# Self-Cooled Dynamic Solar Array

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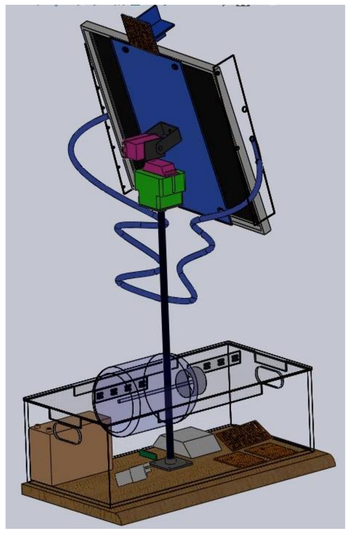
## Introduction

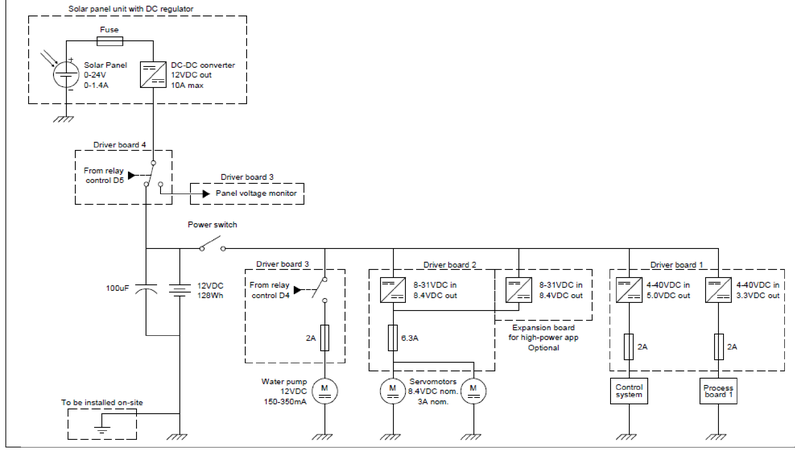
The Self-Cooled Dynamic Solar Array is a fully self-contained, all-in-one solar energy production platform. The system offers three key benefits over existing alternatives, all of which are powered entirely through the system itself.

- Tracking the sun's position to optimize the panel's orientation at all times
- Cooling and cleaning the surface of the panel with a high-pressure water spray
- Calculate solar energy production in real time and report that data as needed to outside SCADA systems

## Solar Array Design



## Design Organization Details



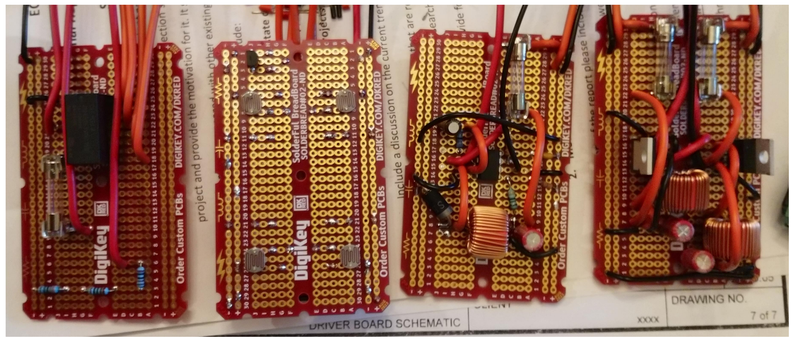

## Benefits and Application

- Bespoke renewable energy, tailored to customer needs
- Maximized energy production over standardized, off-the-shelf alternatives
- Particular useful for:
  - Energy generation in remote locations
  - Reducing area needed for solar farms
- Can be scaled up as needed for large operations while minimizing square footage required for solar production
- Can be scaled down as needed to as small as a single unit for low power applications like remote sensors and monitoring equipment in the field

## Electrical Fabrication & Schematics

The Self-Cooled Dynamic Solar Array's internal components have been meticulously designed down to the gate-chip level, using no prebuilt, off-the-shelf circuits. Instead, it was built from the ground up using our own modular, semi-standardized parts.

This allows us to customize the product for any customer needs, whether that be minimizing cost, maximizing efficiency, or even opening the door to new features like creating a smart network of multiple panels.




From left to right, a water pump enable relay circuit and solar panel production monitoring circuit, an LDR-based tracking circuit, a high-current variable power supply, and a simple 3.3V and 5V power supply circuits on one board.
Every one of these boards is available in multiple configurations, ranging from low-power and low-cost, to high-power and high-cost, and even with some premium extra options available.

## Software Development

The software environment used is through Arduino, which uses C++ language. We developed our code that is able to:

- Control our servo motors using our sun tracking algorithm
- Collect data such as panel output voltage, temperature, and photoresistor readings
- Control the water pump to cool the panel

## Machine Learning

The machine learning algorithm provides predictive data output to provide information for the customer. Here is a rundown of the algorithm:

- Take readings of temperature and panel output voltage
- Store them as separate arrays
- Use linear regression to build and train the model
- Download the file onto the Arduino Nano

Our algorithm will give us an expected panel output voltage when we give it a random temperature.