

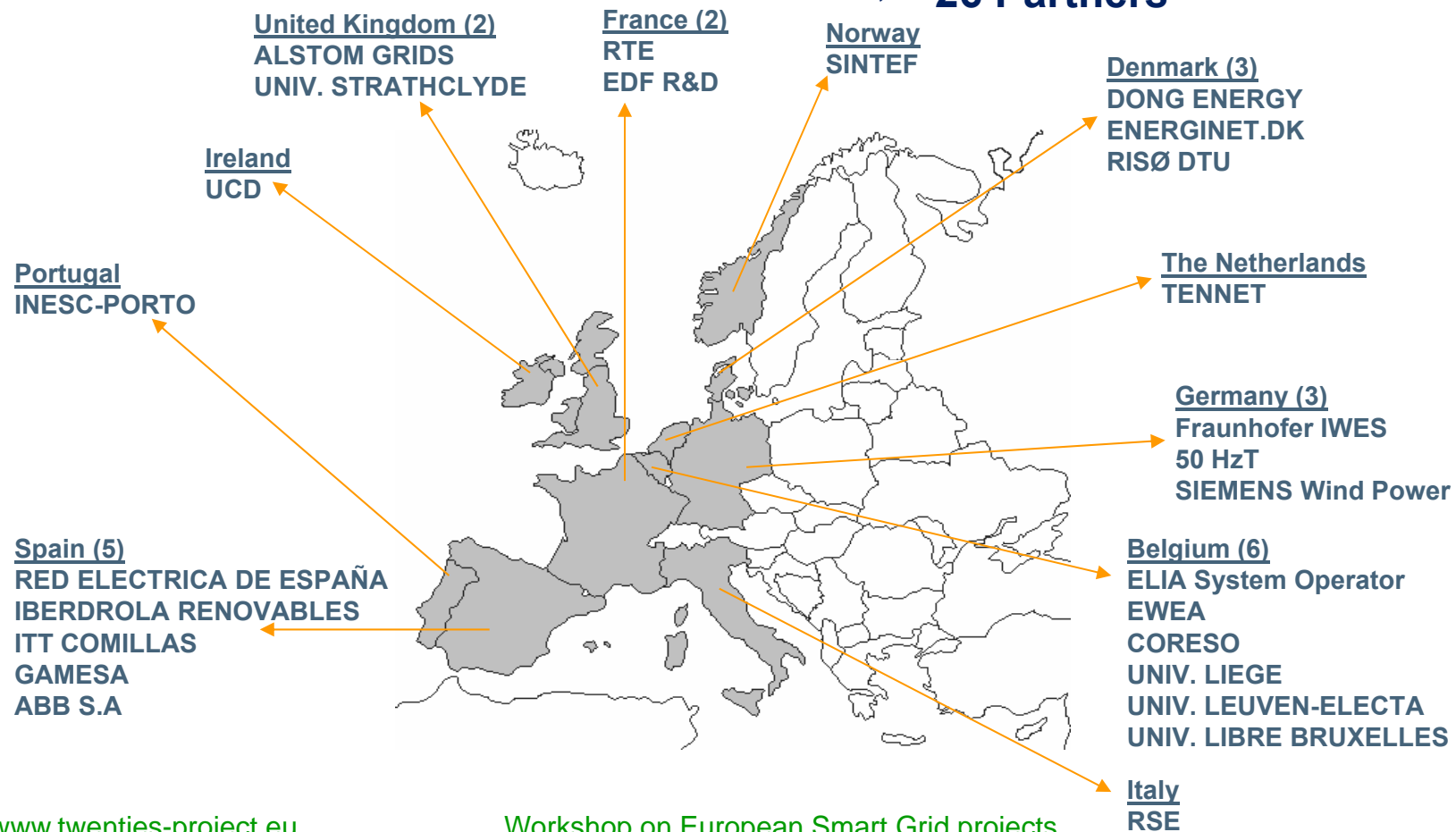
RED ELÉCTRICA DE ESPAÑA

## Workshop on European Smart Grid projects

2nd IEEE Int. Conference on Smart Grids  
Brussels, 17 October 2011

# TWENTIES Consortium

- ✓ 10 European Member States
- ✓ 1 Associated Country
- ✓ 26 Partners





## Objectives and basic data

The TWENTIES project aims at:

*“demonstrating by early 2014 through real life, large scale demonstrations, the benefits and impacts of several critical technologies required to improve the pan-European transmission network, thus giving Europe a capability of responding to the increasing share of renewable in its energy mix by 2020 and beyond while keeping its present level of reliability performance.”*

Project duration:

36 Months

Starting date:

April 2010

Financial figures:

Total Eligible Costs:

56.8 M€

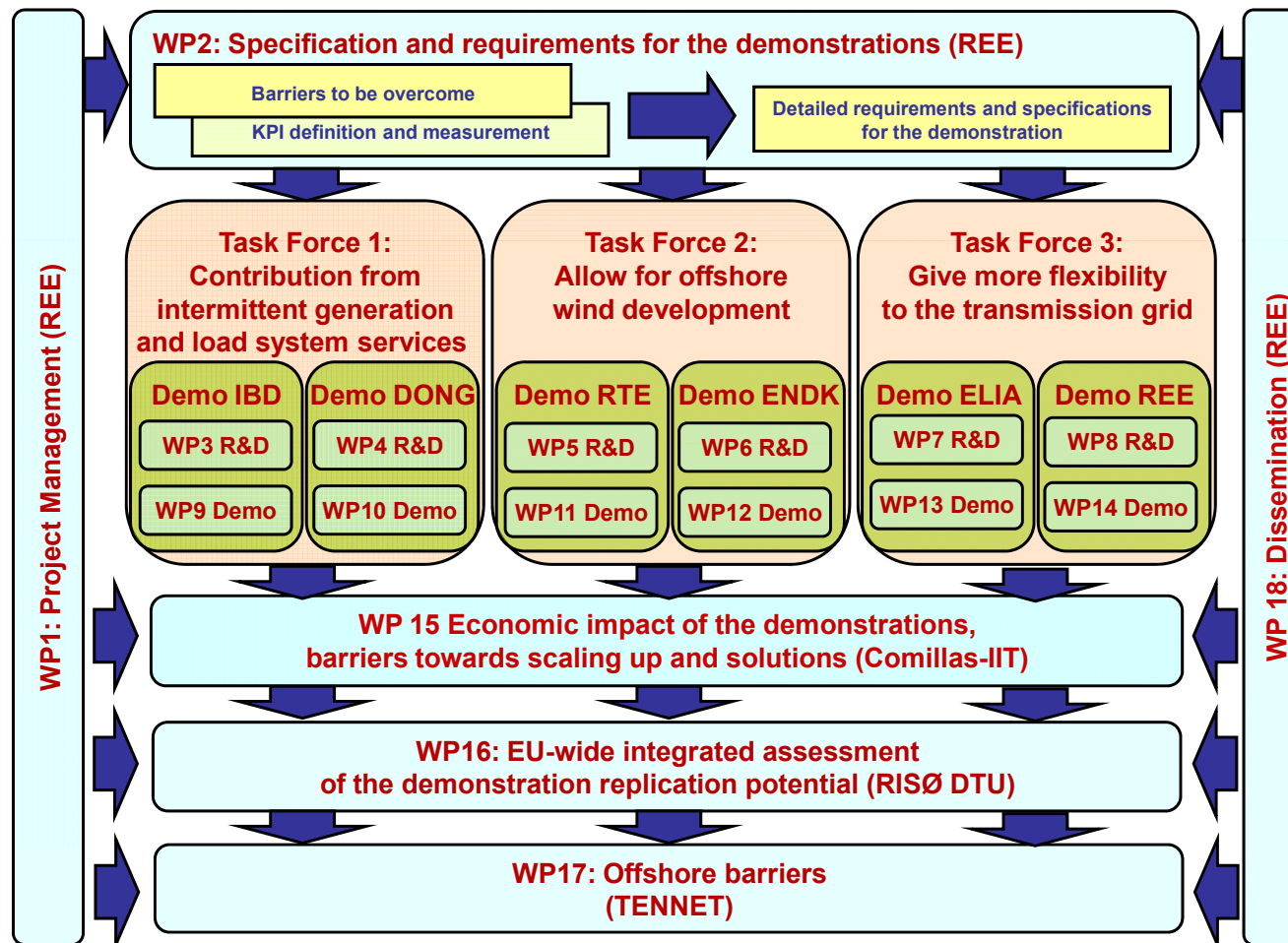
Max. EU contribution:

31.8 M€

Nº of estimated Man.Months:

≈2,500 m.m

# Workpackages Structure and Interaction



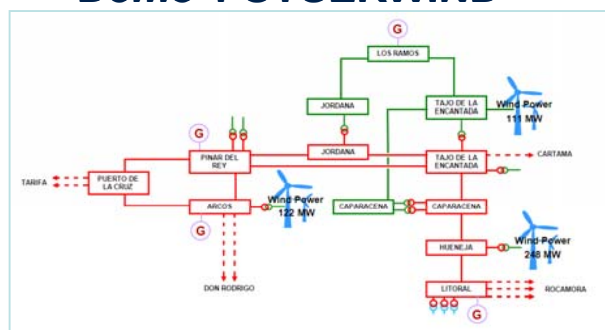
# Six Large Scale Demonstrations

**Task force 1:** Contributions of variable generation and flexible load to system services

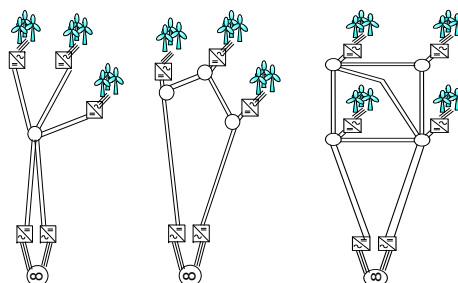
**Task force 2:** Reliable off-shore grid and wind development (and 'smart' licensing in WP17)

**Task force 3:** Improvements in the transmission grid flexibility

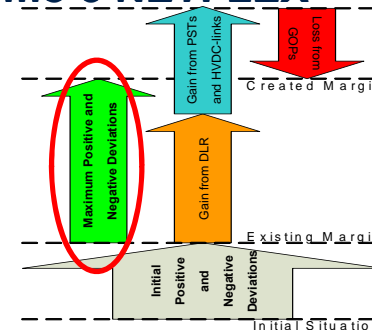
## Demo 1 SYSERWIND



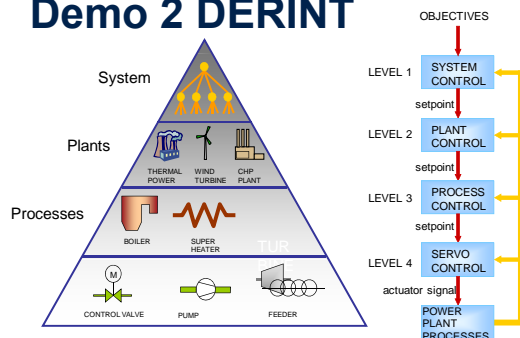
## Demo 3 DC-Grid



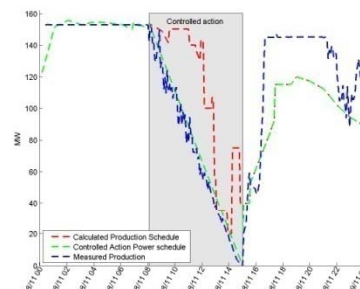
## Demo 5 NETFLEX



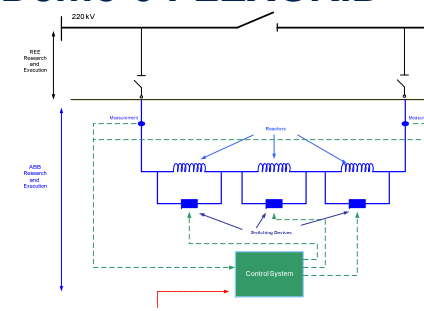
## Demo 2 DERINT



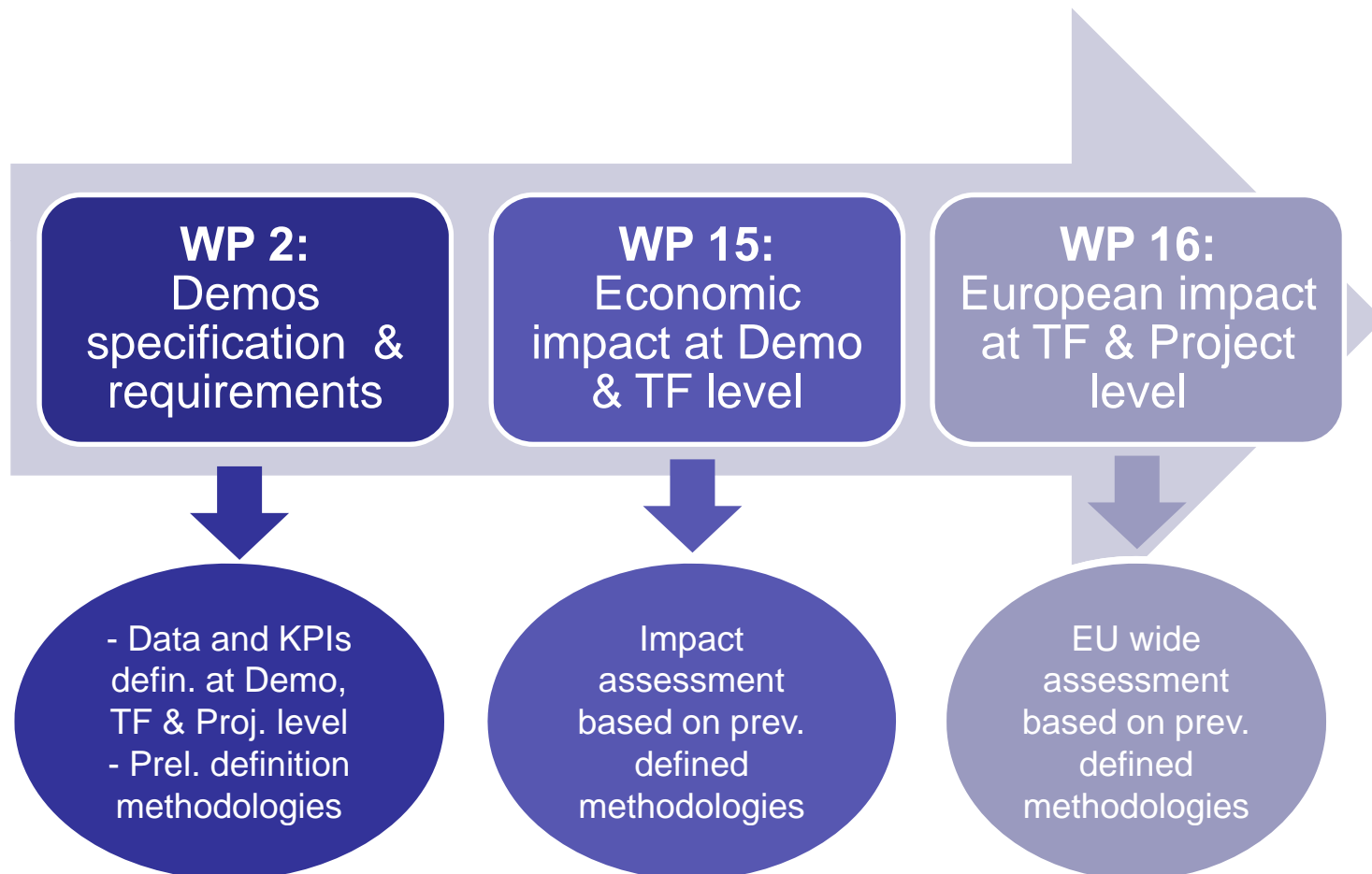
## Demo 4 STORM MANAG.



## Demo 6 FLEXGRID



## Three key Workpackages for impact assessment



## DEMO 1 SYSERWIND (Leader: IBR)

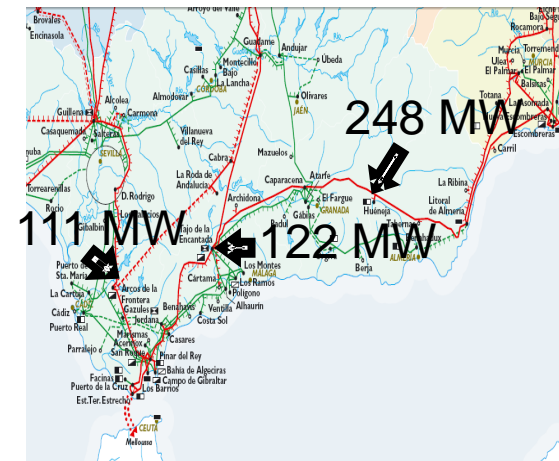
### Main objective

- Tests to provide **new active and reactive power control services to the system (EMS level)**, using improved **systems, devices and tools**, but keeping the **current hardware** at wind farm level.

### Approach

- **Active power regulation:** several wind farms aggregated to provide **secondary frequency regulation**.
- **Reactive power regulation:** several wind farms aggregated to provide **voltage regulation**.
- **Expected impact:**
  - Preserving **stability and security of the energy transmission system**
  - Higher **controllability of the wind energy**
  - Deeper **penetration of wind power** into the Transmission Network.

480 MW  
2 control centers:  
CORE & CECRE





## DEMO 2 DERINT (Leader: DONG Energy)

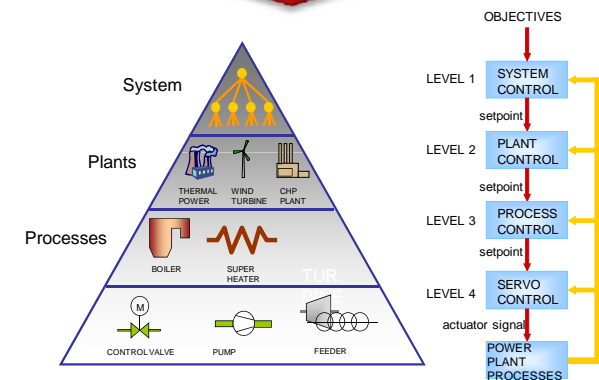
### Main objective

- Improve wind integration based on **intelligent energy management of central CHPs, off-shore wind, and local generation and load units in the distribution grid**

### Approach

- Mobilization of the **entire value chain** across central and local units
- Focus is on shorter time scale with the goal to **balance wind better** i.e. for a longer time and more cost efficiently
- **Market** shaping, **regulatory** recommendations and **scale up** rules
- 3 year iterative roll-out, growing in scale and complexity

Portfolio optimization  
of market positions  
across energy and AS  
markets



Integrating the VPP  
with central power  
control



## Current status of TF 1

- **SYSERWIND:**

- **WP 3: Completed.**  
Development and validation of new tools for the Demo.  
Improved forecast production model
- **WP 9: On going.**  
Implementation works are progressing as scheduled.  
Demonstration tests is going to be held during 1Q2012

- **DERINT:**

- **WP 4: On going.**  
A common understanding on the techniques, concepts and projects to balance wind power has been reached  
Second year iteration is in progress
- **WP 10: On going.**  
VPP concept is successfully integrated in DONG's portfolio.  
Mobilizing DER units is significantly more difficult than expected.

## DEMO 3 DC GRID (Leader: RTE)

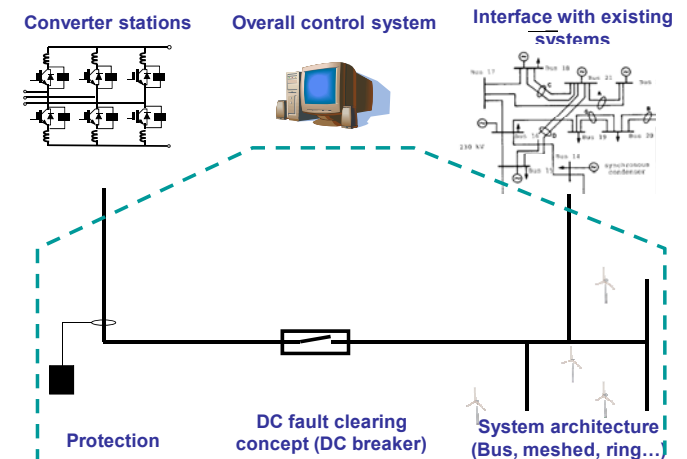
### Main objective

- Assess main drivers for the development of off-shore HVDC networks

### Approach

- Optimal planning and operation of AC/DC interconnected power systems
- Local control of HVDC networks
- Operation under normal and emergency conditions
- Design and quantify experimental DC networks (N-1, faults)
- Design and test control functions, protection systems...
- Benchmark several network topologies

Knowledge and components for connecting offshore resources: multi-terminal DC networks and interaction with on-shore AC system



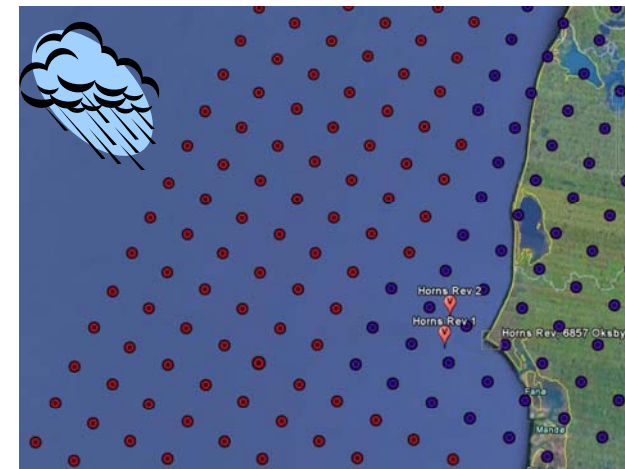
## DEMO 4 Storm Management (Leader: ENERGINET.DK)

### Main objective

- Demonstrate shut down of wind farms under stormy conditions without jeopardizing safety of the system

### Approach

- Horns Rev 2 (200MW)
- Flexible turbine control
- Storm front forecasts
- Investigate cost of changed production associated with the planned down regulation
- Coordinate wind farm control with HVDC interconnector control and with hydro power plant operation



Wind power

Water power

## Current status of TF 2

- **DC Grid:**

- **WP 5: On going.**  
Works on DC network protection req., optimal operation of AC/DC networks and coordination with WP 16 are progressing satisfactorily
- **WP 11: On going.**  
Simulation works on different DC topologies are progressing as scheduled.  
DC breaker tests is going to be defined by the end of 2011  
Detailed test platform will be completed by 1Q2012

- **Storm Management:**

- **WP 6: Completed.**  
Storm passage's forecasting and Balancing control framework
- **WP 12: On going.**  
New storm controller is in process of final validation.  
Installation in all HR2 turbines is going to be held by the end of 2011



## DEMO 5 NETFLEX (Leader: ELIA System Operator)

### Main objective

- Demonstrate at regional level (CWE) how much **additional wind generation** can be handled thanks to **DLR** (Dynamic Line Ratings), **coordination of controllable devices** (PSTs & HVDCs) and usage of **WAMS**

### Approach

- **Dynamic Line Rating (DLR)**
  - Install 10 Ampacimons to monitor the line capacities
  - Forecasting Model
- **Wide Area Measurement System (WAMS)**
  - 3 Phase Measurement Units (PMUs) to assess good operating practices
- **Smart Power Flow Control (Smart-PFC)**
  - Coordinated use of PSTs and HVDCs on international basis using smart tools
  - Assess available margin for additional wind generation



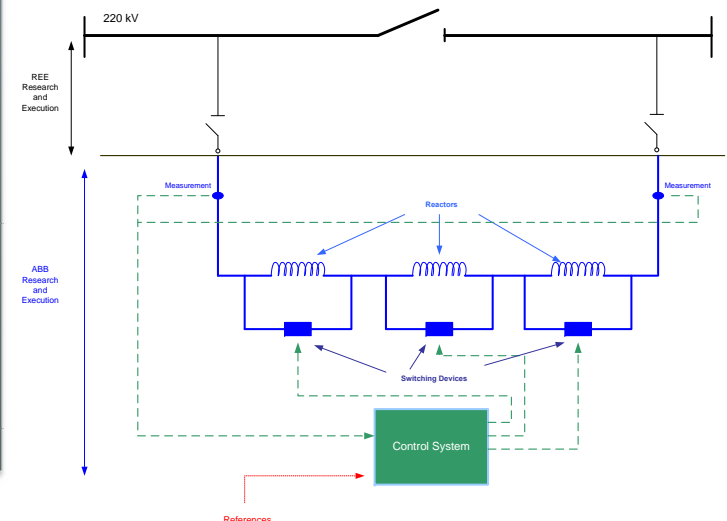
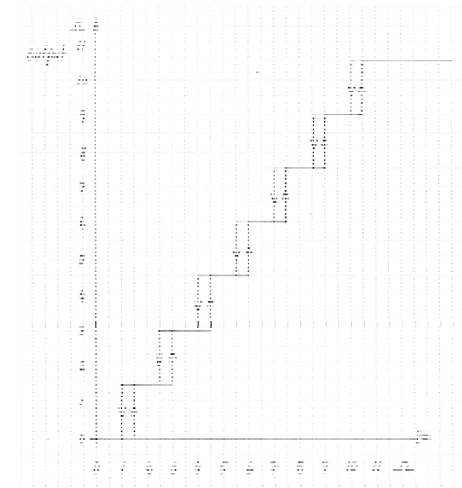
## DEMO 6 FLEXGRID (Leader: REE)

### Main objective

- Demonstrating that current transmission network can meet demands of renewable energy by **extending system operational limits**, maintaining safety criteria.

### Approach

- **Real-time thermal rating**
  - Benchmarking of different commercial devices
  - Analysis on wind power generation and correlation with monitored lines
- **Innovative FACTS (mobility)**
  - Selection of the location of the FACTS
  - Specification, construction and installation of the prototype.



## Current status of TF 3

- **NETFLEX:**

- WP 7: On going.  
Works on DLR and capacity forecast are progressing suitably, new smart-PFC algorithms are being tested, WAMS system is still under development
- WP 13: On going.  
10 DLR equipments are installed, the integration of DLR data into the Smart-PFC algorithm is ongoing.  
PMUs installation is going to be completed by 2Q2012

- **FLEXGRID:**

- WP 8: On going.  
Correlation study on wind production vs OHL capacity is moved to 3&4Q2012  
OLC specs. were completed on 1Q2011
- WP 14: On going.  
OPPC syst. for DLR has been rescheduled to 3Q2012.  
OLC FAT 1Q2012 & SAT 2Q2012

## Current status of impact assessment

- **WP 2: Completed.**
  - Demos' requirements & specifications,
  - KPIs (Demo, TF & Project), and
  - Preliminary definition of methodologies
- **WP 15: On going.**
  - Current activities focussed on detailed methodologies definition and barriers identification.
  - Detailed methodologies validation is going to be held during 1Q2012
  - Demos impact assessment will be carried out during 2&3Q2012
- **WP 16: On going**
  - Current activities focussed on detailed methodologies definition and hydro balancing assessment
  - Detailed methodologies validation is going to be held during 1&2Q2012
  - Replicability and EU wide assessment will be carried out during 2&3Q2012



## Lessons learnt after 18 month of TWENTIES

- **Demos' activities.**

- Strong commitment of Demos' participants is one of the TWENTIES' strengths.
- Clear roles definition and sound leaderships make the Demos run smoothly.

- **Replicability & impact assessment.**

- To define 'ex-ante' KPIs and impact assessment methodologies has demanded a lot of work to the project team.
- To set up a common framework for impact assessment of different Demos, in different environments and regulatory frameworks is also a challenge.
- TWENTIES would like to be a reference of objectiveness.

- **Management & Dissemination**

- Effort for suitable Management & Dissemination are usually underestimated.
- To be familiar with FP7 rules is a MUST for administrative staff and audit co.
- Dissemination is more than project information. It is making project results understandable for technical community (not only to high level specialists).



**Twenties**  
Transmitting wind



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**Thanks for your  
attention**

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