Power and Water Backup for Natural Disasters: Tracking Concentrated Solar Collection with a Simultaneous Cooling and Water Distillation System

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Increasing photons exposed to a solar panel using parabolic mirror reflection enhances energy output, but reflection intensity could overheat the panel, so a new mechanism was engineered to divert excess heat towards distilling water. Autonomously producing solar energy and drinking water from any global location would incredibly improve living conditions in developing countries. Multiple manual experiments to calculate horizontal and vertical angles of the parabolic mirror to shine the largest light beam onto a solar panel were administered, and results were compared to solar azimuth and elevation, deriving an algorithm that produces the angle of the parabolic mirror given solar data. Servo motors were programmed to position the mirror inside a constructed frame-within-frame apparatus to the resulting angles. To prevent overheating, copper tubing underneath the panel circulates cold water, which, when reaching 65°C, panel maximum temperature capacity, transitions to a heating tank. The copper attempted to transform the water into steam, which would travel through a condenser, constantly pumping cold water around steam to convert purified gas into drinkable liquid. Additional light from mirror reflection enhanced voltage output by 1.3% from 9am-3pm. Including energy consumed by one pump, net solar energy produced was 15.8 watt-hours, but altering resistance can determine exact consumption quantity and increase power output. Although tank temperature did not propel phase change, convex lens light concentration or converting solar energy produced into heat could increase temperature. Valves and pumps were operated manually, but could be programmed to communicate autonomously with temperature sensors in the future.

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