Water Tower Power: Storing Solar Energy With an Elevated Pumped Storage Hydropower System

Pollart, Chase (School: Brush High School)
Stone, Carson (School: Brush High School)

Pumped storage hydropower (PSH) is a battery free, energy storage system that uses the potential energy of water to generate hydroelectric power. Our hypothesis was that we would be able to run basic functions, like lights and small electrical appliances, for a small solar powered home with a tower based PSH system. We designed a small scale tower based PSH system to establish how much electricity we could generate. A 50 gallon reservoir with a ½" pipe outlet was suspended 15 feet. We attached a 12v/10 watt turbine to the bottom of the pipe. We placed a 12 volt water pump connected to a 50 watt solar panel in a lower reservoir to pump water into the upper reservoir. We measured the time it took to pump 1 gallon of water into the upper reservoir and the time it took for 1 gallon of water to pass through the turbine. A second turbine was added as well. A multimeter was used to establish the wattage (w=va) produced by the turbine. It took 35 minutes for a 12 volt pump to pump into a 50 gallon water tank at 15 feet. Water released through the 12 volt turbine generated 6 watts of power for 35.7 minutes. Two turbines produced 10 watts of power. We would like to continue our research on 250-500w turbines and their feasibility in a similar system.

Awards Won: