

SIRFN Capability Summary

L2EP, Lille France



Introduction

L2EP has developed an original laboratory facilities called “Distributed Energy platform” to achieve some research and development for different Smart Grid applications. The key research areas are listed below:

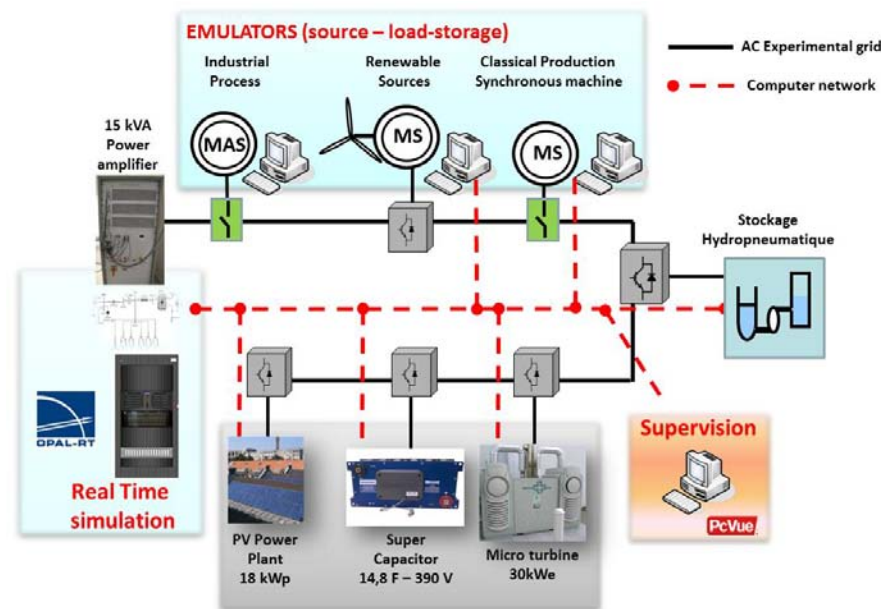
- **Renewable Energy and DER Integration R&D** focuses on participation of distributed energy to ancillary service for power system : voltage regulation, frequency regulation specially for weak network. The coordination of different renewable sources of energy is also addressed.
- **Energy storage R&D** focuses on the test of different type of storage technology with different time response and behavior : supercapacitor, lead-acid and Lithium Ion Battery. The combination of different services are tested on the storage elements : primary regulation, congestion management, filtering of renewable intermittent production ...
- **Power Electronics and Controls** are tested on the platform thanks to open system hardware developed in the lab. Anti islanding algorithm performances are studied and also DC grid connection to AC system for renewable energy production.

Research is conducted within European projects or with some French government funding and most of the time in collaboration with industry and academic partners.

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Renewable Energy and DER Integration

Desired Level of SIRFN Participation: 3

- 1 = Low 2 = Med 3 = High

Description of Activities

L2EP develop different activities to help the integration of renewable energy in electrical grid. One of the main originality of the tests is to mix actual devices with real-time simulation. The interaction between both systems is achieved thanks to high bandwidth power amplifiers.

Connection of real PV inverter on simulated photovoltaic panels and simulated grid in order to test the behavior of the inverter in case of disturbed voltage on the grid. This experimental test bed also allows to assess the algorithms of voltage regulation for these converters on low voltage grid.

This experimental setup can also be used for advanced test of anti islanding algorithm since converters can be virtually connected to complex configurations of grid and load.

Connection of renewable energy to a five point multi terminal DC grid is under progress. It is possible to assess the management of voltage with this type of DC grid but also to analyze the dynamic response of the system in case of different types of DC faults.

Coordination of different type of renewable sources and storage element has been studied with the help of multi agent system

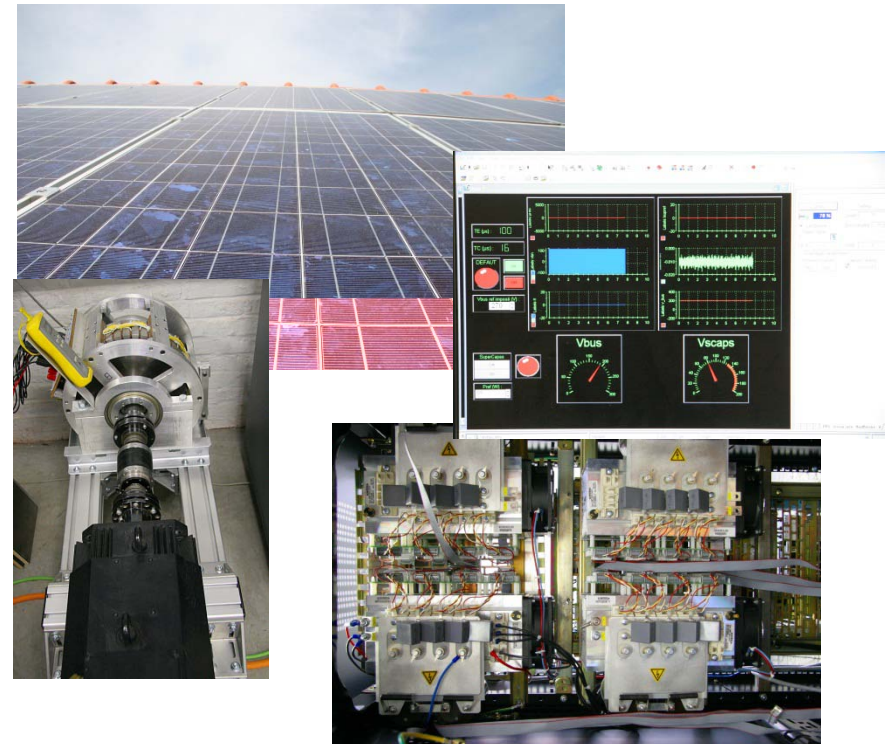
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Building Automation

Desired Level of SIRFN Participation: ?

- 1 = Low 2 = Med 3 = High

Description of Activities

Describe activities in this subtask area with an emphasis on nature of research/testing. Include relevant information on current clients/customers and highlight any unusual capabilities, major accomplishments or relationships.

SIRFN Site Focus Area Lead(s):

Name

Title

E-mail:

Phone:

Name

Title

E-mail:

Phone:

Area for photos, diagrams
or other graphic material.

Website URL: <http://>

PEV Integration

Desired Level of SIRFN Participation: ?

- 1 = Low 2 = Med 3 = High

Description of Activities

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SIRFN Site Focus Area Lead(s):

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Phone:

Name

Title

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Microgrids

Desired Level of SIRFN Participation: ?

- 1 = Low 2 = Med 3 = High

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Distribution Automation

Desired Level of SIRFN Participation: ?

- 1 = Low 2 = Med 3 = High

Description of Activities

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Cybersecurity

Desired Level of SIRFN Participation: ?

- 1 = Low 2 = Med 3 = High

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Title

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Summary of Capabilities for Simulation and Testing

AC and DC sources:

- 3 High BandWidth Power Amplifiers 15 kVA 400 V 1 voltage/current source, 2 voltage source
- Several in house developed DC/AC 3 kW converter for connection of renewable or storage elements
- 10 kVA synchronous machine
- 3 kW gas motor for cogeneration
- 3 kW Stirling motor for cogeneration
- 17 kW PV system

Loads:

- 3 kVA programmable fully programmable loads

Storage:

- 50 kWh 48 V lead-acid battery bank
- 50 kWh 48 V Lithium Ion battery bank
- 3,5 kWh 48 V super capacitor

Controls:

- 5 Dspace control boards
- SCADA simulator with OPC and 61850 protocol
- Labview environment

Test Configurations:

- Provide summary bullets on configurability and test bed setups available.



Multi Terminal DC grid