**BSR/RESNET/ICC 301-2019 Addendum D-202x**

**CO2 Rating Index**

**Draft PDS-02 Changes to Draft PDS-01**

***Modify Section 1 as follows:***

1. Scope**.** This standard is applicable to Dwelling Units and Sleeping Units in Residential or Commercial Buildings, except hotels and motels.[[1]](#footnote-1) Energy Ratings determined in accordance with this Standard are for individual Dwelling Units or Sleeping Units only. This Standard does not provide procedures for determining Energy Ratings for whole buildings containing more than one unit.

This standard identifies the metrics, tolerances, procedures, calculations and the required documentation to: (1) calculate the standard energy use of Dwelling Units and Sleeping Units, (2) determine the Energy Rating Index of Dwelling Units and Sleeping Units, (3) determine the CO2 Index of Dwelling Units and Sleeping Units, (4) define the minimum rated features of Dwelling Units and Sleeping Units, (5) calculate the retrofit savings for existing Dwelling Units and Sleeping Units, (6) calculate the cost effectiveness of energy saving improvements to Dwelling Units and Sleeping Units and (7) label the certified energy and CO2 performance of Dwelling Units and Sleeping Units.

***Modify Section 5 as follows:***

**5.1.2.2. ~~Pollution~~ Emissions ~~Savings~~.** ~~Where determined, t~~The ~~pollution~~ emissions ~~savings~~ for the Rated Home shall be calculated in accordance with Sections 5.1.2.2.2.1 and 5.1.2.2.2.2.

1. * + - 1. **~~Pollution~~ Emissions**. ~~Pollution e~~Emissions for all homes shall be calculated in accordance with Sections 5.1.2.2.1.1 and 5.1.2.2.1.2.

For electricity use, data for the sub-region annual total output emission rates published by Environmental Protection Agency’s ~~2012~~ 2019 eGrid database[[2]](#footnote-2) for electricity generation shall be used to calculate emissions~~.~~[[3]](#footnote-3) except CO2 emissions, which shall be calculated using the Cambium database[[4]](#footnote-4),[[5]](#footnote-5) for the most recent year’s Mid-case, average hourly CO2 generation rate (*co2\_rate\_avg\_load\_enduse*: kgCO2 per MWhenduse) for the local ZIP Code.

For fossil fuel use, ~~pollution~~ emissions shall be calculated using the emission factors given in Table 5.1.2(1).

**Table 5.1.2(1) ~~National Average~~ Emission Factors for Household Combustion Fuels[[6]](#footnote-6)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Fuel Type** | **Units** | **MBtuper Unit** | **CO2lb/MBtu** | **NOxlb/MBtu** | **SO2lb/MBtu** |
| Natural Gas | Therm | 0.1000 | 117.6 | ~~93.0~~0.0922 | 0.0006~~0~~ |
| Fuel Oil #2 | Gallon | 0.1385 | ~~159.4~~161.0 | ~~127.8~~0.1300 | ~~0.5066~~0.0015 |
| Liquid Petroleum Gas (LPG) | Gallon | 0.0915 | 136.~~4~~6 | ~~153.4~~0.1421 | ~~0.0163~~0.0002 |

* 1. **Labeling.** Energy Rating labels shall, at a minimum, contain the information specified by Sections 5.3.1 through 5.3.~~67~~8.
		1. Real property physical address of the home, including city and state or territory.
		2. Energy Rating Index of the home.
		3. CO2 Index for the home, calculated in accordance with Section 6.
		4. Projected CO2 emissions for the home, calculated in accordance with Sections 5.1.2.2.1.1 and 5.1.2.2.1.1.

**~~5.3.3.5.3.4~~5.3.5.** Projected annual site energy use of the home by fuel type.

**~~5.3.4.5.3.5~~5.3.6.** Projected annual energy cost of the home,[[7]](#footnote-7) calculated in accordance with energy price rate provisions of Section 5.1.2.1.1.

**~~5.3.5.5.3.6~~5.3.7.** Name and address of the Approved Rating Provider.

**~~5.3.6.5.3.7~~5.3.8.** Date of the Energy Rating.

***Add the following new section and renumber following sections accordingly:***

1. **CO2 Rating Index.** The CO2 Index shall be calculated for the Rated Home in accordance with equation 6-1 using the provisions of Sections 6.1 through ~~6.4~~6.5

**CO2 Index = ACO2 / ARCO2 \* 100 (Equation 6-1)**

where:

ACO2 = Annual hourly CO2 emissions from the Rated Home

ARCO2 = Annual hourly CO2 emissions from the CO2 Index Reference Home

* 1. The CO2 emission factors for household combustion fuel use shall be those given in Table 5.1.2(1).
	2. The CO2 emission factors for electricity use shall be the levelized CO2 emission factors calculated using the Cambium database[[8]](#footnote-8),[[9]](#footnote-9) for the Low Renewable Energy Cost Scenario for the Long-Run Marginal enduse CO2 generation rate (*co2\_lmer\_enduse*: kgCO2 per MWhenduse) for the local ZIP Code using equation 6-2 with a starting year of 2025.[[10]](#footnote-10)

$LRMER\_{levelized}=\frac{\sum\_{t=0}^{n-1}\frac{LRMER\_{t}}{\left(1+d\right)^{t}}}{\sum\_{t=0}^{n-1}\frac{1}{\left(1+d\right)^{t}}}$ **(Equation 6-2)**

where:

*LRMERt* = long-run marginal emission rate for year *t*

*d* = real social discount rate = 0.03

*n* = evaluation period in years = 25

* 1. The CO2 emission factors shall be applied to the hourly Purchased Energy by fuel type for both the Rated Home and the CO2 Index Reference Home.
	2. The CO2 Index Reference Home shall be identical to the Energy Rating Reference Home except that it shall use electricity for all energy end uses.
	3. Where reported, the CO2 savings for the Rated Home shall be the CO2 emissions for the CO2 Index Reference Home minus the CO2 emissions for the Rated Home.
1. (Normative Note) The terms “Dwelling Unit” and “Sleeping Unit” are interchangeable with the term “home” throughout this Standard, except where specifically noted. [↑](#footnote-ref-1)
2. (Informative Reference) http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html [↑](#footnote-ref-2)
3. (Informative Note) RESNET will compile and publish annual total output ~~pollution~~ emission rate data for NOx, SO2 and CO2 in accordance with the provisions of this section that can be used by Approved Software Rating Tools for the calculation of emissions. [↑](#footnote-ref-3)
4. <https://cambium.nrel.gov/> [↑](#footnote-ref-4)
5. Gagnon, Pieter, Will Frazier, Elaine Hale, and Wesley Cole, 2020. “Cambium Documentation: Version 2020.” Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A20-78239. <https://www.nrel.gov/docs/fy21osti/78239.pdf> [↑](#footnote-ref-5)
6. (Informative Note) ~~Developed from the U.S. DOE National Impact Analysis AHAM2 report (appendix 15A)~~ EPA, AP 42, Fifth Edition, Volume I, Chapter 1: External Combustion Sources <https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-fifth-edition-volume-i-chapter-1-external-0> [↑](#footnote-ref-6)
7. (Informative Note) The projected energy cost shown on the label might not reflect the projected energy costs to be paid by the occupant as metering configurations can result in certain energy costs and end-uses being paid by the building owner. [↑](#footnote-ref-7)
8. <https://cambium.nrel.gov/> [↑](#footnote-ref-8)
9. Gagnon, Pieter, Will Frazier, Elaine Hale, and Wesley Cole, 2020. “Cambium Documentation: Version 2020.” Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A20-78239. <https://www.nrel.gov/docs/fy21osti/78239.pdf> [↑](#footnote-ref-9)
10. (Informative note) National Renewable Energy Laboratory (NREL) provides a spreadsheet tool for the calculation of levelized CO2 emission rates. The NREL spreadsheet tool uses the input parameters specified by this section as inputs to the spreadsheet tool. [↑](#footnote-ref-10)