SMALL COMMUNITY TEST SITE: MELTEMI

Vassilakis A., Messinis G., Kleftakis V.,Latoufis K., Pazios Th., Hatziargyriou N.

National Technical University of Athens, Greece

e-mail: {avassil, vkleft, tompaz}@mail.ntua.gr, {gmessinis, latoufis, nh}@power.ece.ntua.gr

1. Introduction

Meltemi is a seaside resort located 15 km north-east of Athens. It consists of 170 cottages that are used as a holiday resort mostly during summer. The Meltemi camping is a perfect living test field for the Electric Energy Systems Laboratory of the NTUA. The field has been employed in a number of European and national R&D projects and studies regarding smartgrids technologies [1]. It has been used to validate methods of intelligent load management and increasing the use of RES. Tests have been performed to simulate emergency and critical grid situations, where the site could balance its consumption with local generation. Tests have also simulated the provision of ancillary services to the upstream network including load shedding for system support during peak load.

2. Distributed Energy Resources

The campus facilities comprise various Distributed Generators(DGs), including:

- 40kVA diesel generator.
- Small residential wind turbines.
- 4.5 kW photovoltaic panels.

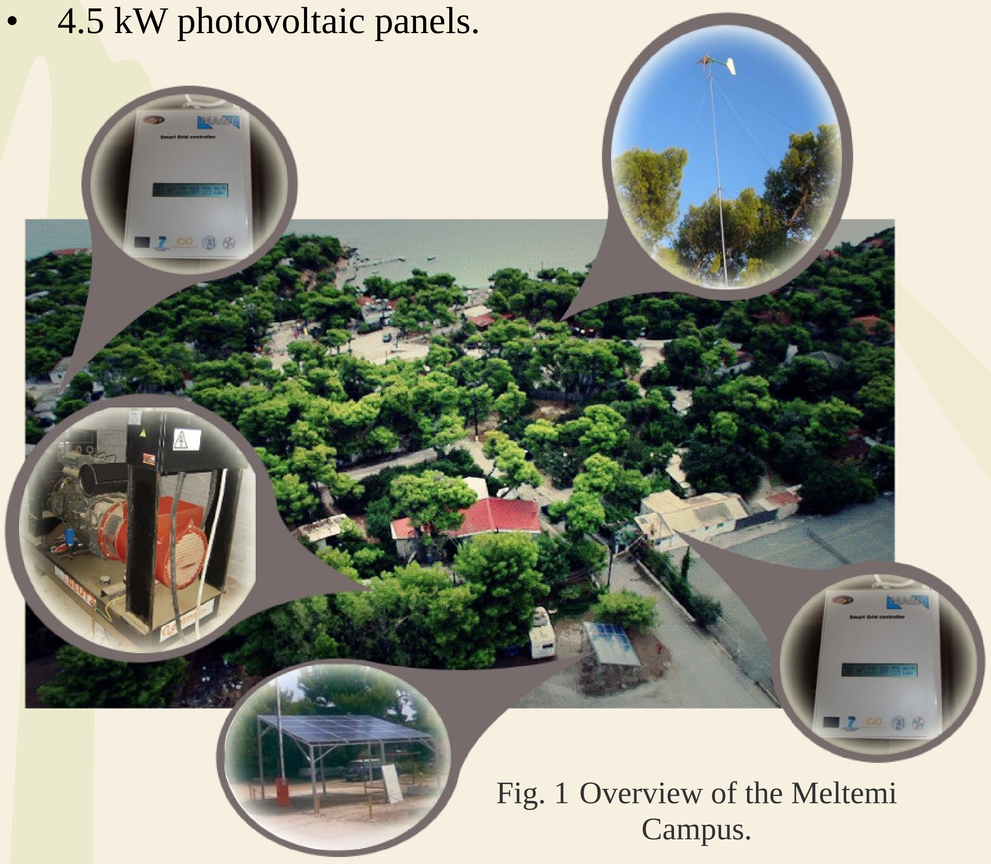

Fig. 1 Overview of the Meltemi Campus.

3. Intelligent Load Controllers

- A Multi-Agent system (MAGIC) has been installed in a number of households allowing the DGs and the loads to negotiate in order to optimize energy production and consumption [2].
- The basic component of the MAGIC system is an intelligent load controller, based on an embedded processor that runs Linux that can be used to monitor the status of a power line providing voltage, current and frequency measurements and hosts the Java based agents.

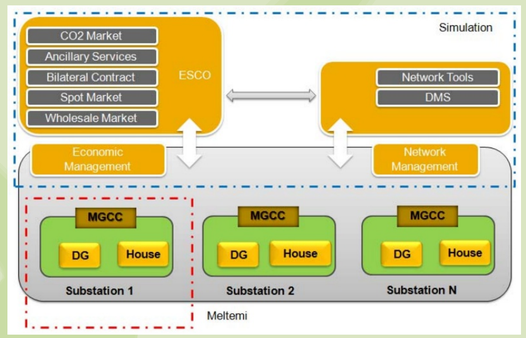

Fig. 2 Overview of Agents in the Meltemi.

4. Small wind turbine test site

Within the campus a small wind turbine test site has been developed that allows outdoor measurements of the power and energy production of household small wind turbines for grid connected and battery charging applications [3].

- Testing of small wind turbines ranging from 1.2m to 7.6m rotor diameter.
- The facilities of the test site are in accordance to the IEC 61400-12-1.
- Logged data are stored locally and remotely on SmartRue data base in NTUA.
- Data management tool, allows in depth analysis of the measurements.

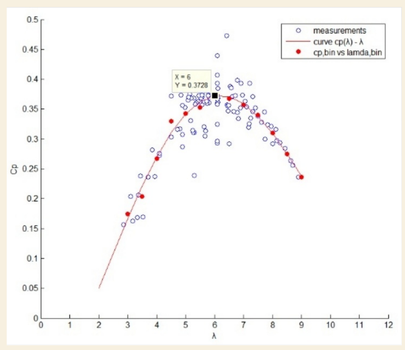

Fig. 3 Experimental measurements (C_p - λ).

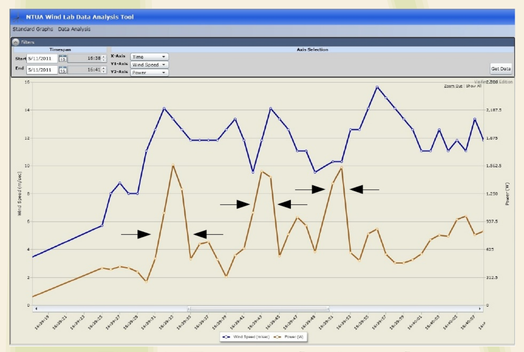

Fig. 4 Data analysis tool.

Fig. 5 Small wind turbine test site's facilities infrastructures.

5. e-Bike Charging System

On-going projects include the design and installation of an e-bikes sharing system.

- Stations with automated self-serve docking-charging systems, are located at key destinations within the camp.
- The station utilizes energy produced by RES and a battery bank (of 150Ah) for recharging the battery of electric bicycles.
- Back-up supply by the utility power grid, via a DC-AC battery inverter is also provided.
- The stations are able to work on various modes, both island and grid connected mode as well as to accomplish zero net energy consumption.

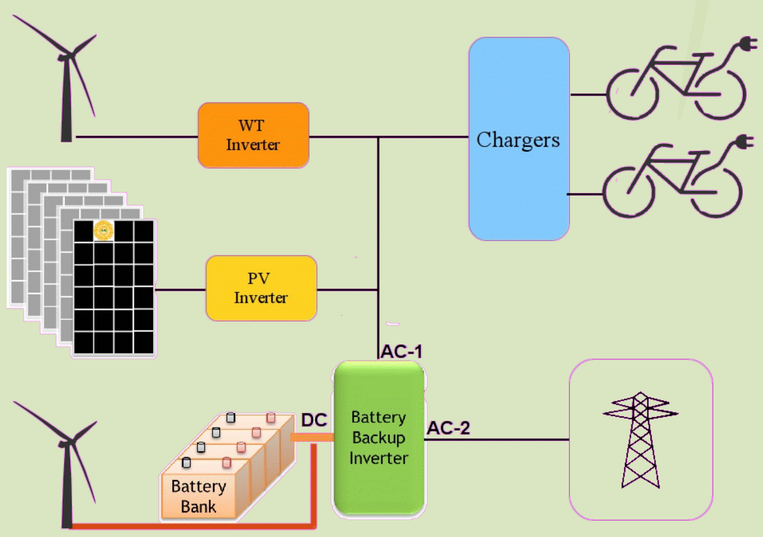

Fig. 6 The charge station set up.

References

[1] N. Hatziargyriou, "Microgrids: Architectures and Control", Wiley-IEEE Press, January 2014.

[2] A.. Dimeas, N. Hatziargyriou , "Intelligent applications for consumer management", IEEE Power and Energy Society General Meeting, 2012.

[3] K. Latoufis, G. Messinis, P. Kotsampopoulos, N. Hatziargyriou, "Axial flux permanent magnet generator