# EcoGrid EU

## Analysis of the European Framework for Balancing Power – opportunities and new trends identified within the EcoGrid EU project

Presentation at:

Workshop on DSM

Potentials, Implementations and Experiences

Presentation by:

Georgios Giannopoulos

(Elia Group Strategy and Innovation department)

20/05/2013

# Content

- **Power balancing and the role of different actors**
- Uses of demand response
- What is being demonstrated in Denmark?
- EcoGrid EU and different all balancing mechanisms across Europe
- Scalability and replicability of EcoGrid EU

# Energy trading

Producers want to sell energy

Retailers want to buy energy for their customers

**Obligation**

This has to be done via a BRP

**BRPs are responsible to balance their portfolio on a Qh basis**

- Day ahead purchases/sales of a BRP have to be balanced
- BRPs have to pay imbalance tariffs if their portfolio is not balanced
- If all BRPs are balanced, everyone is happy!

# BRP and balancing

## How can a BRP balance his portfolio?

- By making long term contracts of trading energy
- By using the Day Ahead market
- By using the intra-day market
- Using his own assets to regulate power

## What if he fails to do it?

- It is the TSO that takes over the balancing task
- TSO is acting very close to real time
- By activating power reserves

## Where does the TSO find the reserves?

- By contracting them from BRPs
- Sourcing them from neighboring TSOs
- From BRPs of neighboring countries (NOIS list)

# Different kinds of reserves

| Old term | New term | Purpose |
|---|---|---|
| Primary reserves | Frequency containment reserves (FCR) | Stabilize the system frequency due to an imbalance within the Synchronous Area |
| Secondary reserves | Automatic FRR | Reserves with a short activation time which are used to restore the ACE of the control block to zero |
| Tertiary reserves | Manual FRR | FRR consists of an automatic and manual part |
| Slow tertiary reserves | Replacement Reserves (RR) | Optional reserves with an activation lead time exceeding 15 minutes that have to release the FRR to be prepared for further imbalances |

In addition, in some cases, BRP can try to balance their portfolio by using their own assets, including **demand**.

# Content

- Power balancing and the role of different actors
- **Uses of demand response**
- What is being demonstrated in Denmark?
- EcoGrid EU and different all balancing mechanisms across Europe
- Scalability and replicability of EcoGrid EU

# Uses of demand response?

| Type of service | Who is benefited? |
|---|---|
| **Peak shaving**<br>• Shifting the demand towards hours with lower energy prices<br>• This has to be know in advance to schedule the consumption | Customers and market actors (in case of adequacy problems) |
| **Balance BRP's portfolio**<br>• A BRP could use this flexibility to balance his portfolio after the market closure | BRP |
| **Ancillary services**<br>• DR can offer balancing services to the system under normal imbalances<br>• DR could be useful also in cases where the systems is operated to its limits | TSO |
| **Congestion management**<br>• DR could be used to solve congestion problems (power and voltage) mainly on the low voltage grid | DSO |

# Characteristics to be considered

Some characteristics of DR define the offered services

- Duration

  There are devices that once they are triggered, they cannot be interrupted (p.ex. washing machine)

  More suitable for peak saving as they can be scheduled in advance

- Reliability

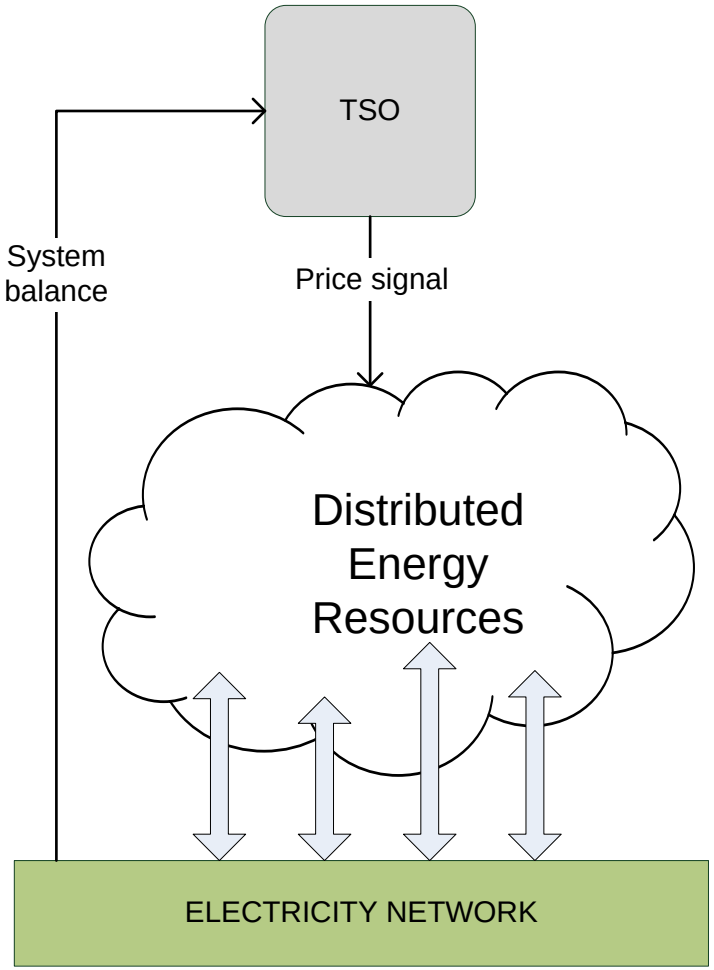
  According to the certainty of delivery of a service, it can substitute different kinds of reserves

- Energy neutrality/rebound effect
  - Some processes have to consume a specific amount of energy
  - It can be shifted in time
  - The TSO has to have need for an energy neutral product
  - Rebound effect: energy recovery after consumption has been reduced/increased during demand response

# Content

- Power balancing and the role of different actors
- Uses of demand response
- **What is being demonstrated in Denmark?**
- EcoGrid EU and different all balancing mechanisms across Europe
- Scalability and replicability of EcoGrid EU

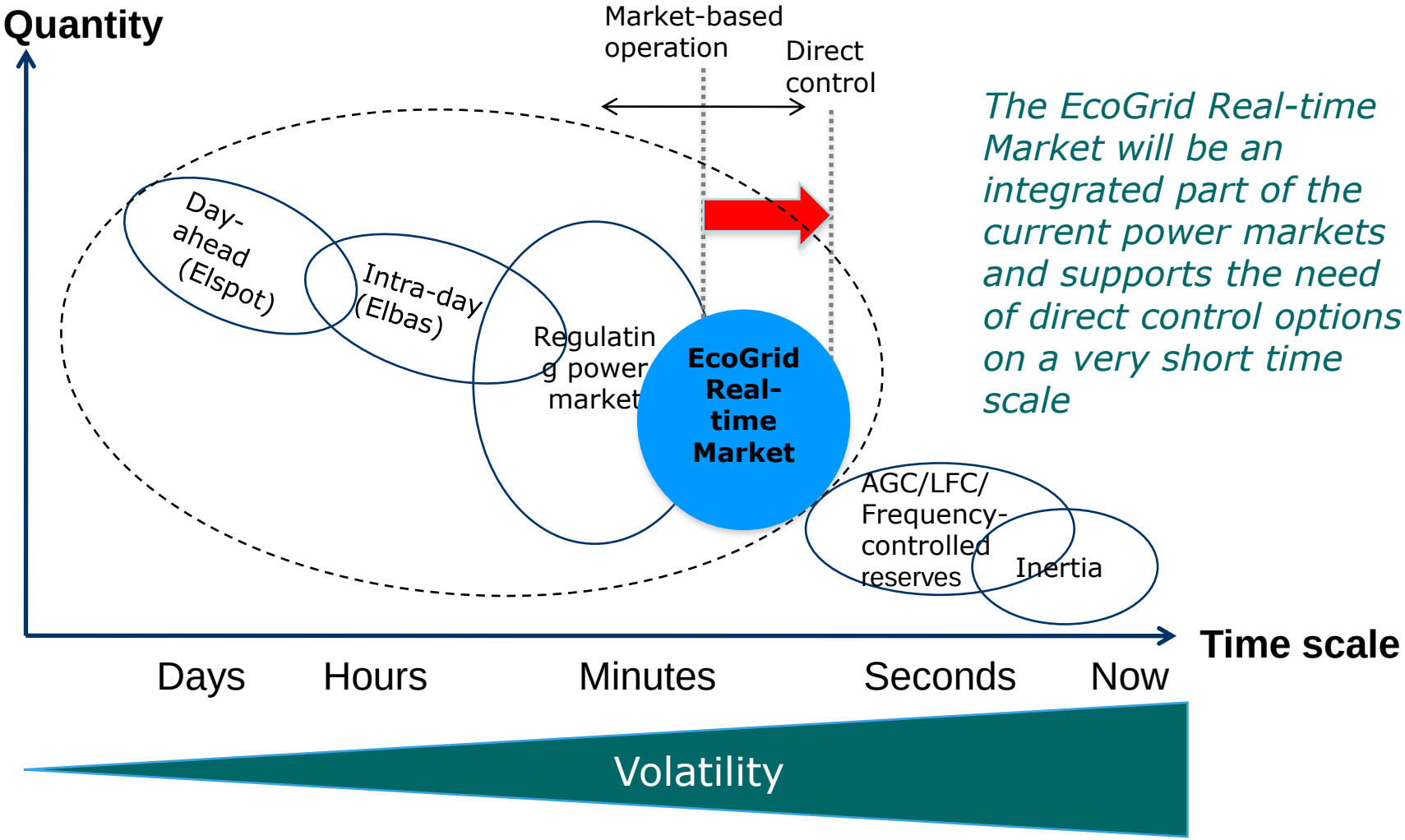
# Balancing services to TSO




Closed-loop pricing process:

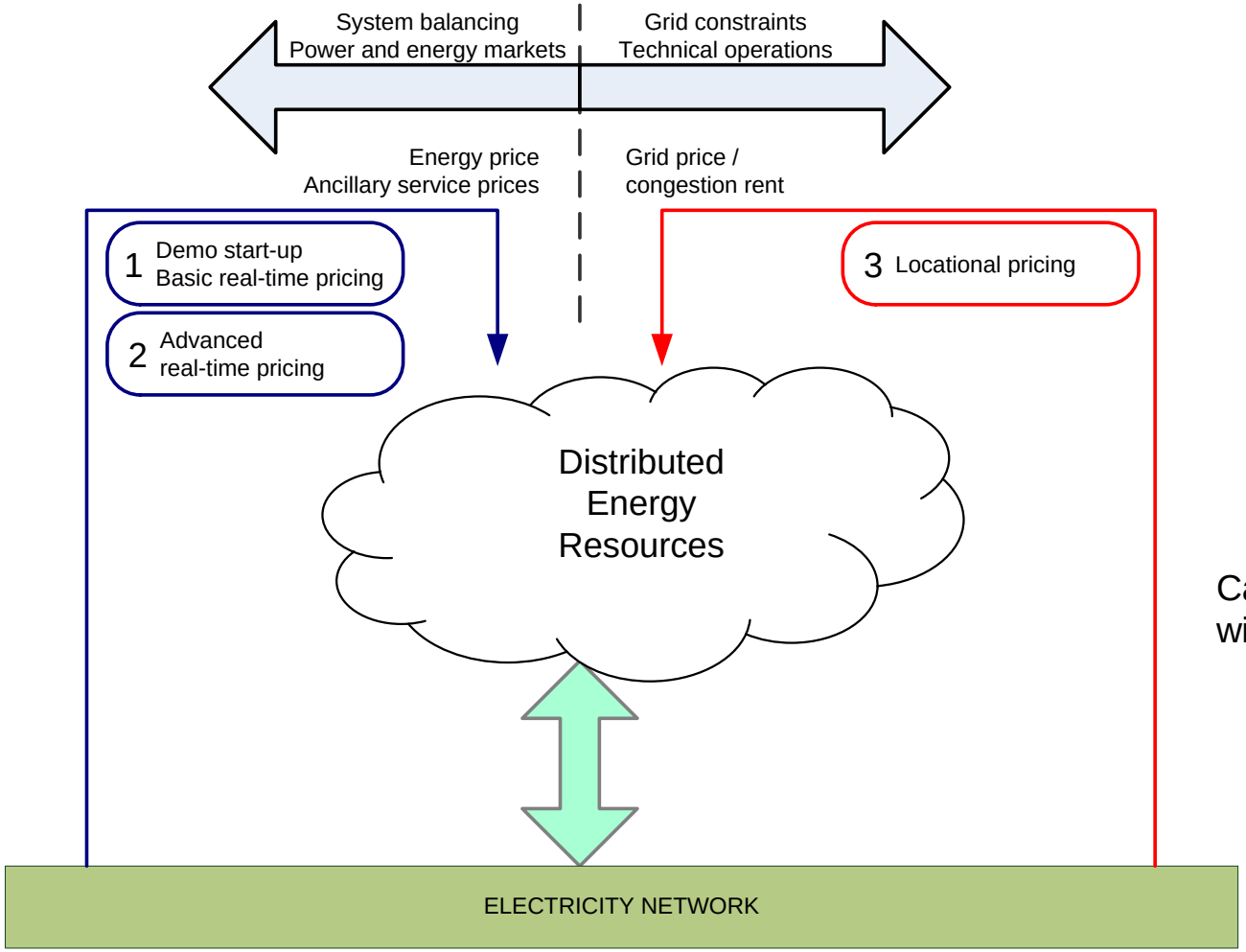
1. Monitor system balance – detect need for corrective action (MW)
2. Convert the need for corrective action (MW) to a need for price correction (EUR/MWh) using forecast of response to price
3. Publish the price
4. Monitor system balance – update response forecasts
5. Repeat loop indefinitely

# The Scope of a Real-time Market




*The EcoGrid Real-time Market will be an integrated part of the current power markets and supports the need of direct control options on a very short time scale*

# Demonstration phases




Can we alleviate **congestions** with locational pricing?

# Content

- Power balancing and the role of different actors
- Uses of demand response
- What is being demonstrated in Denmark?
- **EcoGrid EU and different balancing mechanisms across Europe**
- Scalability and replicability of EcoGrid EU

# Balancing processes

## 1) Centralized dispatch markets

- TSO closes the market after day ahead (DA) clearing
- No intra-day(ID) market
- Uses the remaining flexibility to balance the system and manage congestions
- Poland, Ireland, Italy

## 2) Pro-active balancing markets

- BRPs can exchange power during DA and ID (one hour before operating time)
- TSO freezes the market one hour before real time
- TSO acts on forecasted imbalance by activating slow (cheaper) reserves in advance
- France, Spain, UK, Nordic countries

## 3)Re-active balancing markets

- BRPs can trade energy in DA and ID
- They can still balance their portfolio until real time
- TSO takes action only in real time
- He has to use fast reserves
- He needs to publish close to real time information on system imbalance

# Imbalance volume calculation



## Two portfolios calculation

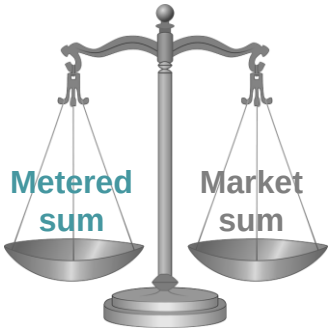
- BRP for consumption and BRP for production
- Each BRP has to be balanced

  Imbalance consumption = metered offtake - (sales - purchases)

  Imbalance production = metered injection - (sales - purchases)
- A BRP with both portfolios cannot use them to balance each other

## Single portfolio optimization

- One BRP
- Imbalance = (metered injection – metered offtake) – (sales - purchases)
- BRP will be settled according to his total position
- BRPs have more means to balance their portfolio
- Which is most suitable to EcoGrid EU?



# Imbalance pricing

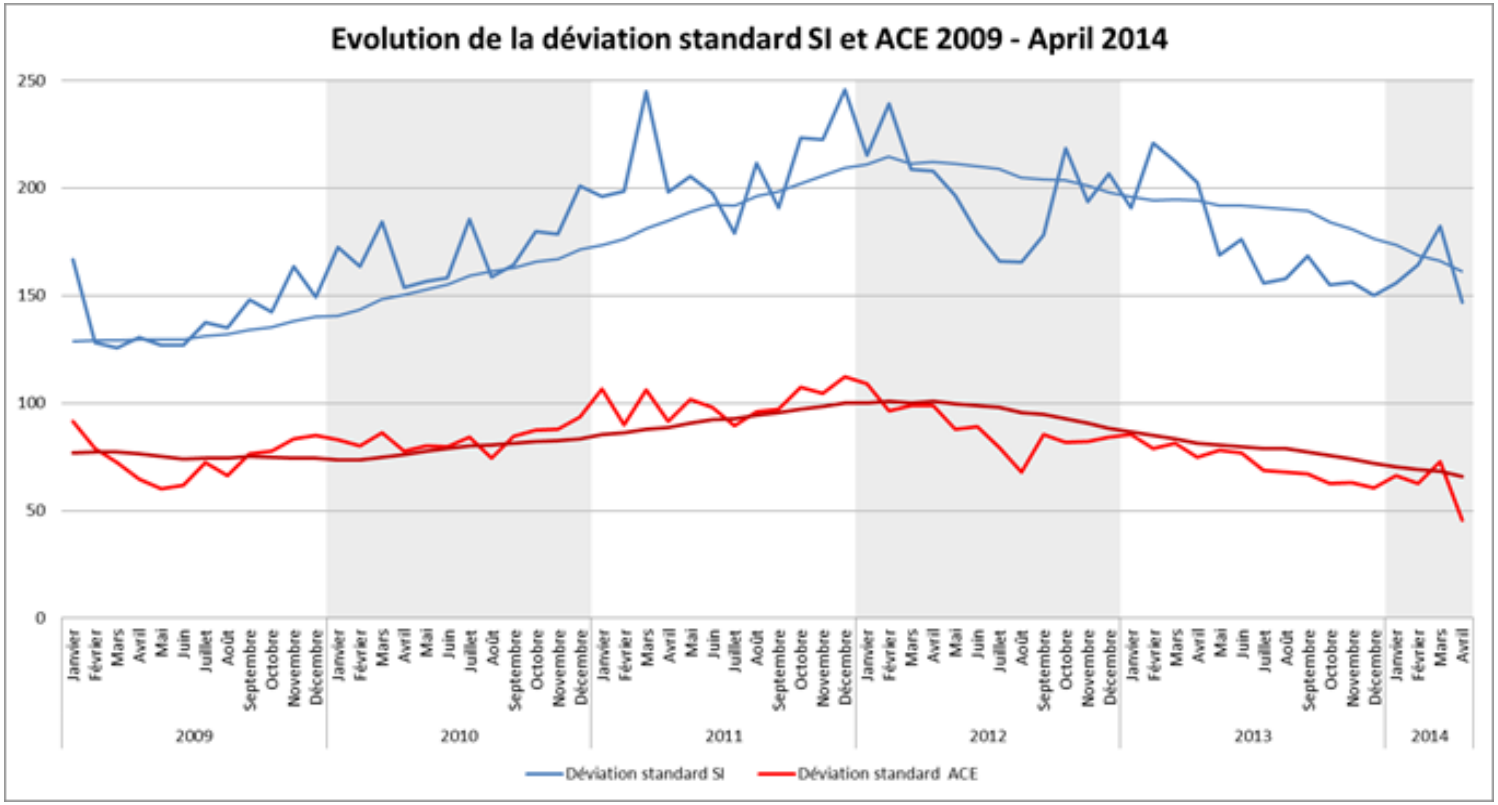
## Two price model

- Positive and negative imbalances are priced differently
- Price of positive imbalance is lower than for negative
- Example
  - System need power
  - BRP produced more than expected
  - BRP will receive the DA price
  - If he produced less than expected, he would have paid the balancing price which is higher than the DA price
- In Denmark, this model is used for production BRPs

## One price model

- Both imbalances are priced in the same way
- In the previous case, the BRP would have received the balancing power instead of the DA spot price
- Higher incentive to contribute to balancing
- Case of Belgium and BRP for consumption in Denmark

# Evolution of System Imbalance and ACE 2009-2014



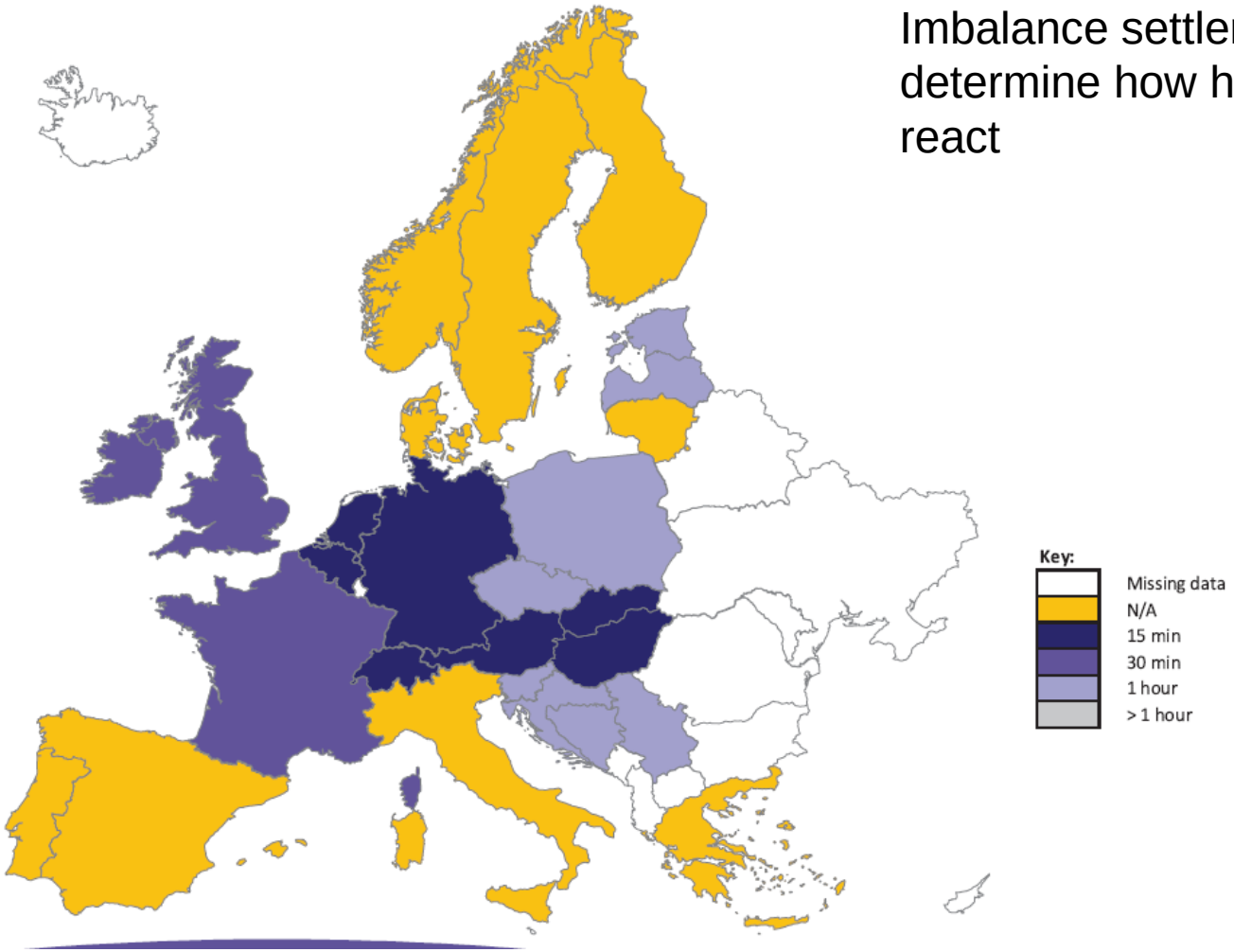

Double average pricing

Single marginal pricing

Enhanced real-time balancing information

Stronger incentives via imbalance pricing

# Imbalance settlement period




Imbalance settlement period will determine how hast the BRPs need to react

# Transparency guidelines

- The European Commission approved a regulation regarding the submission and publication of data in electricity markets.

- Transparency Guidelines are promoting the publication of relevant balancing information close-to-real time
  - Examples
    - Activation prices of balancing energy: ASAP but not later than one hour after procurement;
    - Amounts of activated balancing energy: ASAP but no later than 30 min after operation period;
    - Imbalance prices: ASAP;
    - Total imbalance volume: ASAP but no later than 30 min after operation period.

⇒ Transparency Guidelines are a step in the right direction for EcoGrid

⇒ Due to this regulation TSOs will **be obliged to publish, close to real time**, information and hence move closer to the EcoGrid concept

# Content

- Power balancing and the role of different actors
- Uses of demand response
- What is being demonstrated in Denmark?
- EcoGrid EU and different balancing mechanisms across Europe
- **Scalability and replicability of EcoGrid EU**

# Deployment and replication in Europe

- 7 Desk studies (collect relevant knowledge presently available)
  - Belgium, Estonia, Germany, Netherlands, Portugal, Spain, United Kingdom

- 4 Case studies (study the replication of EcoGrid EU in different countries)
  1) Belgium (Elia, Eandis)
  2) Netherlands (ECN)
  3) Germany (AIT)
  4) Iberian (TECHNALIA, EDPD)

Main deliverable  **Replication Roadmap**

- Recommendations to policy makers
- How to address various constrains identified by different case studies

# Belgian case study

**Target**

- Comparison of benefits between:
  a) Use of demand response (DR) for reduction on TSO **balancing costs**
  b) Use of DR for reduction of consumers' **energy costs**
- Impact of DR on **congestion management** on TSO/DSO

**Constrains**

- Issues addressed by case study BE
  + Technical
  + Economical
  + Legal
  – Public acceptance

**Method**

- Based on findings from LINEAR project and EcoGrid EU results
  i. Available flexibility
  ii. Response to different prices

# Thank you
# for your Attention

# Annex slides

# Price ranking of activated volumes