**Residential Grid-Tie Photovoltaic System**

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**Goal:** The goal of this project was to design a fixed-tilt residential grid-tie photovoltaic system that meets the TVA Green Power Switch Generation Partners program requirements and be as efficient and cost effective as possible to maximize financial return on the system.

**Objectives:**
- Create a system that can be paid off in 10 years
- Develop system that meets all requirements of TVA Generation Partners
- Gain knowledge of how PV systems work
- Develop an understanding of how utility interconnectivity works
- Design a modular system that uses the Enphase M215 micro inverter
- Design a second residential PV system that uses one large grid-tie inverter

**TVA Green Power Switch:**
- 12 cent premium per kilowatt produced
- 10 year contract for added premium
- 500 watt minimum/50kW maximum system size
- Federal tax credit for 30% of total cost available
- $1000 for startup costs from TVA
- System must have lockable disconnect
- Must be IEEE 1547, 1547.1, and UL 1741 certified
- Must pass electrical inspection by licensed electrician

**Major Components:**
- Inverter(s)
- Photovoltaic (Solar) Panels
- Racking for Panels
- Cables and Wiring

**Final Design:**
- 9.6kW Panel Rating System – 40 Panels
- Enphase M215 for Micro Inverter Design
- SMA Sunnyboy 8000US for Centralized Inverter Design
- Iron Ridge Scalable Ground Array for Racking
- Canadian Solar CSP6-240 Poly-Crystalline Solar Panel

**Cost Analysis**
- Cost Analysis was performed
- Payback occurred with-in project goal guidelines
- Outcome better than one or two axis tracking