

Problem:

- Can Mt. Ararat High School (MTA) achieve carbon neutrality within its campus?
- How can Mount Ararat High School be more energy efficient?

Background:

- MTA needs a large amount of energy to operate and serve the needs of 865 people.
- MTA purchases two forms of energy, electricity and natural gas.
- MTA has 1,687 solar panels on its roof.
- Solar electricity generated varies by month.
- All the energy generated from the solar panels are sent to CMP to be calculated. MTA then receives credit for energy.
- Natural gas at MTA is mainly used for heating and cooking.
- Without MTA's geothermal system its overall energy use would be higher.

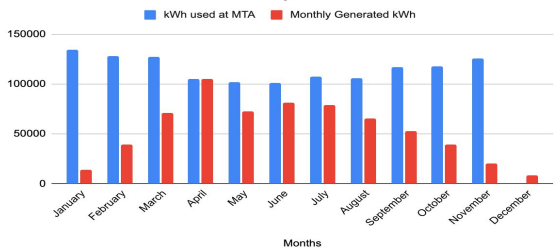
Process:

- Obtain MTA's energy electric and gas bills.
- Determine natural gas use.
- Calculate how much energy the solar panels generate over one year.
- Compare amount of energy generated from solar panels with with how much of that the school uses.
- Go onto roof to measure the square footage of the area of solar panels.
- Calculate how many more solar panels needed for MTA to be balanced (carbon neutral).
- Identify and inventory areas near school where the extra solar panels could be located.
- Determine how many solar panels could fit into each area.

Mt. Ararat High School Energy Use and Efficiency

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Electrical kWh used and Monthly Generated kWh at MTA 2023



**Total electrical energy used by MTA in 2023:
1,270,578 kWh**

**Total electrical energy produced by solar panels in
2023: 646,645 kWh**

Conclusions:

- About 51% of the electrical energy that MTA uses come from their Solar Panels (1,687)
- MTA uses about twice as much of the energy as it generates
- 1454 extra solar panels needed for carbon neutrality
- Proposed areas would fit approximately 3,906 solar panels (see "future area" below)

Calculations:

- 983 metric tons of CO₂ equivalents electric use in 2023
- 52.5 metric tons of CO₂ equivalents natural gas use in 2023

- 1,035.5 metric CO₂ equivalence total used.
- 1687 solar panels generate 453 metric tons of CO₂ equivalents per year.
- The forest at MTA removes 190 metric tons of CO₂ equivalents per year.
- Together the solar panels and the forest save 643 metric tons of CO₂ equivalents per year.
- This means that the school is not carbon neutral by an extra 392.5 metric tons of CO₂ equivalents per year.
- Dividing the metric tons of CO₂ equivalents per year generated by the amount of solar panels (1687) determines the CO₂ metric ton equivalents of one panel per year (0.27 metric tons of CO₂ equivalents).
- $392.5 / 0.27 = 1454$ more solar panels needed for carbon neutrality.

References:

- Revision Energy. "Mt. Ararat High School Annual Operations Report." Review, Topsham, Maine. *Revision Energy*, 1 Oct. 2022. Accessed 2 Apr. 2024.
- Google Earth accessed March 21st 2024
- EPA Greenhouse Gases Equivalencies Calculator accessed March 21st 2024

