



Energy Choice Overlays (ECO) Simple Edition v1.0

For use with the 2024 International Energy Conservation Code



Technical document / May 2026

About this resource

Energy Choice Overlays (ECO) recognize the efficiency of electric heat pumps and encourage their installation while preserving building owners' fuel and equipment type choices. This proposal is intended for jurisdictions considering the adoption of the **2024 International Energy Conservation Code (2024 IECC)**. Comparable amendments may be adopted by jurisdictions considering the **2027 IECC**, as the 2024 and 2027 code editions are likely to have similar structures and base stringency levels as of this proposal's publication.

Why? Even minimum-efficiency electric heat pump equipment uses far less energy than high-efficiency combustion equipment because heat pumps move energy, rather than extract it by combusting fuel. The model energy code does not recognize this efficiency, however. Builders are not allowed to count the efficiency of heat pumps as a product class toward code compliance: this means buildings using heat pumps are effectively required to use far less energy than buildings using other types of space and water heating equipment. This matters for home energy efficiency: Pacific Northwest National Laboratory's energy modeling of 2024 IECC prototype homes suggests that the **whole-home energy use of mixed fuel homes may be up to 50% higher than the energy use of homes with heat pump equipment**. This leaves cost-effective energy savings and flexibility on the table and misses an opportunity to encourage low-pollution new construction.

This Simple edition of ECO leverages model code appendix language to minimize adoption, implementation, and compliance barriers. Due to this simplified approach, this edition of ECO reduces the efficiency gap between buildings with and without heat pumps but does not eliminate it in most climate zones. Jurisdictions interested in reducing fuel type bias more comprehensively may be interested in the **Energy Choice Overlays v2.0**.

Electric ready. This proposal additionally adopts appendices to provide infrastructure for efficient electric alternatives to combustion equipment installed at the time of construction: [Appendix RK](#) for low-rise residential buildings, and [Appendix CH](#) for other buildings. Installing this infrastructure at the time of construction preserves future building owners' choices by reducing the need for disruptive retrofits and significantly reduces the cost of future electrification.

Proposed code text is depicted through underlining, 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.

How it works: Residential low-rise buildings

This resource's approach: improve efficiency by complying with Appendix RG or selecting heat pump equipment. Jurisdictions can take a simple step toward boosting energy efficiency and cutting pollution from new construction by giving buildings two options to improve their efficiency: [Appendix RG](#), the 2024 IECC's residential stretch code, or using heat pumps, which achieve the same or higher level of efficiency.

Note on compliance tools. Compliance with the amended prescriptive pathway may be demonstrated with [REScheck](#), which includes an option to comply with Appendix RG. Compliance with other pathways may be demonstrated with standard tools and software packages.

Code language: Residential low-rise buildings

Adopt the **2024 IECC**, including **Appendix RK** and **Appendix RG**, as modified. Amend as follows:

R101.2 Scope. This code applies to the design and construction of detached one- and two-family dwellings and multiple single-family dwellings (townhouses) and Group R-2, R-3 and R-4 buildings three stories or less in height above *grade plane*.

R101.2.1 Appendices. Provisions in the appendices shall not apply unless specifically adopted and referenced as a requirement of a compliance option. **Appendix RG** and **Appendix RK** are required for compliance paths as specified in **Section R401.2**.

Amend as follows.

R401.2.1: Prescriptive Compliance Option. The Prescriptive Compliance Option requires compliance with one of the following:

1. Dwelling units shall comply with all of the following:
 - a. Electric heat pump equipment shall be configured as the primary space heating source, with supplemental heat controls complying with R403.1.2.
 - b. Electric heat pump equipment shall be sized to at least 50% of design heating load as calculated in compliance with Section R403.7.
 - c. Sections R401 through R404 and R408.
2. Dwelling units shall comply with Sections R401 through R404 and R408 as modified by Appendix RG Section RG101.3.

R401.2.2: Simulated Building Performance Option. The Simulated Building Performance option requires compliance with one of the following:

1. Dwelling units shall comply with all of the following:
 - a. Electric heat pump equipment shall be configured as the primary space heating source, with supplemental heat controls complying with R403.1.2.
 - b. Electric heat pump equipment shall be sized to at least 50% of design heating load as calculated in compliance with Section R403.7.
 - c. Section R405.
2. Dwelling units shall comply with Section R405 as modified by Appendix RG Section RG101.1.

R401.2.3: Energy Rating Index Option. The Energy Rating Index (ERI) Option requires compliance with one of the following:

1. Dwelling units shall comply with all of the following:
 - a. Electric heat pump equipment shall be configured as the primary space heating source, with supplemental heat controls complying with R403.1.2.
 - b. Electric heat pump equipment shall be sized to at least 50% of design heating load as calculated in compliance with Section R403.7.
 - c. Section R406.
2. Dwelling units shall comply with Section R406 as modified by Appendix RG Section RG101.2.

How it works: Commercial and taller multifamily buildings

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 adapts language from [IECC 2024 Appendix CE](#), which helps to correct this bias by requiring buildings to achieve a comparable level of energy efficiency regardless of the types of appliances they use.

Performance pathway. The 2024 IECC performance pathway has been removed in this overlay. This simplifies enforcement and training while ensuring both prescriptive (IECC) and performance (ASHRAE 90.1 Appendix G) pathways remain available.

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.

Code language: Commercial and taller multifamily buildings

General

Adopt the **2024 IECC**, 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 required 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, as amended by the following:*

1. ANSI/ASHRAE/IES 90.1 Appendix G is modified to be based on Site Energy Use Intensity in accordance with Section I6 of Informative Appendix I.

Prescriptive Pathway

Modify Section C406.1 to incorporate Appendix CF, Sections CF 103. The intent of this change is to help close the performance gap between new buildings that use heat pumps and new buildings that do not.

C406.1 Compliance. Buildings shall comply as follows:

1. Buildings with greater than 2,000 square feet (186 m²) of conditioned floor area shall comply with Section C406.1.1.
2. Buildings with greater than 5,000 square feet (465 m²) of conditioned floor area shall comply with Sections C406.1.1 and C406.1.2.
3. Build-out construction greater than 1,000 square feet (93 m²) of conditioned floor area that does not have final lighting or final HVAC systems installed under a prior building permit shall comply with Section C406.1.1.2.
4. Buildings without heat pumps shall comply with Section 406.1.1.1.

C406.1.1.1 Reserved Buildings without heat pumps. The number of efficiency credits required by Section C406.1.1 shall be multiplied by 1.25 for the following:

1. Buildings using purchased energy that is not electricity for space heating or service water heating.
2. Buildings with electric storage water heaters that are not heat pumps.
3. Buildings with total heat pump space heating capacity less than the space heating load at heating design conditions calculated in accordance with Section C403.1.1.

Exceptions:

1. Portions of buildings devoted to manufacturing or industrial use.
2. Buildings complying with all of the following:
 - 2.1. The building's peak heating load calculated in accordance with Section C403.1.1 is greater than the building's peak cooling load calculated in accordance with Section C403.1.1.
 - 2.2. The building's total heat pump space heating capacity is not less than 50 percent of the building's space heating load at heating design conditions calculated in accordance with Section C403.1.1.
 - 2.3. Any energy source other than electricity or on-site renewable energy is used for space heating only where a heat pump cannot provide the necessary heating energy to satisfy the thermostat setting.
 - 2.4. Electric resistance heat is used only in accordance with Section C403.4.1.1.
3. Low-energy buildings complying with Section C402.1.1.1.
4. Portions of buildings in Utility and Miscellaneous Group U, Storage Group S, Factory Group F or High-Hazard Group H.
5. Buildings located in Climate Zones 0A, 0B, 1A, 1B, 2A and 2B.

Modify **Section C406.2.3.1.2** as follows. The purpose of this change is to address a known error in the model code version of the credit that prevents the credit's use.

C406.2.3.1.2 W02 Electric heat pump water heater. Air-source electric heat pump water heaters shall be installed according to the manufacturer's instructions and at least not less than 30 percent of designed end-use service water heating load requirements shall be met using only heat pump heating at an ambient condition of 67.5°F (19.7°C), db without supplemental electric resistance or fossil fuel heating. ~~For a~~ Where heat pump water heater with supplemental electric resistance heating is installed, the heat pump-only capacity shall be deemed at 40 percent of first-hour draw. Where the heat pump-only capacity exceeds 50 percent of the design end-use load, excluding recirculating system losses, the credits from the Section C406.2 tables shall be prorated as follows:

Equation 4-19
$$EC_{HPWH} = (EC_{BASE}/0.5) \times \{(CAP_{HPWH})/(Endload) \text{ [not greater than 2]}\}$$

where:

EC_{HPWH} = Energy credits achieved for W02.

EC_{BASE} = W02 base energy credits from Tables C406.2(1) through C406.2(9).

Endload = End-use peak hot water load, excluding load for heat trace or recirculation, Btu/h or kW.

CAP_{HPWH} = The heat pump-only capacity at 50.6°F (10.3°C) entering air and 70°F (21°C) entering potable water without supplemental electric resistance or fossil fuel heat, Btu/h or kW.

The heat pump service water heating system shall comply with the following requirements:

1. For systems with an installed total output capacity of more than 100,000 Btu/h (29 kW) at an ambient condition of 67.5°F (19.7°C) db, a preheat storage tank with greater than or equal to 0.75 gallons per 1,000 Btu/h (≥ 9.7 L/kW) of design end-use service water-heating requirements shall be heated only with a heat pump ~~heating~~ when the ambient temperature is greater than 45°F (7.2°C).
2. ~~For systems with~~ Where system piping temperature maintenance is installed, either a heat trace system or ~~a separate water heaters~~ in series for a recirculating system and final heating shall be installed.
3. Heat pump water heater efficiency shall ~~meet or exceed~~ be equal to or greater than one of the following:
 - 3.1. Output-capacity-weighted-average UEF of 3.0 in accordance with 10 CFR 430 Appendix E.
 - 3.2. Output-capacity-weighted-average COP of not less than 4.0 tested at ~~50~~80.6°F (2740°C) entering air and 70°F (21°C) entering potable water in accordance with ANSI/AHRI 1300.

Equation 4-20 (Reserved)

~~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.~~

~~**Equation 4-20** W02 credit = base W02 table credit $\times$ $(HP_{if}/50\%)$~~

~~where:~~

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

Modify Section C502.3.7 to incorporate Appendix CF, Section CF 104. The intent of this change is to help close the performance gap between additions that use heat pumps and additions that do not.

C502.3.7 Additional energy efficiency credit requirements. Additions shall comply with sufficient measures from Sections C406.2 and C406.3 to achieve not less than 50 percent of the number of required efficiency credits from Table C406.1.1(1) based on building occupancy group and *climate zone*. Where a project contains multiple occupancies, credits from Table C406.1.1(1) for each building occupancy shall be weighted by the gross floor area to determine the project weighted average energy credits required. Accessory occupancies shall be included with the primary occupancy group for purposes of this section. Alterations to the existing building that are not part of the *addition*, but are permitted with an *addition*, shall be permitted to be used to achieve the required credits. Additions not served by heat pumps shall comply with Section C502.3.7.1.

Exceptions:

1. Buildings in Group U (Utility and Miscellaneous), Group S (Storage), Group F (Factory), Group H (High-Hazard).
2. Additions less than 1,000 square feet (93 m²) and less than 50 percent of existing floor area.
3. Additions that do not include the addition or replacement of equipment covered by Tables C403.3.2(1) through C403.3.2(16) or Section C404.2.
4. Additions that do not increase conditioned space.
5. Where the *addition* alone or the existing building and *addition* together comply with Section C407.

C502.3.7.1 Additions not served by heat pumps. The number of efficiency credits required by Section C502.3.7 shall be multiplied by 1.25 for the following:

1. Additions using *purchased energy* that is not electricity for space heating or *service water heating*.
2. Additions served by electric storage water heaters that are not heat pumps.
3. Additions served by total heat pump space heating capacity less than the peak space heating load at heating design conditions calculated in accordance with Section C403.1.1.

Exceptions: Additions complying with all of the following:

1. The *addition's* peak heating load calculated in accordance with Section C403.1.1 is greater than the *addition's* peak cooling load calculated in accordance with Section C403.1.1.
2. The *addition's* total heat pump space heating capacity serving the *addition* is not less than 50 percent of the *addition's* space heating load at heating design conditions calculated in accordance with Section C403.1.1.
3. Any energy source other than electricity or *on-site renewable energy* is used for space heating serving the *addition* only where a heat pump cannot provide the necessary heating energy to satisfy the *thermostat* setting.
4. Electric resistance heat serving the *addition* is used only in accordance with Section C403.4.1.1.

Erin Sherman and Jonny Kocher, *Energy Choice Overlays Simple Edition v1.0*, RMI, 2026, <https://rmi.org/insight/the-energy-code-safe-harbor>.

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