

GHG Emissions Reduction Calculations

16,851.71 (MTCO₂e/year)

Estimated emissions reduction from solar compared to grid supplied electricity. As the grid becomes more saturated with renewables over time, the emissions factor will decrease and the annual emissions avoided will also decrease.

[input] **Number of electric vehicles per housing unit**

1.00 (vehicle/housing unit)

Access to charging can increase EV ownership so 1 EV per housing unit was assumed

[value] **Annual emissions associated with a passenger vehicle**

4.60 (MTCO₂/vehicle/year)

From EPA Greenhouse Gas Emissions from a Typical Passenger Vehicle

[calc] **Annual emissions avoided from electric vehicles**

19,642.00 (MTCO₂e/year)

Electricity from charging assumed to be from renewable sources, such as on-site solar and therefore no increase in electricity is included in this calculation.

[value] **Building orientation thermal energy savings**

25% (percent)

Source: Union of Concerned Scientist, What's in an Environmentally Responsible Building? From increasing windows on south facing side and using shading overhang

[value] **Average space heating consumption per household**

51.50 (MMBtu/year/household)

Source: EIA Residential Energy Consumption Survey (RECS) Dashboard for CT for 2020

[calc] **Building orientation heating fuel consumption savings**

12.88 (MMBtu/year)

[value] **Natural gas emissions factor**

0.05311 (MTCO₂e/MMBtu)

Source: EPA 2023 GHG Emissions Factor Hub

[calc] **Annual emissions avoided from building orientation**

2,920.05 (MTCO₂e/year)

Based on annual average housing permits specified above

Estimated natural gas consumption

164,928.75 (MMBtu/year)

Assuming the buildings were oriented to maximize thermal energy savings, using annual average housing permits specified above. Assuming all natural gas.

[calc] **Annual emissions avoided from electrification of heating systems**

8,760.16 (MTCO₂e/year)

Calculation demonstrates the elimination of space heating with natural gas in future residential development through the use of various technologies such as heat pumps. Assuming electricity comes from renewable sources and therefore no increase in electricity is included in this calculation.

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[calc] Carbon sequestration from tree planting
It was assumed that 1 tree would be planted for each housing permit. It was also assumed that tree planting would not occur until year 3 to enable time for project development and adoption by municipalities. The approach for the calculation was developed by referencing the EPA Greenhouse Gases Equivalencies calculations for the number of urban tree seedlings grown for 10 years (<https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references>). A key source used in that calculation was the Method for Calculating Carbon Sequestration by Trees in Urban and Suburban Settings report published in 1998 by the U.S. Department of Energy Information Administration (<https://www3.epa.gov/climatechange/Downloads/method-calculating-carbon-sequestration-trees-urban-and-suburban-settings.pdf>). This report provides Annual Sequestration Rates by Tree Type and Growth Rate. The lbs. carbon/tree/year values for hardwood trees with a moderate growth rate were used to determine the total carbon sequestered by this project. It was assumed that the trees planted in this project will have been grown for 1 year in a nursery, consistent with the EPA's assumption in the equivalency calculations. The full carbon sequestration calculations that show the increasing carbon sequestration as the trees mature is shown in the accompanying spreadsheet.

Summary of carbon sequestration from tree planting

Year	lbs carbon/year	MTCO2/year
Year 1	0	0
Year 2	0	0
Year 3	11,529	19
Year 4	26,474	44
Year 5	44,835	75
2025-2030	82,838	138
Year 6	67,039	111
Year 7	93,086	155
Year 8	123,403	205
Year 9	157,990	263
Year 10	196,847	327
Year 11	240,401	400
Year 12	288,225	479
Year 13	340,746	567
Year 14	398,391	663
Year 15	460,733	766
Year 16	528,199	878
Year 17	600,362	999
Year 18	677,649	1127
Year 19	760,487	1265
Year 20	848,449	1411
Year 21	941,962	1567
Year 22	1,041,026	1731
Year 23	1,145,214	1905
Year 24	1,255,380	2088
Year 25	1,371,097	2280
2025-2050	11,619,524	19,325

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[value]	Number of years 3 (years)	<i>Assumption: program in place in 2027, emissions reductions from 2027-2030</i>
[value]	Number of years 22 (years)	<i>Assumption: program in place in 2027, emissions reductions from 2027-2050</i>
[calc]	Emissions avoided annually 48,173.92 (MTCO _{2e} /year)	<i>Sum of above calculations excluding carbon sequestration from tree planting</i>
[FINAL]	Total avoided emissions for 2025-2030 144,660 (MTCO _{2e})	<i>(Emissions avoided/year * number of years) + carbon sequestration</i>
[FINAL]	Total avoided emissions for 2025-2050 1,079,151 (MTCO _{2e})	<i>(Emissions avoided/year * number of years) + carbon sequestration</i>

Links to data sources:

CT Department of Economic and Community Development
https://portal.ct.gov/DECD/Content/About_DECD/Research-and-Publications/01_Access-Research/Exports-and-Housing-and-Income-Data

Eversource Solar

<https://www.eversource.com/content/residential/save-money-energy/clean-energy-options/solar-energy/installing-solar/solar-sizing>

EPA AVERT

<https://www.epa.gov/avert/avert-web-edition>

Section D Distributed rooftop entry : 10 MW

Results: "This load profile will displace 16 GWh of regional fossil fuel generation over the course of a year. For reference, this equals the annual electricity consumed by 1,357 average homes in the United States."

EPA GHG Emissions Factor Hub

<https://www.epa.gov/climateleadership/ghg-emission-factors-hub>

EPA GHG Emissions from a Typical Passenger Vehicle

<https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100U8YT.pdf>

Union of Concerned Scientists

<https://perma.cc/72TS-H9S8>

EIA Residential Energy Consumption Survey (RECS) Dashboard

<https://experience.arcgis.com/experience/cbf6875974554a74823232f84f563253?src=%E2%80%B9%20Consumption%20%20%20%20%20Residential%20Energy%20Consumption%20Survey%>