

**Exhibit K**

Carbon Debt Analysis

## I. Introduction

This exhibit analyzes the total amount of greenhouse gas (“GHG”) emissions, or carbon footprint, of the 0.999MW solar generation project (“Project”) located at 0 & 428 Bethmour Road in Bethany, Connecticut, including all aspects of the project over its twenty (20) year life span.

## II. Electricity Generated from Project

The Project will produce about 2,213MWh of electricity during its first year of operation. In total, using the industry standard degradation value of 0.5%, the Project will produce roughly 42,217MWh of electricity during its lifespan.

## III. GHG Emissions of Project

According to the National Renewable Energy Laboratory (“NREL”), solar PV projects on average produce 43 grams of carbon dioxide equivalent per kilowatt-hour (“g CO<sub>2</sub>e/kWh”) of electricity produced.<sup>1</sup> This is a cradle-to-grave average, accumulating all factors from resource extraction and construction to decommission and recycling. Using this average, the Project will produce roughly 1,815 metric tons of CO<sub>2</sub>e during its 20-year life span.

## IV. Comparing Project GHG Emissions to Natural Gas

This exhibit compares the GHG emissions of the Project to that of a natural gas power plant because natural gas is the largest source generating electricity in Connecticut (2.1GWh in March 2023), and therefore, will most likely substitute electricity that is provided by natural gas.<sup>2</sup> The EPA states that the CO<sub>2</sub>e emission rate for natural gas in Connecticut was 821.72lb/MWh in 2021, meaning that for every megawatt hour of electricity produced by natural gas, there were 821.72 pounds of CO<sub>2</sub>e emitted.<sup>3</sup> A natural gas project would emit 15,735 metric tons of CO<sub>2</sub>e to produce the same amount of electricity as the Project. In other words, constructing the Project will create an 88.4% reduction in CO<sub>2</sub>e emissions by replacing 42,217MWh of electricity currently provided through natural gas. As shown in the images below, this 88% reduction is equivalent to removing the emissions from over 3,000 gas-powered vehicles and 2,700 homes per year.

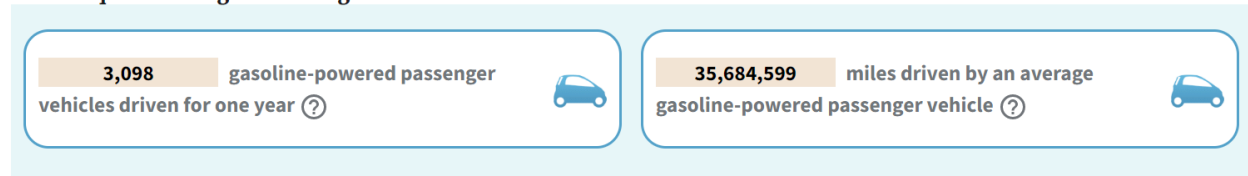
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<sup>1</sup> *Life Cycle Greenhouse Gas Emissions from Electricity Generation: Update*, National Renewable Energy Laboratory, p.3 (Sept. 2021).

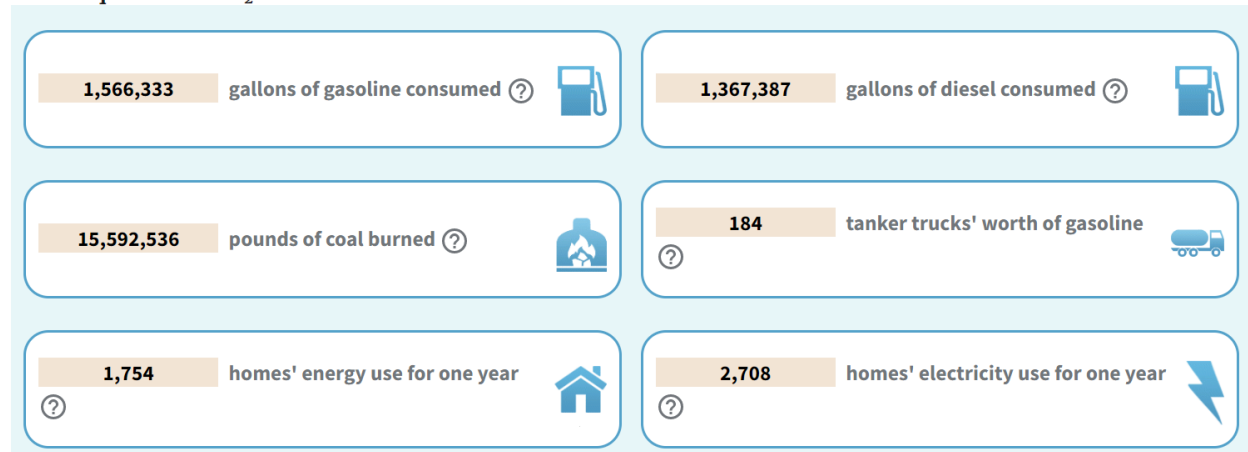
<sup>2</sup> *Connecticut: State Profile and Energy Estimates Overview*, US EIA, <https://www.eia.gov/state/?sid=CT#tabs-4> (last visited June 21, 2023).

<sup>3</sup> *Emission & Generation Resource Integrated Database (“eGRID”): Data Explorer*, US Environmental Protection Agency (“EPA”), <https://www.epa.gov/egrid/data-explorer> (last visited June 21, 2023).

This is equivalent to greenhouse gas emissions from:



This is equivalent to CO<sub>2</sub> emissions from:



If one looks at the entire life cycle of a natural gas project, then it emits almost an additional 6,000 metric tons of CO<sub>2</sub>e for a total of 20,517 metric tons of CO<sub>2</sub>e.<sup>4</sup> All in all, this Project – throughout its entire 20-year lifespan – will replace 91% of the CO<sub>2</sub>e created by an equally-sized natural gas project.


The images below portray the GHG equivalencies of the Project, provided by using the US Environmental Protection Agency's (EPA) Greenhouse Gas Equivalencies Calculator.<sup>5</sup> Again, the Project replaces about 18,702 metric tons of CO<sub>2</sub>e, and in doing so, replaces the equivalent amount of CO<sub>2</sub>e from the following:


<sup>4</sup> *Life Cycle Greenhouse Gas Emissions from Electricity Generation: Update*, National Renewable Energy Laboratory, p.3 (Sept. 2021) (An average natural gas project, from cradle to grave, produces 486 grams of CO<sub>2</sub>e per kWh of energy produced.).

<sup>5</sup> *Greenhouse Gas Equivalencies Calculator*, US Environmental Protection Agency, <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator> (last updated Oct. 11, 2022).

18,702 Metric Tons of Carbon Dioxide (CO<sub>2</sub>) equivalent

This is equivalent to greenhouse gas emissions from:

4,162 gasoline-powered passenger vehicles driven for one year 

47,943,490 miles driven by an average gasoline-powered passenger vehicle 

This is equivalent to CO<sub>2</sub> emissions from:


2,104,422 gallons of gasoline consumed 


1,837,132 gallons of diesel consumed 


20,949,110 pounds of coal burned 

248 tanker trucks' worth of gasoline 

This is equivalent to greenhouse gas emissions avoided by:

6,471 tons of waste recycled instead of landfilled 

924 garbage trucks of waste recycled instead of landfilled 

809,528 trash bags of waste recycled instead of landfilled 

5.2 wind turbines running for a year 

This is equivalent to carbon sequestered by:

309,239 tree seedlings grown for 10 years 

22,302 acres of U.S. forests in one year 

124 acres of U.S. forests preserved from conversion to cropland in one year 

## V. Conclusion

Overall, the net amount of GHG emissions avoided through solar production vastly outweigh the GHG emitted during the initial construction or eventual decommission of the Project, especially when compared to natural gas, the current largest source of electricity generation in Connecticut. This Project would emit roughly 1/10<sup>th</sup> of the CO<sub>2</sub>e produced by an equivalent natural gas plant. As the EPA GHG Equivalencies Calculator illustrates, this reduction of CO<sub>2</sub>e is equal to not burning over 20 million pounds of coal, 5 operating wind turbines, and preserving over 22,000 acres of US forests. This Project would replace natural gas production in Connecticut and reduce almost 20,000 metric tons of CO<sub>2</sub>e in the process.