

What is the Carbon Content of Washington's Future Electricity Load?

Jonlin 10/02/2018

The Energy Code TAG recommended two significant code changes that included as part of their requirements a shift in Washington's energy use metric from "site energy use" to carbon emissions, and that assigned a value of 0.55 pounds of carbon emissions to each kilowatt-hour of electricity (0.55#/kWh).

Representatives of the natural gas industry serving Washington state have requested that the WSEC either not use carbon emissions as its efficiency metric, or else assign a much higher carbon content to electricity in the compliance formulas. The basis for this position is that the Northwest Power and Conservation Council (NWPPCC) has until recently used a "marginal resource" metric when deciding whether it is more economical to meet capacity needs with construction of new power plants or with energy conservation activities. This "marginal resource" had typically been defined as a natural gas generating plant, producing emissions in the range of 0.82 – 1.20#/kWh.

Both the TAG's recommended value and the gas industry's proposed value would discourage the use of electric resistance heat as a primary heating system, so that more efficient heat sources such as heat pumps would be implemented. The TAG-recommended emissions factor for electricity will provide some advantage to electric heat pump systems relative to on-site gas heating emissions, although both systems will qualify when coupled with efficient heating distribution designs. The overall difference in emissions between gas heating and electric heat pump heating will be modest in the context of whole-building energy use.

The TAG adopted a set of assumptions for what constitutes the "avoided carbon emissions." Buildings are being constructed around the state at a rapid pace, increasing load on the grid by more than 1% per year. About 2/3 of that new capacity is continually being met with energy efficiency throughout all sectors, while the remaining capacity is projected to be met with gas generation. The calculation accepted by the TAG was:

- New load met with existing grid resources, due to increased efficiency: 66% (approximate)
- Predicted average emissions from WA grid in 2026: 0.38#/kWh¹
- New load met with gas turbines (CCTs & SCTs): 34% (approximate)
- Predicted emissions from gas turbines: 0.95#/kWh

Therefore, $(0.66 \times 0.38) + (0.34 \times 0.95) = 0.25 + 0.32 = \underline{0.57\#/kWh}$

Because we don't know the exact percentage of load that will be met with existing resources nor the overall emissions rate from the 2026 grid, the result was expressed as an uncertainty range of 0.50 to 0.60, with 0.55#/kWh selected as the midpoint.

To the extent that the installed costs of renewable energy and energy storage continue to fall, some of the new gas turbines currently assumed will not materialize, while others will still be needed to maintain grid capacity and stability for the foreseeable future. This will result in carbon emissions lower than this

¹ Assumes 60% of existing coal in system is replaced with simple cycle gas turbines, based on scheduled closures at Centralia and Colstrip. The actual emissions could range from 0.30 to as high as 0.42#/kWh.

calculated range, although the extent is not yet known. Therefore, the 0.55#/kWh estimate is likely to be, if anything, too high.

The Northwest Power and Conservation Council recently revised its own thinking on this issue², and now instead of determining a “marginal resource” suggests implementing an “avoided carbon emissions rate.” This rate was determined by first calculating total emissions for the western grid without demand reductions, and then comparing the emissions that would be produced if demand were decreased by 100 MW of efficiency improvements. The conclusions in NWPCC’s September 24, 2018 report to the Washington Legislature are remarkably similar to the TAG recommendation, with rates of 0.58#/kWh in 2021, 0.70 in 2026, and 0.55 in 2031.³

This approach aligns with Executive Order 14-04, currently in force, which requires the State Building Code Council to “Ensure that the cost-benefit tests for energy-efficiency improvements include full accounting for the external costs of greenhouse gas emissions,” as well as to “...actively work on the needed code requirements for new buildings as described above.” The Executive Order also requires SBCC to “Achieve early and widespread deployment of energy-neutral buildings prior to the 2031 statutory requirement in RCW 19.27A.160.”⁴

From all the above, I conclude that the TAG’s original recommendation to assign a carbon emissions factor of 0.55#/kWh of electricity savings is well-founded, conservative, and appropriate.

² See third presentation in this slide deck. The hearing is posted on TVW, with this segment beginning at about 1:26 in the recording. <http://app.leg.wa.gov/committeeschedules/Home/Document/185801#toolbar=0&navpanes=0>

³ See slide 45 in the NWPCC slide deck.

⁴ Office of the Governor, Executive Order 14-04, *Washington Carbon Pollution Reduction and Clean Energy Action*, Energy Efficiency section