

ISES Solar Charging Station

Concept Generation and Selection

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October 30, 2013

Overview

- Introduction
- Concept Generation
- Concept Selection
- Gantt Chart
- Conclusion

Introduction

- Sponsor is Dr. Thomas Acker
- Design a solar charging station that can charge small electronic devices.
- Two main subsections to the solar charging station:
 - Control System
 - Display System

Control System 1

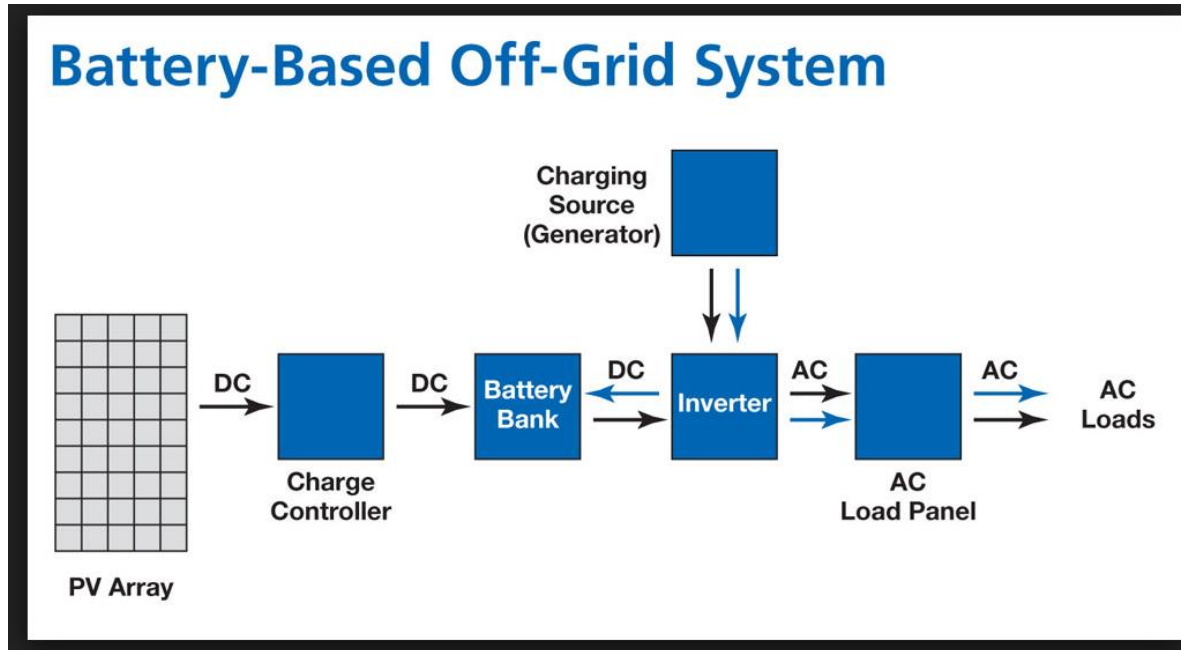


Figure provided by Home Power

Advantages

- Least expensive option
- Fewest components needed

Disadvantages

- Energy losses from batteries not in operation
- Battery replacement over time

Control System 2

Grid tie control system

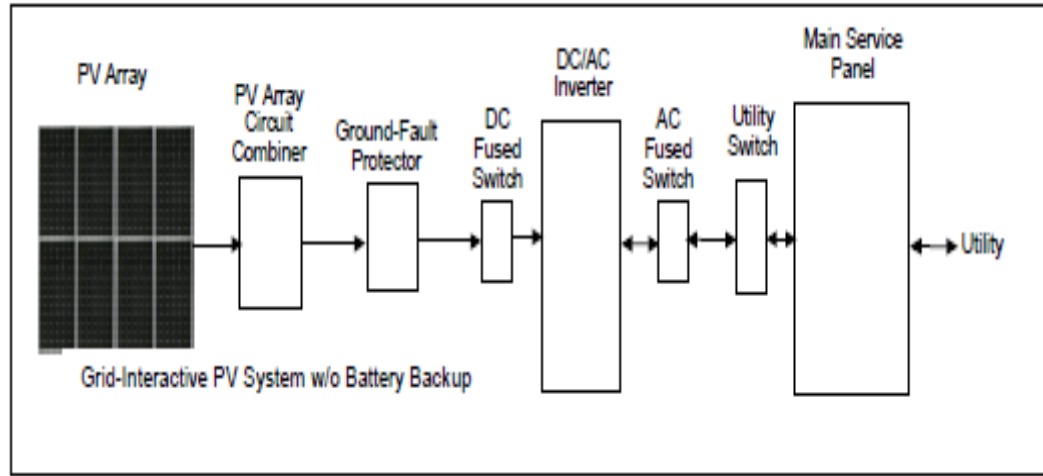


Figure provided by Endecon Engineering

Advantages

- Can be used anytime during the day
- Extra energy goes into the grid to save money

Disadvantages

- Does not work at night during power failure
- Does not save money at night

Control System 3

Grid tie with battery backup control system

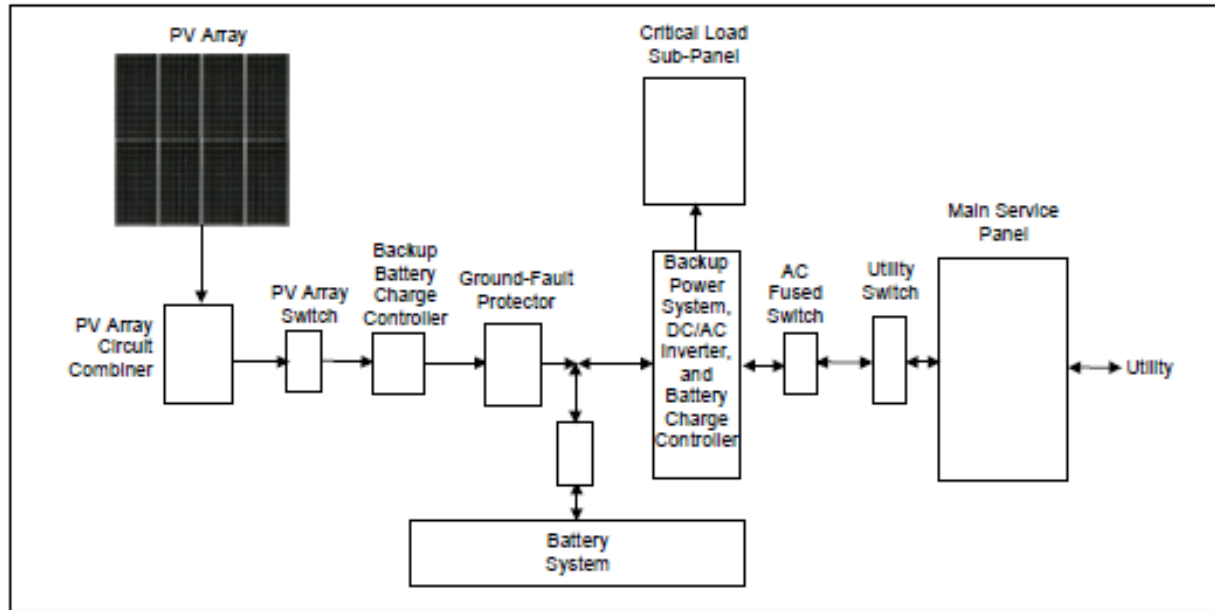


Figure provided by Endecon Engineering

Advantages

- Can still be used during a power outage

Disadvantages

- Complicated to get everything to work properly
- Battery replacement
- The most expensive option

Display System 1

Pre-Programmed Display

Advantages

- Variety of interactive displays
- Most appealing display

Disadvantages

- Price

GEO Chorus PV



Figure provided by GEO

Display System 2

Team Programmed Display

- Code is written by team to display power measurements Basic power display

Advantages

- Cheapest display solution

Disadvantages

- Requires time to program
- Display is limited to simplistic designs

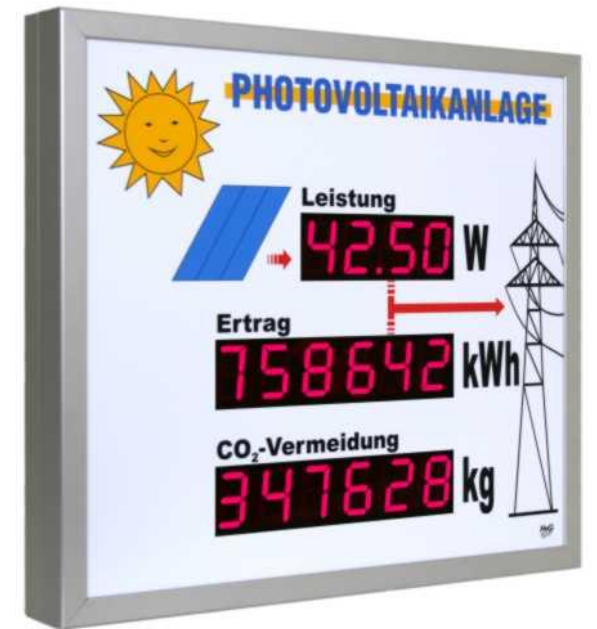


Figure provided by HVG Engineering

Display System 3

Tablet Display

- Data is transmitted wirelessly to the tablet

Advantages

- Complete customization

Disadvantages

- Specialized application programming
- Expensive

Nexus 7



Figure provided by Google

Design Criteria

- Cost- How expensive the system is
- Efficiency- Power savings
- Simplicity- How easy the system is to build
- Reliability- Operates under various circumstances
- Environmentally Friendly- how the design impacts the environment
- Customization- The various features of the display
- Man Hours- The amount of time required
- Adaptability- How compatible the system is

Decision Matrix

Decision matrix for solar control systems

Decision Criteria	Decision Criteria Weights	Grid Only	Battery Only	Grid with Battery Backup
Cost	0.10	3	4	2
Efficiency	0.30	5	3	4
Simplicity	0.10	3	4	2
Reliability	0.40	5	3	4
Environmentally Friendly	0.10	4	2	2
Total		4.5	3.1	3.4

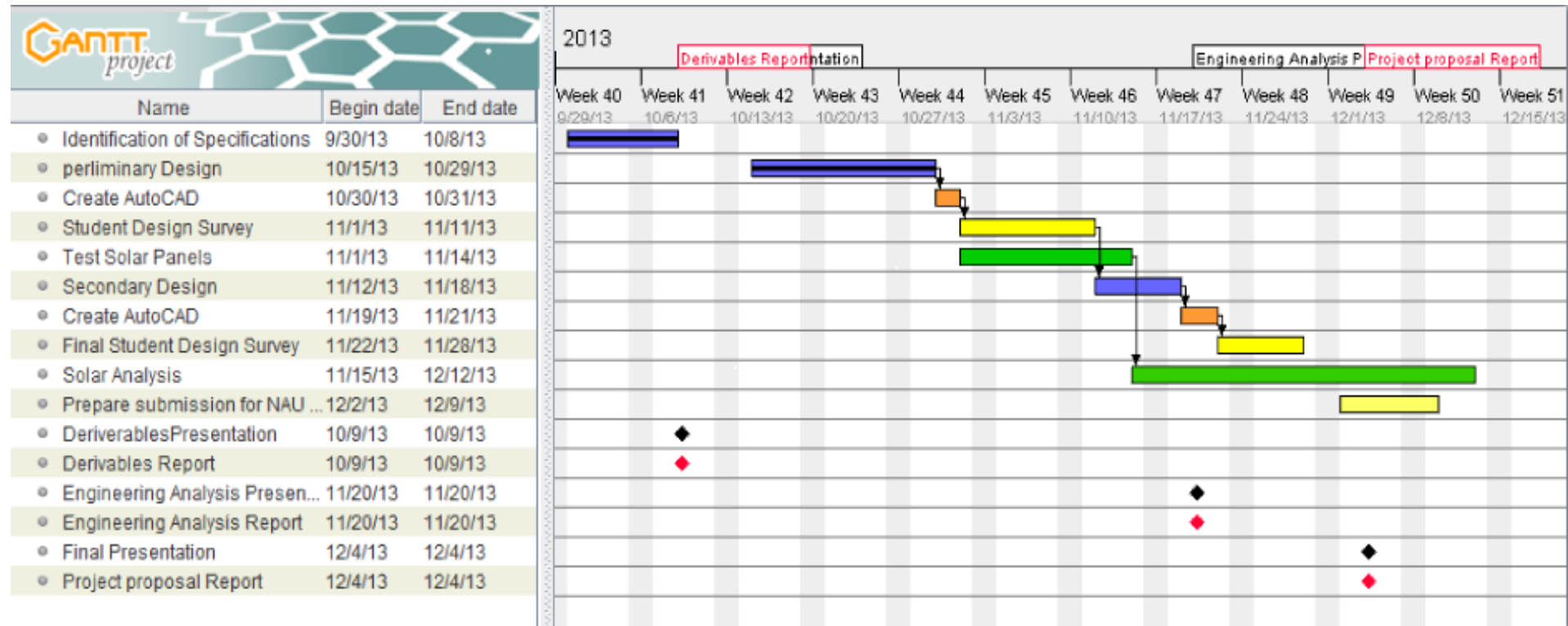
Decision Matrix

Decision matrix for the display options

Decision Criteria	Decision Criteria Weights	Pre-Programmed	Team Programmed	Tablet
Cost	0.05	3	4	3
Reliability	0.40	4	3	2
Customization	0.15	4	5	2
Man Hours	0.10	5	2	2
Adaptability	0.30	4	4	1
Total		4.05	3.55	1.75

Gantt Chart Update

Project Progress



Conclusion

The best overall system includes:

- A pre-programmed display is the best system for displaying power readings because of the efficient technology and competitive pricing.
- A grid tie control system is the optimal choice because it saves money and is the most reliable.

References

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- [2] Sanchez, J., “Choosing a Battery-Based Inverter”, Home Power, www.homepower.com, October 25, 2013.
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- [5] “Nexus 7”, Google, www.google.com/nexus , October 26, 2013.

Questions?