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**SMARTGEN**



# Smartgen project: Sanremo and VPP UNIGE pilots

Federico Silvestro  
University of Genova

IEES (Intelligent Electrical Energy Systems) Laboratory  
[federico.silvestro@unige.it](mailto:federico.silvestro@unige.it)

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Department of Electrical, Electronic, Telecommunications Engineering and Naval Architecture  
Polytechnic School, University of Genoa

## SmartGen:

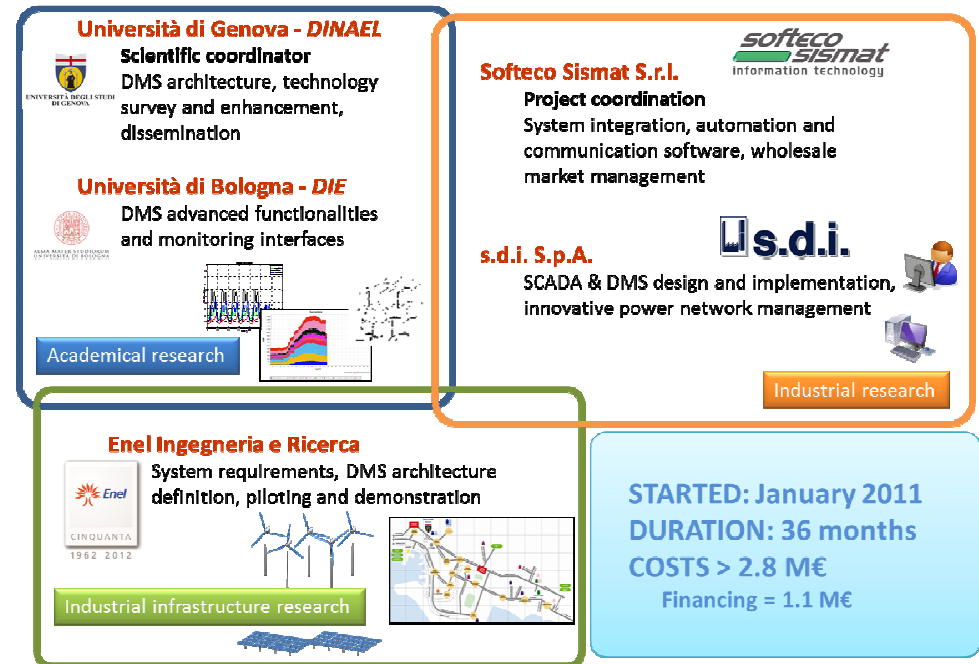
**Innovative tools for the management of electrical distribution grids with renewable generation sources**

**SmartGen** develops and provides  
**enabling technologies** for active  
distribution networks  
Generation/Load Management/Storage

**Development of a advanced DMS**  
(aimed at future scenarios of the  
electricity market), Grid  
control/Energy balancing

## Experiments on real test sites

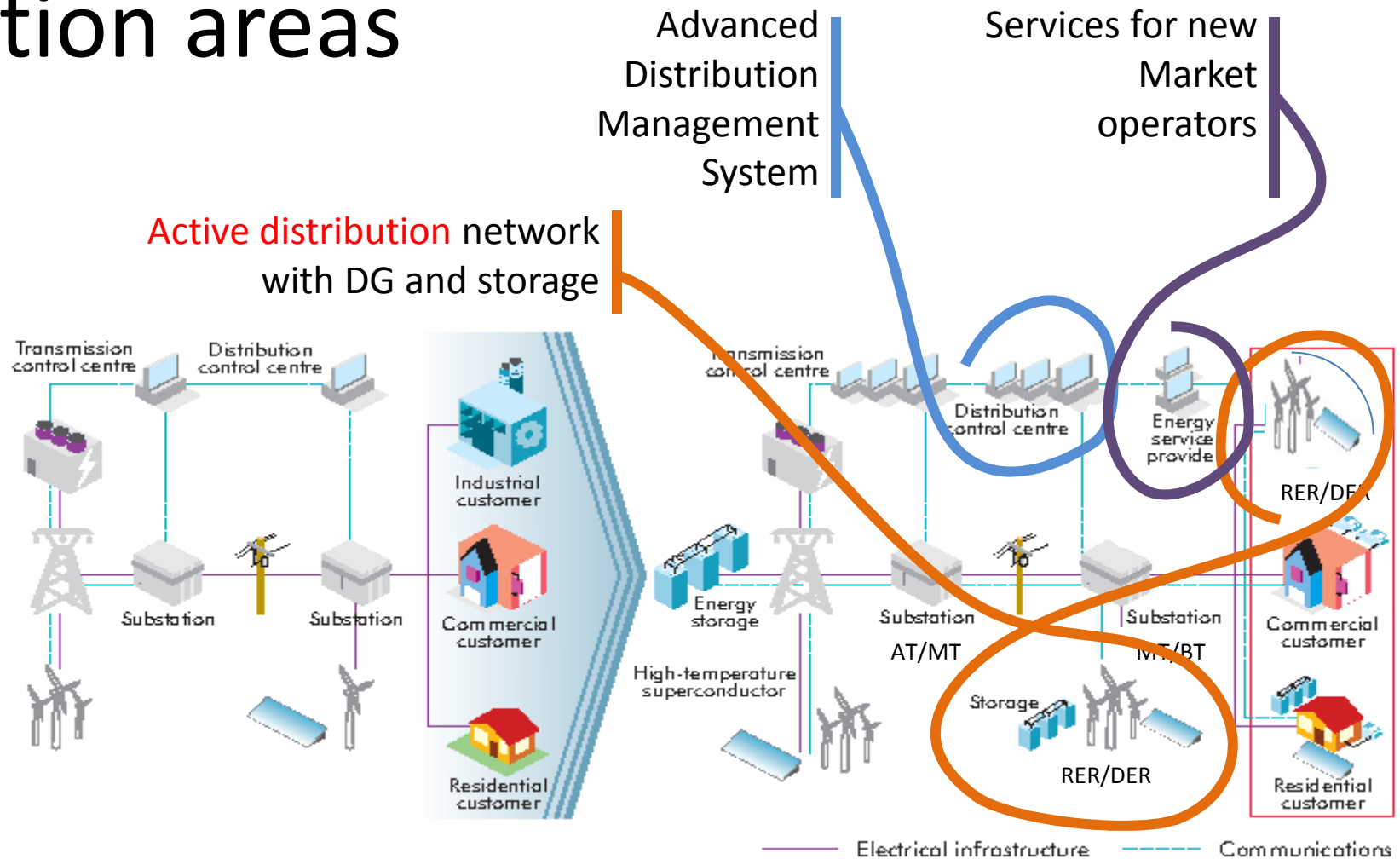
- *AMAIE (Sanremo)*
- *Economics School (University of Genova)*
- *ENEL (Livorno experimental area)*



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**MSE – Ministry of Economic Development**



## Action areas





# Main objectives

## Analyzing scenarios of smart grids and active interaction with the electricity market

- with distributed generation (DG) and storage with the possibility of *load control*
- to identify main technical and economical constraints
- to define future actors (*aggregators*, price signals, active demand management)

## Defining and implementing the architecture of innovative Distribution Management System

- Interfacing to data acquisition systems and SCADA (Supervisory Control And Data Acquisition)
- *State estimation* and simulation scenarios
- Management of optimization problems, control of power flow, voltage and supply of *ancillary services from DG*, and load dispatch
- Study of different distribution management modes: normal , dysfunctional, and/or emergency mode (islanding)

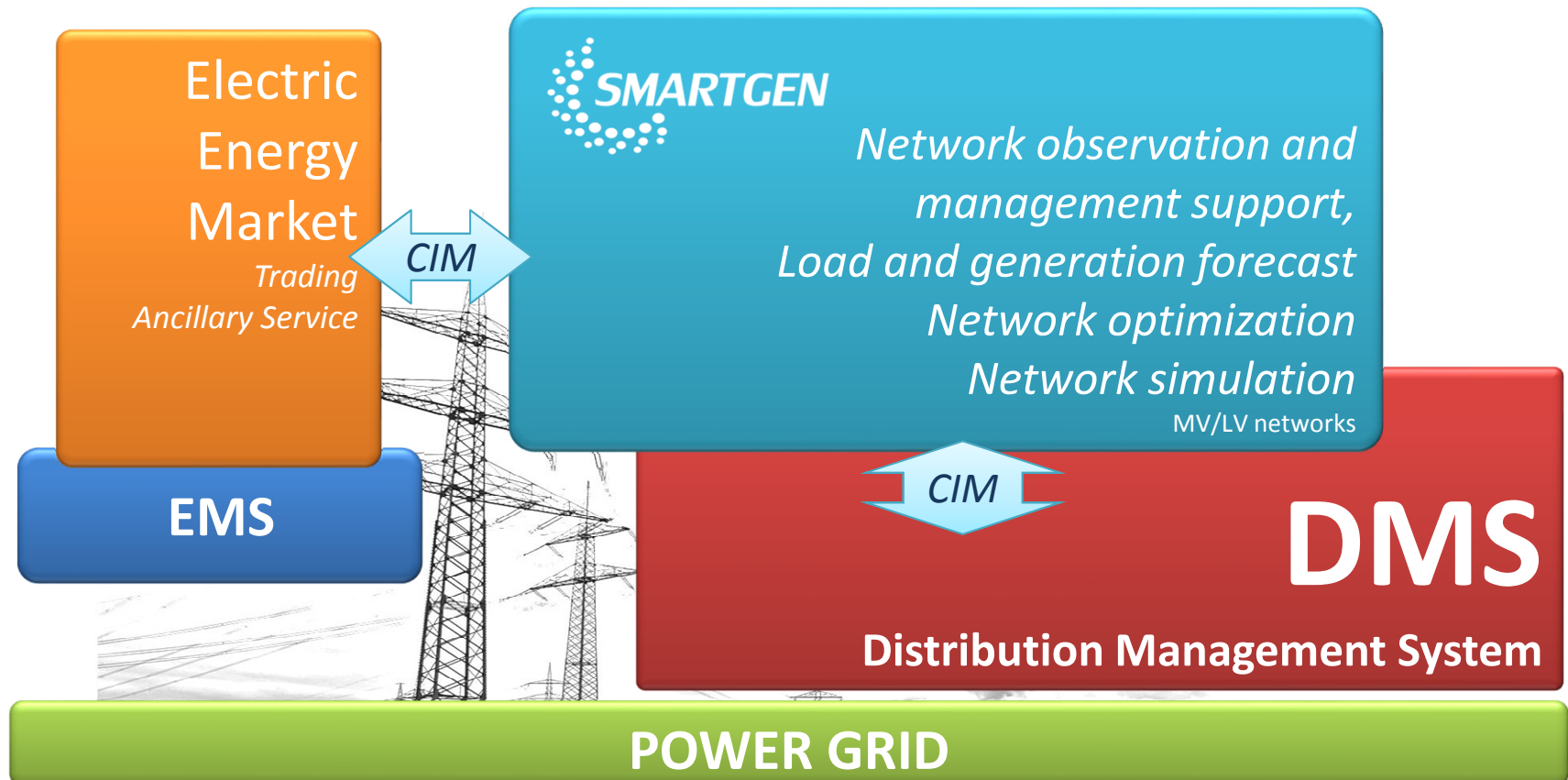
## Demonstrating features and benefits in real user cases

- Definition of complex reference scenarios
- Validation of *real network functional efficiency*
- Integration of real networks and simulation in pilot sites



# Smartgen goals

- Smartgen has developed a platform that "extends" a DMS with new *features*

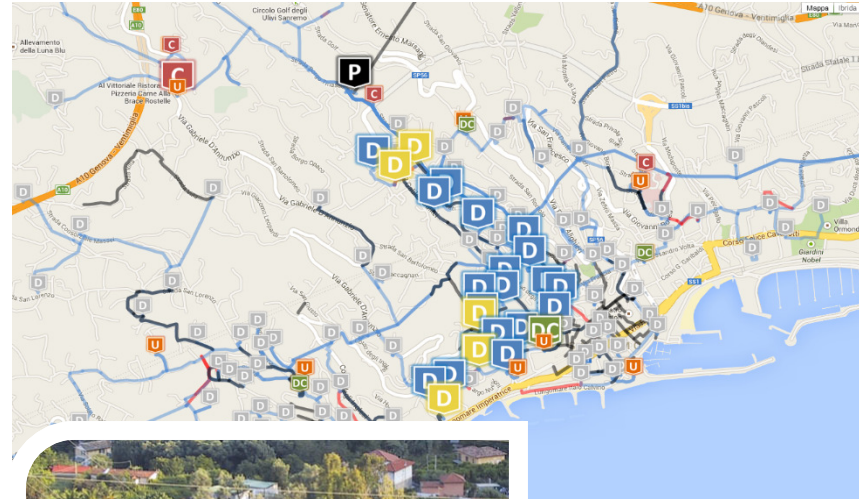






# Real Distribution Network test case

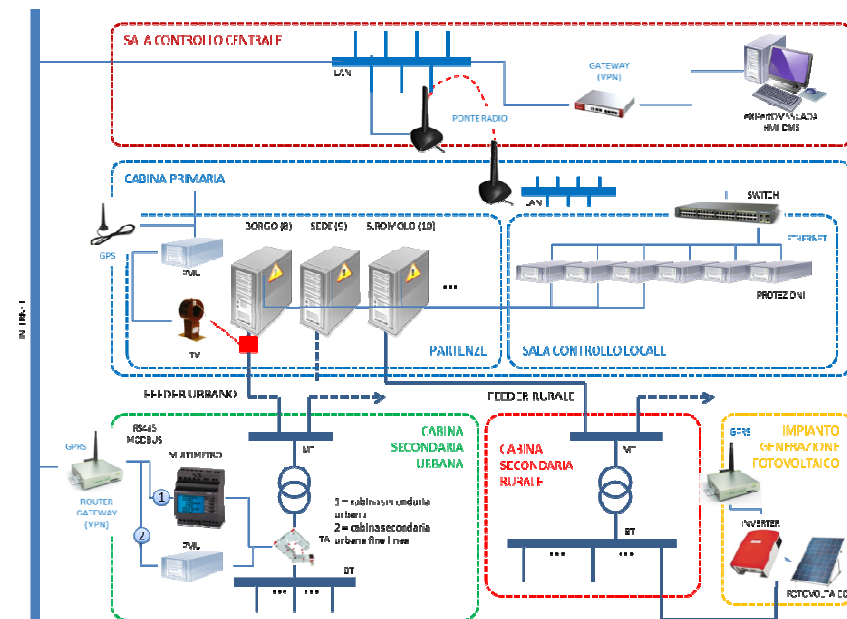
- Primary HV/MV substation supplying urban and rural users
- 2 x 40 MVA transformers
- **10 MV feeders** radially operated
- Nearly 115 km MV lines
- **200 MV/LV substations** 15/0.4 kV
- 30,000 users (27,000 domestic, 15 industrial, 3000 others)
- **100 PV plants:**
  - 1 x 470 kWp at MV
  - 10 x (10-100 kWp) at LV





# Smartgen installations

- Full HV/MV measurements
- 2 feeders fully monitored
- PV plant (470 kWp)
- 2 PMUs
- Meteo forecast

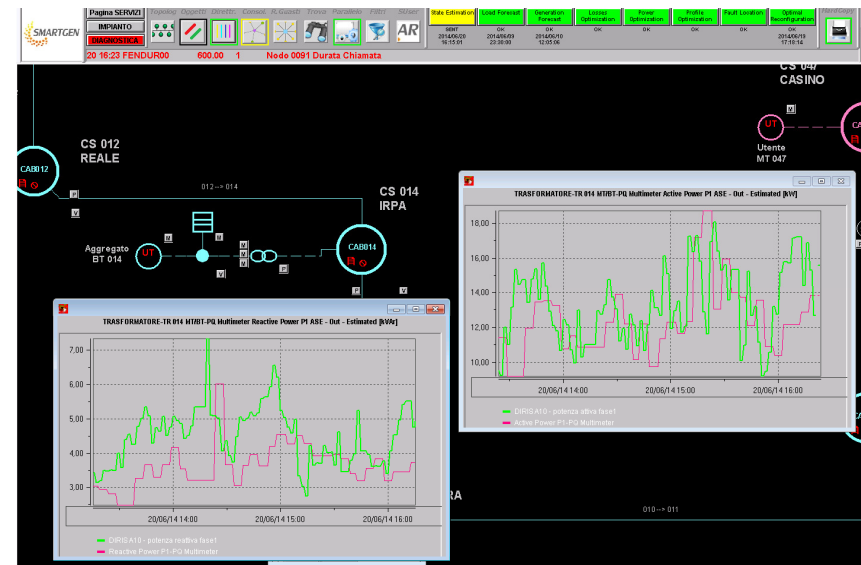




# Sanremo network

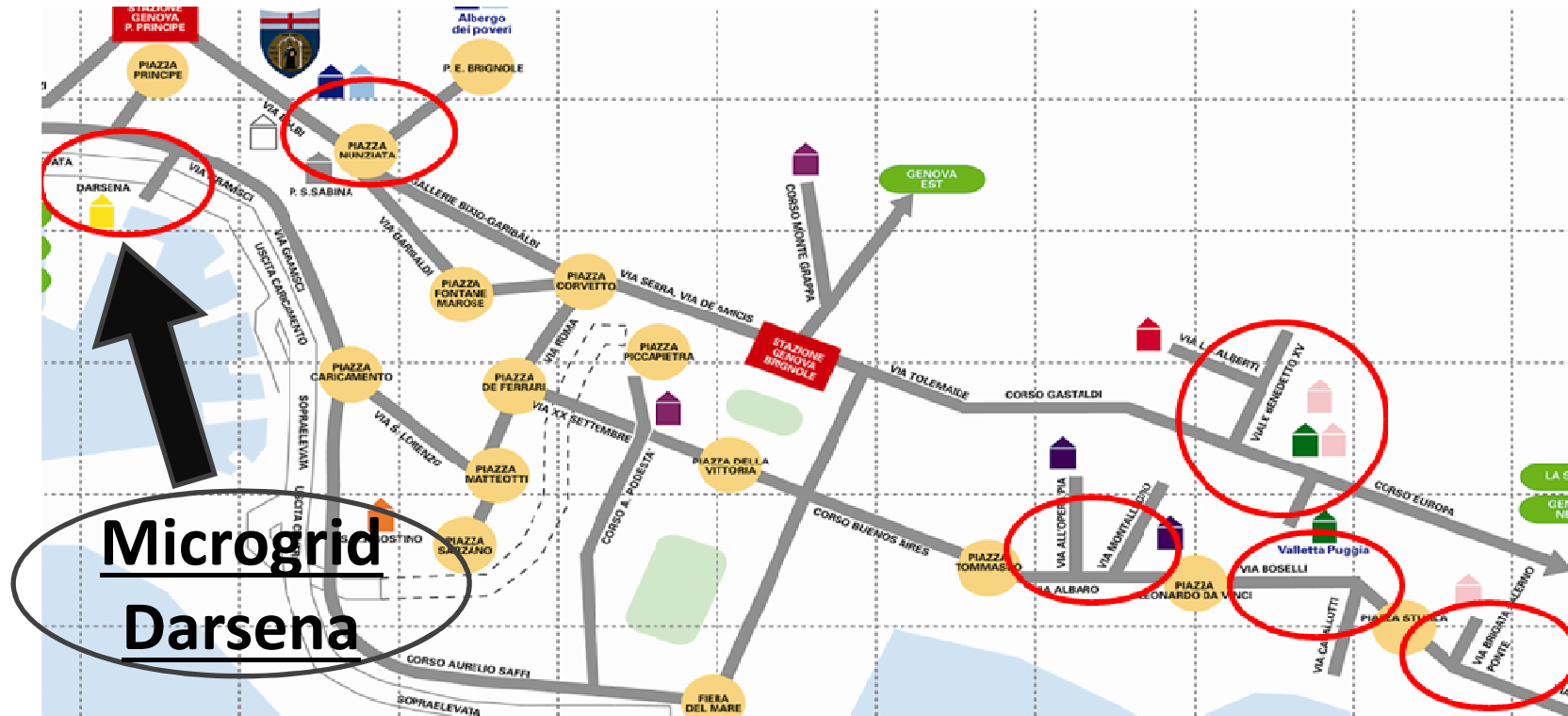
On this network, the goal is to study:

- Analysis of the **voltage profiles** and congestion in the absence and presence of PV distributed generation (connected both LV and MV)
- Study and verification of algorithms of **State Estimation** in distribution networks, load forecasting and production of photovoltaic
- In order to validate these studies, the system has been equipped with a [monitoring system and remote reading of different MV/LV substations.](#)
- Comparison measurements / simulations for other studies





# VPP- University of Genova experimental micro grid



## 20 MV/LV substation monitored in real-time (3 MW peak)



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# VPP- University of Genova experimental micro grid

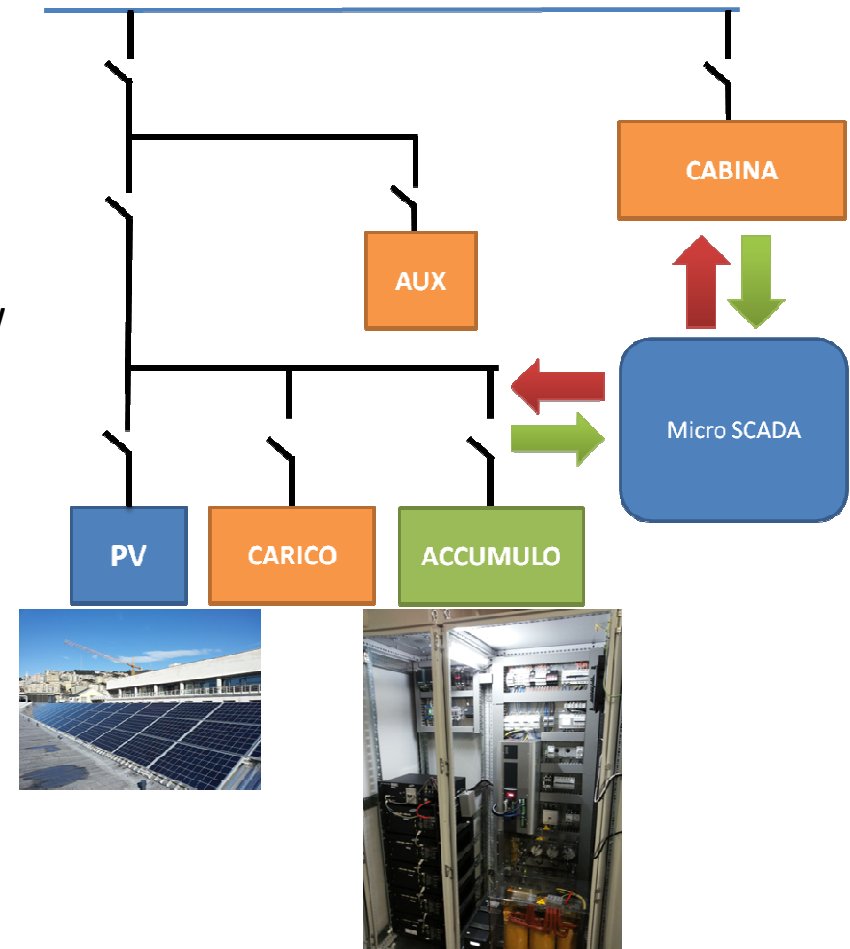
## PV plant

- 19,74 kWp
- Conergy 250 Wp
- 2 Inverters Power One (10 kW)

## Lithium storage

- 1 Rack (5 trays -16 cells) 17,7 kW and 16,8 kWh

**Microgrid**  
**Darsena**

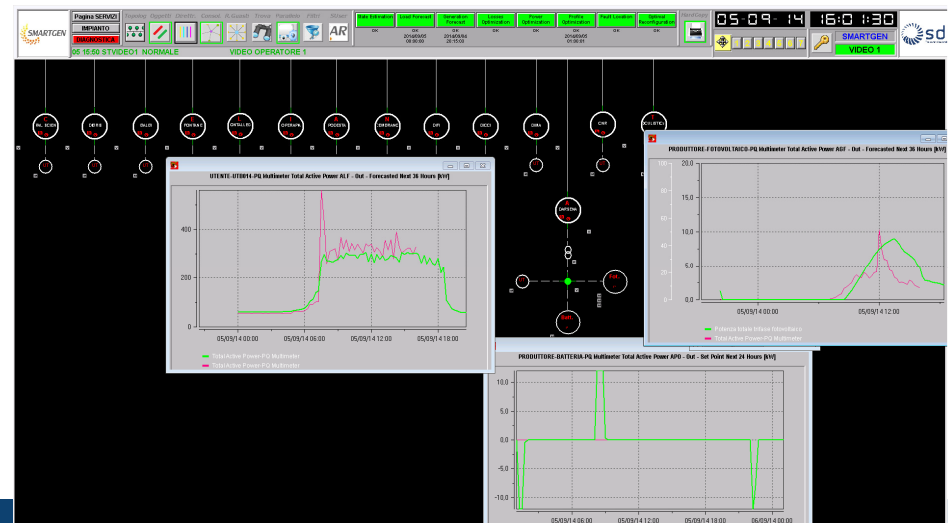
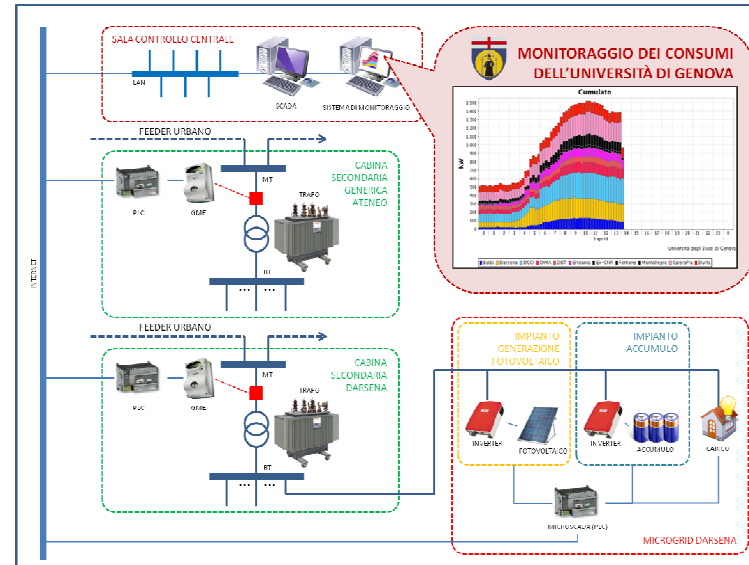




## VPP Unige and Darsena MicroGrid

On this network, the goal is to study:

- **Forecasting** of generation and load
- Algorithms for peak shaving, load following, load shifting
- **Optimization algorithms** for the medium-term economic VPP
- Storage characterization
- To perform these studies, the system is equipped with electric network components and measurement/communication systems suitably interfaced.





# Conclusions

- The DMS proposed by Smartgen is able to handle advanced functions such State Estimation (SE), Load Forecasting (LF), Generation Forecasting (GF), optimization of the working point, control of power flows and voltage also in order to minimize the losses
- 3 pilots with different scales and features are available for validation and experimental testing



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**Thank you for your  
attention**

**Federico Silvestro**

University of Genoa, Italy

Department of Electrical, Electronic, Telecommunication  
Engineering and Naval Architecture  
[federico.silvestro@unige.it](mailto:federico.silvestro@unige.it)



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