Zero Fuel Bias Overlay for Commercial and Taller Multifamily Buildings v1.0

For use with the 2024 International Energy Conservation Code and/or ANSI/ASHRAE/IES Standard 90.1-2022

Justification and Analysis

*This proposal is intended for jurisdictions considering the adoption of the **2024 International Energy Conservation Code Commercial Provisions (2024 IECC) and/or ANSI/ASHRAE/IES Standard 90.1-2022** (ASHRAE 90.1-2022). It adjusts all compliance options so that mixed-fuel and heat pump buildings will be required to meet comparable levels of site energy efficiency.*

*The quantification of all newly proposed and re-baselined credits and conservation objectives is to be determined (TBD). Jurisdictions considering adopting the Code Overlays should reach out to the **US Department of Energy's Building Energy Codes Program** (DOE BECP) to request assistance calculating TBD figures that are appropriate for the climate zones and market conditions across the relevant state or locality. DOE BECP, in conjunction with **Pacific Northwest National Laboratory** (PNNL), provides technical assistance to states and local governments who are updating and implementing their energy codes, free of charge, commonly including technical analysis to help inform energy code deliberations and assess code impacts, and based on the same calculation methods and performance targets used for developing the IECC and ASHRAE 90.1. Alternatively, third-party firms with expertise in energy codes and modeling may be able to provide this service.*

Proposed code text is depicted through <u>underlining,</u> and proposed deletions are depicted through ~~strike-through formatting~~. Explanatory text, not intended to be part of the code, is depicted in italics. In the context of code text, italics indicate the use of a term defined in code.

***Prescriptive pathway.** It is standard practice for credit values to be determined by calculating the savings from the measure compared to a baseline model building using the same fuel for the relevant end use. The 2024 IECC compares heat pump measures to minimum-efficiency electric space heating equipment, while gas furnace measures are compared to a minimum-efficiency gas furnace. This suggests that a building complying with the prescriptive pathway using a natural gas boiler and gas tank water heater may be less energy efficient than an otherwise identical building using an air source heat pump and heat pump water heater.*

The prescriptive pathway in this proposal would instead compare all efficiency measures against a site energy use intensity (EUI) baseline using a minimum-efficiency gas furnace and gas tank water heater. A new measure will award credits based on the energy savings from using heat pump equipment rather than gas equipment, where both appliances meet and do not exceed federal minimum appliance efficiency standards.

***Performance pathway.** The simulated building performance pathway requires that the site EUI of the as-designed model be at least a certain percentage below the site EUI of the standard reference design model. The exact percentage required depends on building type and climate zone, and are TBD by PNNL analysis, such that this pathway will be equally stringent to the prescriptive pathway.*

***ASHRAE 90.1 Appendix G pathway.** This pathway amends ASHRAE 90.1 Informative Appendix I and Appendix G, and removes ASHRAE 90.1 prescriptive and energy cost budget compliance options. The modifications adjust Appendix G's building performance factors (BPFs) to reflect site EUI differences instead of energy cost differences. The BPF required depends on building type and climate zone, and are TBD by PNNL analysis, such that this pathway will be equally stringent to the prescriptive pathway.*

Proposal

General

*Adopt the **2024 International Energy Conservation Code**, including **Appendix CH**, as modified.*

Amend as follows:

> **C101.2 Scope.** This code applies to the design and construction of buildings not covered by the scope of the IECC — Residential Provisions.
>
> > **C101.2.1 Appendices.** Provisions in the appendices shall not apply unless specifically adopted and referenced as a requirement of a compliance option. **Appendix CH** is adopted as a requirement for compliance paths as specified in **Section C401.2**.

Amend as follows:

> **ENERGY USE INTENSITY (EUI).** The metric indicating the total amount of site energy consumed by a *building* in 1 year divided by the gross floor area of the *building*.

Amend as follows:

> **C401.2 Application.** *Commercial buildings* shall comply with **Appendix CH** and either **Section C401.2.1** or **C401.2.2**.
>
> > **C401.2.1 International Energy Conservation Code**. *Commercial buildings* shall comply with one of the following:
> >
> > 1. Prescriptive Compliance. The Prescriptive Compliance option requires compliance with **Sections C402** through **C406** and **Section C408**. *Dwelling units* and *sleeping units* in Group R-2 buildings shall be deemed to be in compliance with this chapter, provided that they comply with **Section R406**.
> >
> > 2. *Simulated Building Performance*. The *Simulated Building Performance* option requires compliance with **Section C407**.
>
> > **C401.2.2 ASHRAE 90.1 Appendix G.** *Commercial buildings* shall comply with the requirements of **ANSI/ASHRAE/IES 90.1 Appendix G**.

Prescriptive Pathway

*Delete **Table C406.1.1(1)** and replace with **Table CF102.1(1)**. The intent of this change is to prevent this proposal's provision of due credit to heat pump measures from inadvertently reducing the energy efficiency required by the code. Credits may be further adjusted to increase stringency using one of the below approaches:*

1. *To set a level of stringency consistent with the recommendations of the 2024 IECC Consensus Committee, apply the 1.25 credit multiplier from **Section CF103.1** to credit requirements for all buildings, regardless of fuels and equipment in the proposed design.*

2. *Increase the number of credits required for every building type and climate zone by the credit value of **C406.2.2.6 H06** when calculated with a coefficient of performance (COP) that meets and does not exceed US Department of Energy minimum efficiency standards for a package heat pump.*

*Modify **C406.2.2** as follows:*

C406.2.2 More efficient HVAC equipment performance. All heating and cooling systems shall meet the minimum requirements of **Section C403** and efficiency improvements shall be referenced to minimum efficiencies listed in tables referenced by Section **C403.3.2**. Where multiple efficiency requirements are listed, equipment shall meet the seasonal or part-load efficiencies including SEER, integrated energy efficiency ratio (IEER), *integrated part load value* (IPLV) or AFUE. Equipment that is larger than the maximum capacity range indicated in tables referenced by **Section C403.3.2** shall utilize the values listed for the largest capacity equipment for the associated equipment type shown in the table. Where multiple individual heating or cooling systems serve the project, the improvement shall be the weighted-average improvement based on individual system capacity. Systems are permitted to achieve HVAC energy credits by meeting the requirements of one of the following:

1. **C406.2.2.1** H01.
2. **C406.2.2.2** H02.
3. **C406.2.2.3** H03.
4. **C406.2.2.4** H04.
5. **C406.2.2.5** H05.
6. <u>**C406.2.2.6** H06.</u>
7. Any combination of H02, H03, H04~~, and~~ H05<u>, and H06</u>.

Amend as follows:

C406.2.2.6 H06 High-Efficiency Heating Equipment Credit Alignment. In accordance with **Section C406.1.1**, not less than 90 percent of the total HVAC heating capacity serving the total *conditioned floor area* of the entire *building* or tenant space shall comply with the requirements of this section. This credit is available for all projects that utilize equipment whose heat efficiencies are listed in tables referenced by **Section C403.3.2.** Energy efficiency credits for heating shall be determined using **Equation 4-19**, rounded to the nearest whole number. Supplemental gas and electric heat for heat pump systems shall be excluded from the weighted average.

$$EEC_{HEHE} = EEC_{Base}\ x\ \frac{EQ_{Design} - 0.8}{2.1} \quad \text{(not less than zero)} \qquad \textbf{Equation 4-19}$$

where:

EEC_{HEHE} = Energy efficiency credits for utilizing high-efficiency equipment listed in the tables referenced by **Section C403.3.2.**

EEC_{Base} = **C406.2.2.6** credits from **Tables C406.2(1)** through **C406.2(9)**.

EQ_{Design} = Minimum required efficiency metric, part-load or annualized where available from **Section C403.3.2,** for the proposed piece of equipment. For heat pumps rated at multiple ambient temperatures, the efficiency at 47°F (8.3°C) shall be used. E_t, E_c, or AFUE efficiency metrics are allowed to be used for combustion appliances. For heat pumps, COP_H shall be used. HSPF2 values shall be divided by 3 to calculate approximate COP_H.

Modify **Section C406.2.3.1.2** *as follows:*

$$EC_{HPWH} = \left(\frac{EC_{BASE}}{0.5}\right)\ x\ \left\{\left(\frac{CAP_{HPWH}}{Endload}\right) \text{[not greater than 2]}\right\} \qquad \textbf{Equation 4-~~19~~20}$$

Delete the following from **Section C406.2.3.1.2**:

~~Where the heat pump capacity at 50°F (10°C) entering air and 70°F (21°C) entering water exceeds 50 percent of the design end-use load, excluding recirculating system losses, the base credits from Section C406.2 shall be prorated based on Equation 4-20.~~

$$\text{~~W02 credit = base W02 table credit~~}\ x\ \left(\frac{HP_{tf}}{50\%}\right) \qquad \textbf{~~Equation 4-20~~}$$

~~Where:~~
~~HP_{tf} = Heat pump capacity as a fraction of the design end-use SHW requirements, excluding recirculating system losses, not to exceed 80 percent.~~

Amend **Tables C406.2(1)** through **C406.2(9)** so that all credit values are "TBD." Credit values for existing measures shall be recalculated to reflect site energy improvements compared to a standard reference design that uses natural gas space and water heating equipment, neither of which may exceed the US Department of Energy's currently effective minimum efficiency standard for those products.

Add Credit H06 to **Tables C406.2(1)** through **C406.2(9)** as follows. The TBD credit values for these measures shall be calculated to reflect site energy improvements compared to a standard reference design that uses natural gas space heating and a package terminal heat pump, neither of which may exceed the US Department of Energy's currently effective minimum efficiency standard for those products.

TABLE C406.2(1)
BASE ENERGY CREDITS FOR GROUP R-2, R-4 AND I-1 OCCUPANCIES

ID	ENERGY CREDIT MEASURE	SECTION	CLIMATE ZONE																		
			0A	0B	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
H06	High-Efficiency Heating Equipment Credit Alignment	C406.2.2.6	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

TABLE C406.2(2)
BASE ENERGY CREDITS FOR GROUP I-2 OCCUPANCIES

ID	ENERGY CREDIT MEASURE	SECTION	CLIMATE ZONE																		
			0A	0B	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
H06	High-Efficiency Heating Equipment Credit Alignment	C406.2.2.6	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

TABLE C406.2(3)
BASE ENERGY CREDITS FOR GROUP R-1 OCCUPANCIES

ID	ENERGY CREDIT MEASURE	SECTION	CLIMATE ZONE																		
			0A	0B	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
H06	High-Efficiency Heating Equipment Credit Alignment	C406.2.2.6	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

TABLE C406.2(4)
BASE ENERGY CREDITS FOR GROUP B OCCUPANCIES

ID	ENERGY CREDIT MEASURE	SECTION	CLIMATE ZONE																		
			0A	0B	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
H06	High-Efficiency Heating Equipment Credit Alignment	C406.2.2.6	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

TABLE C406.2(5)
BASE ENERGY CREDITS FOR GROUP A-2 OCCUPANCIES

ID	ENERGY CREDIT MEASURE	SECTION	CLIMATE ZONE																		
			0A	0B	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
H06	High-Efficiency Heating Equipment Credit Alignment	C406.2.2.6	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

TABLE C406.2(6)
BASE ENERGY CREDITS FOR GROUP M OCCUPANCIES

ID	ENERGY CREDIT MEASURE	SECTION	CLIMATE ZONE																		
			0A	0B	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
H06	High-Efficiency Heating Equipment Credit Alignment	C406.2.2.6	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

TABLE C406.2(7)
BASE ENERGY CREDITS FOR GROUP E OCCUPANCIES

ID	ENERGY CREDIT MEASURE	SECTION	CLIMATE ZONE																		
			0A	0B	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
H06	High-Efficiency Heating Equipment Credit Alignment	C406.2.2.6	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

TABLE C406.2(8)
BASE ENERGY CREDITS FOR GROUP S-1 AND S-2 OCCUPANCIES

ID	ENERGY CREDIT MEASURE	SECTION	CLIMATE ZONE																		
			0A	0B	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
H06	High-Efficiency Heating Equipment Credit Alignment	C406.2.2.6	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

TABLE C406.2(9)
BASE ENERGY CREDITS FOR OTHER OCCUPANCIES

ID	ENERGY CREDIT MEASURE	SECTION	CLIMATE ZONE																		
			0A	0B	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
H06	High-Efficiency Heating Equipment Credit Alignment	C406.2.2.6	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

Simulated Building Performance Compliance

Modify **Section C407.2** *as follows.*

C407.2 Mandatory requirements. Compliance based on simulated building performance requires that a *proposed design* meet all of the following:

1. The requirements of the sections indicated within **Table C407.2(1).**

2. ~~An annual *energy cost* that is less than or equal to t~~The required percen~~tage~~ reduction of the annual *energy* ~~cost~~ *use intensity* (PR_{EUI}~~EC~~) of the *proposed design* compared to the *standard reference design* shall be calculated ~~in~~ according to **Equation 4-34**. ~~Energy prices shall be taken from a source *approved* by the *code official*, such as the Department of Energy, Energy Information Administration's *State Energy Data System Prices and Expenditures* reports. *Code officials* shall be permitted to require time-of-use pricing in *energy cost* calculations.~~ The reduction in *energy* ~~cost~~ *use intensity* of the *proposed design* associated with *on-site renewable energy* shall be not more than 5 percent of the total *energy* ~~cost~~ *use intensity*. The amount of renewable energy purchased from off-site sources shall be the same in the *standard reference design* and the *proposed design*.

~~$PAEC = 100 \times (0.80 + 0.025 - EC_r/1000)$~~

$$PR_{EUI} = \frac{EUI_{PD}}{EUI_{SRD}}$$

where:

~~$PAEC$~~ PR_{EUI} = The percen~~tage~~ reduction of the annual energy ~~cost~~ *use intensity* of the *proposed design* compared to the *standard reference design* as required by **Table C407.2(2)**.

~~ECr = Energy efficiency credits required for the building in accordance with **Section C406.1** (do not *include load management and renewable credits*).~~

EUI_{PD} = The *energy use intensity* of the *proposed design*.

EUI_{SRD} = The *energy use intensity* of the *standard reference design*.

~~*Exceptions:*~~

~~1. Jurisdictions that require site energy (1 kWh = 3413 Btu) rather than energy cost as the metric of comparison.~~

~~2. Where energy use based on source energy expressed in Btu or Btu per square foot of conditioned floor area is substituted for the energy cost, the energy use shall be calculated using source energy factors from Table C407.2(2). For electricity, US locations shall use values from eGRID subregions. Locations outside the United States shall use the value for "All other electricity" or locally derived values.~~

*Delete **Table C407.2(2)** and replace with the following. TBD values shall be replaced by required percent reduction figures consistent with the site energy outcomes of compliance with the prescriptive option as specified in **Section C401.2.1**.*

TABLE C407.2(2)
REQUIRED PERCENT REDUCTION OF PROPOSED DESIGN COMPARED TO THE STANDARD REFERENCE DESIGN

BUILDING OCCUPANCY GROUPS	CLIMATE ZONE																		
	0A	0B	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
R-2, R-4 and I-1	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
I-2	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R-1	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
B	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
A-2	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
M	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
E	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
S-1 and S-2	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
All other	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

ASHRAE 90.1 Appendix G Pathway

Modify Section 3 as follows:

baseline building performance: the annual *site energy* ~~cost~~ for a *building* design intended for use as a baseline for rating above-standard design or when using the *Performance Rating Method* as an alternative path for minimum standard compliance in accordance with Section 4.2.1.1.

proposed building performance: the annual *site energy* ~~cost~~ calculated for a *proposed design*.

Modify Section 4.2.1.1 as follows:

4.2.1.1 New Buildings. New *buildings* shall comply with Section 4.2.2 through 4.2.5 and ~~either the provisions of~~

~~a. Sections 5, "Building Envelope"; 6, "Heating, Ventilating, and Air Conditioning"; 7, "Service Water Heating"; 8, "Power"; 9, "Lighting"; 10, "Other Equipment"; and 11, "Additional Efficiency Requirements," or~~

~~b. Section 12, "Energy Cost Budget Method," or~~

~~c. Normative Appendix G, "Performance Rating Method."~~

Modify Section 4.2.1.1 as follows:

[. . .]

When using Normative Appendix G, the Performance ~~Cost~~ Index (P~~C~~I Site *Energy*) of new *buildings*, *additions* to *existing buildings*, and/or *alterations* to *existing buildings* shall be less than or equal to the Performance ~~Cost~~ Index Target (P~~C~~I$_t$) when calculated in accordance with the following:

$$P\text{C}I_t = [BBUE\text{C} + (BPF_{site} \times BBRE\text{C}) - PRE]/BBP$$

<u>where</u>

P~~C~~I = Performance ~~Cost~~ Index <u>(Site *Energy*)</u> calculated in accordance with Section G1.2.

BBUE~~C~~ = baseline *building* unregulated <u>site *energy*</u> ~~cost~~, the portion of the annual <u>site *energy*</u> ~~cost~~ of a *baseline building design* that is due to *unregulated energy use.*

BBRE~~C~~ = baseline *building* regulated <u>site *energy*</u> ~~cost~~, the portion of the annual <u>site *energy*</u> ~~cost~~ of a *baseline building design* that is due to *regulated energy use.*

BPF = *building* performance factor from Table 4.2.1.1. For *building* area types not listed in Table 4.2.1.1 use "All others." Where a *building* has multiple *building* area types, the required BPF shall be equal to the area-weighted average of the *building* area types based on their *gross floor area*. Where a project includes an *existing building* and an *addition*, the required BPF shall be equal to the area-weighted average, based on the *gross floor area*, of the *existing building* BPF determined as described in Section 4.2.1.3 and the *addition* BPF from Table 4.2.1.1

BBP = baseline *building* performance.

PBP = *proposed building performance*, including the reduced, annual ~~purchased~~ site *energy* ~~cost~~ associated with all *on-site renewable energy* generation *systems.*

PBP$_{nre}$ = *proposed building performance* without any credit for reduced annual *energy* ~~costs~~ from *onsite renewable energy* generation *systems.*

PBP$_{pre}$ = *proposed building performance*, excluding any *renewable energy system* in the *proposed design* and including an *on-site renewable energy system* that meets but does not exceed the requirements of Section 10.5.1.1 modeled following the requirements for a *budget building design* in Table 12.5.1.

PRE = PBP$_{nre}$ − PBP$_{pre}$

When (PBP$_{pre}$ − PBP)/BBP > 0.05, new *buildings*, *additions* to *existing buildings*, and/or *alterations* to *existing buildings* shall comply with the following:

$$P\text{C}I + [(PBP_{pre} - PBP)/BBP] - 0.05 < P\text{C}I_t$$

Informative Notes:

1. PBP$_{nre}$ = *proposed building performance*, no renewable *energy*
2. PBP$_{pre}$ = *proposed building performance*, prescriptive renewable *energy*
3. PRE = prescriptive renewable *energy*

~~Regulated site *energy* cost shall be calculated by multiplying the total site *energy* cost by the ratio of *regulated energy use* to total *energy* use for each *fuel* type. Unregulated *energy* cost shall be calculated by subtracting regulated *energy* cost from total *energy* cost.~~

*Replace Table 4.2.1.1 with the table below. TBD values shall be replaced by building performance factors consistent with the site energy outcomes of compliance with the prescriptive option of this overlay as specified in **Section C401.2.1.***

Table 4.2.1.1 Building Performance Factors (BPFs), Site Energy

Building Area Type	Climate Zone																		
	0A	0B	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
Multifamily	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Healthcare/ hospital	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Hotel/motel	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Office	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Restaurant	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Retail	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
School	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Warehouse	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
All other	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

Modify Section 4.2.1.2 as follows:

4.2.1.2 Additions to Existing Buildings. *Additions* to *existing buildings* shall comply with Section 4.2.2 through 4.2.5 and ~~one of the following:~~

~~a. Sections 5, "Building Envelope"; 6, "Heating, Ventilating, and Air Conditioning"; 7, "Service Water Heating"; 8, "Power"; 9, "Lighting"; 10, "Other Equipment"; and 11, "Additional Efficiency Requirements," or~~

~~b. Section 12, "Energy Cost Budget Method," or~~

~~c.~~ Normative Appendix G, "Performance Rating Method."

4.2.1.2.1 When an *addition* to an *existing building* cannot comply by itself, trade-offs will be allowed by modification to one or more of the existing components of the *existing building*. Modeling of the modified components of the *existing building* and *addition* shall employ the procedures of ~~Section 12 or~~ Normative Appendix G; the *addition* shall not increase the *energy* consumption of the *existing building* plus the *addition* beyond the *energy* that would be consumed by the *existing building* plus the *addition* if the *addition* alone did comply.

Modify Section 4.2.1.3 as follows:

4.2.1.3 Alterations of Existing Building Assemblies, Systems, and Equipment. *Alterations* of *existing building* assemblies, *systems*, and *equipment* shall comply with the provisions of Section 4.2.2 through 4.2.5 and ~~one of the following:~~

~~a. Sections 5, "Building Envelope"; 6, "Heating, Ventilating, and Air Conditioning"; 7, "Service Water Heating"; 8, "Power"; 9, "Lighting"; 10, "Other Equipment"; and 11, "Additional Efficiency Requirements," or~~

~~b. Section 12, "Energy Cost Budget Method," or~~

~~c.~~ Normative Appendix G, "Performance Rating Method," in accordance with Section 4.2.1.1 ~~with the following modifications:~~

~~1. *Alterations* that meet the criteria in Section G3.1.4(a) shall use the BPF from Table 4.2.1.1 multiplied by 1.05.~~

~~2. All other *alterations* modeled following Section G3.3 shall use BPF = 1.~~

Exceptions to 4.2.1.3: A *building* that has been specifically designated as historically significant by the *adopting authority* or is listed in The National Register of Historic Places or has been determined to be eligible for listing by the U.S. Secretary of the Interior need not comply with these requirements.

Modify Section G1.2.2 as follows:

The performance of the *proposed design* is calculated in accordance with provisions of this appendix using the following formula:

Performance ~~Cost~~ Index = *Proposed building performance/Baseline building performance*

Both the *proposed building performance* and the *baseline building performance* shall include all endues load components within and associated with the *building* when calculating the Performance ~~Cost~~ Index.

Modify Section G1.3.2(a) and G1.3.2(p) as follows:

[. . .]

The following documentation shall be submitted to the *rating authority*:

a. The *simulation program* used, the version of the *simulation program*, and the results of the *energy* analysis including the calculated values for the baseline *building* unregulated ~~site~~ *site energy* ~~cost~~ (BBUE€), baseline *building* regulated *site energy* ~~cost~~ (BBRE€), *building* performance factor (BPF), *baseline building performance,* the *proposed building performance,* Performance ~~Cost~~ Site Energy Index (P€I), and Performance ~~Cost~~ Site Energy Index Target (P€I*t*).

[. . .]

p. For any exceptional calculation methods employed, document the predicted *energy* savings by *energy* type, the *site energy* ~~cost~~ savings, a narrative explaining the exceptional calculation method performed, and theoretical or empirical information supporting the accuracy of the method.

Modify Section G2.4.2 as follows:

G2.4.2 Annual ~~Energy Costs~~ Site Energy. ~~The *design energy* cost and baseline *energy cost* shall be determined using either actual rates for *purchased energy* or state average *energy* prices published by DOE's Energy Information Administration (EIA) for commercial *building* customers, but rates from different sources may not be mixed in the same project.~~

G2.4.2.1 The *baseline building performance* and *proposed building performance* shall be determined using conversion factors in Table G2.1.

Table G2.1 Units of Fuel to Site Energy Conversion Factor

Building Project Energy	Units	Site Energy, Btu/unit
Electricity	kWh	3,412
Natural gas	therm	100,000
Propane	therm	100,000
Distillate fuel oil	gal	137,600

G2.4.2.2 Where *on-site renewable energy* or *site-recovered energy* is used, the *baseline building design* shall be based on the *energy source* used as the backup *energy* source, or the baseline *system energy* source in that category if no backup *energy* source has been specified, except where the baseline *energy* source is prescribed in Table G3.1.1-2 and G3.1.1-3. Where the *proposed design* includes *on-site electricity generation systems* other than on-*site renewable energy systems*, the *baseline design* shall include the same generation *systems* excluding its *site-recovered energy*.

Informative Note: *~~The above provision allows users to gain credit for features that yield load management benefits. Where such features are not present, users can simply use state average unit prices from EIA, which are updated annually and readily available on EIA's web site (http://www.eia.gov).~~*

Modify Section G2.5(e) as follows:

[. . .]

e. The Performance ~~Cost~~ Index calculated with and without the exceptional calculation method

Erin Sherman, Daniel Carpenter-Gold, Jonny Kocher, and Jamie Long, *The Energy Code Safe Harbor: How to Adopt Ambitious Building Energy Codes That Boost Efficiency, Reduce Pollution, and Comply with Federal Law*, RMI, 2024, **https://rmi.org/insight/the-energy-code-safe-harbor**.

All images used are from iStock.com unless otherwise noted.

RMI Innovation Center
22830 Two Rivers Road
Basalt, CO 81621

www.rmi.org