GRID4EU - Large-Scale Demonstration of Advanced Smart Grid Solutions with wide Replication and Scalability Potential for EUROPE

ISGAN Annex1 Webinar, January 23rd 2014

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Global agenda

- GRID4EU presentation (Rémy)
- Q/A session
- Zoom on the 6 Demos (Lilia)
- General Work Package activities (Lilia)
- Dissemination activities (Rémy)
- Q/A session
- To stay connected to GRID4EU (Rémy)
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An EU FP7 Smart Grids project

- Project lead by **6 Electricity Distribution System Operators** - covering altogether more than 50% of metered electricity customers in Europe
- Overall **27 partners** from various horizons (utilities, manufacturers, universities and research institutes)
- Duration: **51 months** from November 2011 to January 2016
- Total eligible costs: €54M - requested EC Grant €25.5M

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6 Demonstrators – 27 Partners

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Two categories of objectives

R&D and innovative technology Topics
- Implementing active, more efficient participation of customers to electricity markets (active demand)
- Improving peak load management through increased interactions between network operation and electricity customers
- Using more renewable energy sources connected to distribution networks
- Secure energy supply and network reliability
- Medium and low voltage network supervision & automation
- Electric vehicles
- Storage
- Micro-grids & islanding

Business and Societal Topics
- Smart Grid cost-benefit analysis
- Technologies and standards
- Scalability and replicability over Europe
- Knowledge sharing
6 innovation streams...
…tested by 6 Demonstrators with different boundary conditions…

**VATTENFALL**
Monitoring system of LV network based on AMI infrastructure and intelligent equipments in secondary substations

**ERDF**
Optimization of PV integration into LV grids by using PV and load forecasts, flexible loads, electric storage, islanding and active customer participation

**ČEZ DISTRIBUCE**
LV and MV grids automation including EV management and island operation

**IBERDROLA**
Enhancement of MV and LV networks automation and customers awareness of consumption and network situation

**Enel**
Advanced control system to increase hosting capacity and maximize DER integration in MV networks

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## Interactions and synergies between Demonstrators

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<tr>
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<th>VATTENFALL</th>
<th>IBERDROLA</th>
<th>RWE</th>
<th>Enel</th>
<th>CEZ GROUP</th>
<th>ERDF</th>
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<tr>
<td><strong>Distributed Energy</strong></td>
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<td><strong>Active Demand</strong></td>
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<td><img src="image10" alt="Image" /></td>
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<td><strong>Storage</strong></td>
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<td><strong>Innovative Power</strong></td>
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<td><strong>Management at MV level</strong></td>
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<td><strong>Management at LV level</strong></td>
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<td><strong>Micro-grid (Islanding)</strong></td>
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<tr>
<td><strong>Climate</strong></td>
<td>Cold &amp; Stormy</td>
<td>Mild Mediterranean</td>
<td>Moderate Continental</td>
<td>Dry Mediterranean</td>
<td>Cold Continental</td>
<td>Warm &amp; stormy Mediterranean</td>
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<tr>
<td><strong>Population Density</strong></td>
<td>Urban</td>
<td>Urban</td>
<td>Semi-urban</td>
<td>Rural</td>
<td>Semi-urban</td>
<td>Semi-urban / urban</td>
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…to foster synergies and common work
Project Milestones

- **Project kick-off**
  - Nov 2011

- **Project closure**
  - Jan 2016


- **2011**
  - Oct 2012 Yearly project report

- **2012**
  - Yearly project report

- **2013**
  - Yearly project report

- **2014**
  - Yearly project report

- **2015**
  - Yearly project report

- **2016**
  - Yearly project report

- Definition and publication of technical specifications
- Installation of the equipment for each demonstrator
- Test of the demonstrators / exploitation of data and functionalities
- Return on Experience, projections and replication of results

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6 Demos, 1 project

GWP1 - Project management

GWP2 - Technical specifications & requirements

GWP3 - Scaling-up & replication

GWP4 - Technology & Communication standards

GWP5 - Dissemination

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Global agenda

- GRID4EU presentation (Rémy)

- Q/A session

- **Zoom on the 6 Demos (Lilia)**
  - General Work Package activities (Lilia)
  - Dissemination activities (Rémy)

- Q/A session

- To stay connected to GRID4EU (Rémy)
Demonstrate that European MV networks can use the concept of autonomous, self-organising nodes to serve the need of both the DSO and the served clients.

- Location
  - In the municipality of Reken, North-Rhine Westphalia, Germany

- Other partners involved

- Objectives
  - Multi-agent system as an industrial solution for network operation, thus allowing:
    - Integration of an increasing number of decentralized energy resources (windmills, solar panels…) in the medium and low voltage networks
    - Achieving higher reliability, shorter recovery times after grid failures
    - Avoiding unknown overloads
    - Fulfilling the needs of surveillance and remote-control in MV-networks

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Validate that the control of LV distribution networks using AMR events allows for more distributed generation while improving customer power quality

• Location
  – In Uppsala, Sweden

• Other partners involved
  
  ABB  eMeter  KTH  TELVENT

• Objectives
  • The aim is to validate that the control of the Low Voltage distribution networks using AMM (Automatic Meter Management) and intelligent equipment in the Low Voltage Network allows for more distributed generation while improving customer power quality
  • Show how to monitor and control the Low Voltage network to enable Active Demand, Distributed Generation and Energy Efficiency ambitions
Zoom on DEMO3

Enhance the observability and control of the low and medium voltage distribution networks building on a multi-layer solution for smart metering implementation

- **Location**
  - In **Castellón, Spain**

- **Other partners involved**

- **Objectives**
  - Usage of intelligent meters information for better **knowledge of the network status** (immediate knowledge of **outages**, of electrical magnitudes out of limits, of power quality)
  - Monitoring the LV lines at the SS, to evaluate overloads, unbalances, etc. (nowadays they are not monitored)
  - **Evaluate losses** (technical and non-technical) by comparing SS totals with the accumulated of the customers, hour per hour
  - Reinforce high-voltage (HV) network control by monitoring electrical magnitudes and implementing effective fault detection and automatic restoration
  - **Give customers better information** of their consumption, and inform them about the network situation (ex. disturbances)

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Increase the Medium Voltage (MV) network's hosting capacity for Distributed Energy Resources (DER, in particular solar), introducing Active Control and Demand Response of MV generators, controllable loads and storage.

- **Location**
  - In the area of Forli, Emilia Romagna – Cesena, Italy

- **Other partners involved**
  - Cisco
  - SELTA
  - Siemens
  - RSE
  - Enel

- **Objectives**
  - Implement Active Control and Demand Response of Decentralized Energy Resources (DER), such as generators, controllable loads and storage to increase medium voltage network hosting capacity of renewable generation.
  - Help the medium voltage distribution network to become more flexible with advanced network operation and energy management capabilities.
  - Demonstrate advanced solutions under real operating conditions and on large scale.

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Demonstrate that existing distribution networks having smart metering and CHP Units can be upgraded to allow automatic islanding while ensuring enough power supply

- **Location**
  - In Vrchlabí, Czech Republic

- **Other partners involved**

- **Objectives**
  
  - Demonstrate that existing distribution networks having smart metering and CHP units can be upgraded to allow for automatic islanding while ensuring enough power provision
    
    - full smart meters deployment, including launching of an information customers web portal
    
    - installation of generation capacity of 1,2 MW in DER (CHP units)
    
    - automation of the existing MV and LV grid
    
    - running of automatic island operations ensuring sufficient power supply to the area during the island operations

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Zoom on DEMO6

A smart grid pilot testing and validating massive integration of Distributed Energy Resources (DER) and electricity storage

• Location
  – In Carros near Nice, France

• Other partners involved
  
  ![Logos](image)

• Objectives:
  
  • Design a smart grid in a district with a **high level of solar generation**, **electricity storage** and **load management capabilities**, and test different situations of **local optimization** of the MV/LV network (1)

  • Study **how customers are becoming active** and **adapt their consumption / generation of electricity** to face distribution network or global electricity system’s constraints, especially at peak hours

  • **Assess the costs and benefits** of the smart district for the various players involved

(1) including local safe islanded operations to face emergency situations

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Use cases collection synthesis

1. Secondary Substation Node (SSN) or LV & MV Control Infrastructure
2. Automatic Failure Detection
3. Automatic Grid Recovery
4. Customer Engagement

DEMO1 - RWE
1. Failure Management in MV networks
2. (dec.) grid operation in MV networks

DEMO2 - VTF
1. Outage Detection in the LV Network

DEMO3 - IBD

DEMO4 - ENEL
1. Voltage Control on MV Grids
2. Anti-islanding Protection on MV Grids
3. MV Measurement Acquisition
4. Demand Response for MV Customers

DEMO5 - CEZ
1. LV Grid Automation of Failure Management
2. MV Grid Automation of Failure Management
3. Management of Islanding operation

DEMO6 - ERDF
1. Islanding
2. Reduction of power demand
3. Manage maximised PV production on LV network regarding constraints and flexibility programs
4. Encourage resident to adopt smarter habits according to network state

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Common work between Demonstrators

All Demonstrators Use Cases modeled using a common methodology: the SGAM (Smart Grid Architecture Model)

8 Common Key Performance Indicators (KPIs) defined for 2 or more Demonstrators.

Developed KPIs fed as input for the development of EEGI KPIs done within the scope of GRID+

Common Demonstrators’ Use Cases description

Common Demonstrators’ KPIs definition

Overall Technical Coordination

Peer-review process between Demonstrators

• Technical coordination of the Demonstrators to maximize the added value of the joint impact at EU level
• Pro-active identification of barriers faced by Demos to propose common solutions

Deliverables consistently reviewed by another Demonstrator team to foster knowledge-sharing and common work
A unique method to describe the use cases

- Thanks to the IEC method, enriched by the work done in M/490 mandate of the European Commission we have been able to describe each use cases with a common and shared method.

- Modeling of the demonstrators with the SGAM (Smart Grid Architecture Model) provided by the WG Reference Architecture.
Scalability and Replicability & Cost Benefit Analysis (SRA & CBA)

Replicability
- The ability of a system, network or process to be duplicated in another location or time

Scalability
- The ability of a system, network or process to increase its size/scope/range in order to adequately meet a growth in demand

Cost Benefit Analysis
- The Grid4EU CBA will be based on the JRC methodology
- Grid4EU will report to the European Commission the possible difficulties have identified while implementing the JRC guidelines into real demos.

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Standard Compliance

- Define the most appropriate standards for the different demonstrators
- Validate and share experience in the implementation of standards
- Give feedback and lesson learnt to standardization bodies and Smart Grids community in particular the EU M/490 Mandate
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Grid4EU’s Contribution to ISGAN

- GRID4EU is providing an active contribution to ISGAN
  - Grid4EU participated to the Casebook on AMI (in 2013)
  - Grid4EU’s is currently participating in the Casebook on Demand Management
    - As coordinator of the Casebook
    - As contributor, with a case study by the French Demo

- Casebook participants

- Next steps
  - Casebook finalization
  - Casebook Publication
    
    *End of March 2014*
Links with other EU projects and Worldwide SG initiatives

The GRID4EU project is labeled EEGI Core project:
The EEGI Label acknowledges that a specific project is in line with the spirit of the EEGI and an EEGI Functional Objective as specified in the EEGI Research and Innovation Roadmap.

GRID4EU is in close collaboration with EcoGrid EU
Both projects:
• work together for ISGAN activities.
• have the same project managers at EC.
• are member of the other project’s Advisory Board.

GRID4EU Advisory Board
• 36 members from 10 different countries
• Annual Meeting (2 already hosted)
Q/A Session
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