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

ISGAN Annex1 Webinar, January 23rd 2014

SEVENTH FRAMEWORK PROGRAMME

CO - FUNDED BY THE EUROPEAN UNION

Rémy Garaude-Verdier, ERDF, GRID4EU Coordinator
Lilia Consiglio, ENEL, GRID4EU Technical Director

GRID4EU
INNOVATION FOR ENERGY NETWORKS

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)

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)

An EU FP7 Smart Grids project

GRID4EU
INNOVATION FOR ENERGY NETWORKS

- 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

ERDF — **Project Coordinator**

Enel — **Technical Director**

IBERDROLA — **Chairman of General Assembly**

ČEZ DISTRIBUCE · RWE The energy to lead · VATTENFALL

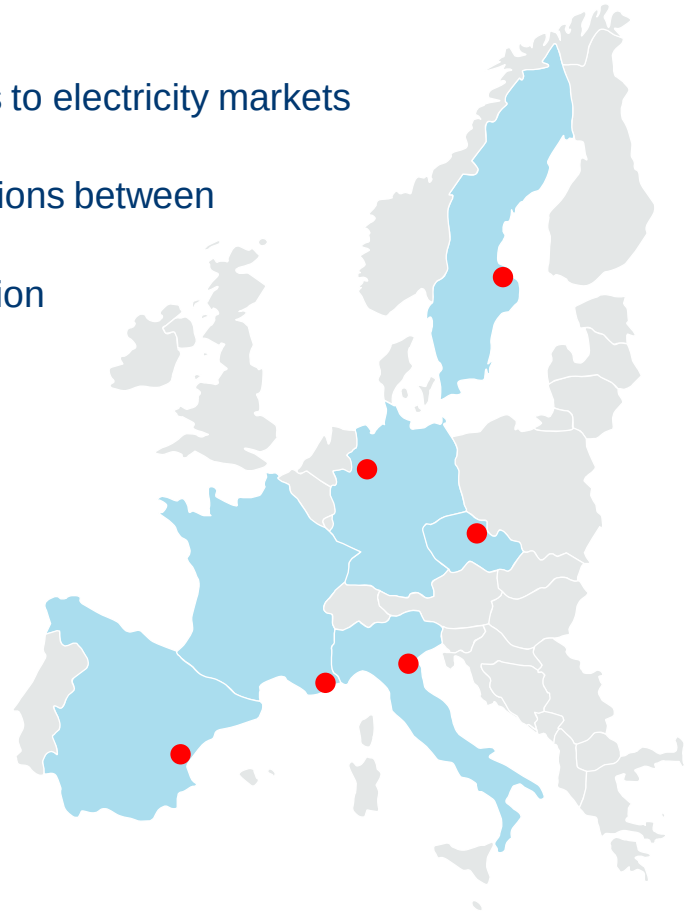
6 Demonstrators – 27 Partners

GRID4EU
INNOVATION FOR ENERGY NETWORKS

Two categories of objectives

R&D and innovative technology Topics

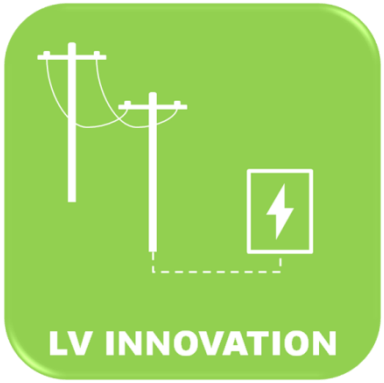
- Implementing active, more efficient participation of customers to electricity markets (active demand)
- Improving peak load management through increased interactions between network operation and electricity customers
- Using more renewable energy sources connected to distribution networks
- Secure 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…

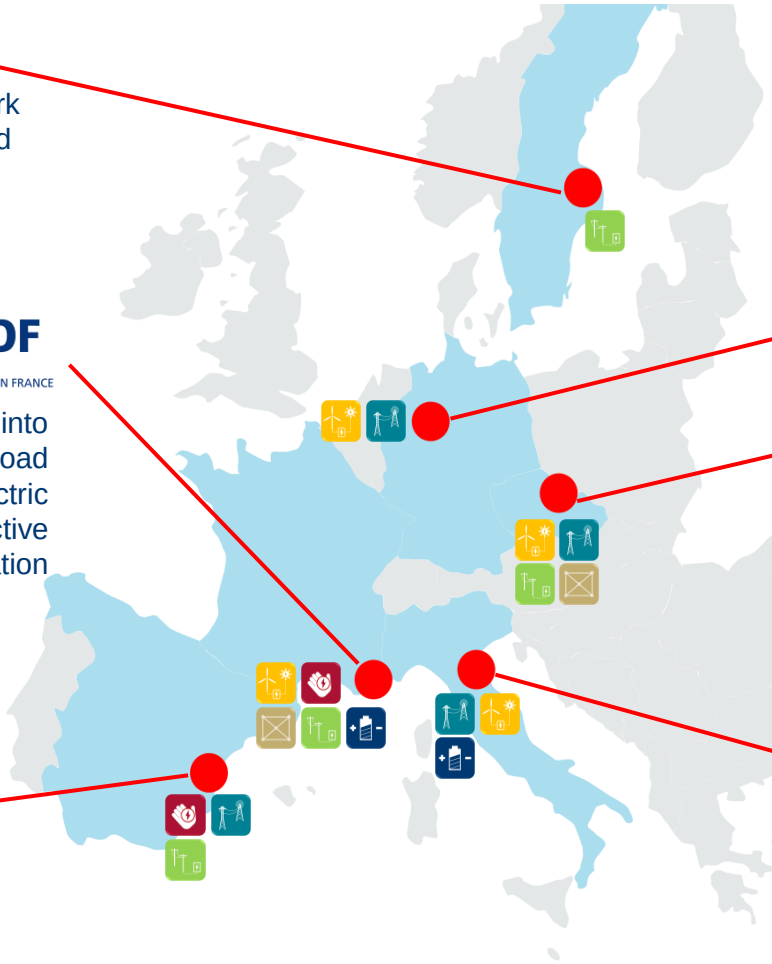
GRID4EU
INNOVATION FOR ENERGY NETWORKS

VATTENFALL

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

RWE
The energy to lead

Improvement of surveillance and advanced control of MV grids based on autonomous Multi-Agent-System



ERDF
ÉLECTRICITÉ RÉSEAU DISTRIBUTION FRANCE

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

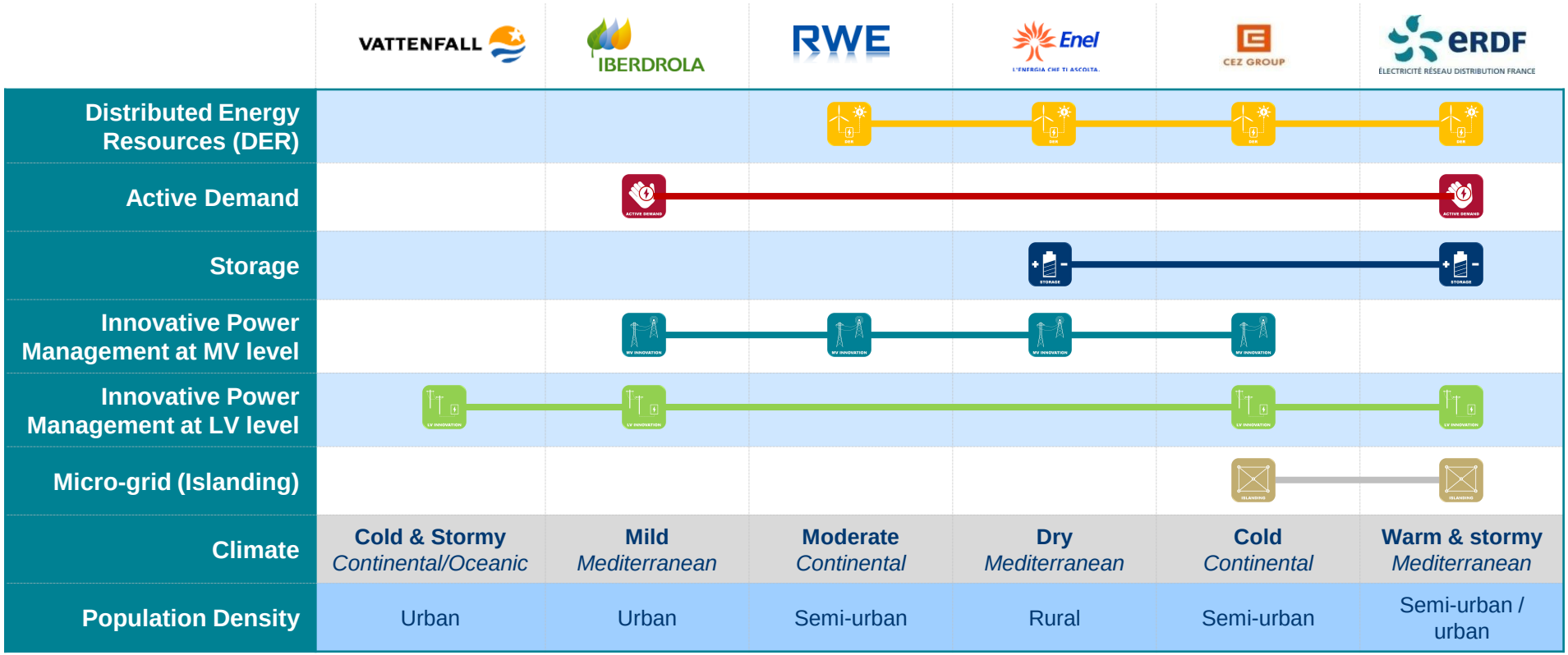
IBERDROLA

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

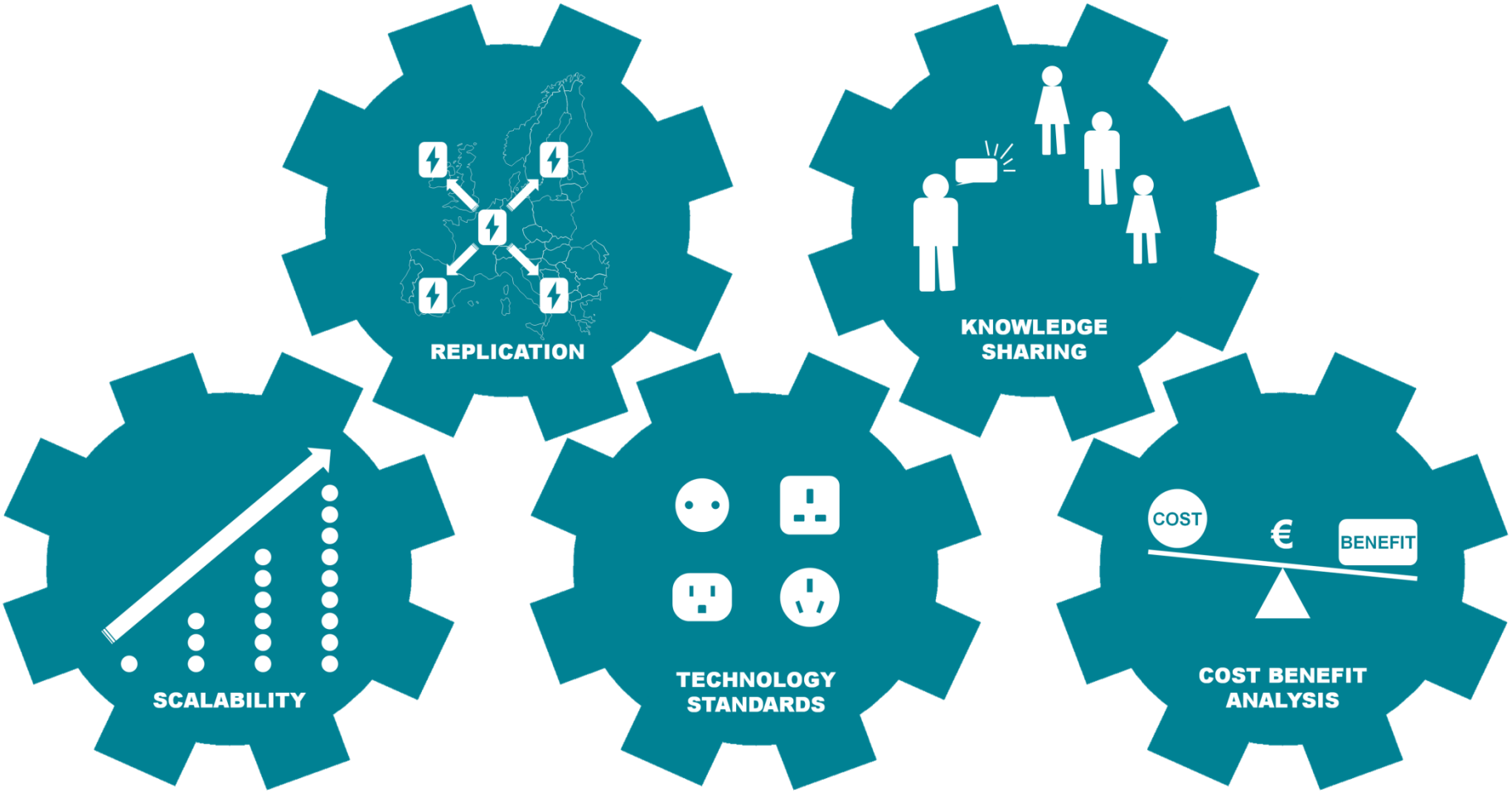
Enel

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

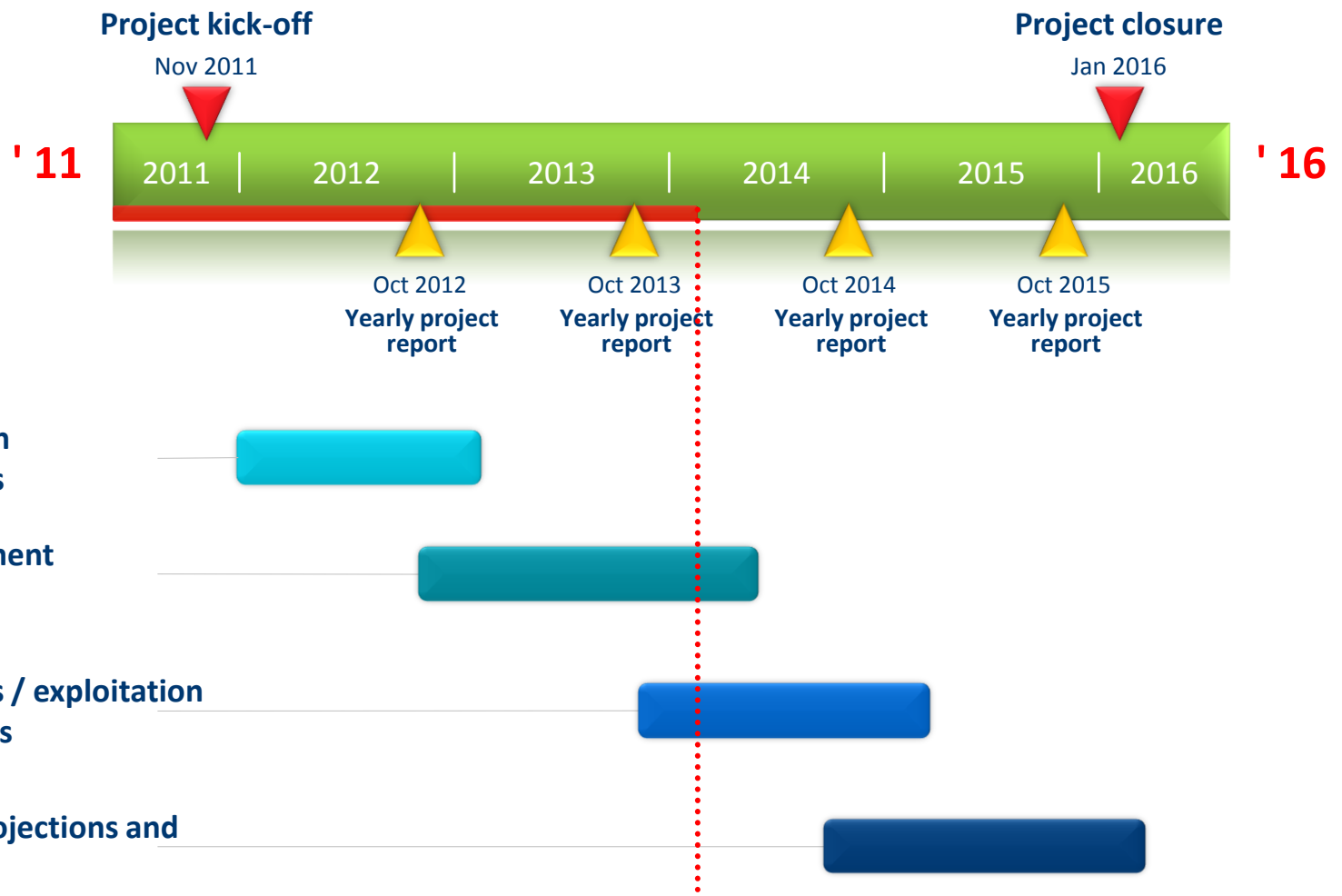
Interactions and synergies between Demonstrators



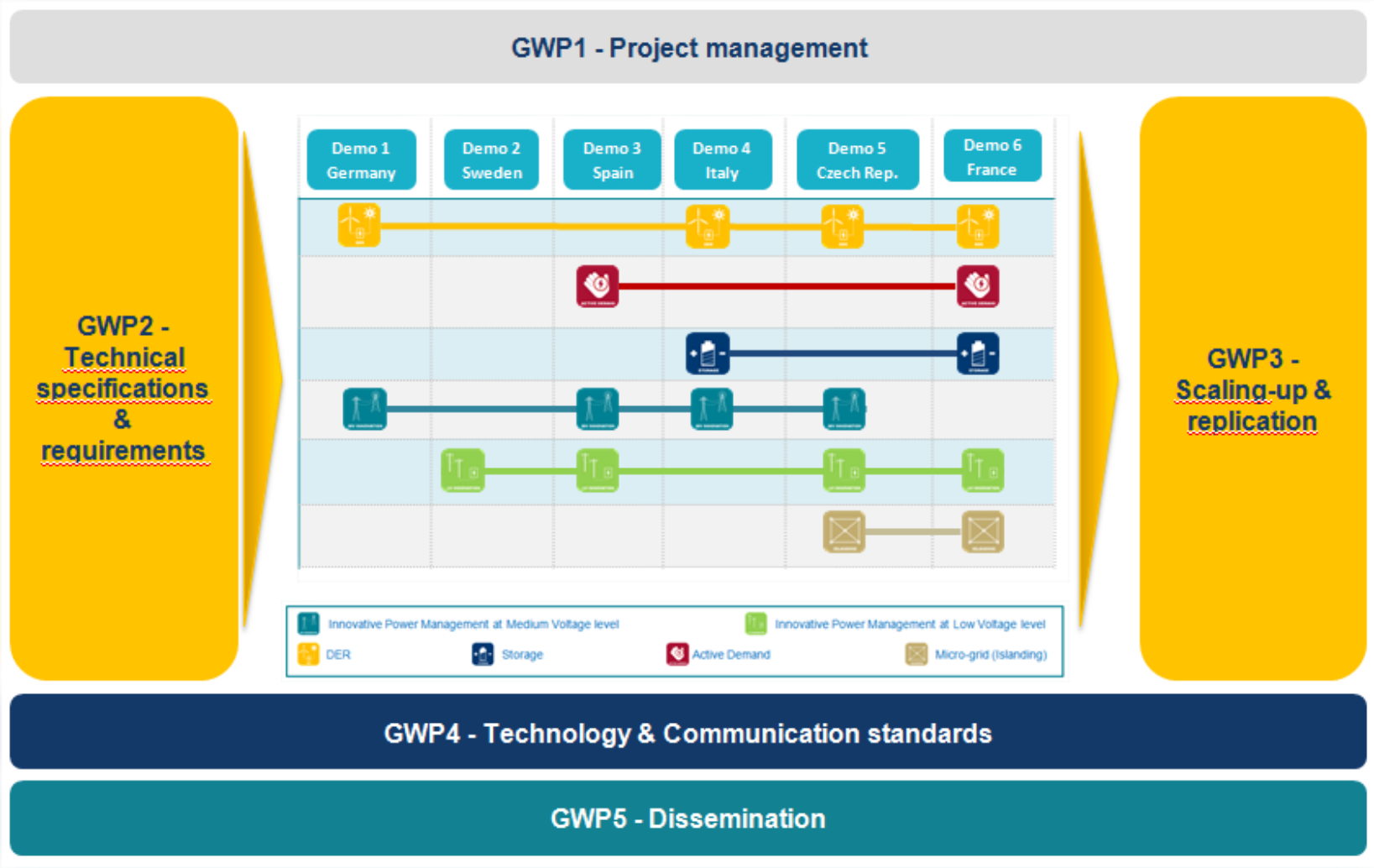
…to foster synergies and common work



Project Milestones



6 Demos, 1 project



Q/A Session

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)

Zoom on DEMO1

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

ABB technische universität dortmund

- 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

Zoom on DEMO2

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

VATTENFALL

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)

Zoom on DEMO4

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
- 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**

Zoom on DEMO5

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**

ČEZ DISTRIBUCE

- Other partners involved

ABB CISCO CURRENT SIEMENS

- 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

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

ALSTOM Grid ARMINES EDF

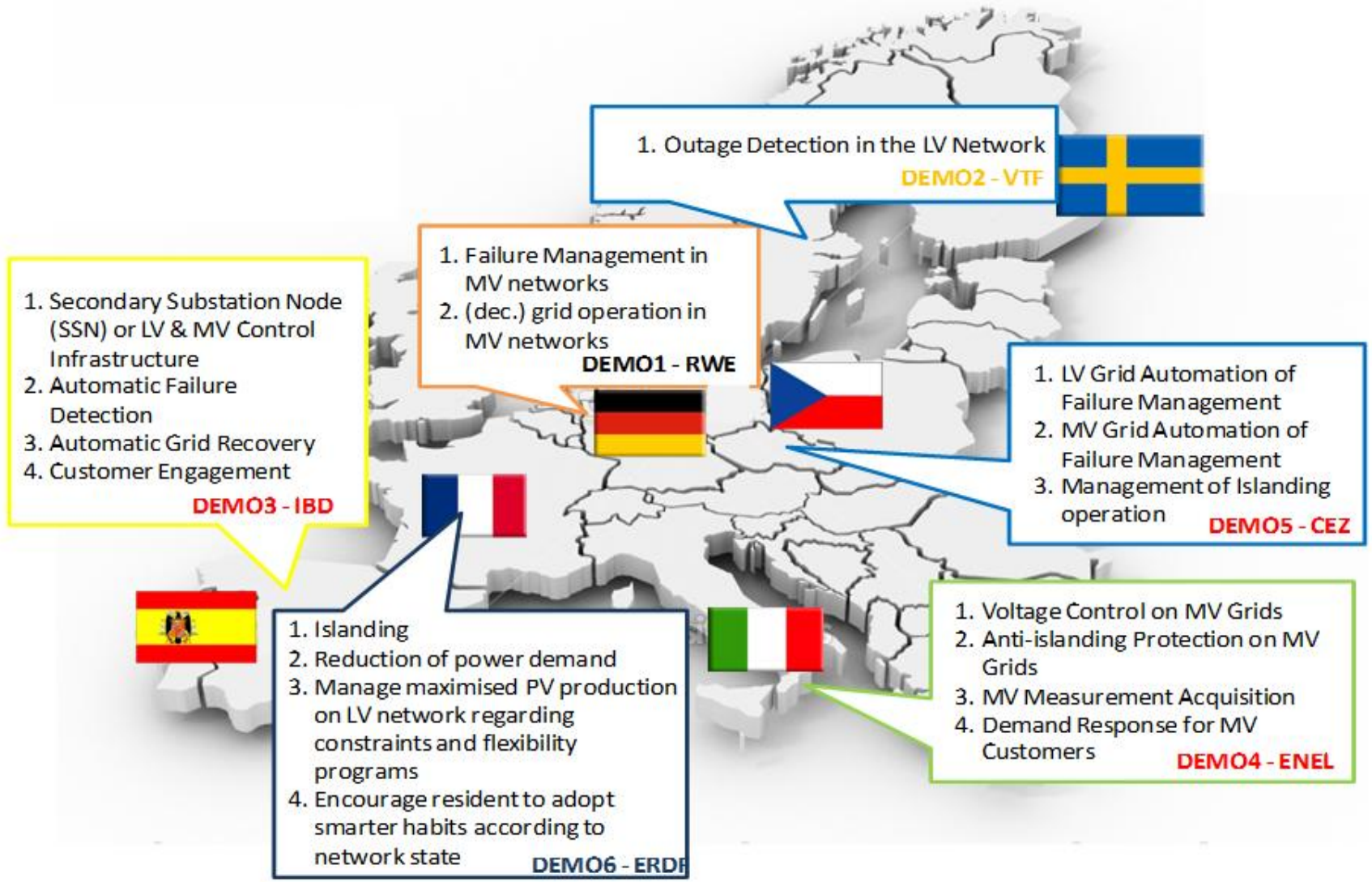
- Objectives :
  - Design a smart grid in a district with a **high level of solar generation**, **electricity storage** and **load management capabilities**, and test different situations **of local optimization** of the MV/LV network (1)
  - Study **how customers are becoming active** and **adapt their 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

Global agenda

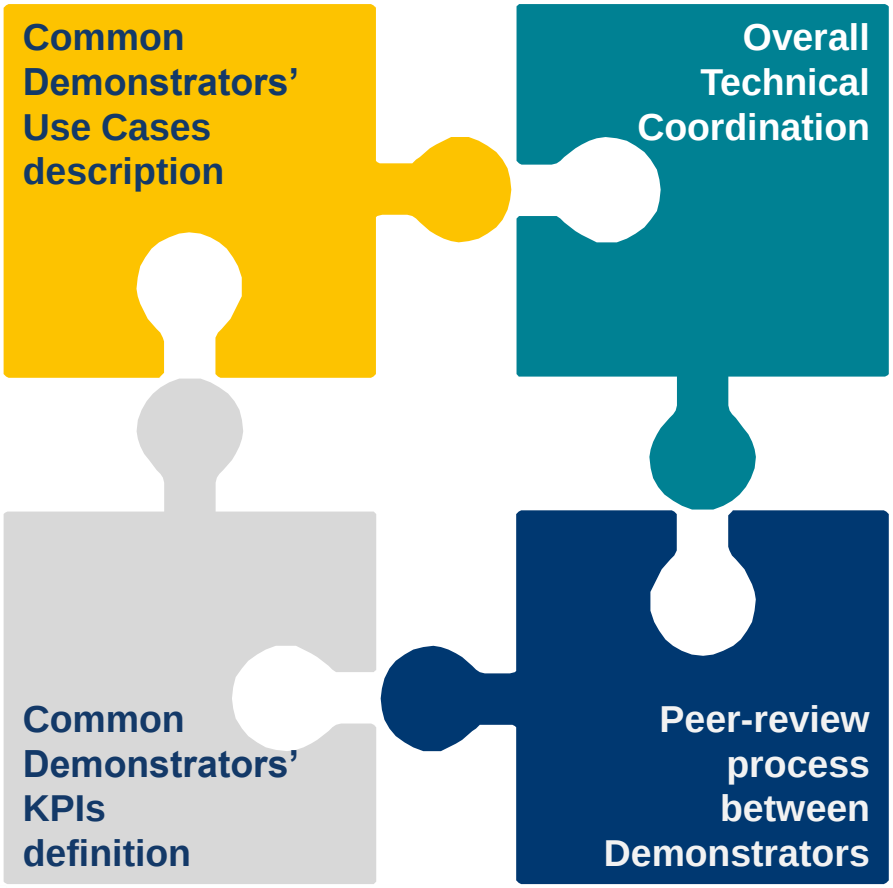
- GRID4EU presentation (Rémy)
- Q/A session
- Zoom on the 6 Demos (Lilia)
- **General Work Package activities (Lilia)**
- Dissemination activities (Rémy)
- Q/A session
- To stay connected to GRID4EU (Rémy)

Use cases collection synthesis



Common work between Demonstrators

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



- 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

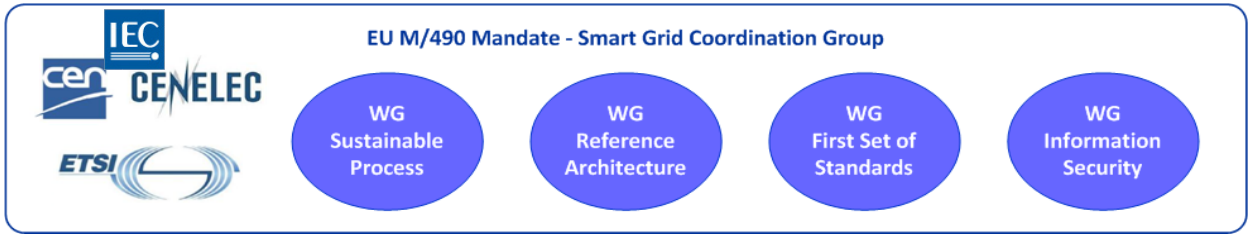
8 Common Key Performance Indicators (KPIs) defined for 2 or more Demonstrators.

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

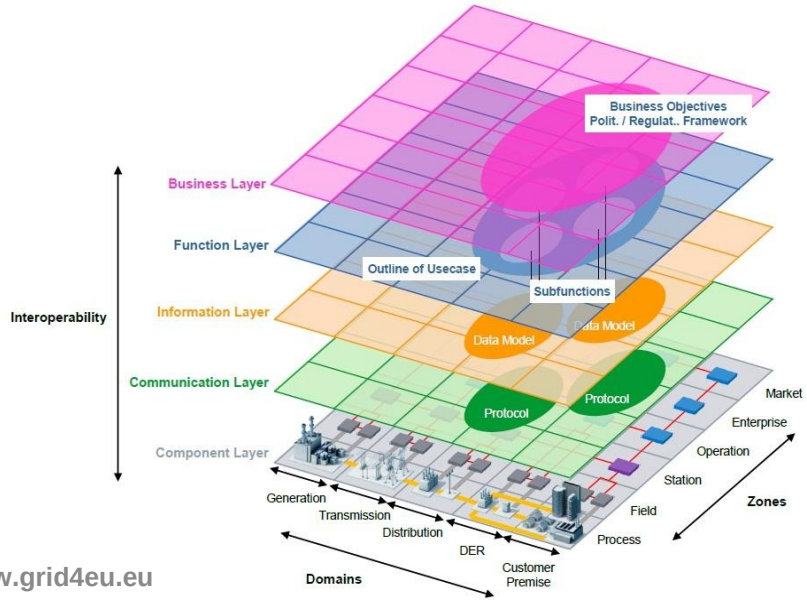
Deliverables consistently reviewed by another Demonstrator team to foster knowledge-sharing and common work

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)

KPIs Baseline calculation

KPIs evaluation and calculation

Data gathering

Grid4EU Analysis

Replicability

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

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.

Scalability

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

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**

Standards		DEMO1	DEMO2	DEMO3	DEMO4	DEMO5	DEMO6	JWG	NIST	IEC SG3'
Communication technologies										
Wired	RS485 (twisted pair)					X				
Wired	Ethernet (IEEE 802.3)				X	X				
Wired	PLC		X	X	X		X			
Wireless	Zigbee (IEEE 802.15.4)			X						
Wireless	GPRS	X	X			X	X			
Wireless	WiMAX (IEEE 802.16)				X	X				
Wireless	LTE				X					
Communication protocols										
	G3 PLC (ITU G.9955/G.9956)						X			
	Meters & More (PLC)				X					
	LonWorks PLC (ISO/IEC 14908-3)		X							
	PRIME (PLC)			X						
	IEC 60870-5-104	X	X	X	X	X				high
	IEC 61850				X	X				core
	IEC 62056 (DLMS/COSEM)			X			X			high
	Modbus					X	X			
	OMA-DM/OMA-DS						X			
	TCP/IP	X			X	X				
	XMPP						X			
	WS-*		X	X			X			
Information models										
CIM (IEC 61968, 61970 & 62325)			X	X	X	X	X			core
DLMS/COSEM (IEC 62056)				X			X			high
IEC 61850-7					X		X			core

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)

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

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)**

GRID4EU public communication

Subscribe to the GRID4EU biannual newsletter:

http://www.grid4eu.eu/common/newsletter-subscriber.aspx

The first two newsletters are already available online:

http://www.grid4eu.eu/dissemination/newsletter.aspx

Follow us on social media:

Follow on Twitter: twitter.com/Grid4EU

Join on LinkedIn: http://www.linkedin.com/groups/Grid4EU-4799216/about

CO - FUNDED BY THE EUROPEAN UNION

SEVENTH FRAMEWORK PROGRAMME

GRID4EU INNOVATION FOR ENERGY NETWORKS

Thank you for your attention!

Visit our website: **www.grid4eu.eu**

All public deliverables are available on the GRID4EU Website:

http://www.grid4eu.eu/project-demonstrators/deliverables.aspx