

PV2GRID - A next generation grid side converter with advanced control and power quality capabilities

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Presentation Outline

- **University of Cyprus – KIOS Research Center**
- **The PV2Grid project**
- **Our capabilities and Solar-Era.Net Call IV**



KIOS Research Center - Background

- **KIOS Research Center for Intelligent Systems and Networks**
- **Founded in 2008**
- **The KIOS Research Center is part of the University of Cyprus**
- **Housed (mainly) at the KIOS Center Building (600 m²)**
- **Web site: www.kios.ucy.ac.cy**
- **About 70 researchers**
 - *8 faculty members*
 - *20 post-doctoral fellows*
 - *40 Ph.D. students*
 - *Several M.Sc. students and non-degree researchers*



KIOS Research Center - Background

- **The KIOS Research Center has participated in 54 research projects since it was founded in 2008**
- **The Center currently has 31 active research projects (10.5M euros share for the Center)**
- **The Center is funded completely from external sources (68% of the funding is from EU instruments)**
- **Collaborations with over 150 organizations worldwide**
- **Focus: Monitoring, Control, and Security of Critical Infrastructure systems**
- **One of the main threads: Electric power systems and integration of renewable energy sources**



The PV2Grid Project – Partners and Aim

A next generation grid side converter with advanced control and power quality capabilities

- **KIOS Research Center – University of Cyprus (Coordinator)**
- **Department of Energy Technology - Aalborg University**
- **Quantum Energy Corporation Ltd**



- ✓ **This project aims to advance the technology related to the seamless grid integration of photovoltaic (PV) systems.**
- ✓ **Development of next generation power electronic Grid Side Converters (GSC) with advanced capabilities and innovative operational management approaches.**



The PV2Grid Project – Objectives

- **Design and develop new generation Grid Side Converters (GSCs) equipped with advanced control capabilities and novel operational mode approaches:**
 - ✓ providing support to the grid when needed
 - ✓ enhancing the power system stability
 - ✓ improving the power quality of the grid
 - ✓ reducing the network losses
- **Design new current controllers with advanced operational capabilities under normal or abnormal voltage conditions.**
- **Develop experimental prototypes of GSCs including the current control techniques, the PQ controllers and the scheduling algorithm.**
- **Design an optimal scheduling algorithm considering a dynamic electricity-pricing environment and the presence of storage (prosumer profit maximization).**

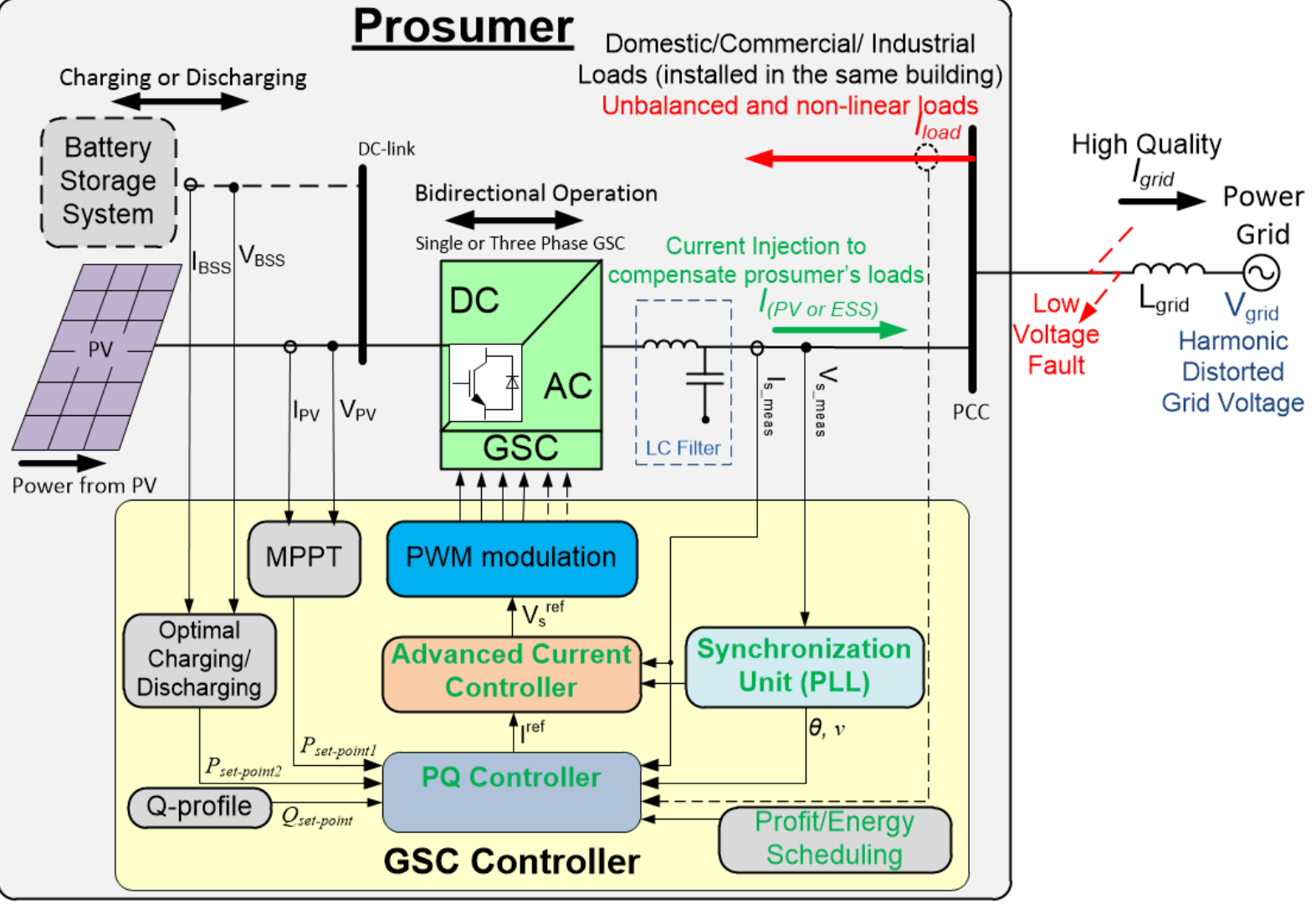


The PV2Grid Project – Main outcomes

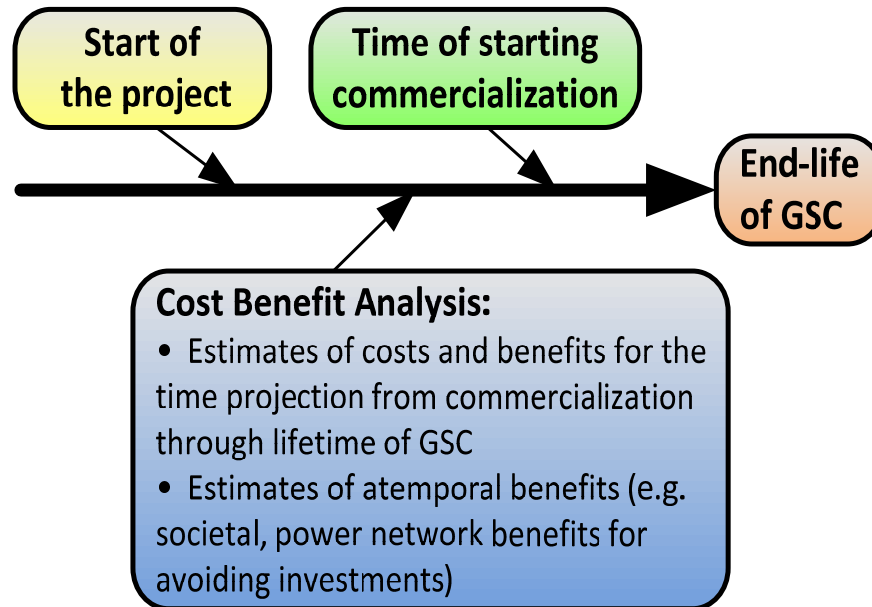
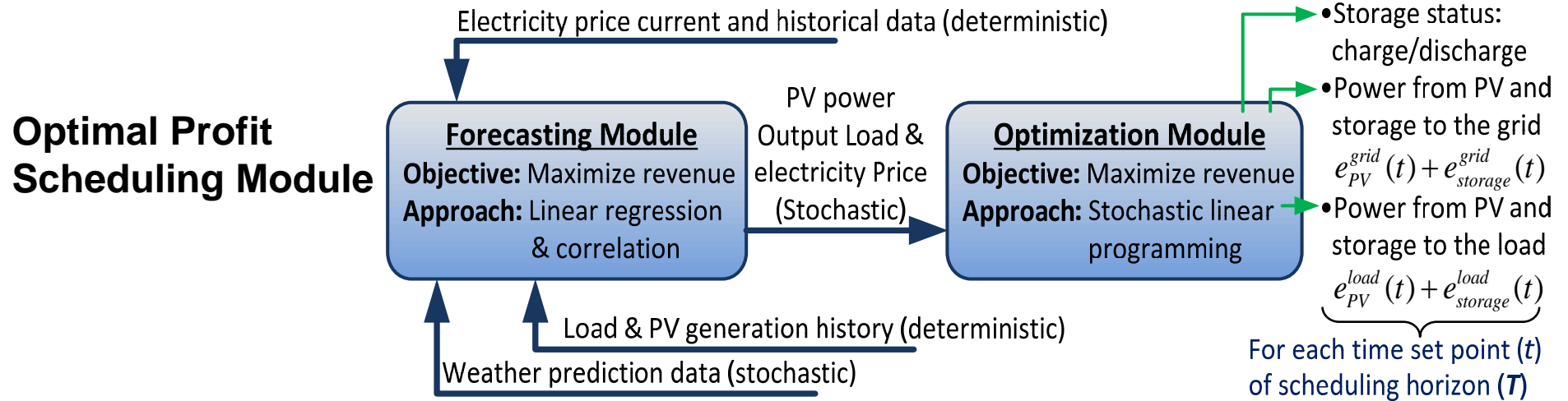
- **Advanced next-generation GSC for PV systems with new power operational management approach, extra functionalities, capabilities, and long lifetime with reduced cost of energy.**
- **Improved overall performance of PV plants by ensuring their efficient and effective grid integration under any grid conditions.**
- **A new multifunctional industrial product that will further assist the grid integration of renewable energy sources.**
- **Advanced single- and three-phase current controllers for enhancing the grid power quality by compensating the non-ideal loads of the prosumer.**



Architecture of the Proposed GSC



Added Functionalities and Timeline for Commercialization



Timeline and cost benefit analysis for the proposed GSC



KIOS Research Center – Our Capabilities

- **Deep knowledge of power system operation (generation, transmission, and distribution)**
- **Modeling and simulation capabilities of both the system and renewable sources (including our custom-made steady state and dynamic models of power system components and renewable sources)**
- **Expertise in power electronics and grid side converters**
- **Fully equipped laboratories for testing and development**
- **Owning and operating a real size grid-connected microgrid (rated at 200 kVA)**
- **Experience in leading both FP7 and H2020 projects**



KIOS Research Center – Call PV4

- **Mainly interested in PV4.3: Grid integration and large-scale deployment of PV**
- **Can contribute to CSP4.2: Dispatchability through storage and hybridisation**
- **Open to coordinate or participate in proposals in the fourth call of Solar-Era.Net**





Thank you!

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<http://www.kios.ucy.ac.cy>

