

Licensing and Technology Transfer Opportunity: Manipal University

Title of Technology Available:

A System and Method for Maintaining Continuous Power Supply to Local Load in On-Line Grid Connected Solar Power Systems

Brief Description of Invention:

The proposed system uses a relay and Arduino to restore the solar power supply to the local load. When the utility supply is interrupted, the relay disconnects the utility supply from the local load and the Arduino generates the synchronizing signal. Therefore, the solar inverter continues to supply the local load without islanding problem. When the supply is restored, Arduino stops generating the synchronizing signal and solar supply synchronizes with utility supply. Both the local load and utility will be supplied by the solar power supply.

Brief Background of Invention:

The solar power is connected in parallel with the utility supply across the load. The PLL based synchronizing unit senses the voltage, frequency and phase from the utility supply and gives signal to the solar inverter to generate the same voltage with same frequency in synchronism with the utility supply. But, when the utility supply is cut-off, the PLL based synchronizer will receive zero voltage and zero frequency. Therefore, the solar inverter will not generate power. This is adopted to prevent islanding. But, the power supply to the local load also will be interrupted. The power generated from the solar panels goes a waste.

Describe the final product:

An additional circuit is proposed which has to be connected to the existing system.

A Normally Open (NO) relay is connected with the utility supply to avoid islanding and is energized from the utility power through the rectifier circuit. The Arduino is used to generate the synchronizing signal to inverter. Pin A0 of Arduino is supplied with 5V DC derived from utility power supply and pin V_{in} is supplied with 5V DC from 12V/10W solar panel through voltage dividers.

When Utility supply exists, the Arduino receives the signal from the utility supply, pin A0 of Arduino goes to high state and Arduino is programmed not to generate synchronizing signal. The inverter is synchronized with the utility with normal working condition and supplies to both the utility and local load.

When utility supply is cut-off, the relay opens, thereby preventing islanding. A0 pin of Arduino goes to low state and Arduino generates the samples of sine wave and converts them to binary. An R2R ladder DAC receives these binary signals and generates the analog synchronizing signal of the pre-fixed frequency. The output of DAC is a sinewave and clamping circuit is used to clamp the output from $+V_m$ to $-V_m$. The two, 12V/10W solar panels are used to supply $+12V$ and $-12V$ to the op-amp. The solar inverter supplies the local load only.

When utility supply is restored, the pin A0 of Arduino goes to high state, relay closes with a small delay to avoid overlapping of two signals and solar inverter synchronizes with utility supply. The solar power is supplied to both the load and utility.

Technological Domain (Keywords):

Grid Connected Solar System, Continuity of supply, Synchronization, Islanding, Local load.

Proof of Concept:

Practically verified the signal generated from the additional circuit and found suitable as the synchronizing signal for the solar inverter.

Stage of Development:

Ideation/Prototype/Advanced Prototype/Ready to Market technology: **Prototype**

Provide Information on Competitors who manufacture and/or sell similar products: **Nil**

What are the unique advantages your innovation has compared to the competition:

The solar power supply will continue to supply the local load with the problem of islanding.

A few potential companies who might be interested in this technology:

All the firms manufacturing the on-line grid connected inverters will be interested in the invention. Some of the licensed and approved firms are: Schneider Electric India Pvt Ltd., Gurgaon, Delta Power Solutions India Pvt Ltd., Uttarakhand, Power One Micro System Pvt Ltd, Bengaluru, AEI Power India Ltd., Pune, etc.

Intellectual Property Status: Indian Patent application with number **201841046499** filed in **2018** (mention year)

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