

Minority Report from TAG member Gary Heikkinen on proposal 141-2018, Total Building Performance

This proposal would replace the existing Performance Path in section C407.1 with the method from ASHRAE Std. 90.1, Appendix G, but using carbon emissions rather than energy cost as the metric. This report is being made in tandem with the minority report on proposal 050-2018, HVAC Total System Performance Ratio and, if energy cost is chosen to be used, that it be used in both methods or, if a different emissions factor for electricity is chosen, that the same factor be used in both.

1. Appendix G was carefully crafted to use energy cost, but the TAG has approved using carbon emissions instead. This could result in system choices that actually cost more to operate rather than less.
2. The emissions factor for electricity approved by the TAG is .55 lbs/kwh. This factor was generated using an ad hoc methodology that is seriously flawed in its assumptions. It is well-accepted by organizations like the EPA, ASHRAE and the NWPCC that the avoided emissions resulting from energy efficiency/conservation come from the marginal resources. The marginal resources do not include base-loaded hydro or nuclear and do not include wind or solar. Today the marginal resources include a mix of coal and gas generation. In a 2018 report from the NWPCC, "In the Northwest, the average CO2 production rate from all electricity generation is low in comparison to other parts of the Western Electric Coordinating Council region (WECC). This is because there are vast hydroelectric and wind generation resources in the Pacific Northwest. These resources have low operating costs, no CO2 emissions, and dispatch before coal-fired or natural gas-fired generating units. However, since the next megawatt of generation avoided would be available from the marginal unit, not an average of all the units online, the emissions of the marginal unit would best represent the avoided carbon risk of serving the last unit of load." The table below is taken from the report. . The significant drop in emissions between 2016 and 2021 is primarily due to coal plant retirements.

Table 1: Annual Average Avoided CO₂ Emissions Rate

Scenario	Average Annual Avoided Emissions Rate (lbs. of CO ₂ per kWh)
2016	1.83
2021 Plan DR	0.91
2026	0.93
2031	0.97

It is the recommendation of this minority report that the MVE Committee consider 2 options:

1. Use energy cost rather than carbon emissions as originally intended in Appendix G (see modified code language attached); or
2. Use a marginal emissions factor for electricity based on the NWPCC report of between .91 and .97 lbs/kwh (see attached modified code language for this option).

Option 1: Modified using energy cost rather than carbon emissions

C407.3 Performance-based compliance. Compliance with this section requires compliance with ASHRAE Standard 90.1 Appendix G, Performance Rating Method, in accordance with Standard 90.1 Section 4.2.1 with the following modifications..

1. The mandatory requirements of Section G1.2.1a of Standard 90.1 are not required to be met.
2. The reduction in annual ~~carbon emissions~~energy cost of the proposed building design associated with on-site renewable energy shall not be more than 3 percent of the total ~~carbon emissions~~energy cost of the baseline building design^[BK(1)].
- ~~3. References to energy cost in Section 4.2.1.1 and Appendix G shall be replaced by carbon emissions calculated by multiplying site energy consumption by the carbon emission factor from Table C407.3(1).~~
- ~~4.3.~~ The building performance factors in Table C4.2.1.1 shall be replaced with those in Table C407.3(2).

**TABLE C407.3(1)
ENERGY COST ~~CARBON EMISSIONS~~ FACTORS**

Type	CO₂e Energy Cost (\$/unit)	Unit
Electricity	0.55 \$0.112	kWh
Natural Gas	11.7 \$1.158	Therm
Oil	19.2 current rate	Gallon
Propane	10.5 current rate	Gallon
Other ^a	195.00 current rate	mmBtu
On-site renewable energy	0.00	

- a. District energy systems may use alternative emission factors supported by calculations approved by the code official.

Option 2: Modified using different emissions factor

C407.3 Performance-based compliance. Compliance with this section requires compliance with ASHRAE Standard 90.1 Appendix G, Performance Rating Method, in accordance with Standard 90.1 Section 4.2.1 with the following modifications..

1. The mandatory requirements of Section G1.2.1a of Standard 90.1 are not required to be met.
2. The reduction in annual carbon emissions of the proposed building design associated with on-site renewable energy shall not be more than 3 percent of the total carbon emissions of the baseline building design [BK(1)].
3. References to energy cost in Section 4.2.1.1 and Appendix G shall be replaced by carbon emissions calculated by multiplying site energy consumption by the carbon emission factor from Table C407.3(1).
4. The building performance factors in Table C4.2.1.1 shall be replaced with those in Table C407.3(2).

**TABLE C407.3(1)
CARBON EMISSIONS FACTORS**

Type	CO2e (lb/unit)	Unit
Electricity	0.55 <u>0.94</u>	kWh
Natural Gas	11.7	Therm
Oil	19.2	Gallon
Propane	10.5	Gallon
Other ^a	195.00	mmBtu
On-site renewable energy	0.00	

- a. District energy systems may use alternative emission factors supported by calculations approved by the code official.