

STANDALONE POWER CONVERTER

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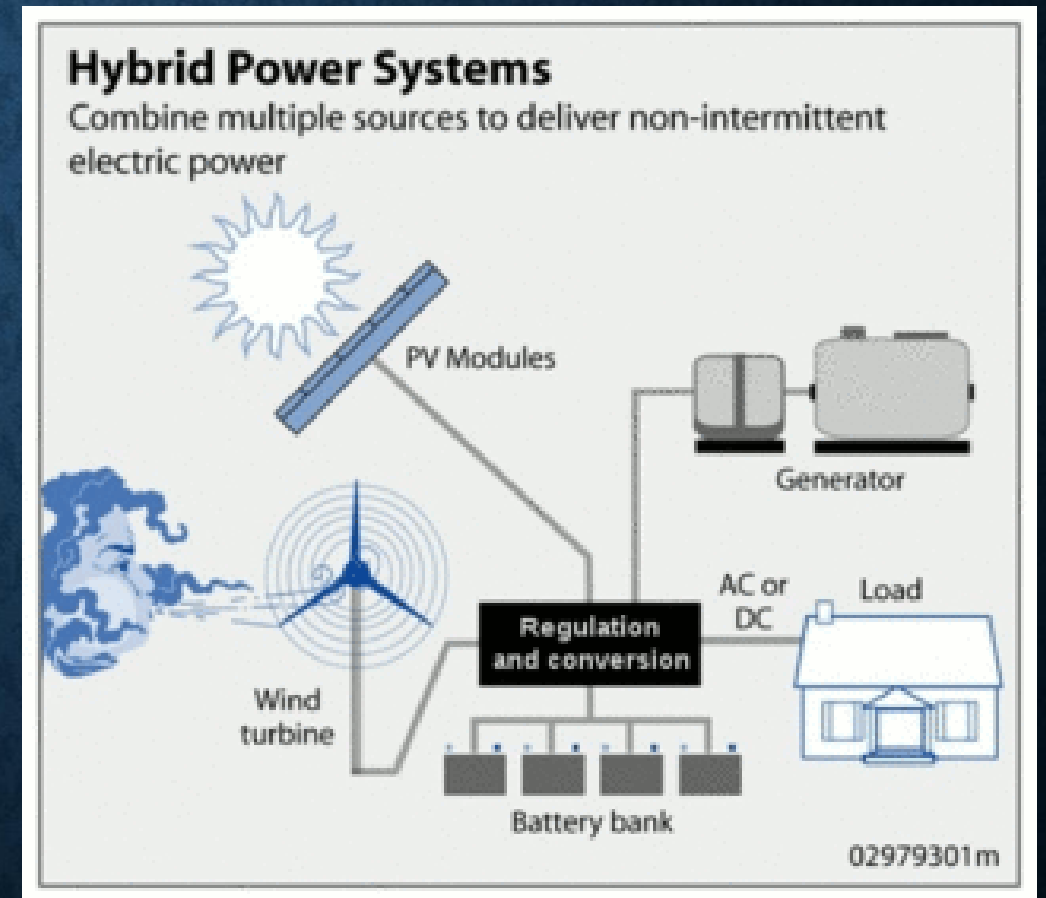
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Client: Venkata Yaramasu

WHAT IS A STANDALONE POWER CONVERTER

- A piece of the standalone power system
- Converts power generated from a source (wind, solar, diesel, etc.) and stores it in a battery
- Converts battery power into an output voltage to power a load (houses)



- It can cost as much as \$50,000 to connect one customer to electricity
- the U.S. Department of Energy estimates 18,000 Navajo homes — about 40 percent — still lack electricity.



OUR CLIENT

- Dr. Venkata Yaramasu
- Assistant Professor at NAU
- Director of AMPERE Laboratory at SICCS



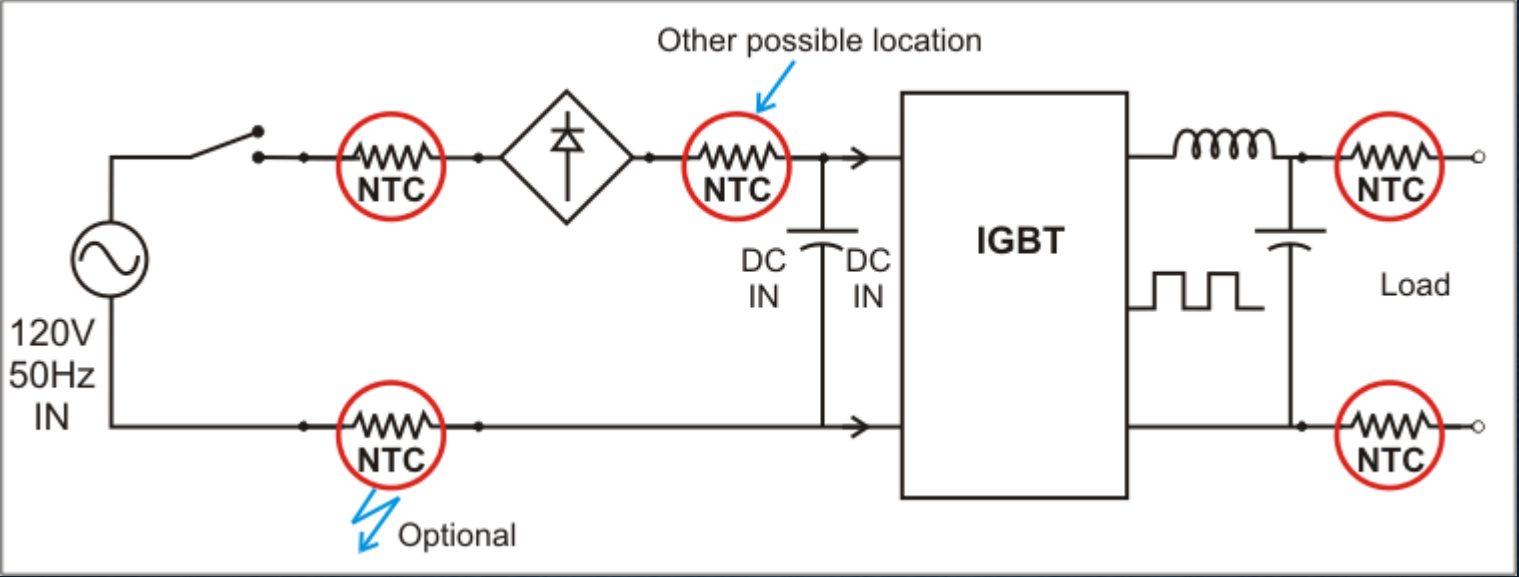
WORK PROCESS

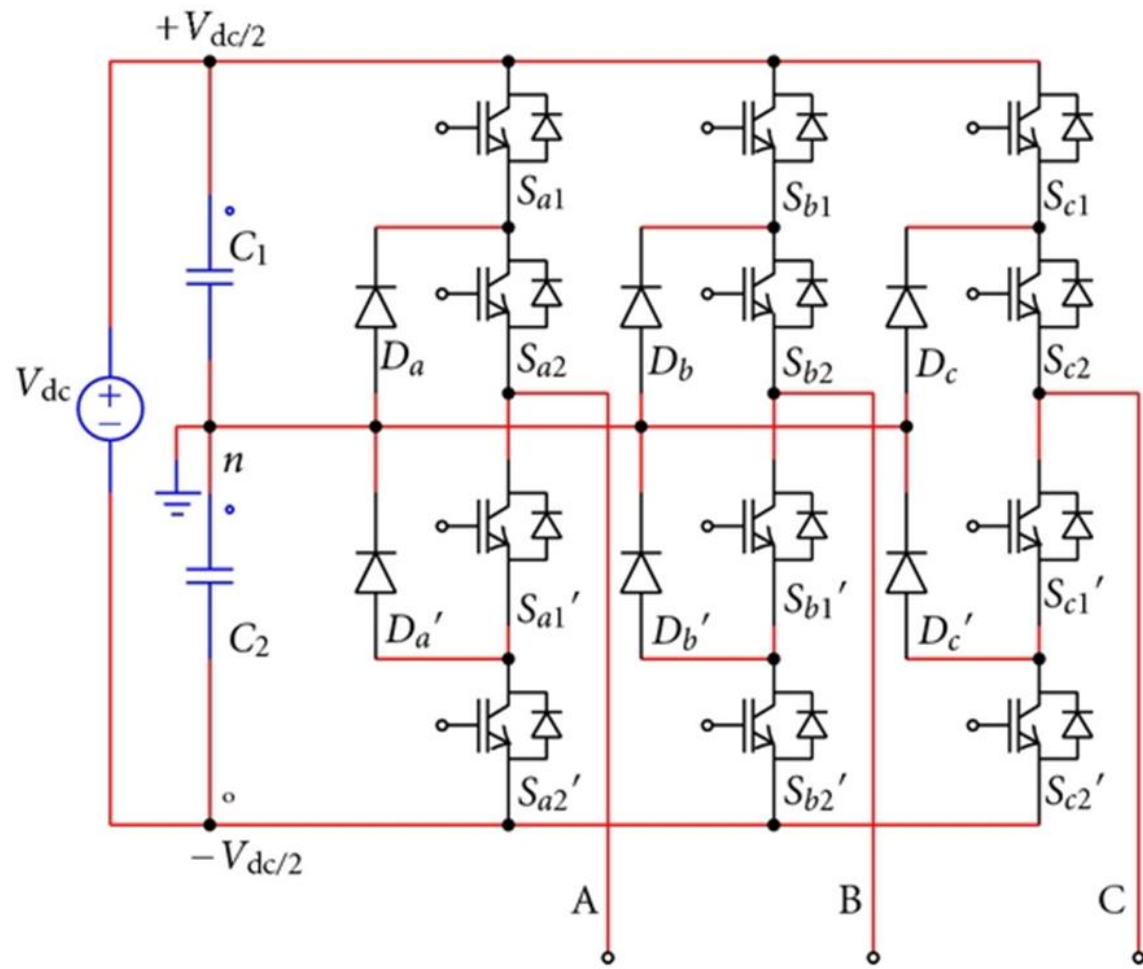
- Create experimental setups for research purposes.
- Analyze results to figure out what the design did well and what flaws hold it back.
- Use previous models to design a new setup and repeat the process.
- Standalone power systems are comprised of many subsystems (Control system, inverters, gate drivers, etc.) so a successful part can be used in a new design.

HOW ITS CURRENTLY IMPLEMENTED

- At low voltages typical converters utilize 2 or three level converters.
- NTC or flat value resistors are used to limit inrush current to protect converter.
- Snubber capacitors may also be implemented for additional switching protection.

- Mid voltage converters require battery storage, relays and produce single phase outputs that only supply balanced loads.
- Only designed to power one house.





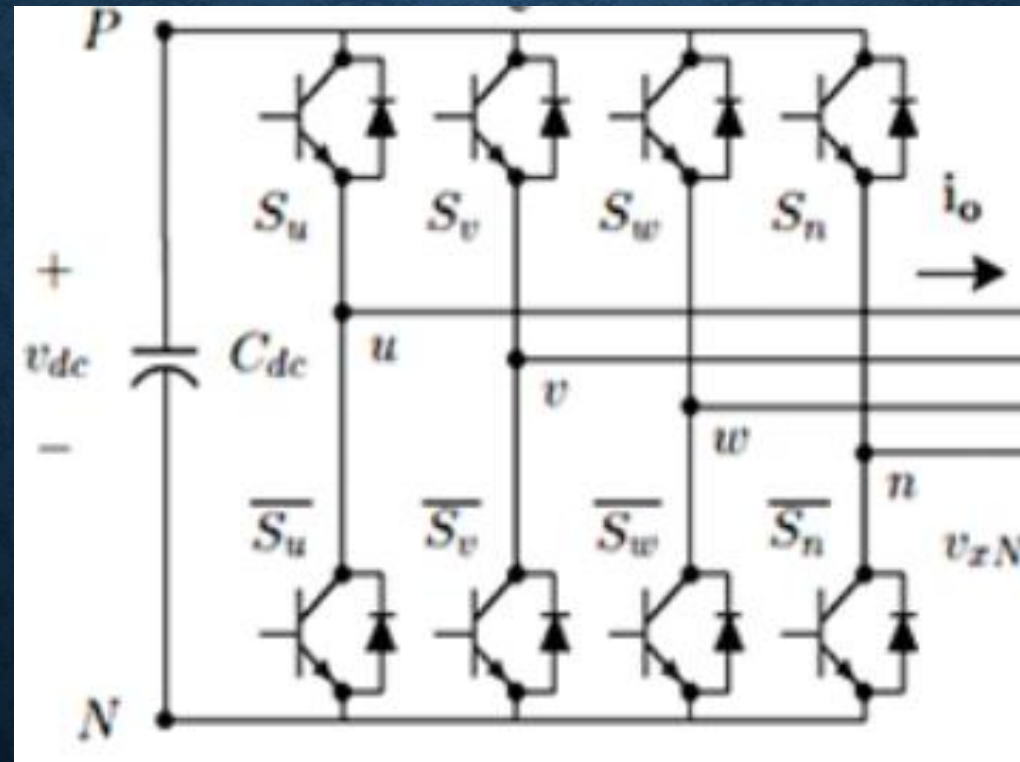
DRAWBACKS OF CURRENT IMPLEMENTATIONS

- At low voltages standard two and three level converters work fine.
- At mid and high voltages power losses become significant.
- High harmonic distortions.
- Inrush currents, and how to limit them without causing excessive losses.
- High switching frequency = cleaner output waveforms but incur high switching losses.
- Since current converters only power one house a community of 20 houses needs 20 standalone power systems, which is costly.

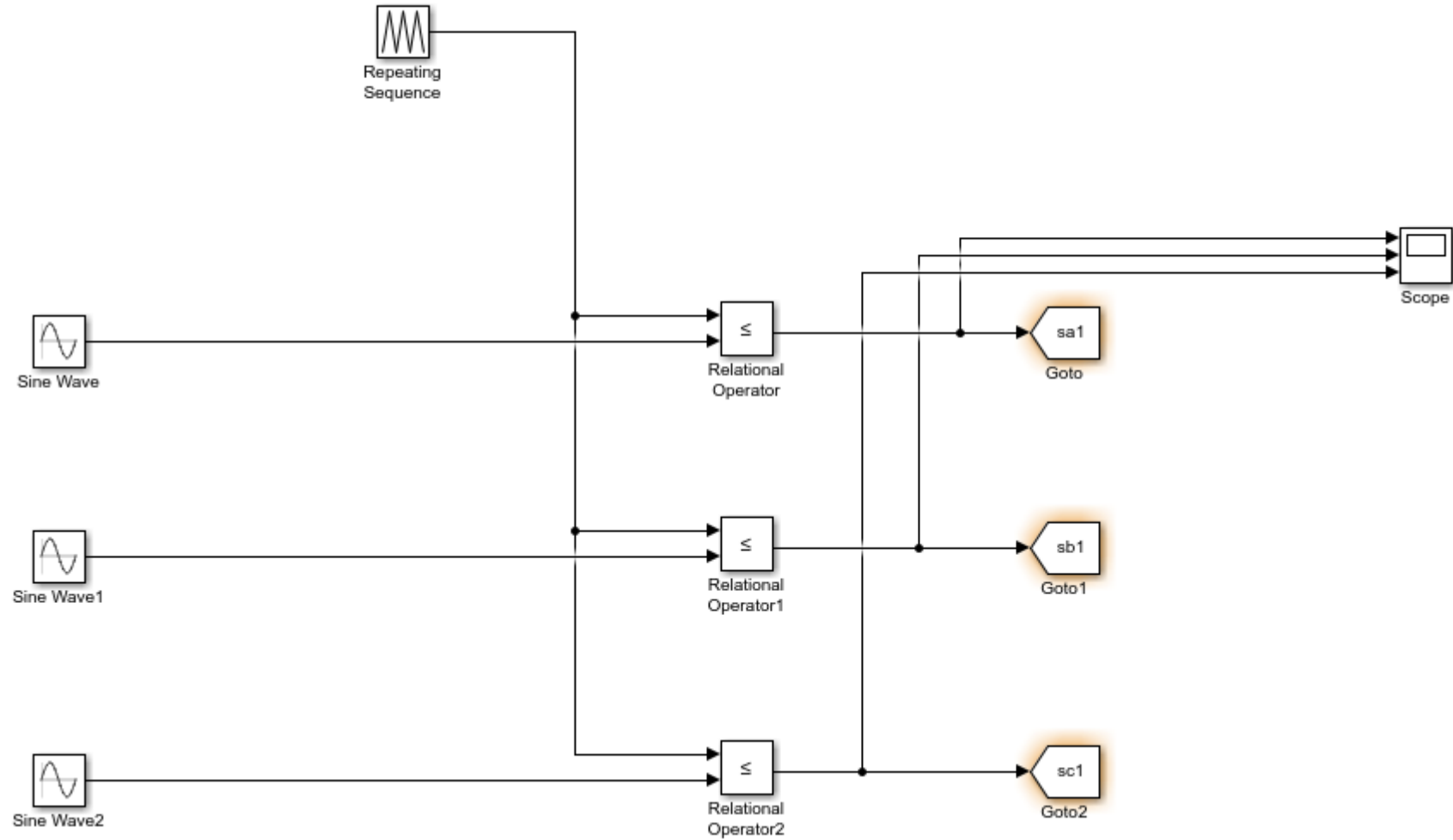
OUR MISSION

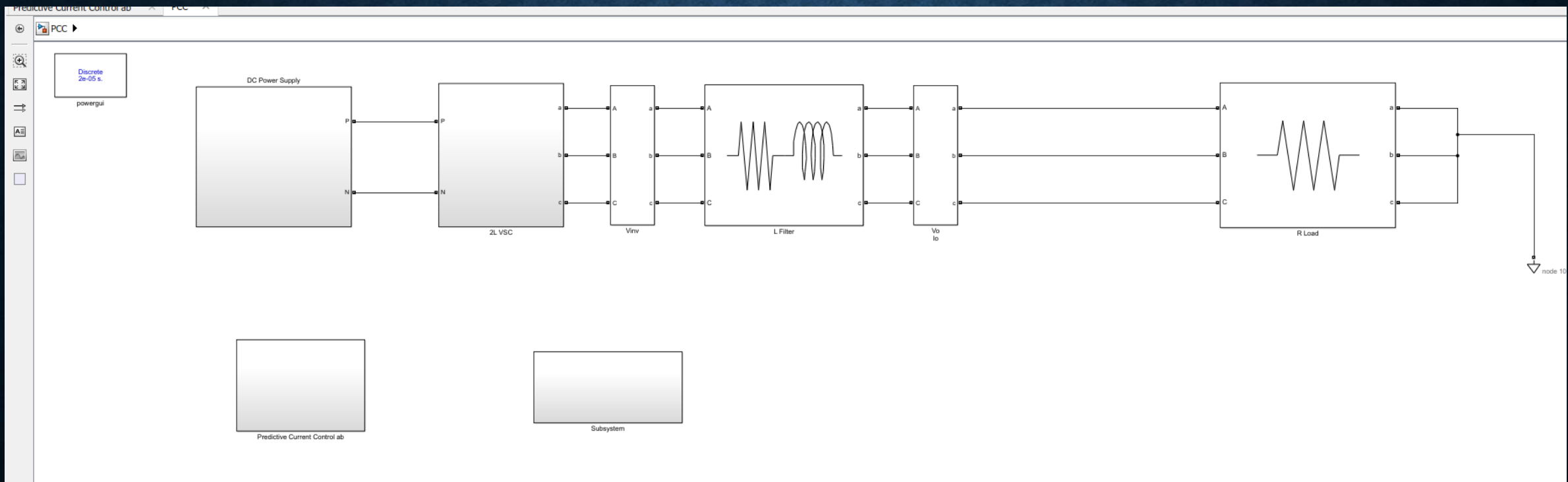
- Develop three-phase four-leg inverter
- Altium software designer
- MATLAB Simulink 2017a
- Dspace DS1103

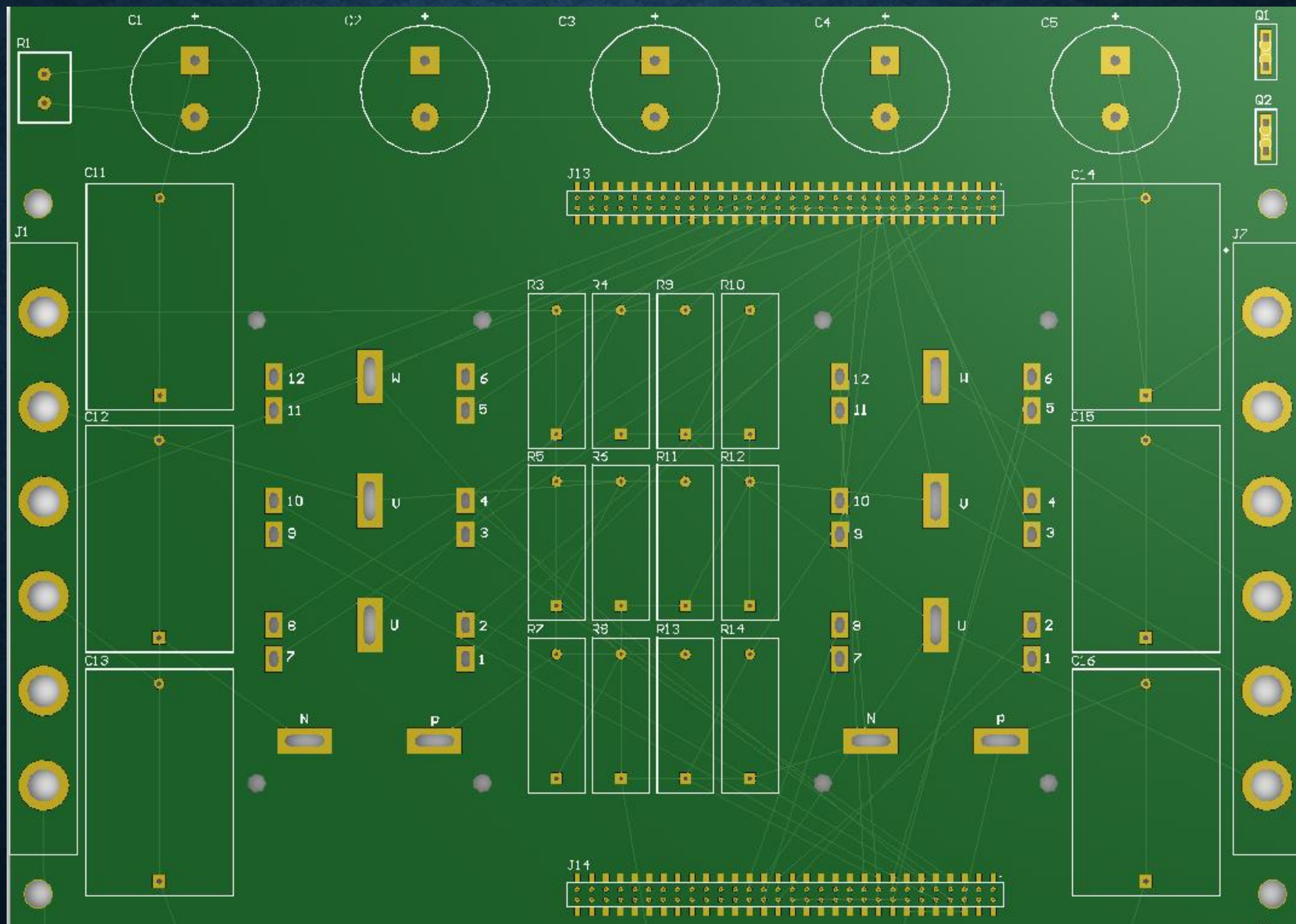
OUR EXPECTED OUTCOME

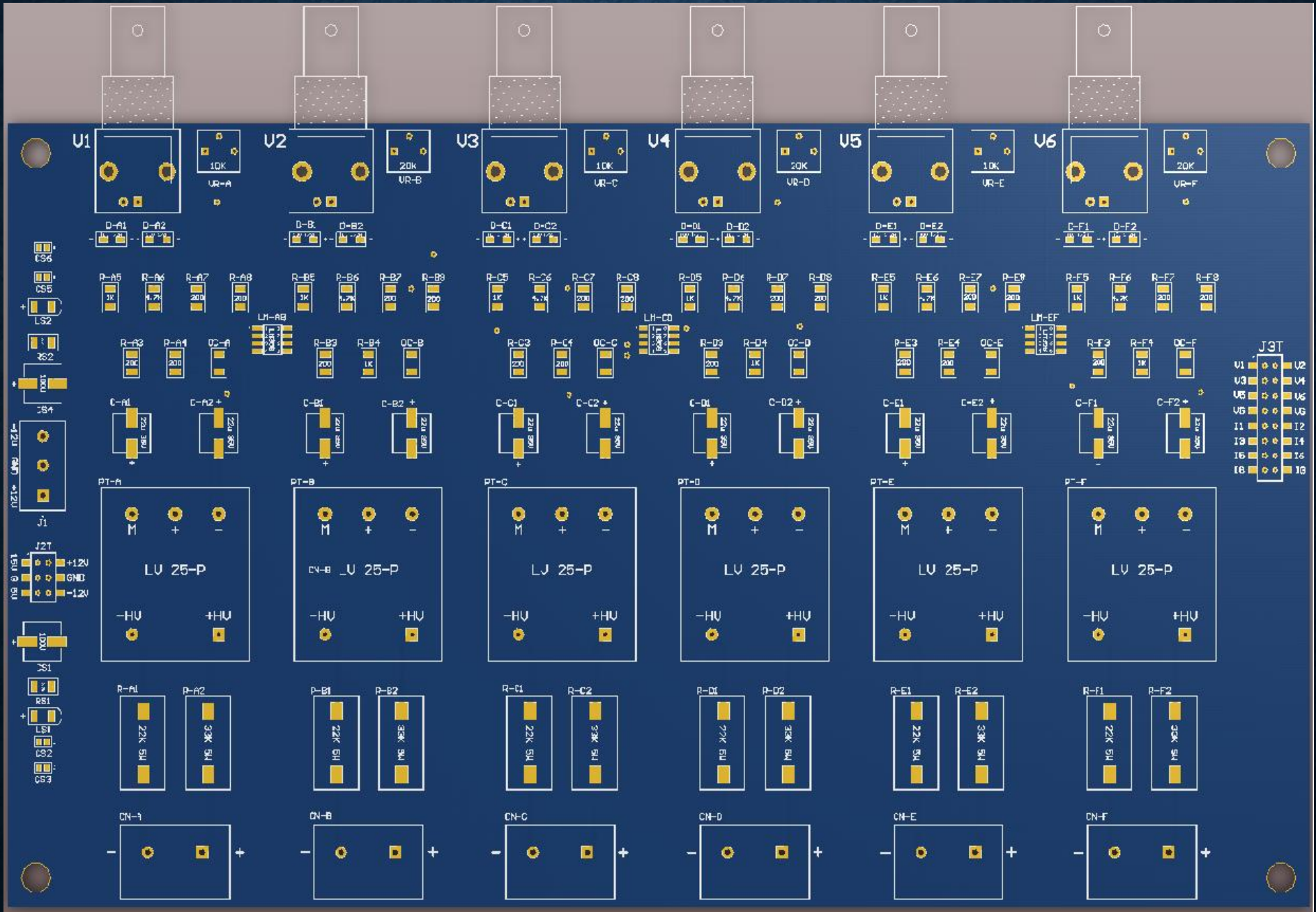


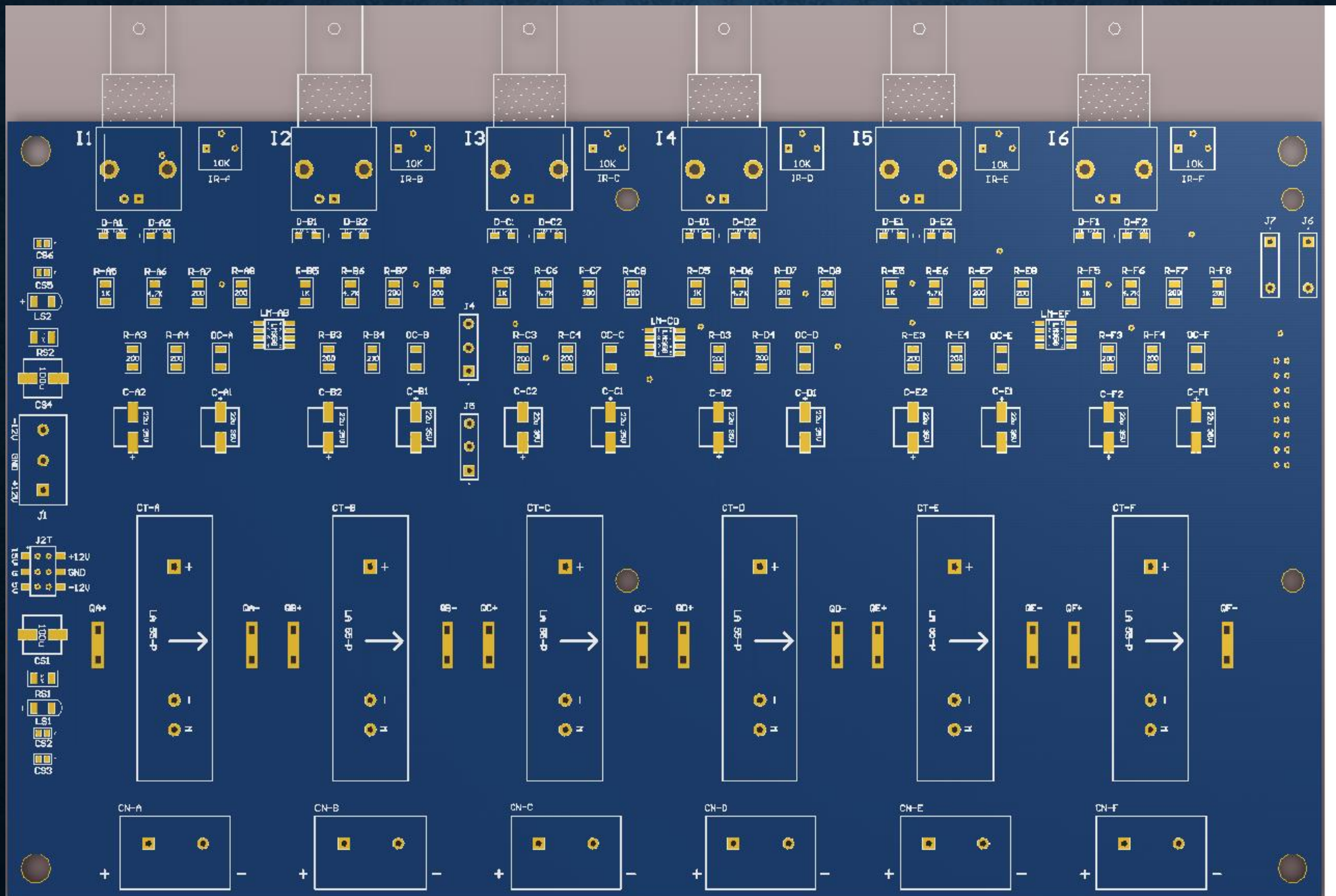
WORK SO FAR











IN SHORT

- We are the standalone power converter team
- We are developing a new converter design for Dr. Venkata Yaramasu, director of the AMPERE laboratory at SICCS.
- Current standalone power systems have too many drawbacks to be efficient.
- Our team is developing a new setup for research purposes to expand our clients knowledge base.
- We hope our solution will decrease losses while improving efficiency so the Navajo can have electricity.

QUESTIONS?