

Project Title: Off Grid Solar Array

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Summary of Functional Requirements

This solar array uses the sun's rays to produce a direct current which charges the battery bank. The inverter then pulls the battery bank's power when a load is connected. The inverter converts the direct current into alternating current and can be used to power the load.

Primary Constraints

The roof space limits the number of panels which limits the power that can be obtained from them, requiring higher rated panels. The roof's layout and pitch also limits the system. The two panels have to face opposite directions due to the gable roof type, making only one face South at a time. This limits the intake of the other panel.

Economic

Human capital: If people begin purchasing and installing their own solar arrays, this will decrease the need for solar companies who install but will increase business and productivity for companies who build the arrays.

Financial capital: People installing their own systems will begin saving money quicker than if someone else did it for them.

Natural Capital: Solar arrays will decrease the amount of coal and other natural resources used to generate electricity but will use more silicon for the panels.

Costs come when homeowners purchase the system and when the system needs to be updated which is generally around 20 years after the installation. The bill of materials is shown in Table 1. This cost is generally paid for by the homeowners. The system starts benefitting them as soon as it is installed by saving money and resources. Future generations can benefit from using solar also because less natural resources are used up and can be saved for the future.

Company	Model	Quantity	Price Per Unit
Astronergy	260 Watt Module Silver MC4 CHSM610P-260 40mm Frame	2	\$225.00
MidNite	MNPV-3, 3 Position Combiner Box	1	\$72.00
MidNite	Breaker DC DIN 15 amp 150VDC DIN, 13mm	1	\$12.50
MidNite	Solar Classic MPPT Charge Controller 150V	1	\$607.00
4 Star Solar	10 AWG-PV Wire – 30' cable extension	1	\$31.00
Cotek	SD series 2500 12V Pure Sine-wave Inverter SD2500	1	\$769.00
MidNite	Breaker DC Panel Mount MNEDC-100 amp 150VDC ¾"	2	\$25.00
MidNite	Breaker Box MNEDC Quad for panel mount DC breakers	1	\$50.00
Universal	RV Mount-Z Flush Mount Feet (4pc) – SLB-0102	4	\$14.29
			Total Parts Cost \$2098.66

Table 1: Bill of Materials

Activity	16-Sep	3-Oct	17-Oct	24-Oct	31-Oct	14-Nov	28-Nov	20-Dec	23-Dec	7-Jan	16-Feb	18-Feb	19-Feb	25-Feb	26-Feb	2-Jun
Get Quotes from Contractors																
Abstract																
Value Statement																
Business Model Canvas																
Marketing Data Sheet																
First Pass Senior Project																
Cost Analysis																
Ethics Evaluation																
Senior Project Paper																
Designs Finished																
Permits Filed with City and SCE																
Order Parts																
Design Review																
Racking Installed																
Solar Panels Installed																
Wiring Finished																
Project Expo																

Table 2: Estimated Time Development

Activity	16-Sep	3-Oct	17-Oct	24-Oct	31-Oct	14-Nov	28-Nov	3-Feb	24-Feb	3-Mar	4-Mar	5-Mar	10-Mar	11-Mar	18-Mar
Get Quotes from Contractors															
Abstract															
Value Statement															
Business Model Canvas															
Marketing Data Sheet															
First Pass Senior Project															
Cost Analysis															
Ethics Evaluation															
Senior Project Paper															
Designs Finished															
Order Parts															
Racking Installed															
Solar Panels Installed															
Wiring Finished															
Final Report															

Table 3: Actual Time Development

Commercial Basis

The total cost of this system is around \$2,000 but allows the convenience of not needed any hookup to electricity or paying any electric bill. This system's cost will change based on the homeowner's needs and can be reduced if needed.

Environmental

The system will save natural resources such as coal, nuclear, natural gas, and petroleum from being used to generate power. These will still be used but if a significant number of people use solar on their homes, this number could decrease.

Manufacturability

This project involves purchasing the parts from other manufacturers. They are the main resource used but they are not putting the system together. Connecting the individual manufactured parts will include placing the panels in series to achieve the maximum output from the system while keeping the current low and the raising the voltage. A key part is making sure the correct wire sizes are used. Having too small of a wire will not handle the current that is needed causing the system to have problems. Safety is also a concern when wiring up the panels. Breakers can set a limit on the current and can save components if it is unreasonably high for the system.

Sustainability

Most solar panels are given a twenty to twenty-five year warranty. The homeowner will be able to make up their money spent and start saving much before the time they need to be replaced. By using solar, other resources can be sustained and used in the future. This project could be improved by using smaller breakers, more efficient batteries, and smaller wires. Safety is the largest issue when upgrading parts because the panels have been producing a current which could be dangerous if the proper steps are not taken.

Ethical

This idea and project is not to start a company and make money from it, but rather to help other homeowner's save money and learn about solar in the process. Good instructions should be given in order to stay away from damaging the service panel or injuring anyone in the construction process.

Health and Safety

The largest concern with this self-installed system is the wiring. This can be very dangerous if not done correctly and in the right order. Adhering to the codes and limitations to achieve safety is a reliable and helpful way to ensure safety.

Social and Political

Society can be impacted by learning more about solar which will cause a larger understanding of renewable energies and their importance to the environment and future. This project does not only save money but more importantly can help save Earth's resources. Politically speaking, the government should consider whether paying for solar will save more money in the long run and help get the United States out of debt.

Development

Developing this system will take time and care. The time will mainly come from ordering the correct parts and not paying too much for them. Once construction begins, it is estimated to take around two weekends to complete. The electrical work must be completed carefully in order to maintain a safe work environment and not damage any of the equipment.