Building an Efficient Reversible Fuel Cell Stack for Use as a Backup Power Source

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Hawaii's energy costs are the highest in the nation. Hawaii is currently using solar and wind energy to try and combat these high prices. This project improves upon the current systems by replacing the battery backup storage with a reversible fuel cell (RFC). This project tests the effectiveness of using manganese sulfate as a catalyst, stainless steel as the electrode and ocean water as the electrolyte for an RFC. This project analyzed this RFC in parallel stacks of one, three, six, nine, and twelve. RFC stacks in parallel connections are utilized to increase the amperage of the system. This project also analyzed the effectiveness of manganese sulfate when added to the electrolyte. The twelve RFC stack with the catalyst produced the most power with 38.0 watts. This data was taken to create an observation buoy powered by solar energy and utilized a six RFC stack as backup power. The observation buoy included an anemometer, beacon, and rain collector for the solar panel and RFC stack to power. The solar energy powered the observation buoy for 12 hours and then was shut off to see the effectiveness of the RFC backup system. The RFC backup system was able to power the buoy for 24 hours, without the aid of solar energy. This will be tested further to create a backup system for home solar energy.

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