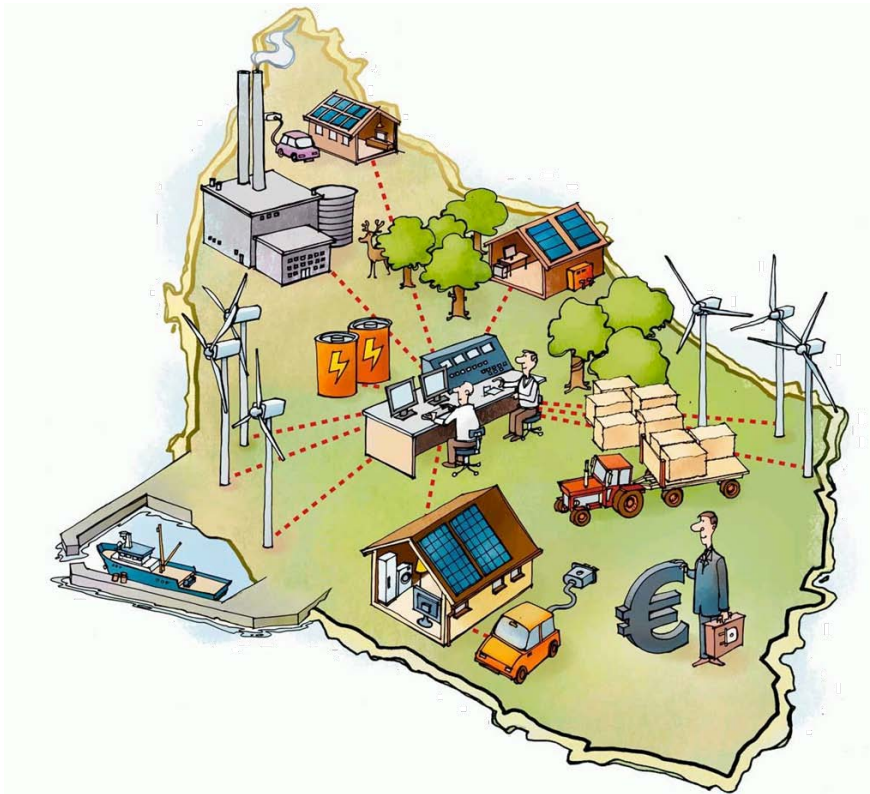


# EcoGrid EU

## A Prototype for European Smart Grids

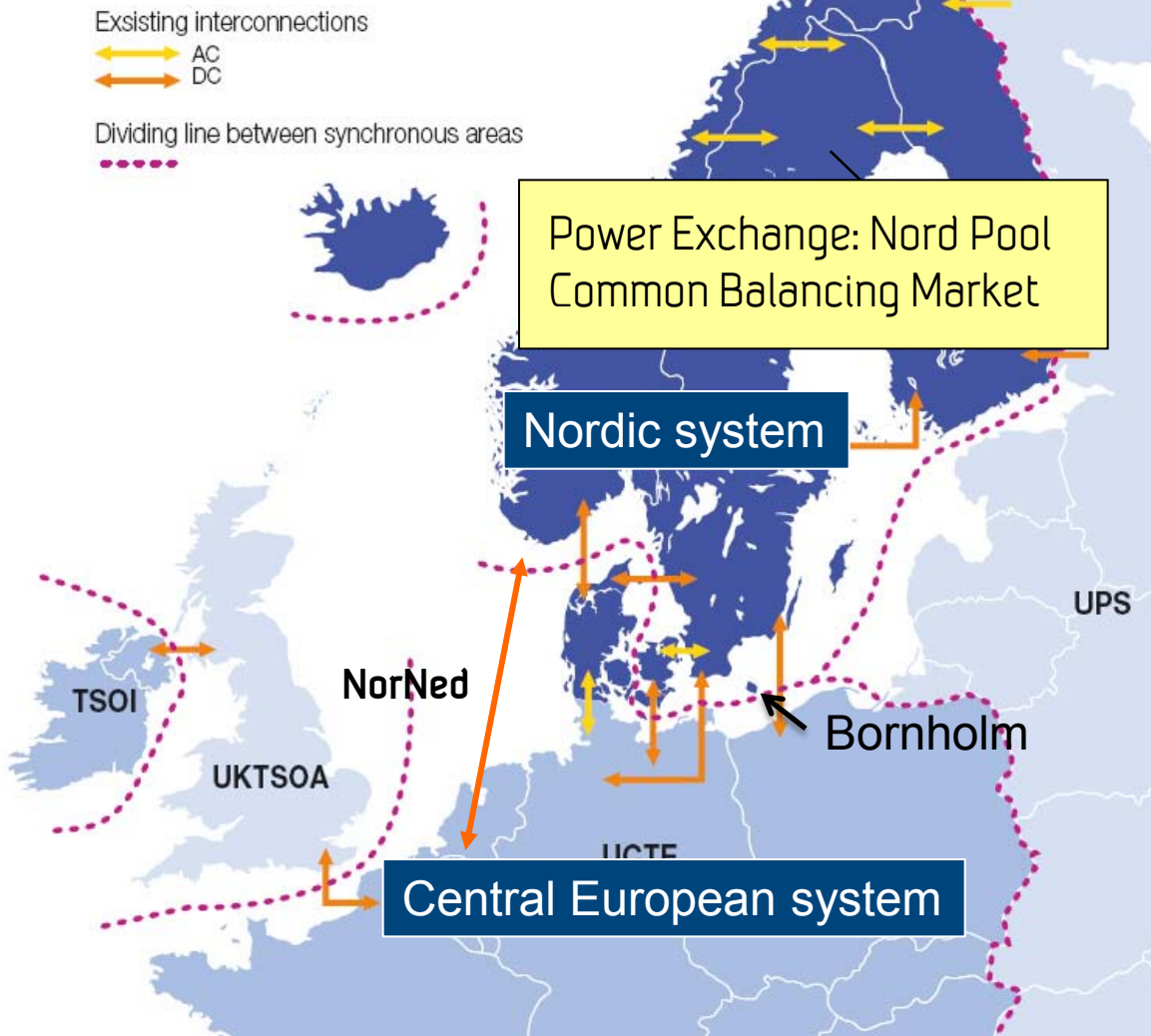


Presentation at: Workshop on  
European Smart Grid projects  
Brussels, 17 October 11

Presentation by:  
Ove S. Grande, SINTEF ER

# Content

- Background - The Challenges of Tomorrow
- The Real-time Market Approach
- Bornholm – a Unique Demonstration Site
- Project organisation
- Impacts



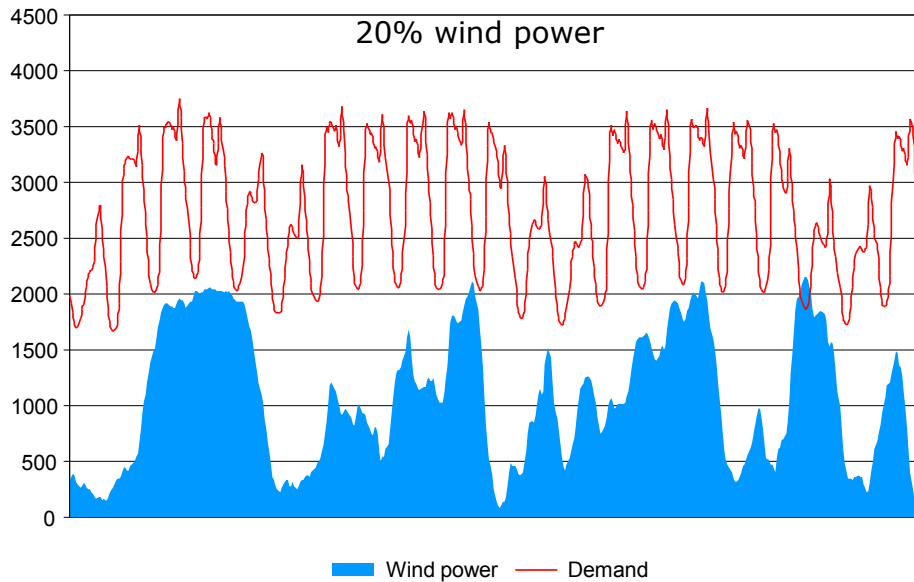
- Nordic system: 91 GW (47 GW hydro)
- Central European system: 667 GW

- Development towards integration:
  - Market coupling of Day Ahead Markets (TLC, CWE)
  - Integration of balancing markets

# The Wind Power Challenge

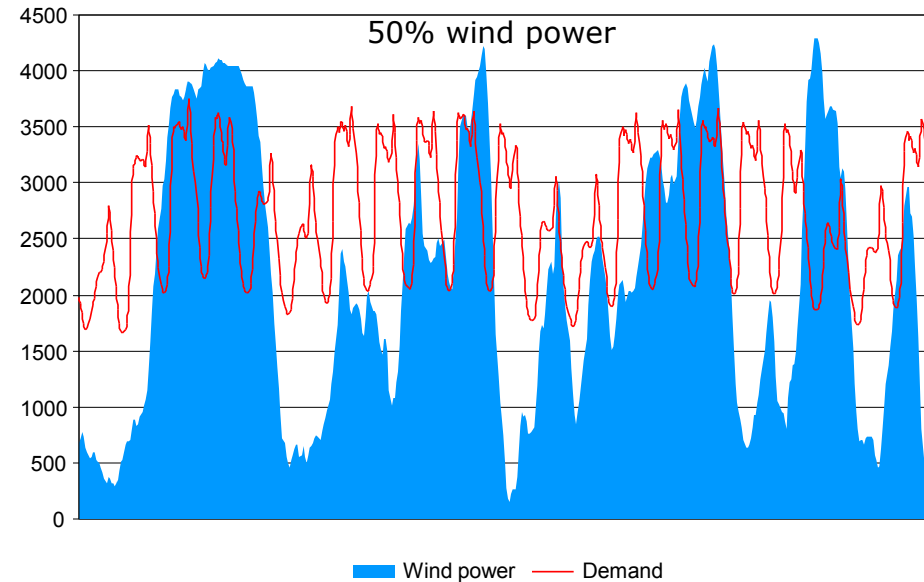
## An illustrative case from Denmark

### Today (2008)



Wind power covers the entire demand for electricity  
in 200 hours (West DK)

### Tomorrow (2025)



In the future wind power will exceed demand  
in more than 1,000 hours

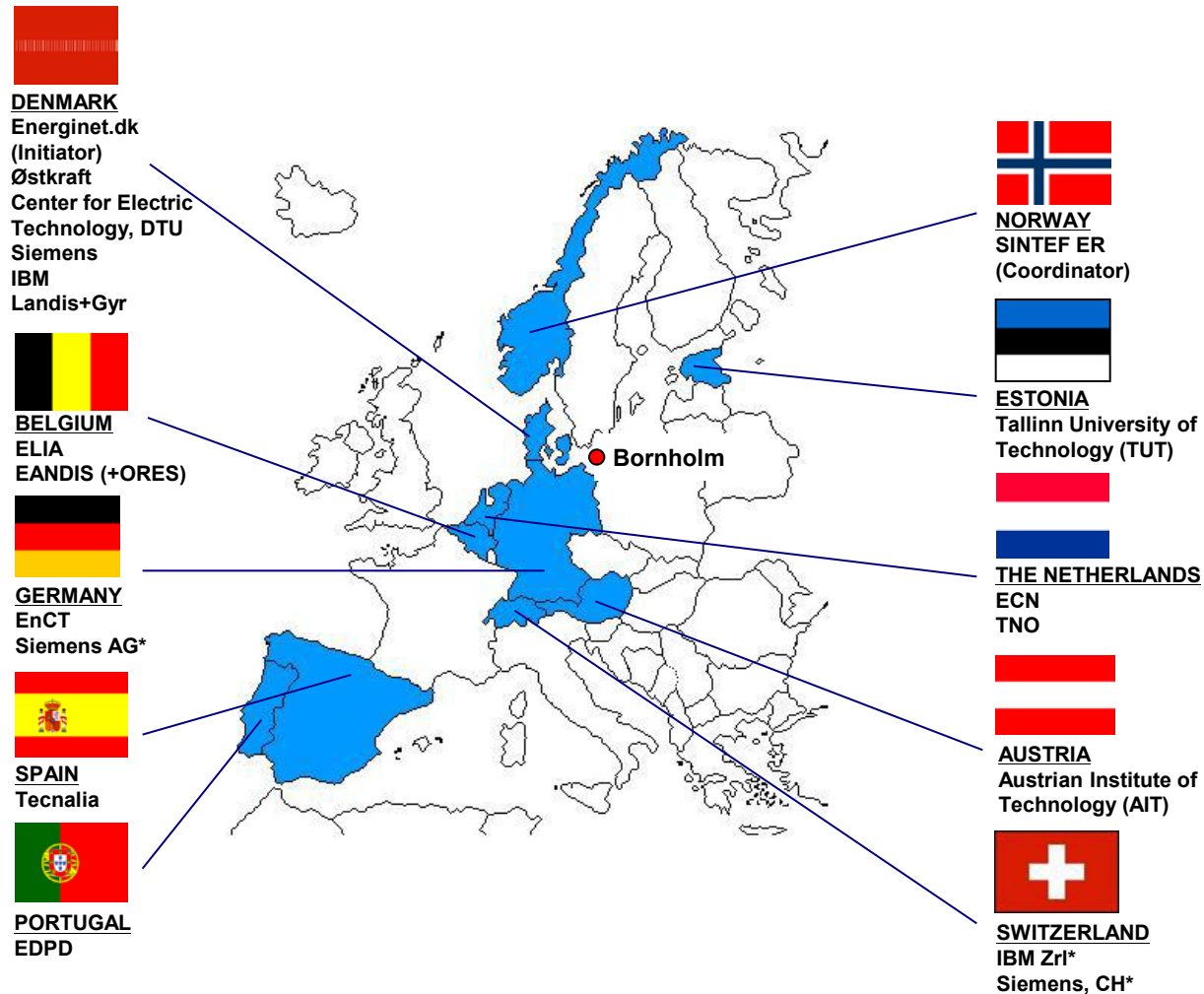
## ***EcoGrid EU meets the increasing need for balancing services***

- Increased need for regulation power due to growing share of RES
- EcoGrid EU provides an efficient market based solution for near to real time reserves from smaller customers (prosumers)

# EcoGrid EU in Brief

- A proposal under EU's FP7-Energy-2010-2.1.1
- Total budget: 21 million Euro (EU: 12,7 million Euro)
- Project period: 1 March 2011 -28 February 2015
- A large scale demonstration of a real-time market place for distributed energy resources
- A demonstration of a *real* power system with more than 50 % renewable energy

# EcoGrid EU Partners



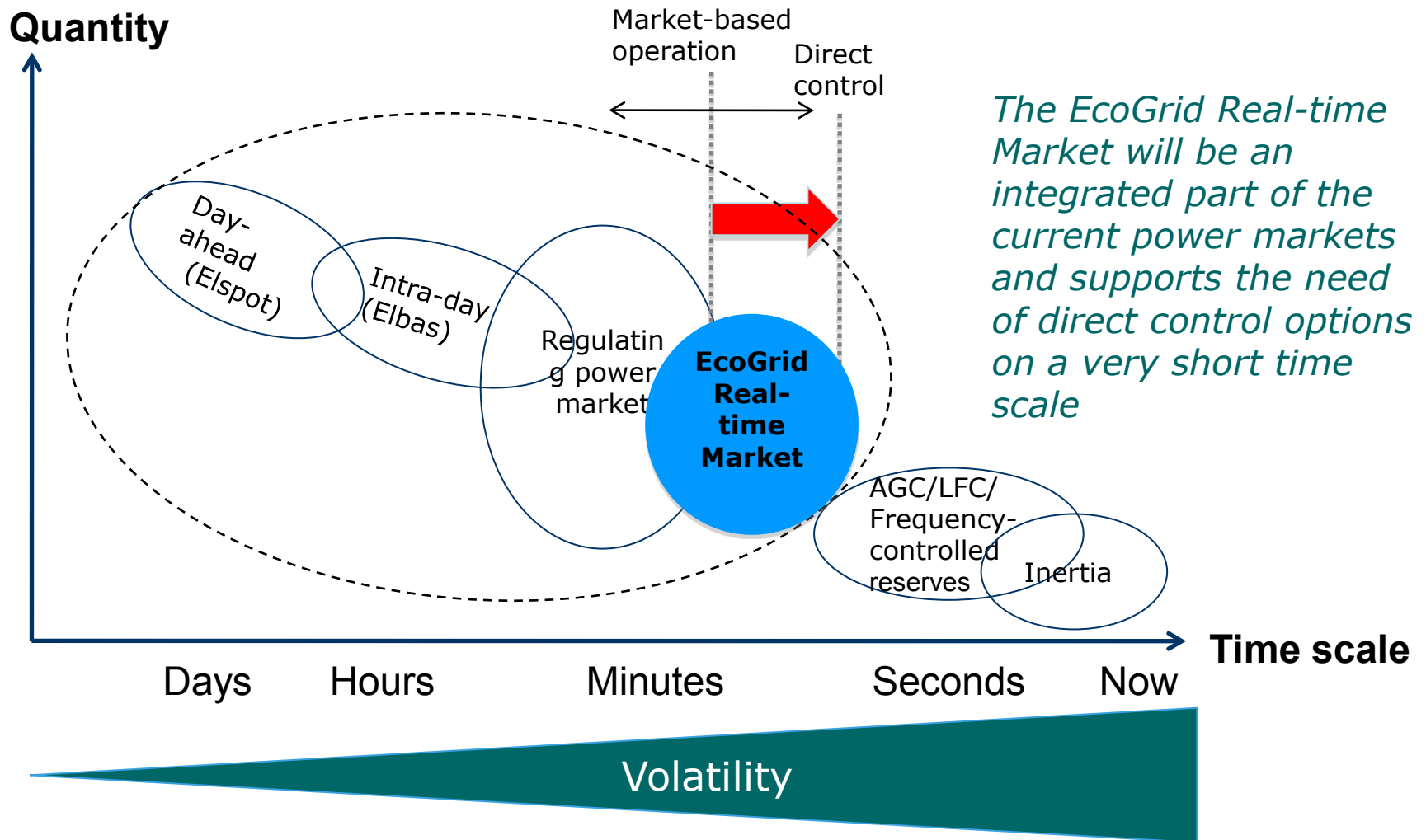
\* Third Party

# Roles of the Partners





# The Scope of a Real-time Market



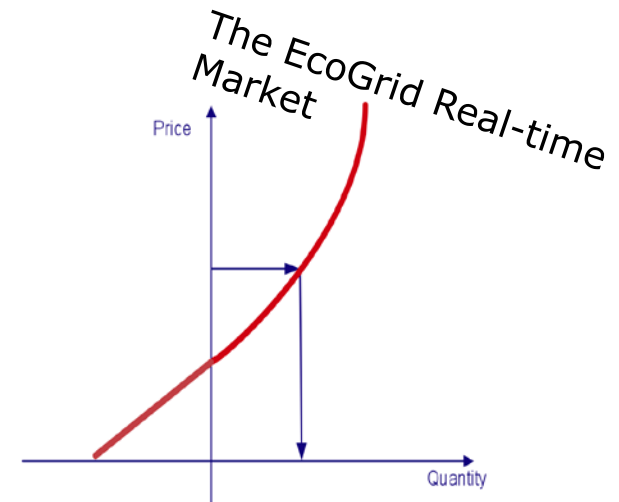
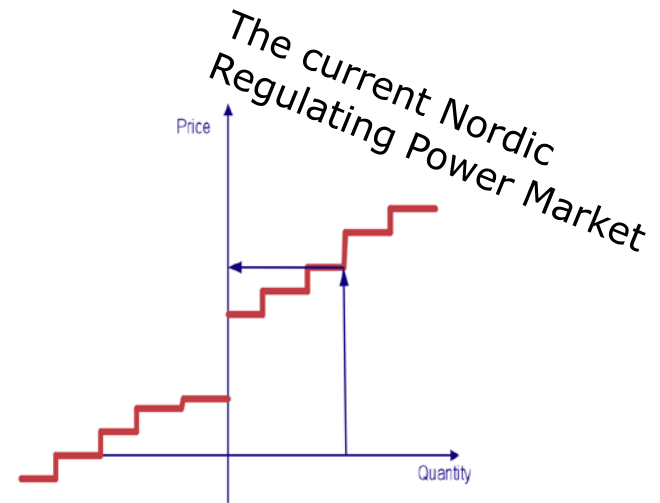
# An Additional Source of Regulation Capacity

## The current balancing market:

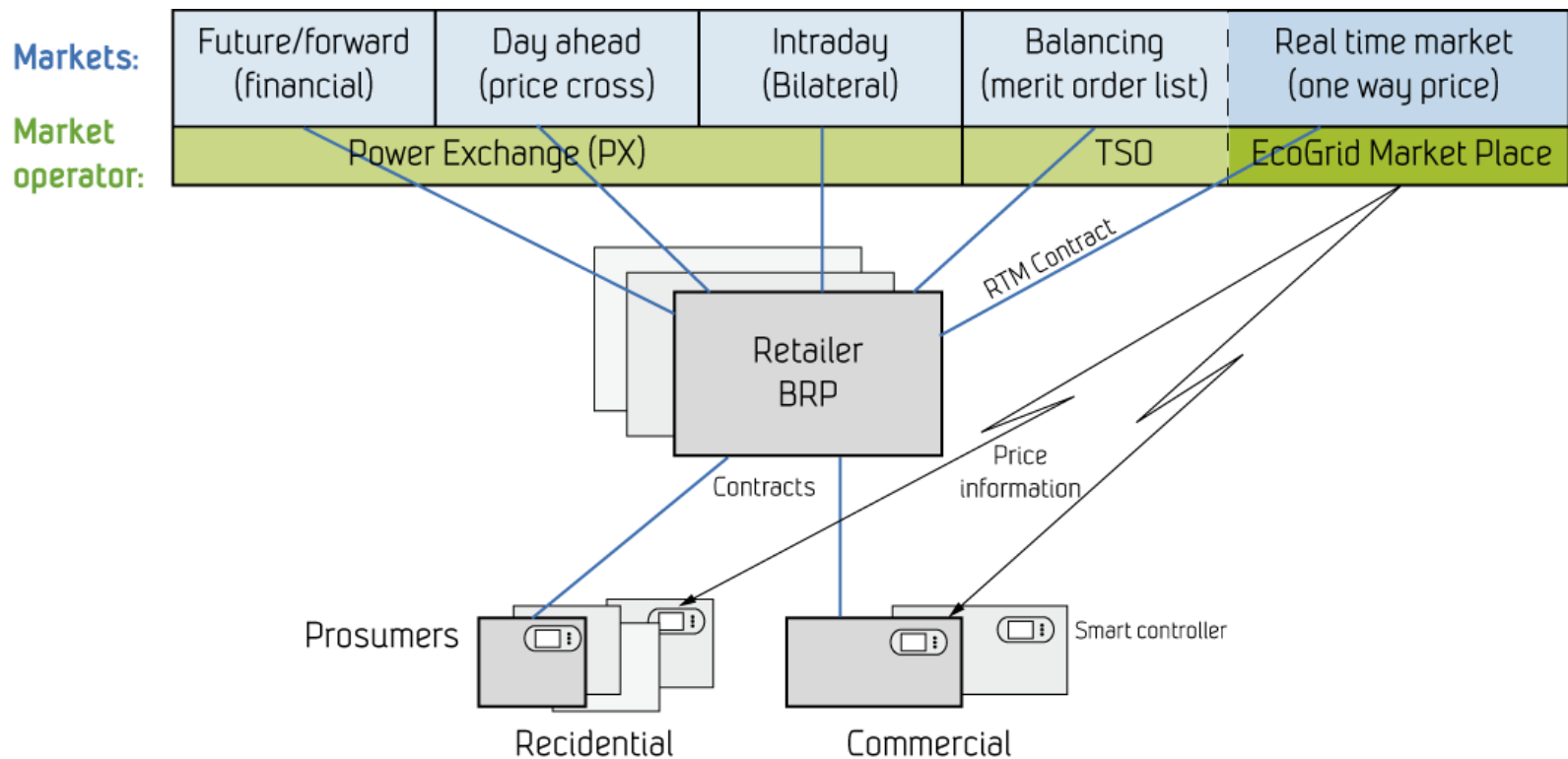
- Merit order list of regulation objects
- Include only large producers, large consumers and aggregated smaller units (minimum 10 MW)
- 15 minutes response requirement

## The new real-time market:

- No restriction on the size of units (MW)
- 5 minutes price intervals
- Response dependent of the accumulated price elasticity



# Example of business model

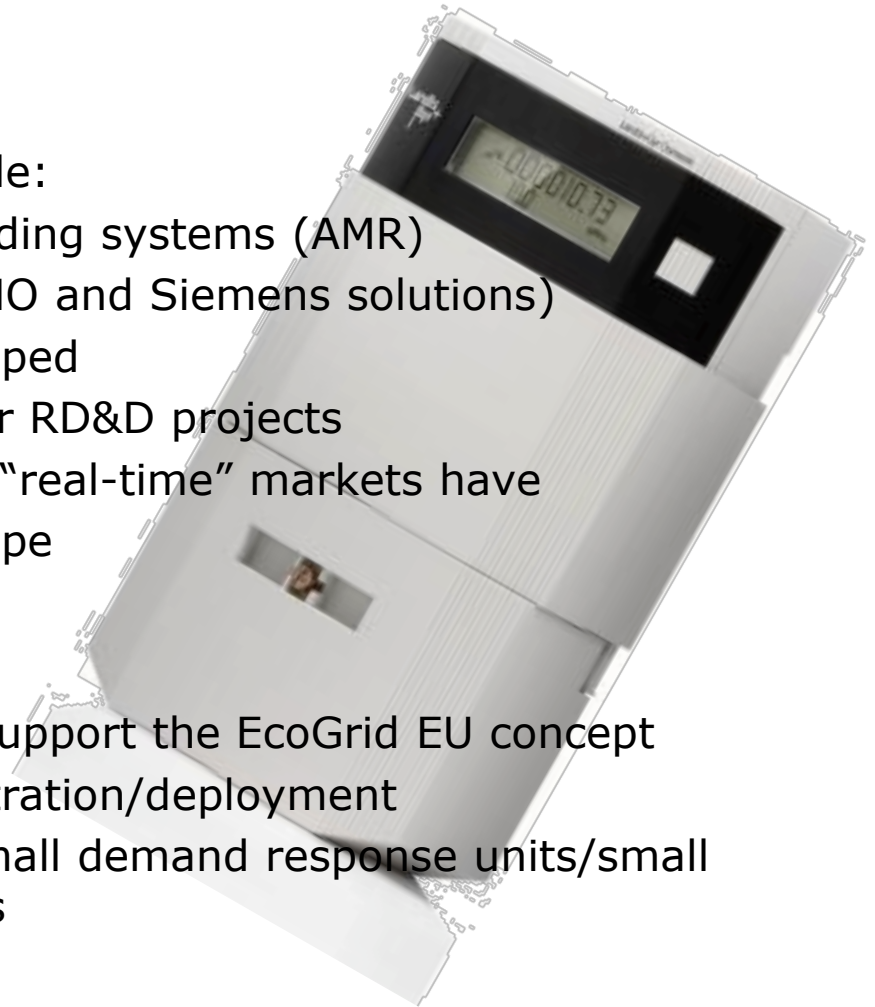


# How does the Real-time Price Signal Work?

- Broadcasted price signals:
  - Step 1: Day-ahead Elspot market is sent to the end-user - soon after clearing
  - Step 2: Real-time five minutes prices updated – to reflect the need for up or down regulation
- The Real-Time Market Operator sets the price on the basis of the need for balancing resources
- The Real-Time Market Operator could be the TSO(s)

# Development of a New ICT platform

- Build on proven solutions where available:
  - Use of modern automatic meter reading systems (AMR)
  - Smart controllers (based on ECN/TNO and Siemens solutions)
  - End-user devices/appliances - equipped with solutions demonstrated in other RD&D projects
  - Demonstration of other concepts of “real-time” markets have been done successfully outside Europe
- New ICT challenges include:
  - Development of architectures that support the EcoGrid EU concept
  - Management of large scale demonstration/deployment
  - Management of a multiple mix of small demand response units/small scale production/storage capabilities



# End-user Involvement

- Response to real time price only, every 5 minutes
- Automation necessary
- Customer segmentation
- Customer recruitment challenges:
  - Information and understanding of the potential benefits of participation (economical/energy savings/security/environment)
  - Acceptance of technology and automation
  - Contractual issues

# 2000 Participating Customers in the Demonstration



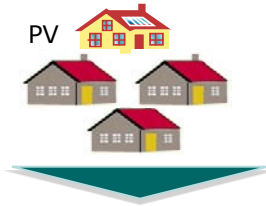
## “The reference group”

- 200 households with a smart meter
- No access to specific information or “smart” equipment



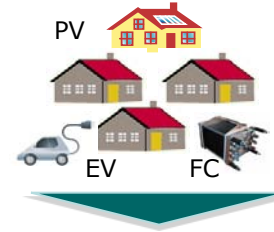
## “The self-help”

- 400-500 households with a smart meter
- Receiving market price information/prognosis
- Must move their energy consumption by themselves



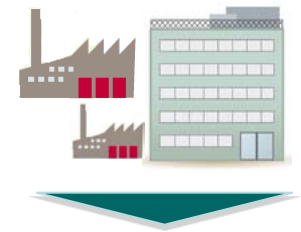
## “The semi-advanced”

- 700 semi automated households with a smart meter
- Installation of 1-2 reactive appliances responding to market price signals/prognosis
- All houses have installed heat pumps or electric heating



## “The advanced”

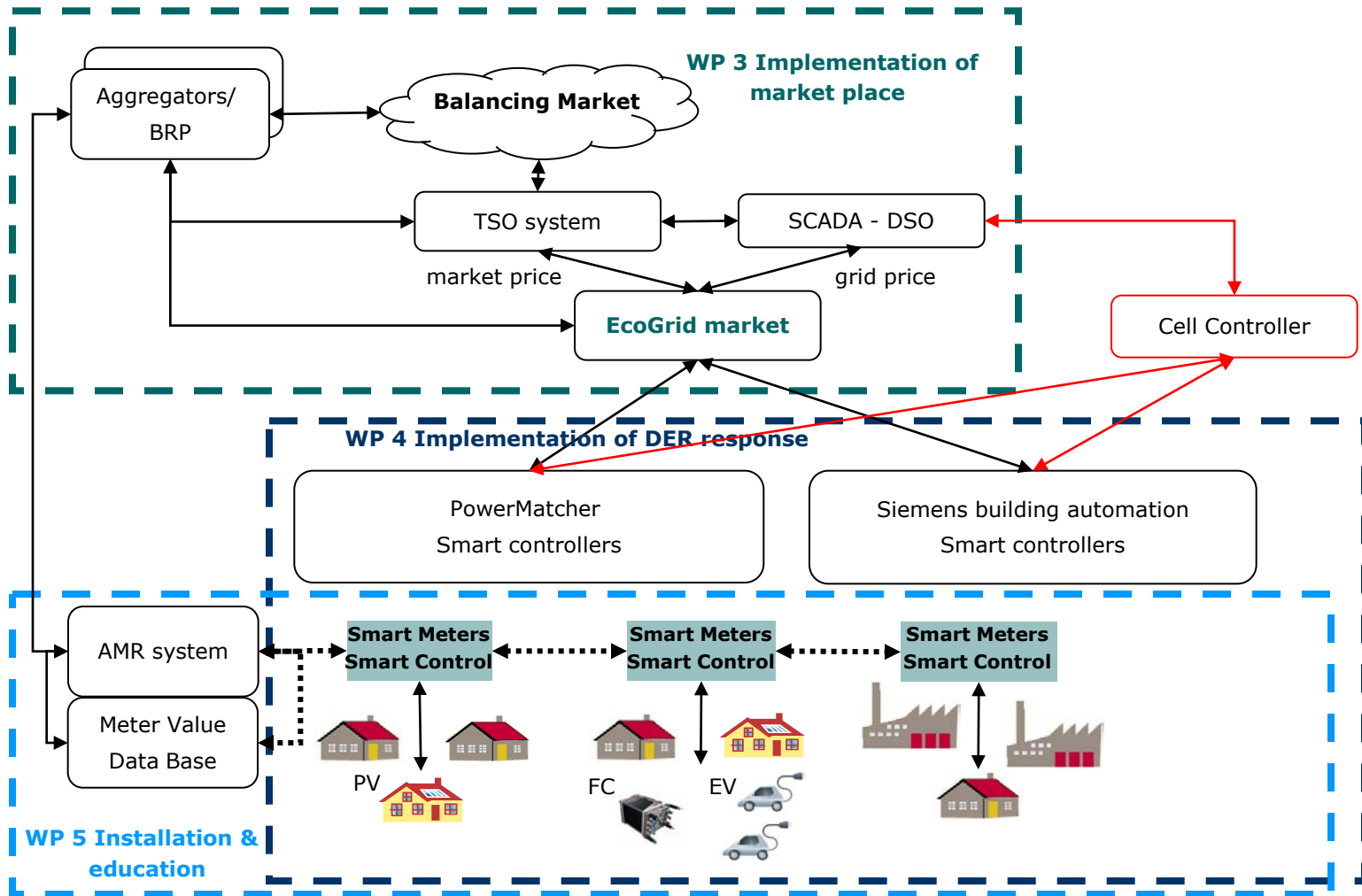
- 500 fully automated households with a smart meter
- Installation of multiple connected appliances, all of which are responsive to price signals



## “The smart businesses”

- 100 commercial/public customers with a smart meter
- Including small business units and the public customers
- Approx. 4 connected smart appliances

# Technology Involved

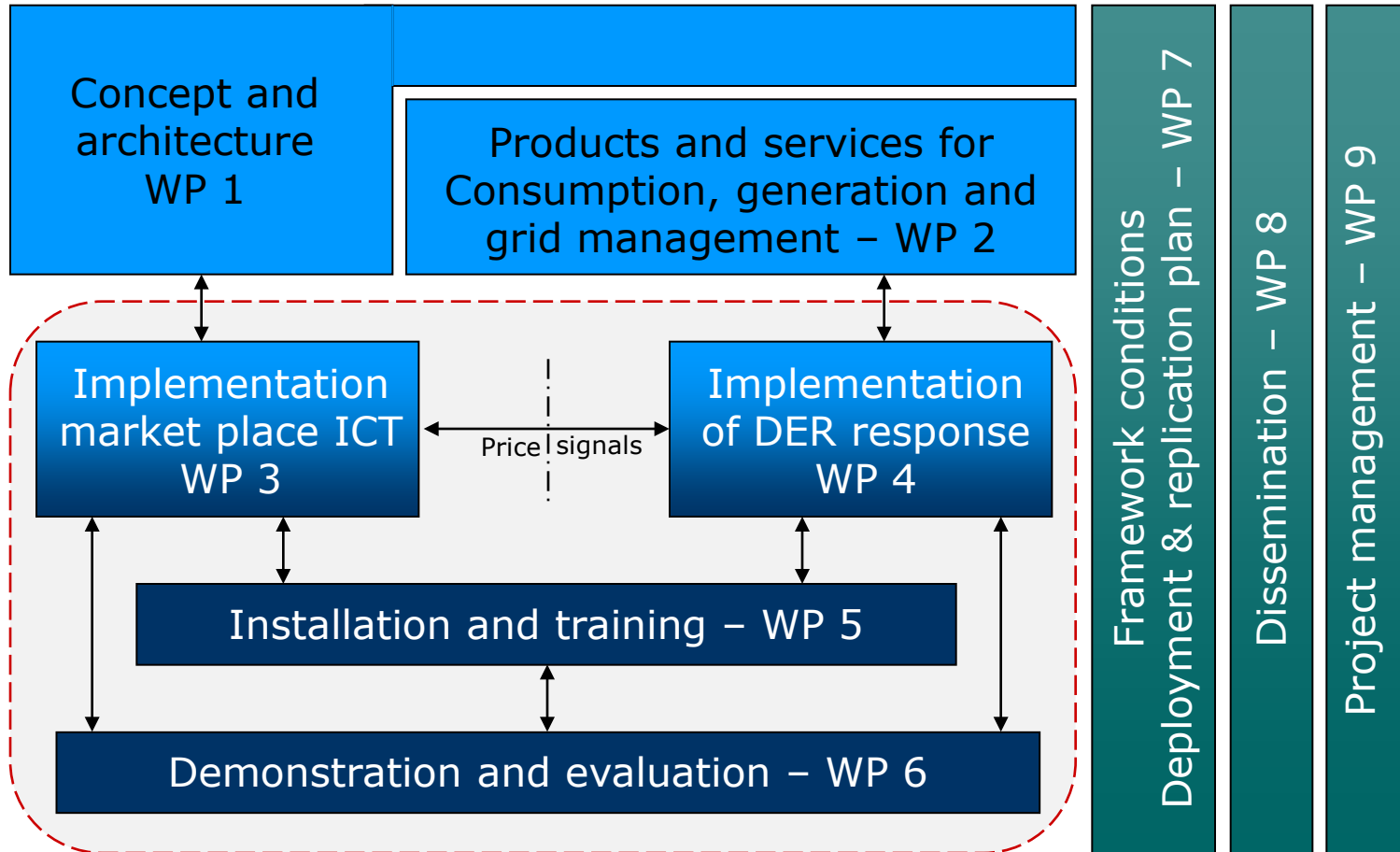




# New Solutions = New Challenges

- Settlement and billing:
  - Meters should handle 5-minutes interval readings
  - Large amount of data should be managed in the settlement process
- Technology
  - Adaptation to the basic concept
  - Standardisation
- End-user acceptance
- Replication and exploitation
  - Many countries have deployed meters with 15 minutes/hourly reading
  - The EcoGrid EU concept must be adapted to those conditions
  - Standardisation necessary

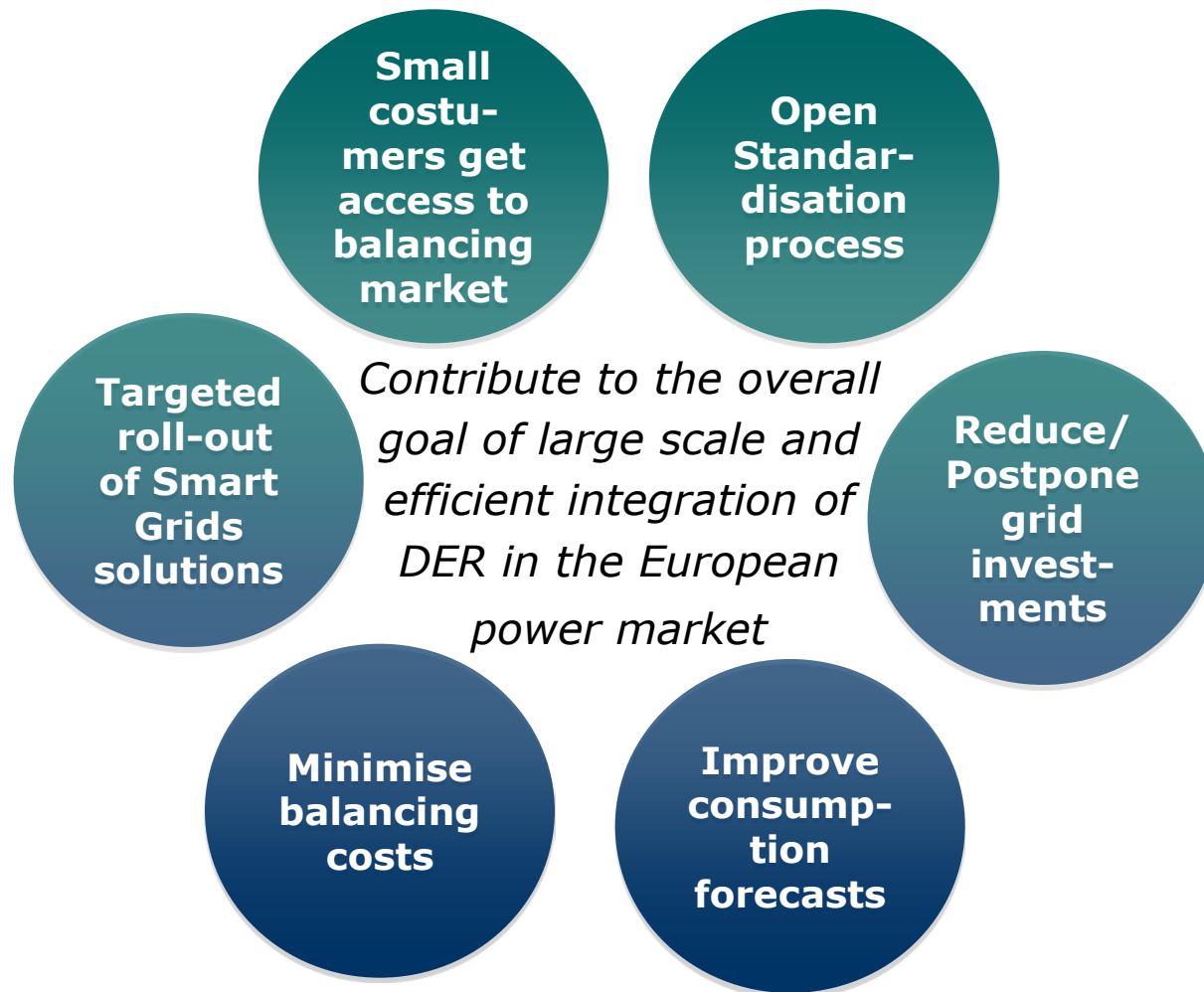
# Organisation of EcoGrid EU



# Projects Synergies and Added Value

Projects	Description	Techni- cal R&D	Market Design	Techni- cal Demo	Market Demo
FENIX	Identification of technical capabilities of DER to provide system service through aggregation (VPP-concept). Small-scale demonstration.	***	*	***	
More Micro Grids	Integration of small-scale DER through micro grid approach. Design of alternative control strategy to enable autonomous operation. Small-scale demo.	***		***	
EU DEEP	Development of innovative business models for integration of DER into current system/market operation.	**	**		**
DISPOWER	Survey on present power supply systems, including ICT technologies. Laboratory facilities for development/test.	**	*	**	
ADDRESS	New Active Distribution Networks to balance in real-time power generation and demand. 3 test field planned	***	**	**	*
GridWise (US)	Demonstration of real-time market with each participant submitting bids and offers every 5 minutes		**		***
EcoGrid EU	Demonstration of large-scale real-time market participation for DER/flexible demand	**	***	**	***

# Overall Impact of EcoGrid EU



## Bornholm - a unique test site

Thank you  
for your Attention

