**IECC®: SECTION 202 (New), R404.4 (N1104.4) (New), R404.4.1 (N1104.4.1) (New), 404.4.2 (N1104.4.2) (New), R404.4.3**

(N1104.4.3) (New), TABLE R405.2, TABLE R406.2, R406.3.2, TABLE R406.5

Proposed changes based on stakeholder feedback.

1. Split definition into separate definitions for Potential Solar Zone Area and Annual Solar Access for greater clarity. Moved position of low-sloped roof to clarify that “orientation requirement” only applied to steep slope roofs. Added additional sentence further clarifying the types of obstructions that that can be considered when calculating annual solar access.
2. Editorial change to Exception 1 under both R404.4.1 and R404.4.2.
3. Changed R404.4.1 so that it also applies to other R3 occupancies and that R404.4.2 only applies to R2 and R4 occupancies.
4. Modified R404.4.2 exception 2 to remove CZ 4C and 5C, the PV requirements were found to be cost effective for low-rise multifamily in these CZ per the original Cost Impact statement included in the monograph.
5. Modified R404.4.3 to align with language used in REPI-158 for documentation of RECs.
6. Clarify that requirement in Table R405.2 should be at bottom under Electrical and Lighting Power Systems and not under General
7. Based on approved REPI-126-21 that modified R406, remove proposed changes to R406.3.2 and Table R406.5

Proponents:

**2021 International Energy Conservation Code**

Add new definition as follows:

R202

POTENTIAL SOLAR ZONE AREA. The combined area of any steep-sloped roofs oriented between 90 degrees and 300 degrees of true north and any low-sloped roofs where the *annual solar access* is 70 percent or greater.

ANNUAL SOLAR ACCESS. The ratio of annual solar insolation with shade to the annual solar insolation without shade. Shading from obstructions located on the roof or any other part of the building shall not be included in the determination of annual solar access. Shading from existing permanent natural or person-made obstructions that are external to the building, including but not limited to trees, hills, and adjacent structures, shall be considered for annual solar access calculations.

Add new text as follows:

R404.4 (N1104.4) On-site renewable energy.

The building shall comply with the requirements of R404.4.1 or R404.4.2.

R404.4.1 (N1104.4.1) One- and two- family dwellings and townhouses and other R-3 Occupancies.

Install an on-site renewable energy system with a nameplate DC power rating measured under standard test conditions, of no less than 2kW

Exceptions:

1. A building with a permanently installed domestic solar water heating system with a solar savings fraction of not less than 0.5.
2. A building in climate zone 4C, 5C or 8.
3. A building where the *potential* solar zone *area* is less than 300 square feet.
	* 1. **(N1104.4.2) Group R2 and R4 Occupancies.**

Install an on-site renewable energy system with a rated capacity of not less than 0.75 W/ft2 multiplied by the gross conditioned floor area

Exceptions:

* + - 1. A building with a permanently installed domestic solar water heating system with a solar savings fraction of not less than 0.5.
			2. A building in climate zone 8.
			3. A building where the *potential solar zone area* is less than 300 square feet.

R404.4.3 Renewable energy certificate (REC) documentation. Where *RECs* are associated with *renewable energy* power production required by Section R404.4.1 or R404.4.2, documentation shall comply with Section R404.5.

Revise as follows:TABLE R405.2 REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE

Portions of table not shown remain unchanged.

|  |  |
| --- | --- |
| **SECTIONa** | **TITLE** |
| **Electrical and Lighting Power Systems** |
| R404.4 | On-site renewable energy |

# TABLE R406.2 REQUIREMENTS FOR ENERGY RATING INDEX

Portions of table not shown remain unchanged.

|  |  |
| --- | --- |
| **SECTIONa** | **TITLE** |
| R404.2 | Interior lighting controls |
| R404.4 | On-site renewable energy |
| R406.3 | Building thermal envelope |

a. Reference to a code section includes all of the relative subsections except as indicated in the table.

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Reason: On-site electricity generation using photovoltaics is a key technology for reducing greenhouse gas emissions associated with Commercial and Residential buildings. According to the most recent assessment by the National Renewable Energy Lab (NREL) the cost of installed photovoltaics in 2020 was 3% lower than in 2019 and 65-70% lower than the cost of similar sized systems in 2010. With the continued drop in cost of installing on-site PV the cost per kilowatt hour of PV generated electricity is at parity with grid purchased electricity in many States throughout the country. This proposal describes requirements for prescriptive solar PV that must be installed at the time of construction. Analysis by PNNL shows that on-site renewable electricity generation is cost effective across all low-rise multifamily buildings and most single family and one or two unit townhouses. The analysis was done using each of the Residential prototypes in each ASHRAE climate zone. The capacity requirements were established by calculating the highest on-site solar PV capacity that limited electricity export back to the grid. The threshold used for determining these capacities was a grid export limit of less than 0.5% of total annual building electricity consumption. A review of the hourly results showed it was unrealistic to set a hard limit of zero overproduction. When calculating cost effectiveness no credit was taken for electricity that was exported back to the grid. The calculation of grid exports was done on an hourly basis. The proposed requirements reduce purchased energy from the electrical grid which will help reduce green house gas emissions and energy costs for building owners.

PVs provide substantial benefits to the consumer and society by helping to reduce GHG emissions associated with electricity generation. PV market growth combined with a cleaner grid will support goals of reduced GHG emissions established across the U.S. and others by federal agencies, as well as many states and local governments.

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

For this analysis of residential building solar PV cost effectiveness was calculated using the Life Cycle Cost methodology established by Pacific Northwest National Lab for determining National and State cost effectiveness of the 2021 International Energy Conservation Code. The DOE methodology accounts for the benefits of energy-efficient home construction over the life of a typical mortgage, balancing initial costs against longer term energy savings. The Life-Cycle Cost methodology provides a full accounting over a 30-year period of the cost savings, considering energy savings, the initial investment financed through increased mortgage costs, tax impacts, and residual values of energy efficiency measures. The installed cost of solar PV was based on costs reported in the U.S. Solar Photovoltaic System and Energy Storage Cost Benchmark: Q1 2020 published by NREL in 2021. Installed costs were scaled based on solar PV capacity from 2kW up to 200kW and applied based on the calculated capacity required for each prototype in each climate zone.

The proposed solar PV capacities were shown to be cost effective for R occupancies in each ASHRAE climate zone except for climate zone 8 and for single family residences in all climate zones except 4C, 5C and 8.