

POWER QUALITY MEASUREMENTS IN MINI-GRIDS INCLUDING PHOTOVOLTAIC UNITS AND BATTERY STORAGE

Aristomenis Neris, Stathis Tselepis

Center for Renewable Energy Sources

19th km Marathonos Ave., 190 09 Pikermi, Athens, Greece,

Tel: +30 210 6603368-9, Fax: +30 210 6603318, e-mail: mneris@cres.gr, stselep@cres.gr

Abstract

The Photovoltaic Department of the CRES has developed a small-scale hybrid power plant, in the framework of EU projects, for the investigation of operational problems caused from the penetration mainly of solar power in small island grids. A schematic of this plant is shown in Fig.1. The information bus that runs parallel with the energy bus is used for the collection of measurements from the power devices as well as the transmission of control signals to them.

A significant part of these operational problems is related to the quality of power supplied to the end user. Because of the power electronic devices used to interface the PV units and storage devices to the grid, the power quality is affected from the injection of harmonic currents. Additionally, when the power fed from the photovoltaic units is comparable to the load demand, frequency stability problems may occur.

Recently, the SCADA system of the CRES Hybrid Power Plant has been upgraded and power quality monitoring measurements have been added to the existing set. In this way, the impact of power electronic devices design and different control strategies on power quality can be addressed through field tests and measurements in the hybrid power plant.

The purpose of this paper is to present the architecture of the upgraded SCADA application and to demonstrate the measurement and control capabilities of the hybrid power plant. The SCADA application has been developed in Labview 6.1 environment using OPC technology. This technology allows the interface of the communication hardware without the need of specific drivers. For the evaluation of the developed scheme, a number of field tests have been performed. A set of measurements, collected from the SCADA application during these tests, that include current harmonics injected by the two inverters and voltage harmonics at the load terminals, will be presented and discussed.

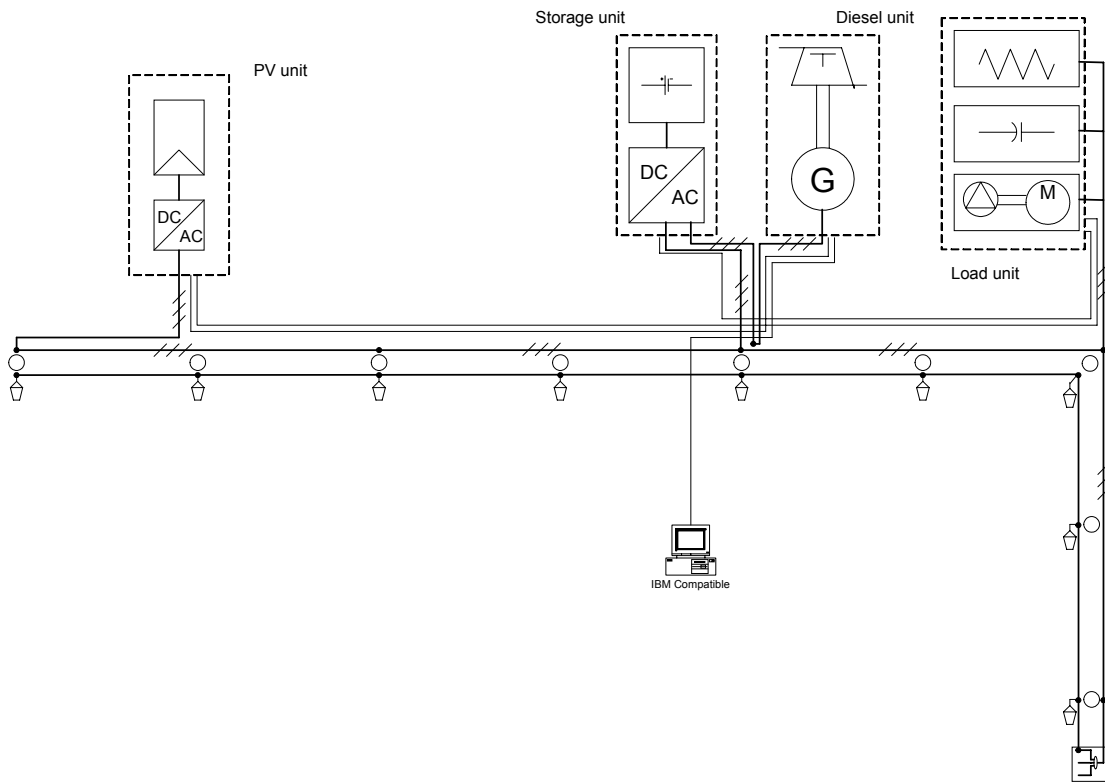


Fig.1. CRES hybrid power plant.

Topic: 2. System