A FUTURE-PROOF PILOT MICROGRID ENHANCING THE INTEGRATION OF PV GENERATION: 3DMicroGrid PROJECT

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INTRODUCTION

The current paradigm of energy generation and consumption in the world makes it necessary to use the term Microgrid. Nowadays, it is normal to find several energy renewable sources and energy storage installed in different buildings, and therefore, close to the energy consumption. For this reason Microgrids are a reality in our society. This concept of network is a near future for nearly grid-isolated countries like Malta where only recently got connected to mainland Europe. Malta is an island that receives a large amount of solar irradiation, around 1700kWh/m^2, and does not have any other natural resources, as shown in Figure 1. This poster presents the case study of 3DMicroGrid project which is based at the Malta College of Arts, Science and Technology (MCAST) main campus, an education and research facility, where the first-microgrid scenarios will be demonstrated on the Maltese island by 2019.

OBJECTIVES OF 3DMicroGrid PROJECT

I. To establish decentralised control paradigms, such as voltage control, and demand response based on available power sources and dynamic loads (energy users),
II. To develop an open source Smart Micro-Grid framework,
III. To design-in modularity for scalability of Smart Micro-Grid functions, and
IV. To develop robust autonomous agents for the Smart-Grid paradigm

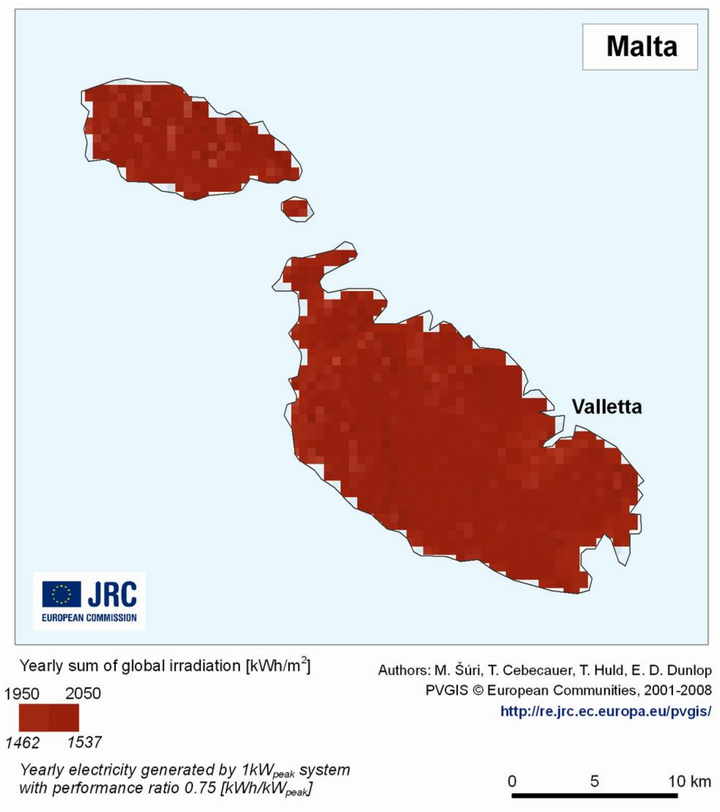

Figure 1: Typical irradiation in Malta

MCAST MICROGRID ARCHITECTURE

Figure 2 shows MCAST microgrid living laboratory high-level system architecture. The microgrid is fed from two 11/0.4kV 1600kVA substations. The MCAST microgrid living laboratory will be accessible for education and research purposes which will see algorithms piloted such as voltage control, with a droop control, in each solar PV installation, curtailing of loads and in the future energy storage for demand shifting.

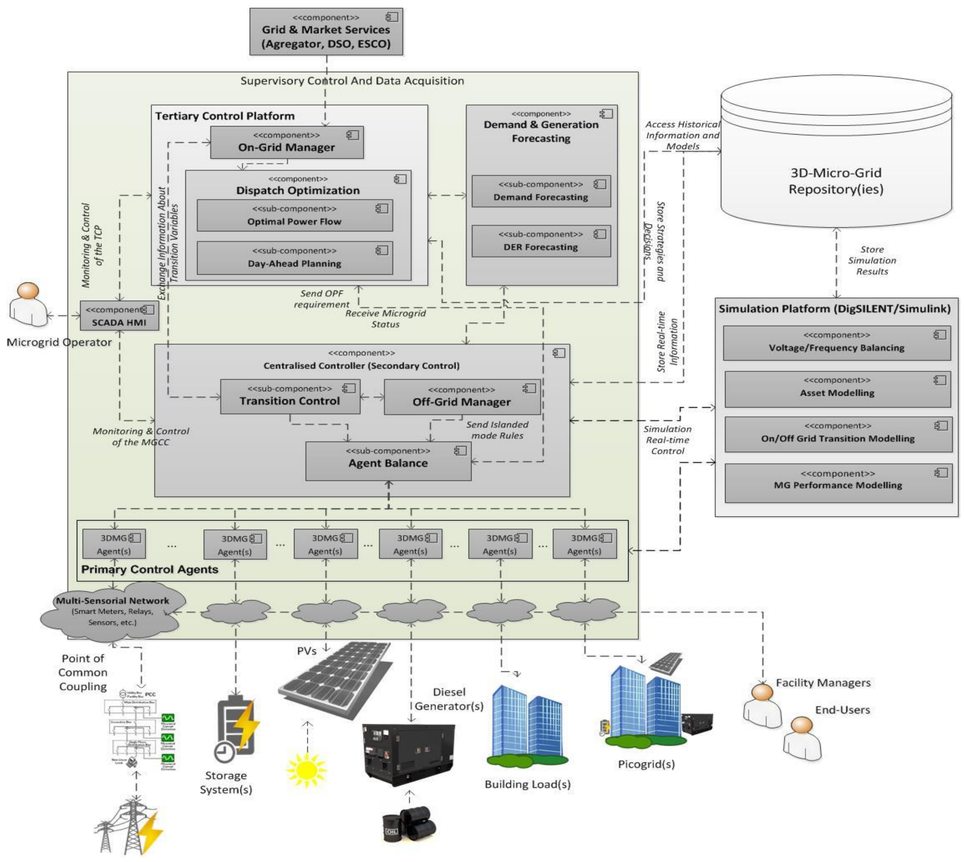

Figure 2: MCAST microgrid living laboratory high-level system architecture

RESULTS

Figure 3 shows a typical workday demand and energy resource profile, during a spring academic day, for one of the blocks at MCAST main campus, Paola, Malta. The energy resource is from solar PV systems and is estimated that from the 64kWp PV systems connected to new campus buildings about 25% may be covering the consumption load during day times.

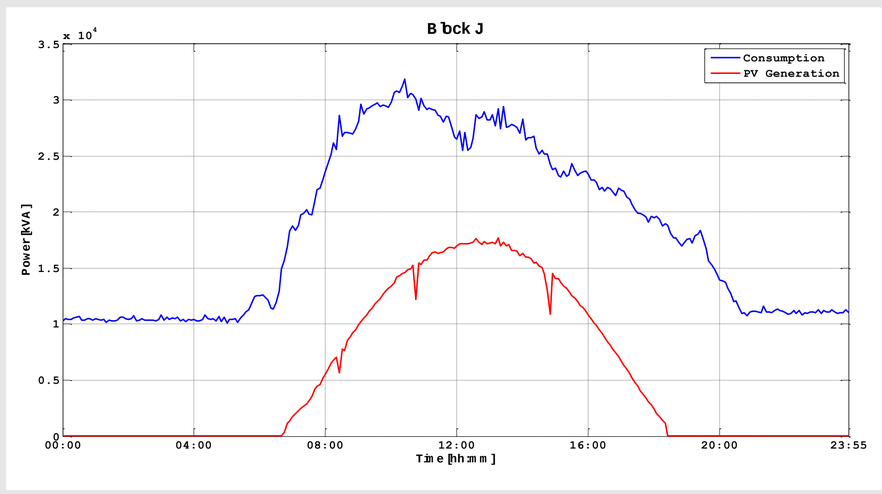

Figure 3: Typical workday demand and energy resource profile in one block

CONCLUSION

This project is a benchmark for training and research purpose micro-grid that may integrate new control algorithms for renewable and conventional sources of energy, introduction of efficient energy utilisation and possible energy storage. This study is a Living Laboratory that is identifying faults, performance issues and building usage.

ACKNOWLEDGEMENTS The authors wish to thank for their financial support the Malta Council for Science and Technology (MCST) (Grant ENM-2016-002a), Spain Ministerio de Economía, Industria y Competitividad (MINECO), Jordan The Higher Council for Science and Technology (HCST), Cyprus Research Promotion Foundation (RPF) and Greece General Secretariat for Research and Technology (GRST) through the ERANETMED initiative of Member States, Associated Countries and Mediterranean Partner Countries (3DMgrid Project ID eranetmed_energy-11-286) and the Malta Council of Science and Technology (MCST) for their Internationalisation Partnership Awards 2016 and 2017.

PRESENTED AT THE 27TH INTERNATIONAL PHOTOVOLTAIC SCIENCE AND ENGINEERING CONFERENCE (PVSEC-27), JAPAN. NOVEMBER 2017