 (N1104.4.1) (New), R404.4.1.1 (N1104.4.1.1) (New), R404.4.1.2 (N1104.4.1.2) (New), R404.4.1.3 (N1104.4.1.3) (New), R404.4.1.4 (N1104.4.1.4) (New), R404.4.2	Adds new definitions and code provisions for homes to be solar ready.	The proposed revisions and additions to the code have been moved from the 2021 IECC Appendix RB Solar-Ready Provisions to the base code. The amendments would require all new homes to be solar ready by requiring a designated 300 square foot minimum “solar ready zone” on the roof.

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Discussion
	(N1104.4.2) (New), TABLE R405.2, TABLE R406.2		
REPI-070-21	R202 (New), R403.1, R403.1.1, R403.1.2 (New), R403.1.2.1 (New), R403.1.2.2 (New), R407.2, CTA (New), IEC (New), OpenADR (New), AHRI Chapter 06 (New), CTA Consumer Technology Association Technology & Standards Department (New)	Adds two definitions for demand response signal and control, adds requirements for demand responsive thermostats and new sections for single stage HVAC system controls and variable capacity/two stage demand response controls. New additions to Chapter 6 references for CTA, IEC, OpenADR, and AHRI.	Realizing grid-interactive efficient buildings (GEBs) requires buildings with automated demand response capabilities that enable standardized control, subject to explicit consumer consent, of energy smart appliances on an electricity network. This is achieved through communication between appliances and a controlling entity that is in communication with the consumer participants.
REPI-090-21	R202 (New), R403.5.4 (New), TABLE R403.5.4 (New), TABLE R405.2, TABLE R406.2, ANSI Chapter 06 (New), ASME Chapter 06 (New)	Adds two definitions for demand responsive control and demand response signal, a new section for demand responsive water heating requirements and Table R403.5.4 defining demand responsive controls for water heating.	Would allow the thermal storage in storage water heaters to become grid-interactive with demand response controls to use of water heating energy when the energy is abundant, clean, and/or inexpensive.
REPI-111-21	R404.4 (N1104.4) (New), R404.4.1 (N1104.4.1) (New), R404.4.2 (N1104.4.2) (New), R404.4.3 (N1104.4.3) (New), R404.4.4 (N1104.4.4) (New), R404.4.5 (N1104.4.5) (New)	Adds new sections in R404 for electric readiness requirements (individual branch circuits) in mixed fuel homes for cooking products, clothes dryers, water heaters, electrification ready circuits and water heater space for future heat pump water heaters.	Would ensure that a home built with gas or propane can easily accommodate future electric appliances and equipment. Change would protect homeowners from future costs, should natural gas become less affordable or even unavailable over the life of the building.
REPI-155-21	RC102 (AX102) (New), R202 (New), Appendix RX (New), RX101 (New), RX101.1 (New), RX101.2	Adds a new optional appendix for all-electric building requirements.	Would align Appendix RE with the ICC's stated goals on carbon and energy reductions by requiring buildings be all-electric in addition to

Proposal Number[a]	Code Section(s)[b]	Description of Change(s)	Discussion
	(New), RX102 (New), RX102.1 (New)		energy efficient. Since the Appendix is structured to be used as an optional stretch code, it presents opportunities for jurisdictions to begin to move residential construction toward full decarbonization in line with climate goals.

For more information, visit: energy.gov/eere

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