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| **Equivalency Problem** | #2: A Winery goes Green |
| **Student** | Suraj Sehgal |
| **Assumptions:** | |
| [list any assumptions you will take into account for your calculation, either from the prompt or any that you have included]   * A mature tree will absorb more than 48lbs of CO2 in a year; 35 trees = 1680 lbs of CO2 = 762 kg CO2/year * PG&E electricity grid GHG = 200 kg CO2/MWh * Sharp ND216U1F; 216 Watt; 1750 panels = 378000 watts or 378 kWh/year * Entire PV system with the efficiency and azimuth = 611,494 kWh/year = 611.494 MWh/year * Solar panels produce 50g of CO2 per kWh * Manufacturing solar panels also produces 50g of CO2 = 1750 panels\*50 = 87.5 kg CO2 | |
| **Calculation:** | |
| * Carbon Capture of the Oak Trees:   + 35 oak trees \* 48lbs CO2/year/tree = 762 kg CO2/year * Amount of electricity produced by the PV system   + 611.494 MWh/year * CO2 emissions from producing the electricity:   + 50g CO2 \* 611494 kWH/year = 30902700 g CO2/year = 30,902.7 kg CO2/year   + + manufacturing (87.5 kg CO2) = 30,989.2 kg CO2/year * Number of years to match the carbon capture of oak trees:   + 30989.2/762 = **40.67 years** | |
| **Reflection:** | |
| It’s pretty surprising to see just how many years it will take for the solar panels to match the carbon capturing potential of the oak trees. It makes me reconsider the balance between preserving nature and biodiversity versus promoting the energy transition. Manufacturing of silicon and in general producing solar panels also have an inbuilt carbon cost. I wonder if there are additional factors to consider like the species affected by the loss of these oak trees, or the carbon costs associated with shipping and setting up the solar panels (assuming they may come from a different location). | |
| **Sources:** | |
| * <https://www.usda.gov/media/blog/2015/03/17/power-one-tree-very-air-we-breathe#:~:text=According%20to%20the%20Arbor%20Day,the%20very%20air%20we%20breathe>. * <https://pvwatts.nrel.gov/pvwatts.php> * <https://thesolarstore.com/manuals/SHARP216.pdf> * <https://solarisrenewables.com/blog/what-is-the-carbon-footprint-of-solar-panel-manufacturing/> | |