

Solar Assisted HVAC System

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EPS Booth: 346

TEAM 6

Abstract:

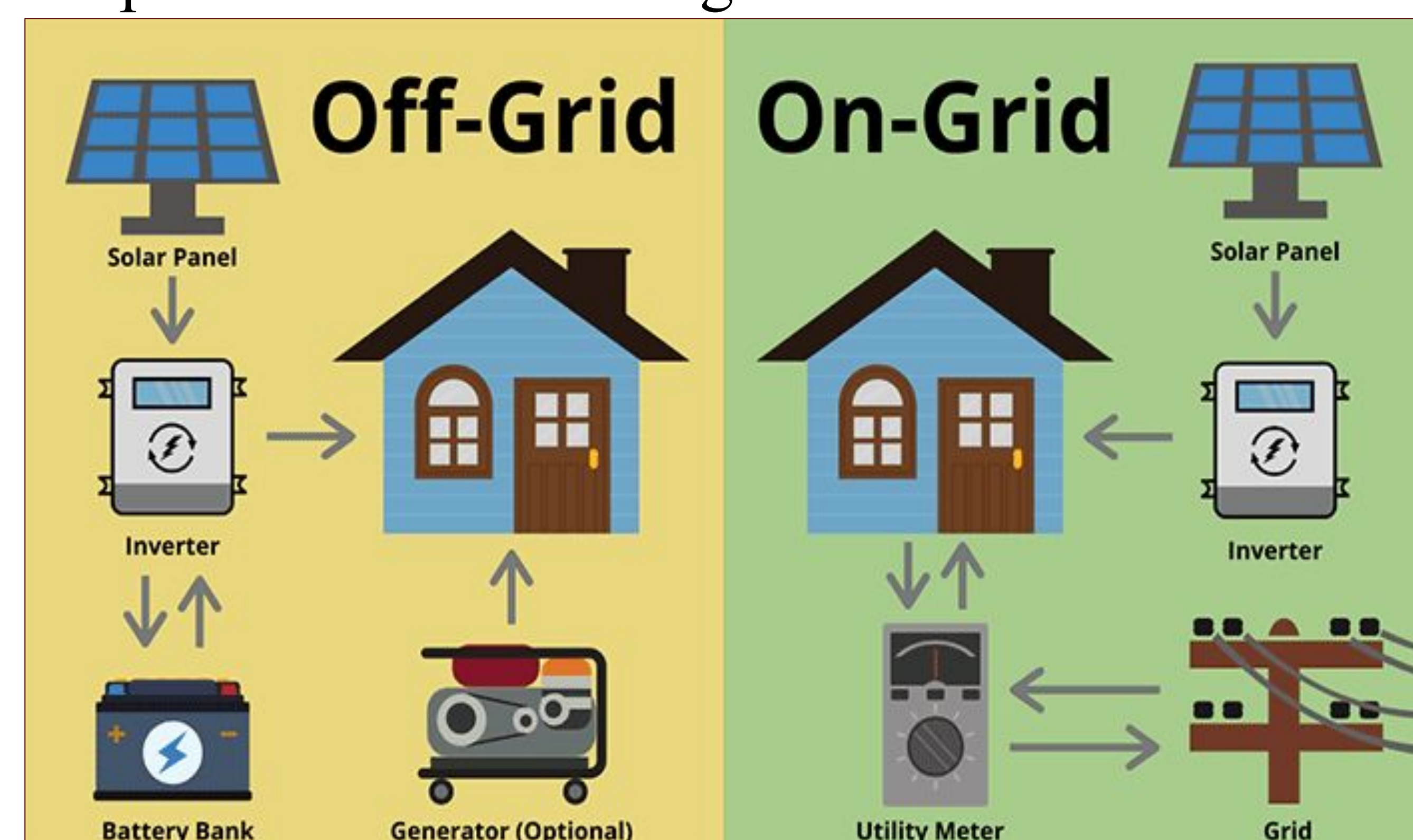
The cost of utilities can get expensive, especially during periods of extreme weather. To address this issue, we developed a method for sharing the power delivered by the utility grid and a separate solar powered system. Under different conditions, we were able to use a microcontroller to toggle between grid power, solar power, or both.

Motivation:

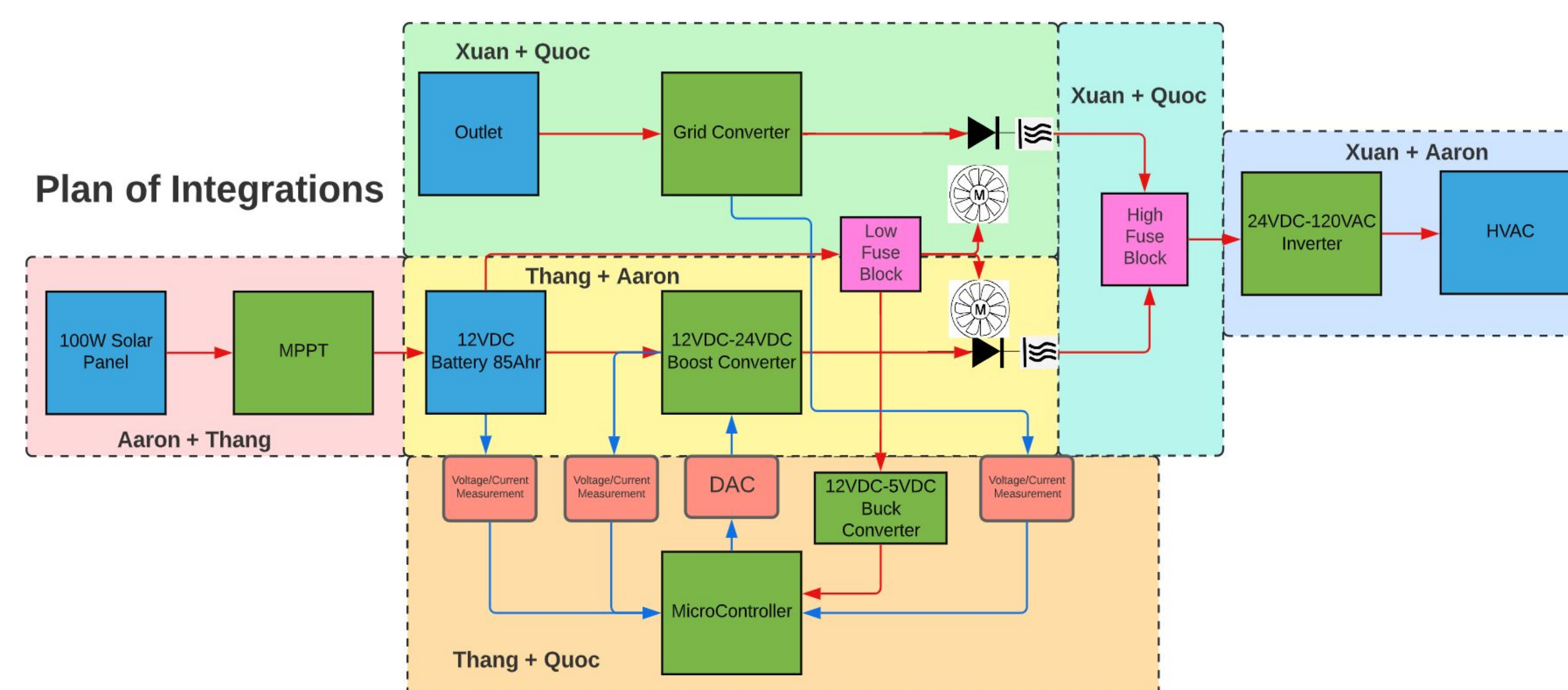
Our team established the idea of creating a Solar-Assisted HVAC System that incorporates both grid-connected and solar-connected electricity. By creating and storing energy during peak sun hours, our system promotes environmental friendliness, by cutting carbon emissions and reducing monthly energy expenses.

Engineering Analysis:

- Our system will use solar power during peak sun hours to help reduce the workload on the grid and prevent power outages.
- Maximizes the use of solar power in residential housing by reducing grid power consumption and the monthly utility bill.
- Protecting the environment by using solar power to reduce nitrogen oxides emission.

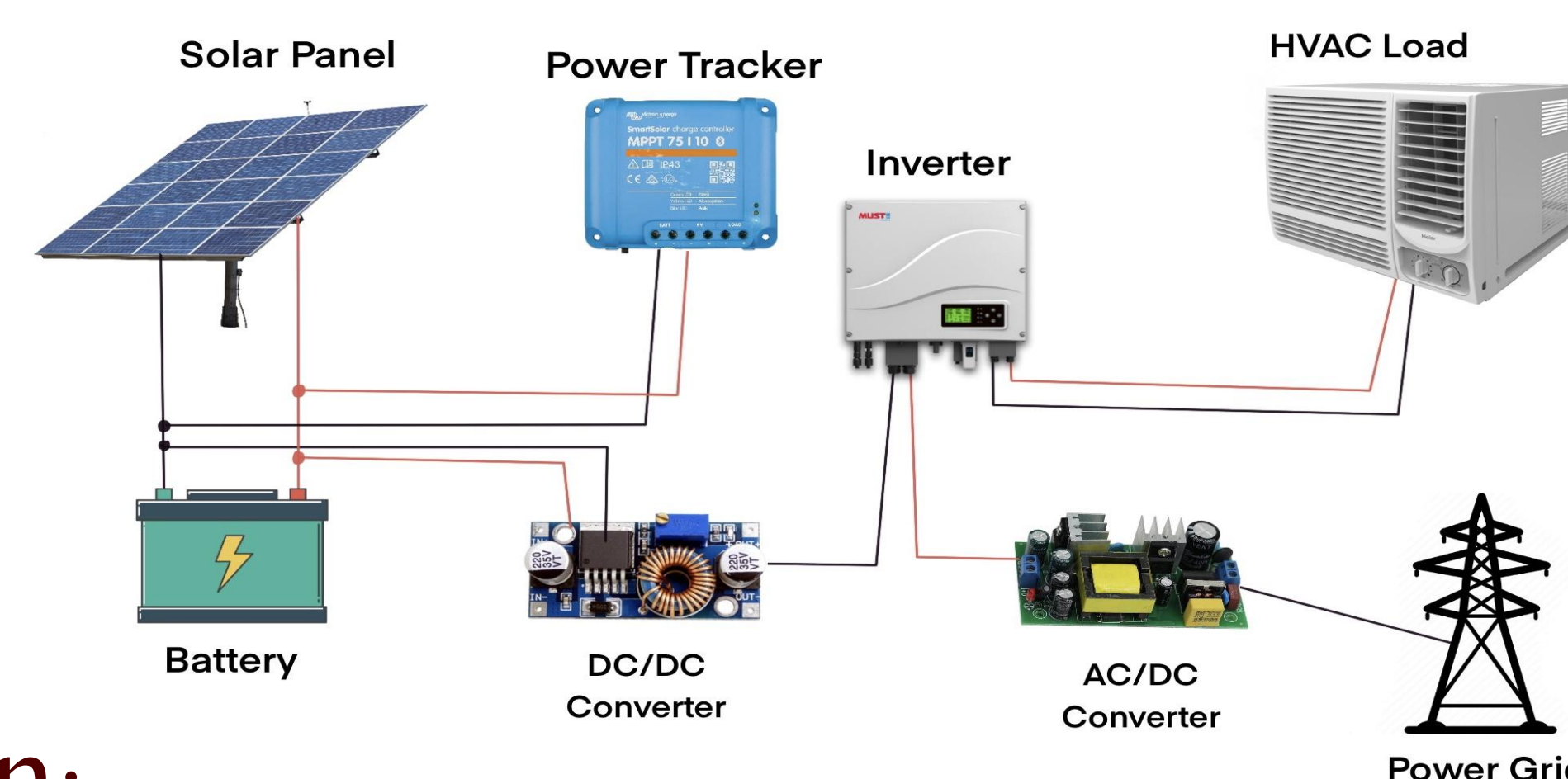


System Overview/Diagram:



System Main Components:

- Solar Panel and MPPT
- Battery and Solar Converter
- MicroController Unit
- Inverter and Power HVAC



Design:

Two modes of operation:

- Implement load sharing and redundancy power systems concept to supplement power to the HVAC system utilizing a solar system.
- Fully operating Solar System as an Emergency Operation Plan (EOP)

Mode 1: Load Sharing/Redundancy	Mode 2: Emergency Operation Plan
The Solar System will share half the load of the Grid System	The Solar System will supply 100% when battery is above 80%
The grid will supply 100% when battery is below 40%.	Load-sharing when battery operating below 80% capacity

Results:

The overall system effectively demonstrate that this concept could be operational and executed through a smaller size power supply (60W fan instead of 500W HVAC).



Impact

- Economic impact: The system uses solar power which reduces the overall utility cost.
- Environmental impact: The system will use solar energy so it can lessen the burden on home's electricity and reduce NO2 emissions.

References

- "Modelling and design of a linear predictive controller for a solar powered HVAC system," 2012 IEEE International Symposium on Industrial Electronics
- "Design and Implementation of Peltier Based Solar Powered Air Conditioning and Water Heating System," 2018 3rd IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology
- <https://spectrum.ieee.org/a-plugandplay-microgrid-for-rooftop-solar>

Acknowledgements

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