

Five years experience in mini-grids with AC coupled PV

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Generally, a photovoltaic generator can be integrated in the power system of a mini-grid using a DC coupling or an AC coupling. Due to its simplicity in small stand-alone systems, the coupling of the PV field to the storage battery through a load controller is commonly preferred. However, for bigger systems, where modularity, expandability, installation of several PV fields distributed on the mini-grid are important criteria, AC-coupling of the PV field through a string inverter presents several advantages.

ISET has a long experience in the development of the AC-coupled PV technology. This R&D activity evolved in a family of commercial products (Sunny Boy, Sunny Island, Sunny Control from the company SMA Regelsysteme GmbH).

In this paper, the operational experience of two pilot plants based on the AC coupled PV technology, will be presented. The first plant is the “Starkenburger Hütte” a single user system in the Austrian Alps. The second system is a multi-user mini-grid located in a remote area on a Greek island.

1. “Starkenburger Hütte” Pilot Plant

The Starkenburger Alpine hut is located in Austria at an altitude of 2229 m. It can offer full accommodation for up to 56 persons during the summer season (June to October). The hut is powered by a 3-phase AC system consisting of six AC-coupled photovoltaic fields (each 880 Wp), three Battery units and a gas combined heat and power unit. The installed power of electric appliances is about 25 kW, for an annual useful electricity consumption of 4500 kWh. After five years of operation, the system has proved to be reliable. ISET has monitored the operation of this stand alone hybrid electric power supply system since 1997.

2. Multi-user mini-grid with distributed PV generators on Kythnos island

Since April 2001, in collaboration with the company SMA Regelsysteme GmbH and the Greek research institute CRES, ISET has been operating a multi-user mini-grid on the Cycladic island Kythnos. The system is supplying a three-phase mini-grid in a remote bay, with 11 houses connected.

The power system is composed of :

- a central building where the battery storage, the battery inverters and the data logging equipment are located
- a low voltage distribution grid
- 5 distributed AC coupled photovoltaic generators
- 11 houses equipped with distributed load controllers, meters.