Climate Change
Climate change is one of the biggest problems we as a civilization face. Our hope from this project is to provide an efficient renewable energy source for our energy needs.

Photovoltaic panels:
Solar energy is one of the most infinite sources of energy available in nature. Photovoltaic is a technology of acquiring electrical energy from solar rays. Solar cells are used to extract/absorb energy found in solar rays.

Maximum Power Point Tracking (MPPT):
Traditionally Photovoltaic method is known to be inefficient. There are many solar ray voltage(s) unaccounted. It is very important maximize as much energy provided per square inch. A lot of the waste occurs when conditions change abruptly. For example when it gets cloudy or starts to rain. MPPT is a technique to maximize output power as source change. In other words one does not want the panels to work at full capacity when it’s not sunny.

Subsystem Details:
Pilot Cell Measurements: The pilot cell measurements are made in 2 main steps. Firstly, the incoming open circuit voltage is read using a voltage divider, where the measurement is sent to the Arduino. Secondly, the short circuit current is read by closing a switch and reading using a current sensor where the measurement is again sent to the Arduino for later use.

DC/DC Converter:
The converter will work by use of an inductor and switching mechanism to induce current from the power cell and ultimately boost to a voltage according to a calculated duty cycle. This duty cycle will be found using the maximum power transfer theorem in order to make both the source and load resistances equal to one another.

Arduino Microprocessor:
The microprocessor will take incoming measurements in a timely manner and under changing conditions. The arduino will be used to control the switching mechanisms in both the pilot cell measurements and the pulse width modulation duty cycle for the boost converter. The main operation done by the arduino is to solve in real time, the appropriate duty cycle which allows the source and load resistances to be equal.

Proof of Concept and Theory:
Maximum Power Transfer Theorem: The maximum power transfer theorem states, that when a source impedance is the same as the load impedance there will be a maximum power transfer from source to load. There is a point on the power and load curve where the maximum power is achieved as seen in the figure below. This is the point to which the max power point will be achieved by the circuit.

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Data and Conclusion:
The data found is based on subsystem testing and under a static load resistance. This was primarily to solve for a proof of concept and we plan on doing further final testing, in order to come up with a complete functional design.

Conclusion:
In the end the MPPT as shown in the data provided a boost in output power when compared to without MPPT. This shows that the circuit is properly working. The main goal of this project is to combat rising issues of global warming. By maximizing power output, there is a direct assistance in taking relief off of power grids and enabling solar energy as a viable option. The goal is to implement this device on residential settings to allow homes to operate off the grid and serve as self-sustaining models. Currently undergoing further testing to charge a 12V battery.