NCPRE
National Center for Photovoltaic Research and Education
Power Electronics

Kishore Chatterjee
January 13th 2017
Deliverables: Phase-I

Motivation:

Development of low-cost and robust power electronic solutions for PV applications in rural areas
Deliverables: Phase-I

A. Stand Alone PV Based Single Phase Power Generating Unit for Rural Household Application

➢ Salient Features:

- 12V battery compatible system (1-ph, 230 V, 500 VA)
- Galvanic isolation by using HF transformer
- Battery over charge and over discharge protection
- SPWM Inverter ensuring Sine wave output.
- MPPT Tracking for maximum utilization of PV power.
Deliverables: Phase-I

B. 300 VA low cost PV Battery integrated standalone inverter for rural area

- **Salient Features:**
  - 12 V/24 V Battery PV compatible
  - Integrated MPPT and charge controller
  - DC link capacitor selection for longer life time.
  - Reduce number of power electronics switching devices.
  - Low cost and high reliability.
Deliverables: Phase-I

C. 5 kVA SiC devices based high performance transformer-less on-grid inverter for residential application

- **Salient Features:**
  - 94% part load efficiency, with 2% THD
  - Low leakage current with reduced magnetics using multilevel converter and inverter
Deliverables: Phase-I

• D. Power electronic interfaced solar powered irrigation water pump

  ➢ **Salient Features:**

  ▪ Induction motor drive of 3hp capacity
  ▪ SVM and V/f control of IM
Deliverables: Phase-I

E. Low-cost BLDC motor for PV based deep bore-well water pumping

- Salient Features:
  - Higher flux concentration, low flux leakage and robust spoke type rotor
  - Sensor less closed-loop speed control along with MPP tracking
Activities in Phase -II

• To convert the five semi-engineered products developed in Phase – I into viable industry level products.
Activities in Phase -II

• Hardware-in-Loop Simulation for Testing Small and Medium Power Grid Connected Solar Inverters and their Control and Protection

**Motivation:** To develop a platform for testing both power hardware and control/protection functionalities of a solar PV dc-ac converter in a Hardware-in-Loop scheme facilitating:

- Transparency to the user
- Due respect to distribution standards relating to anti-islanding protection, fault current contribution, protection etc.
Activities in Phase -II

- Development of a large inverter which mimics a power distribution system
- Emulation of the behavior of the distribution system
- Real Time Digital Simulator (RTDS) as a digital controller for the system for testing feedback controller functionality and to ensure protection features
- Design, integration, simulation and analysis of the whole setup
Activities in Phase -II

- Development of intelligent battery chargers for the Li–Cd cells developed in Phase-I
- Grid connected solar power plants – Inverter configuration, control issues and protection
- Remote monitoring of performance of installed solar power plants
- Evaluation of existing solar power plants by employing professionals