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 • Shifting the demand towards hours with lower energy prices • This has to be know in advance to schedule the consumption	Customers and market actors (in case of adequacy problems)
Balance BRP's portfolio • A BRP could use this flexibility to balance his portfolio after the market closure	BRP
Ancillary services • DR can offer balancing services to the system under normal imbalances • DR could be useful also in cases where the systems is operated to its limits	TSO
Congestion management • 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

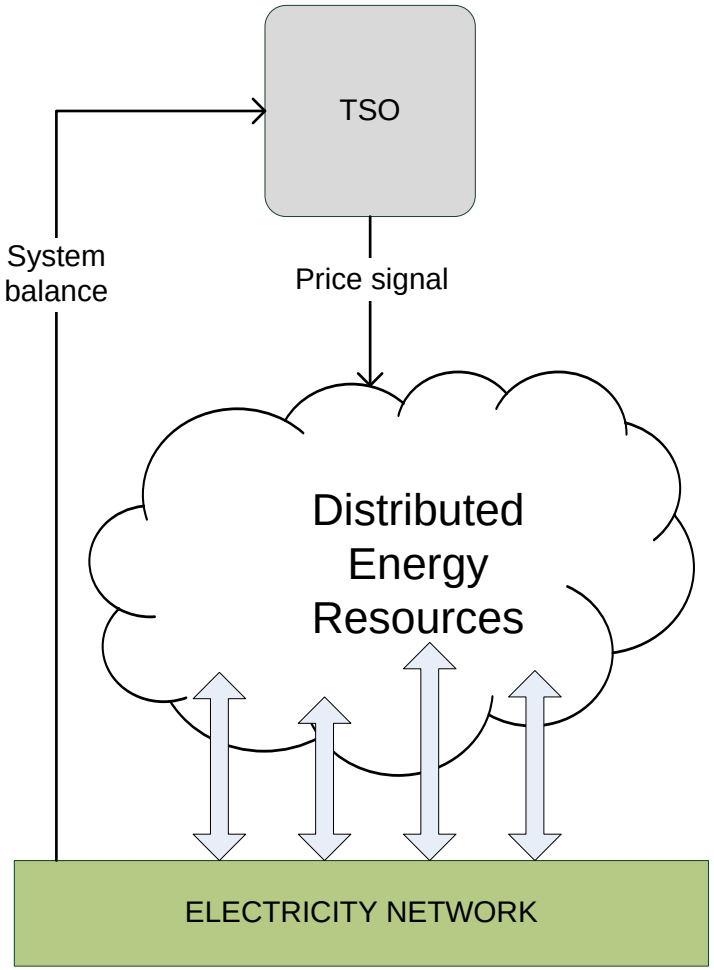
  According to the certainty of delivery of a service, it can substitute different kinds of reserves

- 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

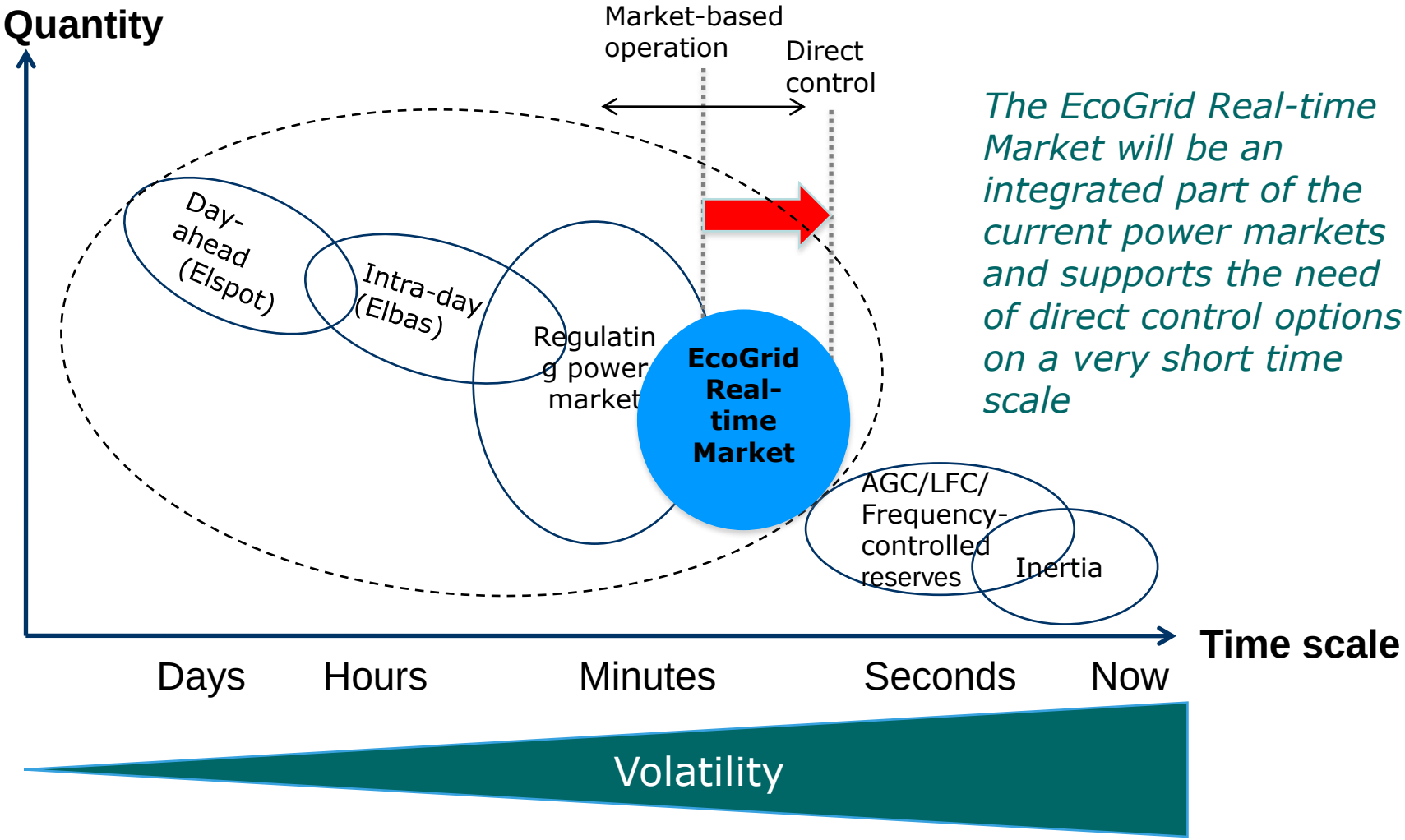
Balancing services to TSO



Closed-loop pricing process:

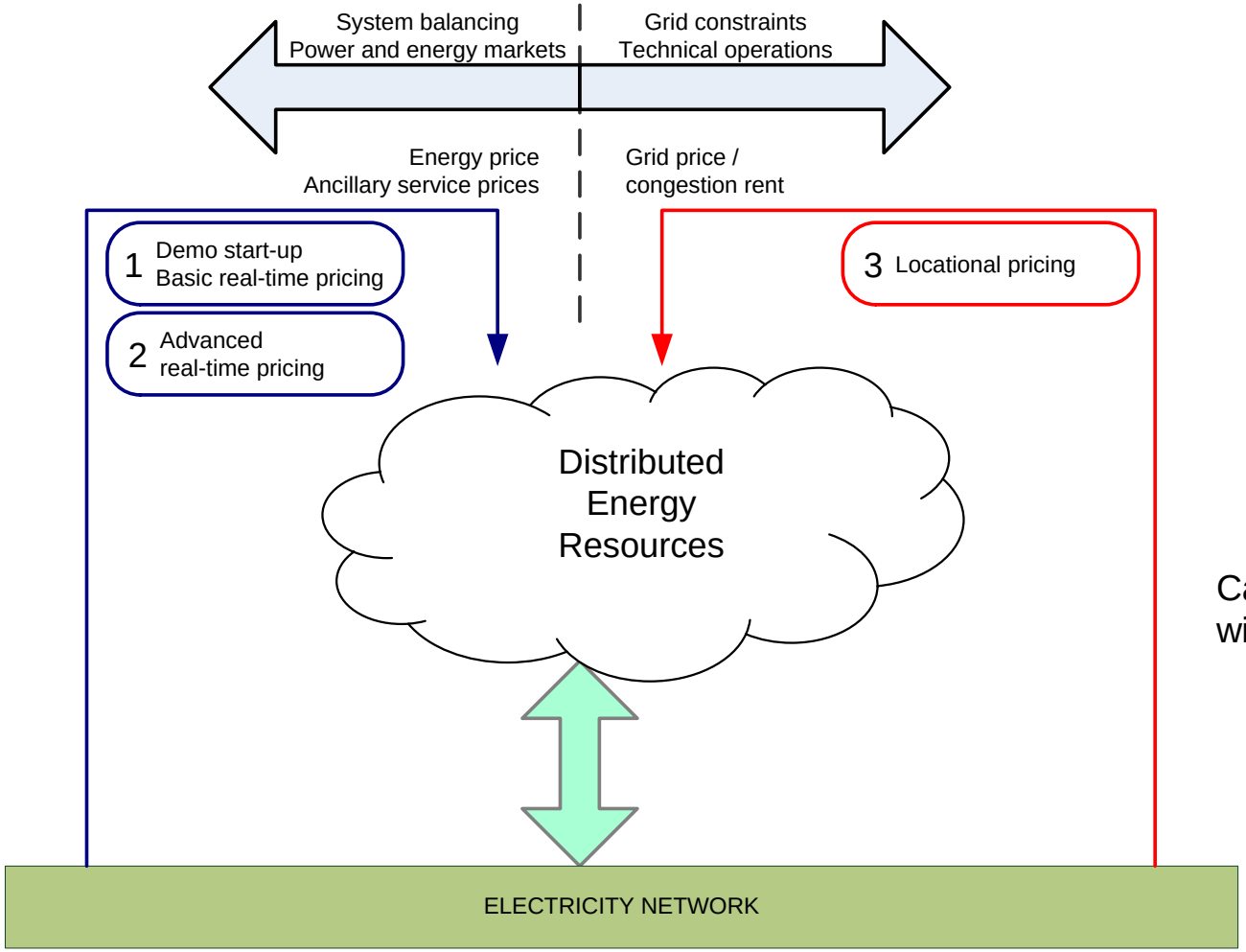
1. Monitor system balance – detect need for corrective action (MW)
2. Convert the need for corrective action (MW) to a need for price correction (EUR/MWh) using forecast of response to price
3. Publish the price
4. Monitor system balance – update response forecasts
5. Repeat loop indefinitely

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

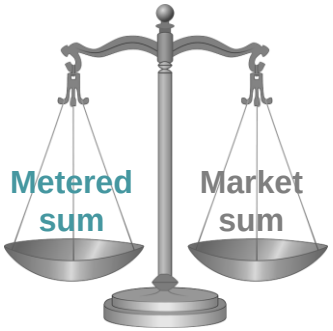
- BRP for consumption and BRP for production
- Each BRP has to be balanced

  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

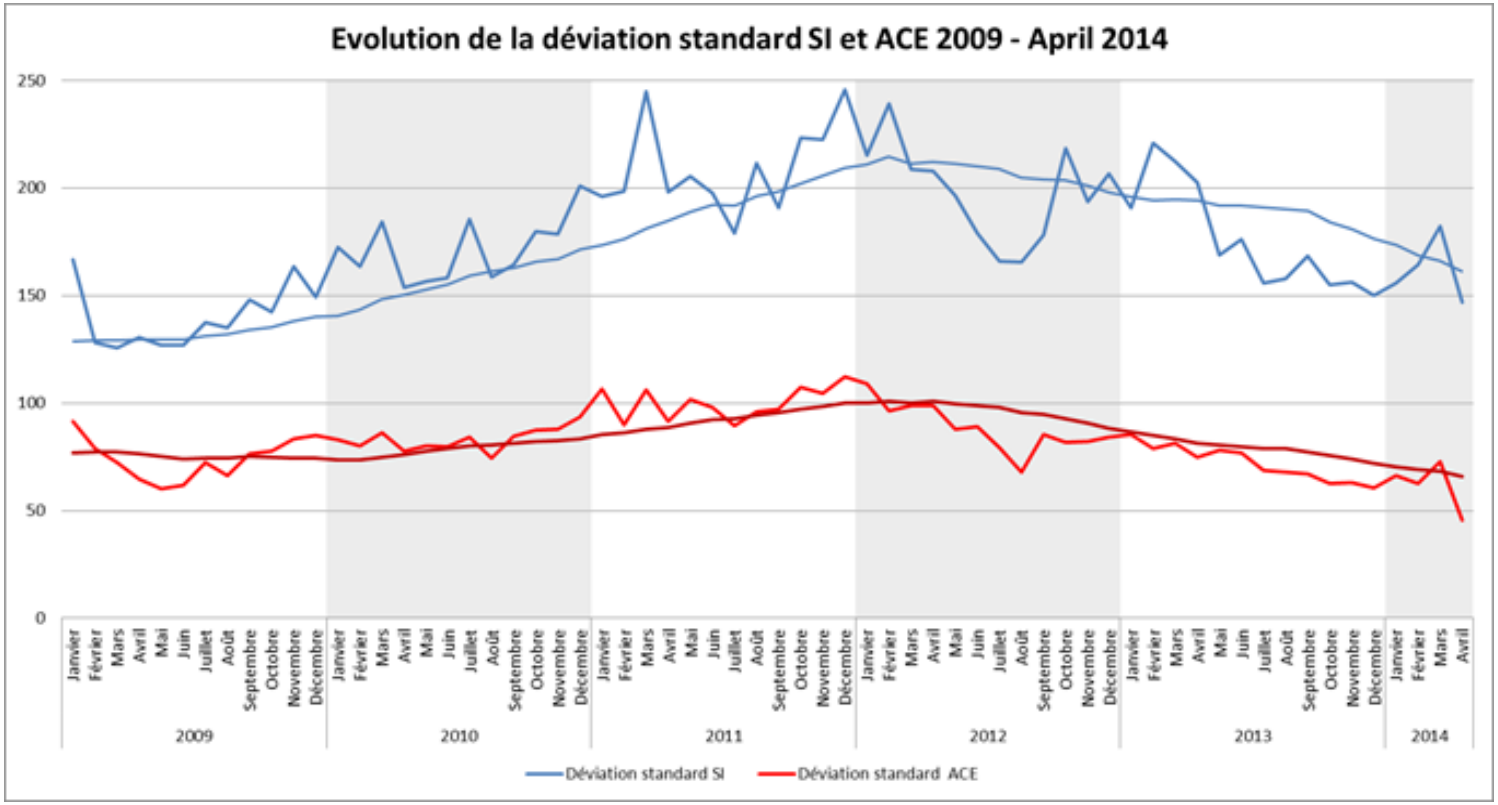
Two price model

- 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



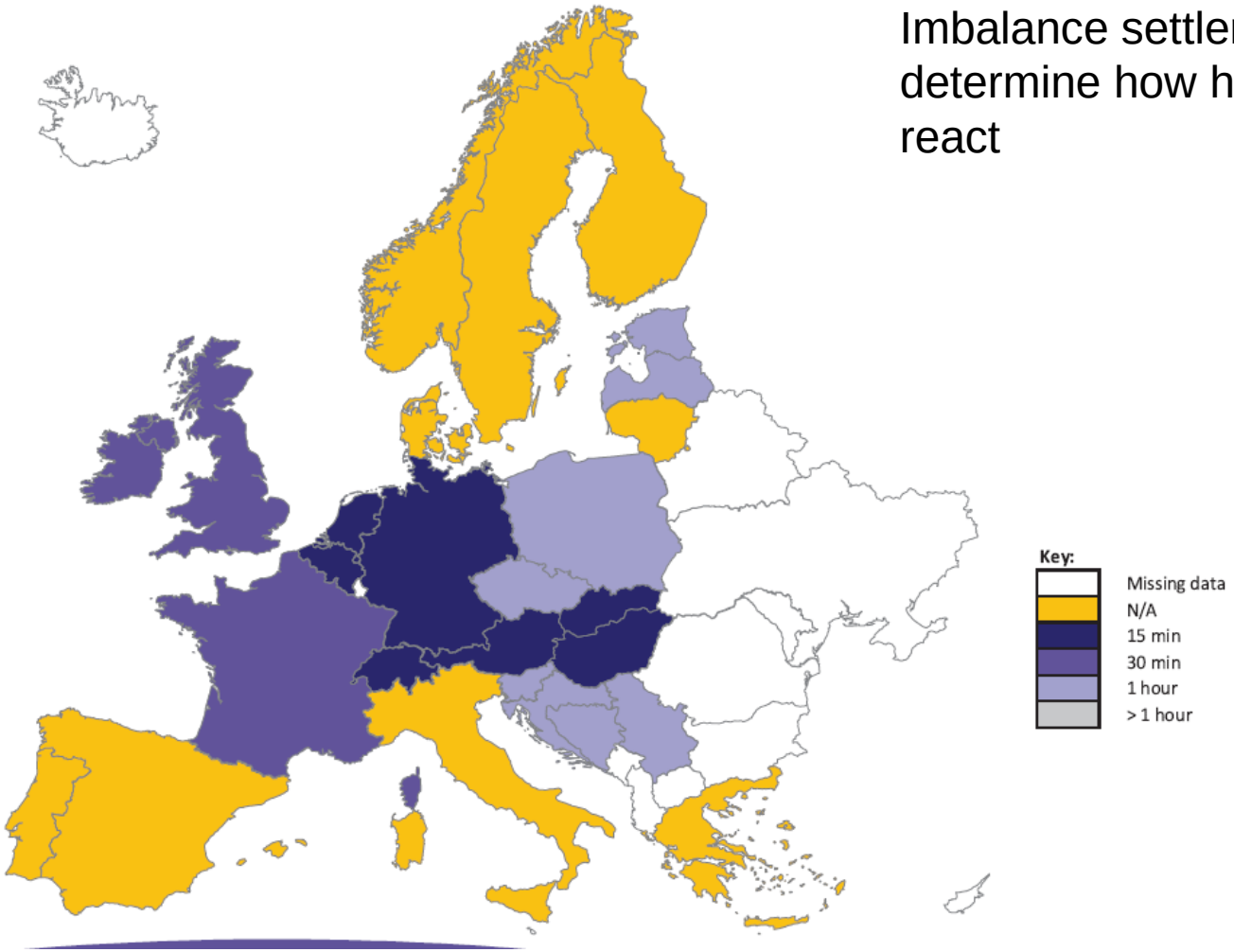
Double average pricing

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