Carbon Debt Analysis

To:	Sam Valone, LSE Phobos LLC
From:	Anthony Capuano
Subject:	Bina and Abraham 4.05 MW Solar Farm (166 South Street, Morris, CT)
Date:	10/17/25
CC:	Eric LaBatte

Introduction

This memorandum summarizes Solli's analysis of the proposed project's impact in terms of the equivalent carbon emissions avoided through the generation of carbon-free electricity, as compared to conventional electrical energy sources. The evaluation uses current U.S. Environmental Protection Agency (EPA) carbon sequestration factors available at the time of this memorandum to conduct the carbon debt assessment.

The analysis concludes that developing and operating the 4.05 MW Solar Facility will result in a net environmental benefit. Specifically, the carbon emissions avoided by the project substantially outweigh the impact of clearing 5.47 acres of trees at the site—by a factor of 562.

Project Information

The Project area is comprised of a 19.92± acre portion of the 37.30± acre property. As part of the development of the Project, approximately 5.47 acres of trees will be cleared or trimmed for the placement of the solar array and shade mitigation.

Carbon Debt Analysis

The United States Environmental Protection Agency (EPA) provides specific carbon sequestration data and conversion factor data to perform a Carbon Debt Analysis. As set forth in further detail herein, we will calculate and compare two carbon values by applying the prescribed sequestration data and conversion data. The first calculation establishes a baseline value as the "existing condition scenario." This value is established by measuring the carbon sequestration capability of the Site without the proposed solar Project. The second calculation derives a value that is the "solar Project scenario." This value is calculated based on the removal of 5.47 acres of vegetative cover and the installation of the proposed Project. This second value will be representative of the amount of carbon that will not be released from "typical" energy generating means due to the carbon free energy generation of the solar Project.

According to the EPA Greenhouse gas electricity reduction equivalency conversion factor, updated November 2024, the amount of carbon sequestered in one year by 1 acre of forest is equal to -1.00 metric tons (MT) of CO2 (the negative value indicates carbon sequestration). In this case, the 5.47 acres of forest provides an annual carbon debt of -5.47 MT CO2.

The proposed solar project is calculated to produce 6,947 MWh of energy during the first operational year. According to the EPA Greenhouse gas electricity reduction equivalency conversion factor, electricity reduction equivalency factor of 0.672 MT CO2 per MWh (updated November 2024) was applied to the annual energy production of 6,947 MWh of electricity over the operating life, for an estimated carbon offset of 4,668.4 MT CO2 per year.

In comparing the two scenarios, the following can be concluded:

1. By adding the calculated carbon debt of -5.47 MT CO2 to the 4,668.4 MT CO2 of carbon offset yields a net carbon offset of **4,662.9 MT CO2** annually for the project.
2. The net annual improvement in carbon reduction will be realized in **0.43 days**

   *(5.47 T CO2 / 4,668.4 MT CO2) * 365 Days = 0.43 Days*
3. The EPA's online GHG Equivalencies Calculator estimates the annual carbon offset from the project to be equivalent to **3,076 acres of forest**, which is approximately **562 times** the acres of forest that will be removed for this project.
4. It would take **less than 9 days** to recover the loss of carbon sequestration by the 5.47 acres of cleared trees over 20 years.

   *5.47 MT CO2 / yr * 20 Years = 109.4 MT CO2*

   *4,668.4 MT CO2 / yr * 20 Years = 93,368 MT CO2*

   *109.4 MT CO2 / 93,368 MT CO2 * 20 Years * 365 Days = 8.5 Days*

Closing

Please contact me at anthony@sollillc.com if there are any questions.

Sincerely,

Solli Engineering, LLC

Anthony Capuano, P.E. (Massachusetts)
Project Manager

Greenhouse Gas Equivalencies Calculator

Convert emissions or energy data into concrete terms you can understand — such as the annual CO_2 emissions of cars, households, and power plants.

The Greenhouse Gas Equivalencies calculator allows you to **convert emissions or energy data to the equivalent amount of carbon dioxide (CO_2) emissions from using that amount**. The calculator helps you translate abstract measurements into concrete terms you can understand, such as the annual emissions from cars, households, or power plants. This calculator may be useful in communicating your greenhouse gas reduction strategy, reduction targets, or other initiatives aimed at reducing greenhouse gas emissions.

Updated November 2024

These estimates are approximate and should not be used for emission inventories or formal carbon emissions analysis. See Calculations & References for equations and sources used.

Step 1 – Enter and convert data

Select data to convert:

- (•) Energy data
- ( ) Emissions data

Enter data:

Unit	Amount
( ) Gallons of gasoline	6947000
( ) Gasoline-powered passenger vehicles	
(•) Kilowatt-hours avoided	
( ) Kilowatt-hours used	
( ) MCF of natural gas	
( ) Therms of natural gas	

Enter ZIP Code for regional weighted marginal emission rate (lb/MWh)

Please enter a valid 5-digit zip code so the calculator can estimate emissions avoided using an emissions factor specific to your region. If you don't enter a ZIP code or you enter an invalid ZIP code, the calculator will use a national average avoided emissions rate, which may not be accurate for your region.

06763

Convert data | Clear Fields

Step 2 - View results

3,067 Metric Tons of Carbon Dioxide (CO_2) equivalent

This is equivalent to greenhouse gas emissions from:

715 gasoline-powered passenger vehicles driven for one year	4,156 electric-powered passenger vehicles driven for one year
7,809,324 miles driven by an average gasoline-powered passenger vehicle	

This is equivalent to CO_2 emissions from:

345,068 gallons of gasoline consumed	301,239 gallons of diesel consumed
3,406,445 pounds of coal burned	40.6 tanker trucks' worth of gasoline
531 homes' energy use for one year	981 homes' electricity use for one year
17 railcars' worth of coal burned	7,100 barrels of oil consumed
140,878 propane cylinders used for home barbeques	0.0008 coal-fired power plants in one year
0.008 natural gas-fired power plants in one year	377,339,916 number of smartphones charged

This is equivalent to greenhouse gas emissions avoided by:

1,084 tons of waste recycled instead of landfilled	155 garbage trucks of waste recycled instead of landfilled
260,682 trash bags of waste recycled instead of landfilled	0.916 wind turbines running for a year

This is equivalent to carbon sequestered by:

50,707 tree seedlings grown for 10 years	3,076 acres of U.S. forests in one year
18.3 acres of U.S. forests preserved from conversion to cropland in one year	