Briefing Paper

Energy Trust of Oregon Carbon Emissions Avoidance Methodology

Updated May 2024

The purpose of this briefing paper is to describe how Energy Trust calculates the amount of carbon dioxide (CO_2) emissions avoided through its energy-saving and renewable energy-generating measures. [1]

Energy Trust delivers energy-efficiency and renewable power programs for residential, commercial, industrial and agricultural utility customers in Oregon and Southwest Washington. Between 2002 and 2023, Energy Trust saved 965 average megawatts (aMW) of electricity (including self-direct savings), generated 154 aMW of renewable energy and saved 100 million annual therms of natural gas. These combined actions avoided 42.9 million metric tons of CO_2 emissions.

Reducing greenhouse gas emissions is one of the benefits of Energy Trust's investments in energy efficiency and renewable energy, in addition to financial savings on customers' utility bills, system-wide savings through deferred utility investments, income for local businesses and other non-energy benefits. Emissions are avoided by reducing the need for utilities to generate carbon-based energy for the equivalent amount of energy delivered by Energy Trust energy efficiency savings and renewable energy generation.

Methodology for calculating carbon avoidance

To calculate the amount of CO_2 emissions avoided, Energy Trust uses marginal emissions rates expressed as pounds of CO_2 per kilowatt hour (kWh) of electricity saved or generated by renewable resources and per therm of natural gas saved. Marginal refers to resources that would be added or removed from the grid if the energy load were to increase or decrease. The marginal generation resource is often a resource with a different emissions rate than the average emission rate for the power system as a whole. For example, hydroelectric resources are rarely on the margin. Marginal emissions rates are reviewed annually by Energy Trust and updated as new information becomes available.

Energy Trust uses different methodologies to calculate the amount of CO_2 emissions avoided from electric and natural gas efficiency, and from electric efficiency and renewable energy generation before and after 2022.

Carbon emissions avoided from electric savings and generation: 2022 and beyond

Generating electricity emits different amounts of CO_2 depending on when it is generated and what types of power plants are running at those times. To reflect variations in the power system, Energy Trust uses different marginal emissions rates based on when energy savings or renewable energy generation occurs and the years, times of day and seasons when the measure is forecasted to operate over its lifetime.

For these calculations, Energy Trust uses a 20-year hourly regional carbon emission forecast from the Northwest Power and Conservation Council (Council); other data sources are used when suitable data isn't available from the Council. By combining load profile data, which

[1] Energy Trust reports all emissions avoided as carbon dioxide or CO_2. Starting in 2022, emissions avoided through electric efficiency or renewable energy generation are technically carbon dioxide equivalents, or CO_{2e}, which is a measure of the total greenhouse gases emitted expressed in terms of the equivalent measure of CO_2. Greenhouse gases include nitrogen oxides, sulfur dioxide, methane and nitrous oxide. For simplicity, Energy Trust reports all CO_{2e} as CO_2.

represents when measures will save or generate energy, and the Council's carbon forecasts, Energy Trust is able to quantify time-based CO_2 emissions avoided for individual energy-saving measures based on the assumed load profiles and how long the measure is active. The result is pounds of CO_2 emissions avoided per kWh saved or generated for each load profile for each year of that profile's measure life extending to a maximum range of 70 years. Since the forecast shows declining carbon savings over time due to future decarbonization of electricity generation, measures with longer measure lives now report less carbon savings than they would have under the previous methodology's single carbon multiplier.

Energy Trust uses the best information available, which is currently the Council's marginal carbon emissions forecast. If utility-specific marginal carbon emissions forecasts from Portland General Electric or Pacific Power become available, Energy Trust will consider using this data for this process.

Carbon emissions avoided from electric savings and generation: 2001 to 2021

Energy Trust developed the methodology described above in 2022 to reflect forecasted changes in the power system and how electricity will be generated.[2] To calculate avoided CO_2 emissions prior to 2022, Energy Trust continues to apply a single annual marginal emissions rate to all years: 1.09 pounds of CO_2 per kWh. This is based on an analysis in the Council's 2018 report on avoided CO_2 rates per kWh in the Northwest as part of its 7th Power Plan, released in 2016.

Carbon emissions avoided from natural gas savings

Energy Trust calculates the amount of CO_2 emissions avoided through natural gas efficiency by applying one marginal emissions rate for all years and load profiles using data from the U.S. Energy Information Administration.[3] This could change in the future depending on emerging carbon policy and changes in the sources of gas such as renewable natural gas or hydrogen.

Currently the marginal emissions rate is 11.7 pounds of CO_2 per therm saved. (There are 117 pounds of CO_2 per 1,000,000 British thermal units (BTUs) of natural gas, and one therm of savings is equal to 100,000 BTUs saved.)

Reporting avoided carbon emissions

For public reporting and general communications purposes, Energy Trust uses the rates and methodologies described above to calculate the CO_2 avoided in metric tons or pounds. Carbon avoidance amounts before 2021 were reported in short tons, not metric tons; since short tons are smaller than metric tons, results in 2021 and beyond appear smaller than results reported prior to 2021.

Quarterly and annual reports to the Oregon Public Utility Commission include Energy Trust's energy savings and generation results and benefits, including the quarterly and annual CO_2 avoided. All reports are available at www.energytrust.org/reports.

[2] In 2021, Energy Trust extrapolated avoided carbon emissions from analysis provided in the 2021 Power Plan and calculated the average avoided emission rate 2021 to 2041 of 0.63 pounds of CO_2 per kWh hour saved. This was applied to all past and future savings for reporting in 2021.

[3] http://www.eia.gov/tools/faqs/faq.cfm?id=73&t=11; https://www.eia.gov/environment/emissions/co2_vol_mass.php; http://www.eia.gov/tools/faqs/faq.cfm?id=45&t=8