

Designing a Micro-Grid Controller

SmartGrid Solutions

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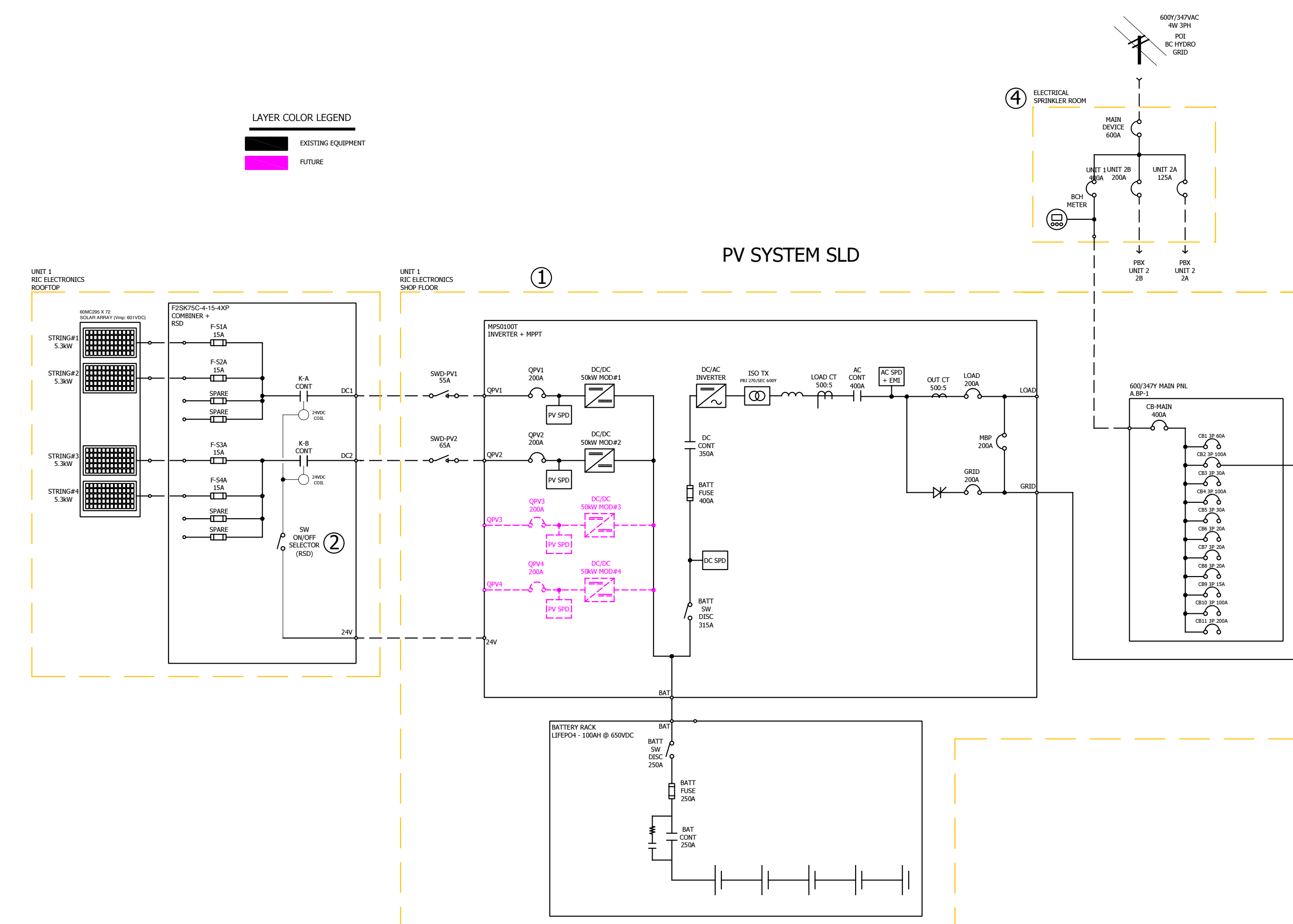


Problem

- Users can pay heavy financial penalties for using excess power.
- Renewable energy generation is creating an increasing demand for energy storage.
- Battery Energy Storage requires a controller to determine when to utilize the energy.



Single Line Diagram of System



Project Solution

- Use a PLC (Programable Logic Controller) as a micro-grid controller.
- The controller monitors the power from the utility, loads, solar arrays, and battery levels.
- The controller programming will be customized to match the specific user's system configuration.
- Output power will be controlled to avoid peak rate penalties.
- Further programming can add functionality for TOU (Time of Use) optimization, power quality improvement, and grid stabilization.

Implemented Hardware

- Schneider Modicon M241 Programmable Logic Controller
-Communication via Modbus protocol
- Inverter - RIC Electronics
-100kW, 600VAC input/output
- RIC, Batteries Lithium Iron Phosphate (LiFePO4)
-650VDC String, 100Ah
- Solar Array
-4 X 5.3kWp PV panels @ 600VDC



LiFePO4 batteries inside BESS

Team Biographies

Tim Ritsema - Project Manager

- Electrical engineering student with 15 years of industry work experience with power systems protection at Altelec Technical Sales & Services.

Shahmeer Adil- Software Lead

- Electrical engineering student that has worked with TC Energy for a 12-month internship term in the Electrical and Controls team.

Juan Villarreal - Software Lead

- Electrical engineering student with a minor in computer engineering. Completed a 16-month internship with Ontario utility company Hydro One.

Heather Wilkes - System Analyst

- Electrical engineering student who completed a 12-month internship at CNRL and is currently working part-time as an electrical designer.

Sam Wilkinson - System Analyst

- Electrical engineering student who worked as a process engineer with Dorigo, a PCBA contract manufacturer during his internship.