Digitally Optimizing “Smart” Photovoltaics

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Problem
Can a real-time microprocessor optimize solar power?

Hypotheses
A) Evaporated water can be cooled by a solar-powered Peltier device, producing safe drinking water.
B) A microprocessor can monitor the maximum power point to optimize solar power and be radio-linked for computer analysis.

Solar panel power ramps up and drops, but microcontroller keeps it at “knee” of maximum power output by checking voltage and current and adjusting PWM duty cycle.

Distillation Device

Data

Distillation works well

VOLTAGE:
4.01 V-7.20 V when sunny
0.00 V-0.60 V when overcast

Conclusions
A) Solar-powered distillation DOES work, but NOT EFFICIENTLY: 2.2 liters maximum
B) Microcontroller showed proof of concept for power increase and is licensed to JouleNet for a model solar farm, but is still being tested

Applications
Water distillation and solar energy for sustainability
Microcontroller proof of concept VIABLE for low cost +10% energy optimization
Radio can network 1000s+ solar panels
Similar technology could network air quality or temperature monitors

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Key Circuit Elements
PIC18F8722 with two interrupts
thermistor
cadmium photocell
802.15 radio