Parabolic Solar Water Heater for the Navajo Nation

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The purpose of this science fair project is to design a parabolic mirror with copper tubing at its focus, and use a solar-powered pump that can efficiently heat water solely from solar energy. The goal is a practical solar water heater that works with solar arrays to test in rural homes that are off-the-grid. The target of this study was these rural homes, in particular, because living on the Navajo reservation has shown that this is a necessity for many people without money and existing infrastructure. This science fair project uses a mirror with a parabolic cross-section to focus sunlight upon a copper pipe. Separately, solar photovoltaic cells power a pump to circulate water through the copper pipe. The result is a completely solar-powered water heater which could be used on the Navajo Nation for homes that are remote and completely off-the-grid. The question of efficiency is addressed by dividing the heating of the water as measured in Watts (Joules/second) by the Watts received from the sun. The project showed an efficiency of 88%, which proved that a parabolic solar water heater with copper tubing at the focus, and a solar-powered pump, could efficiently heat water solely from solar energy.

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