

RE223-19

IECC®: Appendix RB (IRC Appendix Q) (New), RB102 (IRC AQ 102) (New), RB103 (IRC AQ 103) (New), RB103.1 (IRC AQ103.1) (New), RB103.2 (IRC AQ103.2) (New), TABLE RB103.2 (IRC AQ103.2) (New)

Proposed Change as Submitted

Proponents: Eric Makela, New Buildings Institute, representing New Buildings Institute (ericM@newbuildings.org); Lauren Urbanek, Natural Resources Defense Council, representing Natural Resources Defense Council (lurbanek@nrdc.org)

2018 International Energy Conservation Code

Add new text as follows:

Appendix RB (IRC Appendix Q) **ZERO ENERGY RESIDENTIAL BUILDING PROVISIONS**

RB102 (IRC AQ 102) COMPLIANCE

(Note: language to replace R401.2 Compliance)

Existing residential buildings shall comply with Chapter 5. New residential buildings shall comply with Section RB103.

RB103 (IRC AQ 103) **ZERO ENERGY RESIDENTIAL BUILDINGS**

RB103.1 (IRC AQ103.1) General.

New residential buildings shall comply with Section RB103.

RB103.2 (IRC AQ103.2) Energy Rating Index Zero Energy Score.

Compliance with this section requires that the *rated design* be shown to have a score less than or equal to the values in Table RB103.2 when compared to the *ERI reference design* determined in accordance with RESNET/ICC 301 for each of the following:

1. ERI value not including net onsite power production calculated in accordance with RESNET/ICC 301, and
2. ERI value including net onsite power production calculated in accordance with RESNET/ICC 301

**TABLE RB103.2 (IRC AQ103.2)
MAXIMUM ENERGY RATING INDEX^a**

| CLIMATE ZONE | ENERGY RATING INDEX not including onsite power | ENERGY RATING INDEX including onsite power (as proposed) |
|--------------|------------------------------------------------|----------------------------------------------------------|
| 1 | 43 | 0 |
| 2 | 45 | 0 |
| 3 | 47 | 0 |
| 4 | 47 | 0 |
| 5 | 47 | 0 |
| 6 | 46 | 0 |
| 7 | 46 | 0 |
| 8 | 45 | 0 |

a. The building shall meet the mandatory requirements of Section R406.2, and the building thermal envelope shall be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or Table R402.1.4. of the 2015 *International Energy Conservation Code*.

Reason: This proposal provides cities and states an appendix to the residential section of the 2021 IECC that would result in a residential building that has zero energy consumption over the course of a year. Jurisdictions would have the prerogative to adopt the appendix in support of policy goals related to energy efficiency and renewable energy.

The provisions contained in this appendix are not mandatory unless specified as such in the jurisdiction’s adopting ordinance.

Why is this needed?

States and cities across the country are pursuing policies to reduce the energy consumption of buildings. More than 270 cities and counties and 10 states are signatories to the “We Are Still In” commitment supporting climate action to meet the goals of the Paris climate accord. Thus far, seventy cities have committed to to being powered by 100% renewable energy and more are joining all the time. The building energy code is an important policy tool for jurisdictions as they pursue these types of policy goals.

Many of these energy and climate-related goals have a target year of 2030, so the time is ripe to provide this option in the model energy code. While jurisdictions already can modify the model code to meet their needs, many do not have the in-house expertise to develop and vet this type of code language. Integrating a zero energy building pathway into the 2021 IECC as a jurisdictional option will make the model energy code a more robust policy tool. Use of appendices in the IECC have proven successful with the solar provisions in the 2018 IECC appendices.

Including a zero energy building appendix in the model energy code can smooth the transition to zero energy for builders. Rather than jurisdictions going alone— leading to a patchwork of zero energy residential code approaches—a single IECC appendix would provide consistent national language across the residential industry for manufacturers, builders and trades. Builders can standardize their construction practices across jurisdictions and states to meet these requirements. This makes education, incentive programs, and implementation significantly more straightforward and cost-effective.

How the Zero Energy appendix works

While there are a number of definitions of “zero energy buildings” (also referred to as “zero net energy,” “net zero energy,” or simply, “net zero”), the Appendix is based on the Energy Rating Index (ERI) compliance path found in section R406 of the 2018 IECC. In principle, the proposal works as follows:

1. Required ERI values are based on a highly efficient energy use performance level before considering on-site power generation.
2. The remaining energy use, on an annual level, is satisfied with on-site power generation.

The Energy Rating Index scores are set for a highly efficient level of energy consumption, which importantly, is still cost effective for the homeowner. These scores, which range from 42 to 48 based on climate zone, were calculated based on a thorough analysis of HERS scores nationwide, a survey of HERS scores for model high-performance home, modeling done for ASHRAE 90.2, and the U.S. DOE Zero Energy Ready Home program.

On-site renewable energy capacity is then required to meet the remaining energy use, resulting in an Energy Rating Index score of zero. Software required in the RESNET 301 standard can easily generate an ERI score of the home before and after the inclusion of renewable energy (known as Onsite Power Production in HERS). All renewable energy is required to be on-site. The minimum envelope backstops required in section R406 are also required in this appendix. Homes may use any fuel in accordance with RESNET 301 to comply with the Appendix.

Bibliography: Presentation: 90.2 Compliance Requirements. Results from EnergyGauge 5.0 Simulations and Economic Analysis SSPC 90.2

Cost Impact: The code change proposal will increase the cost of construction

If adopted by the state or jurisdiction, complying with this appendix will increase the first cost of construction but the Energy Rating Index values, before the addition of onsite power production, that have been selected were found to be cost effective based on information presented to the ASHRAE Standard 90.2 committee. All of the ERI scores without onsite power production have been found to have Savings/Investment Ratios (SIR) of greater than 1.0.

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Public Hearing Results

Committee Action:

Disapproved

Committee Reason: It needs additional compliance language for buildings without solar. Does not offer guidance or flexibility, it needs the term "net" included in title, and the EIR numbers are too low (Vote: 6-5).

Assembly Action:

None

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Individual Consideration Agenda

Public Comment MAKELA-3:

IECC®: RB103.2 (IRC AQ103.2) (New), TABLE RB103.2 (IRC AQ103.2) (New)

Proponents: Eric Makela, representing New Buildings Institute (ericm@newbuildings.org); jim edelson (jim@newbuildings.org) requests As Modified by Public Comment

Modify as follows:

2018 International Energy Conservation Code

RB103.2 (IRC AQ103.2) Energy Rating Index Zero Energy Score. Compliance with this section requires that the *rated design* be shown to have a score less than or equal to the values in Table RB103.2 when compared to the *ERI reference design* determined in accordance with RESNET/ICC 301 for each of the following:

1. ERI value not including ~~net~~ onsite power production (OPP) calculated in accordance with RESNET/ICC 301, and
2. ERI value including ~~net~~ onsite power production calculated in accordance with RESNET/ICC 301 with the OPP in Equation 4.1.2 of RESNET/ICC 301 adjusted as follows

(Equation RB-1)

Adjusted OPP = OPP + CREF + REPC

Where:

CREF (Community Renewable Energy Facility power production): The yearly energy, in kilowatt hour equivalent (kWh_{eg}), contracted from a community renewable energy facility that is qualified under applicable state and local utility statutes and rules, and that allocates bill credits to the rated home.

REPC (Renewable Energy Purchase Contract power production): The yearly energy, in kilowatt hour equivalent (kWh_{eg}), contracted from an energy facility that generates energy with photovoltaic, solar thermal, *geothermal energy*, or wind systems, and that is demonstrated by an energy purchase contract or lease with a duration of not less than 15 years.

**TABLE RB103.2 (IRC AQ103.2)
MAXIMUM ENERGY RATING INDEX^a**

| CLIMATE ZONE | ENERGY RATING INDEX not including onsite power <u>OPP</u> | ENERGY RATING INDEX including Adjusted onsite power <u>OPP</u> (as proposed) |
|--------------|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| 1 | 43 | 0 |
| 2 | 45 | 0 |
| 3 | 47 | 0 |
| 4 | 47 | 0 |
| 5 | 47 | 0 |
| 6 | 46 | 0 |
| 7 | 46 | 0 |
| 8 | 45 | 0 |

a. The building shall meet the mandatory requirements of Section R406.2, and the building thermal envelope shall be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or Table R402.1.4. of the 2015 *International Energy Conservation Code*.

Commenter's Reason: RE223 should be approved as modified by this Public Comment. The original proposal was recommended for disapproval by the committee by a narrow vote of 6-5. The reasons cited by the committee have been addressed through this modification. The modification address the Committee concerns as follows:

- The Committee requested that this proposal include an additional method of compliance for buildings without solar, and additional flexibility for buildings that have a limited ability to generate sufficient renewable energy on-site. These concerns are addressed through the addition of the Adjusted Onsite Power Production calculation, which allows compliance via a combination of onsite power production, energy generated through community renewable energy facilities, and renewable energy purchase contracts or leases.
 - The information needed about how much energy is being procured from each source (onsite, community facility, or through a contract/lease) will be disclosed in the contracting documents. From there, the Adjusted OPP is calculated through simple addition and entered into Equation 4.1.2 of RESNET/ICC 301. Calculation proceeds as usual within Section 4.1.2 using the Adjusted OPP to determine the Energy Rating Index.
- A home must meet two ERI score requirements, one without considering power production (ie, considering only energy efficiency) and one taking power production into consideration. The Adjusted OPP calculation for procurement of offsite kWh_{eq} is only used when calculating whether a home fulfills the requirement to have zero net energy consumption.
- This modification provides substantial flexibility for builders to comply in the way that is most cost-effective and best suits the local market.
- There was discussion during the Committee hearings that this proposal needs the term “net” included in the title. We do not feel this is necessary, as we are following the Department of Energy protocol by using the “Zero Energy Buildings” terminology.
- There was discussion during the Committee hearings that the ERI numbers are too low. In fact, the ERI values not including OPP are buildable and were found to be cost-effective based on a thorough analysis of HERS scores nationwide, a survey of HERS scores for model high-performance homes, modeling performed for ASHRAE 90.2, and the U.S. DOE Zero Energy Ready Home. The required scores are designed to be aggressive yet achievable, adopted by cities and jurisdictions ready to lead the market by adopting this optional appendix.

Cost Impact: The net effect of the public comment and code change proposal will increase the cost of construction. If adopted by the state or jurisdiction, complying with this appendix will increase the first cost of construction but the Energy Rating Index values, before the addition of onsite power production, that have been selected were found to be cost effective based on information presented to the ASHRAE Standard 90.2 committee. All of the ERI scores without onsite power production have been found to have Savings/Investment Ratios (SIR) of greater than 1.0.