

e-control Workshop on Market Design of the Future,

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# Wind of change: The process of market integration and congestion management

Karsten Neuhoff

Wien, 29.3.2012

Wind of change: The process of market integration  
and congestion management

- 1 Dimensions to consider in power market design**
- 2 Time to trade and joint products**
- 3 Access and flexibility for use of scarce transmission**
- 4 The draft proposal by ENTSO-E from 23.3.2012**

# 1

## Is the power market design open for all technologies?

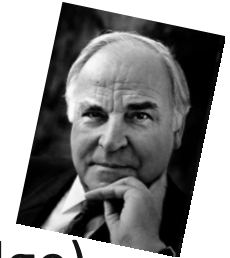
### its all about time

- Align auction time frames with forecast quality
- Joint auction for linked energy products



### and space

- Market-based allocation of scarce transmission (financial transmission contracts to compensate/hedge)
- Unlock flexibility of network with nodal pricing



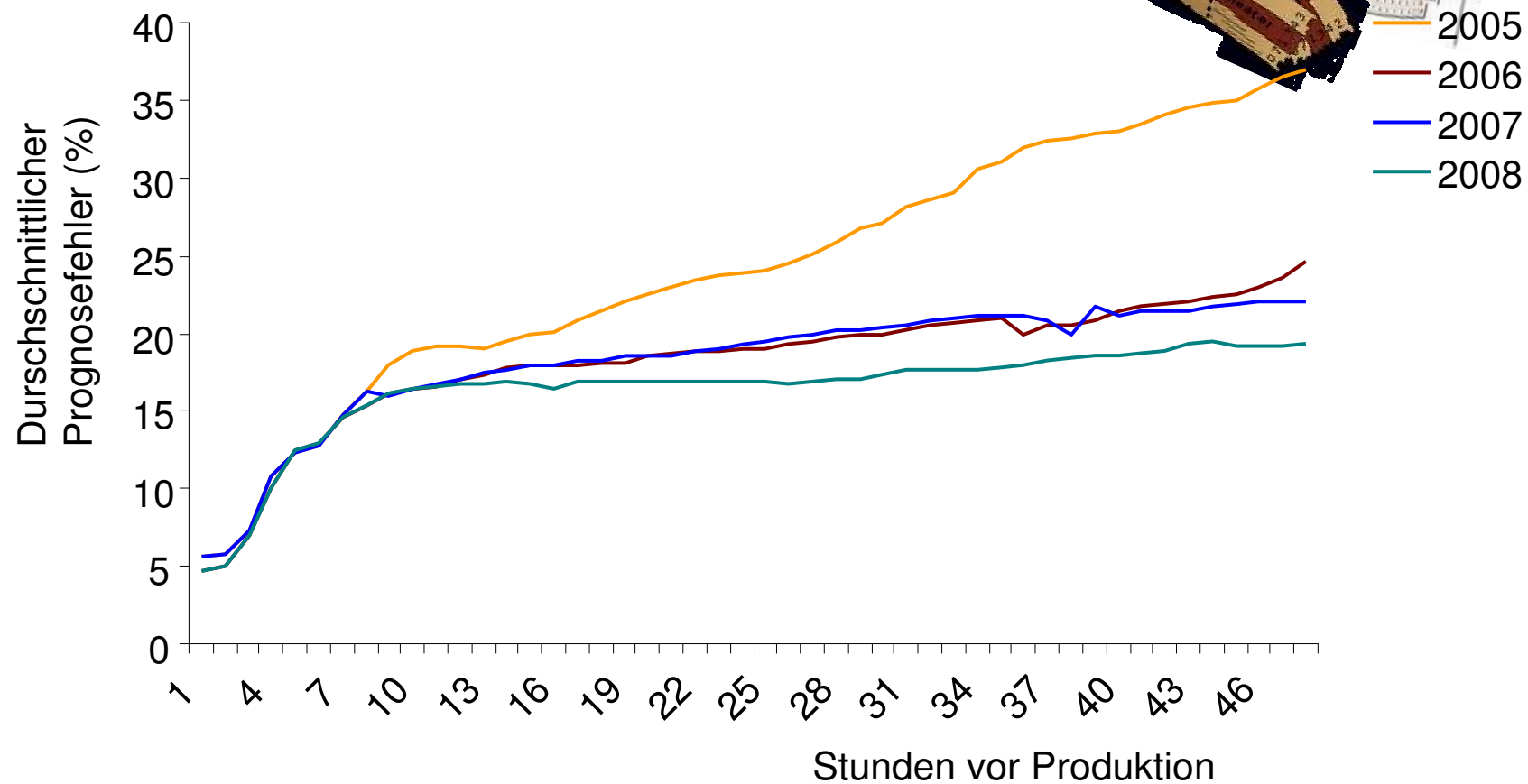
### and obviously system security

- ISO to host information and responsibility



## 2

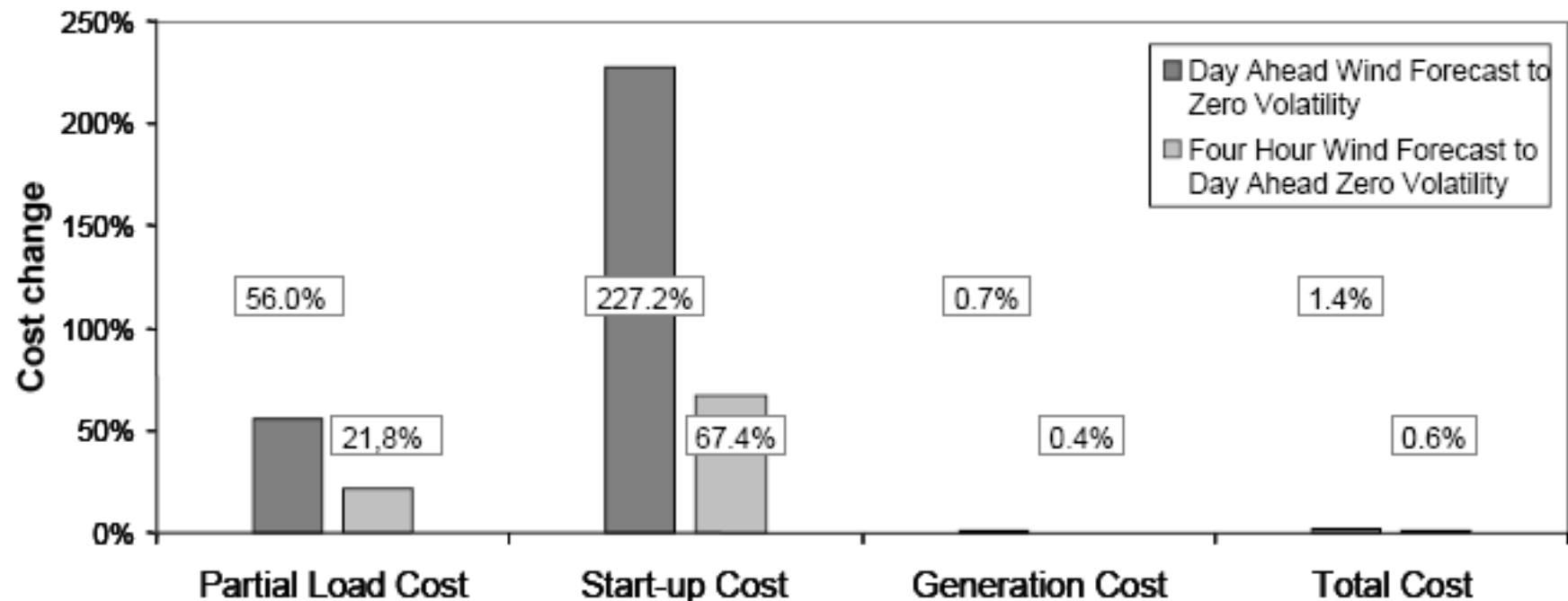
## The time to trade



Präsentation in Brüssel, 10. Juni, 2010, [http://www.climatepolicyinitiative.org/news\\_berlin.html](http://www.climatepolicyinitiative.org/news_berlin.html), von Ignacio de la Fuente, Red Eléctrica de España



# The value of adjusting dispatch to improved forecasting






























Source: Müsgens, F. and Neuhoff, K., 2006, Modelling Dynamic Constraints in Electricity Markets and the Costs of Uncertain Wind Output, *Cambridge EPRG Working Paper*, 05/14.

## 2

## Combining products

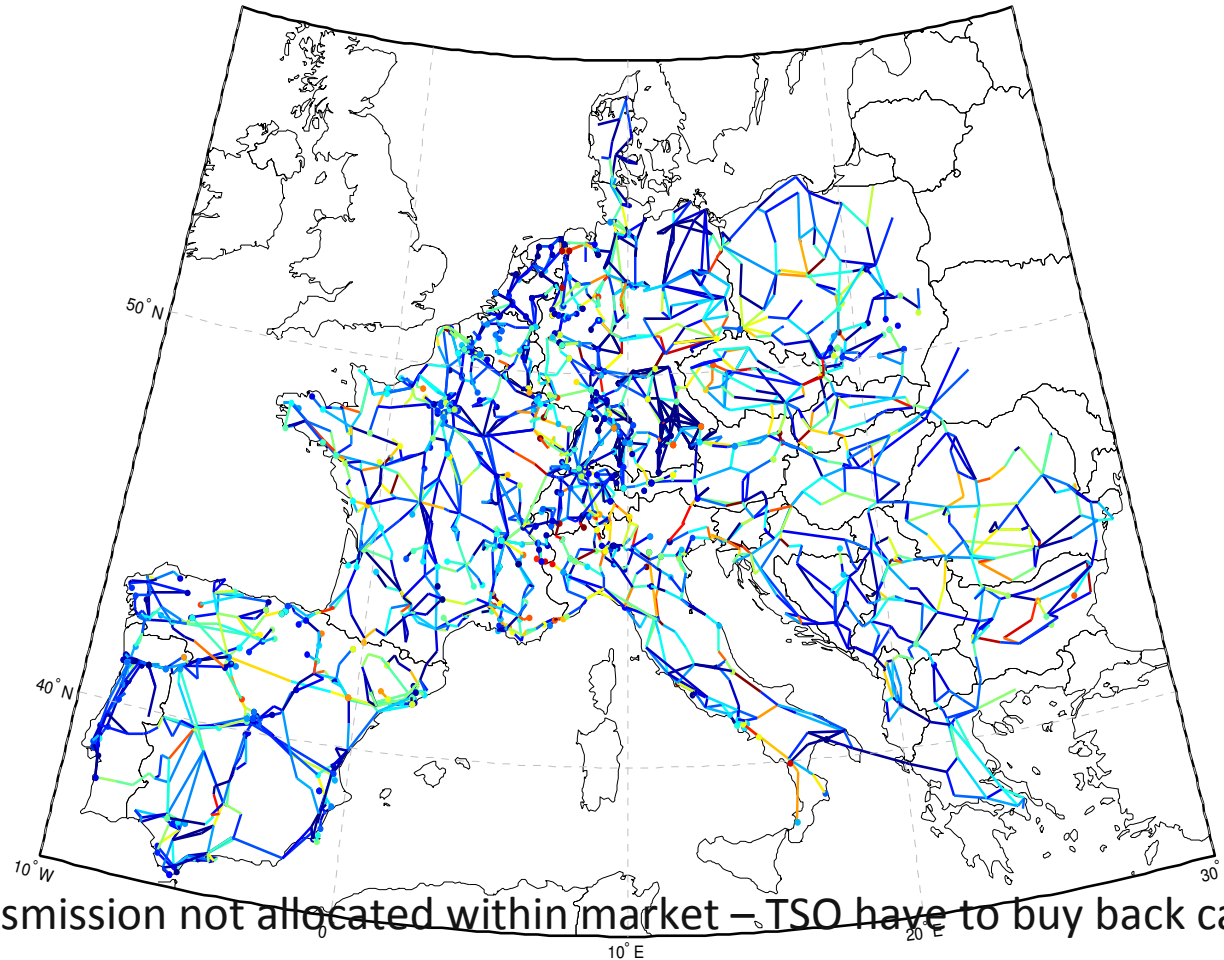


	Dispatch adjusted during day	Balancing requirements / provision adjusted during day	Flexible use of individual power stations	International integration of intraday & balancing markets	Integration of demand side response services	Effective monitoring of market power possible
UK System				N/A		
German system		N/A				
Nordpool						
Spanish system				N/A		
Nodal pricing system						



# 3

## Issuing multiple property rights



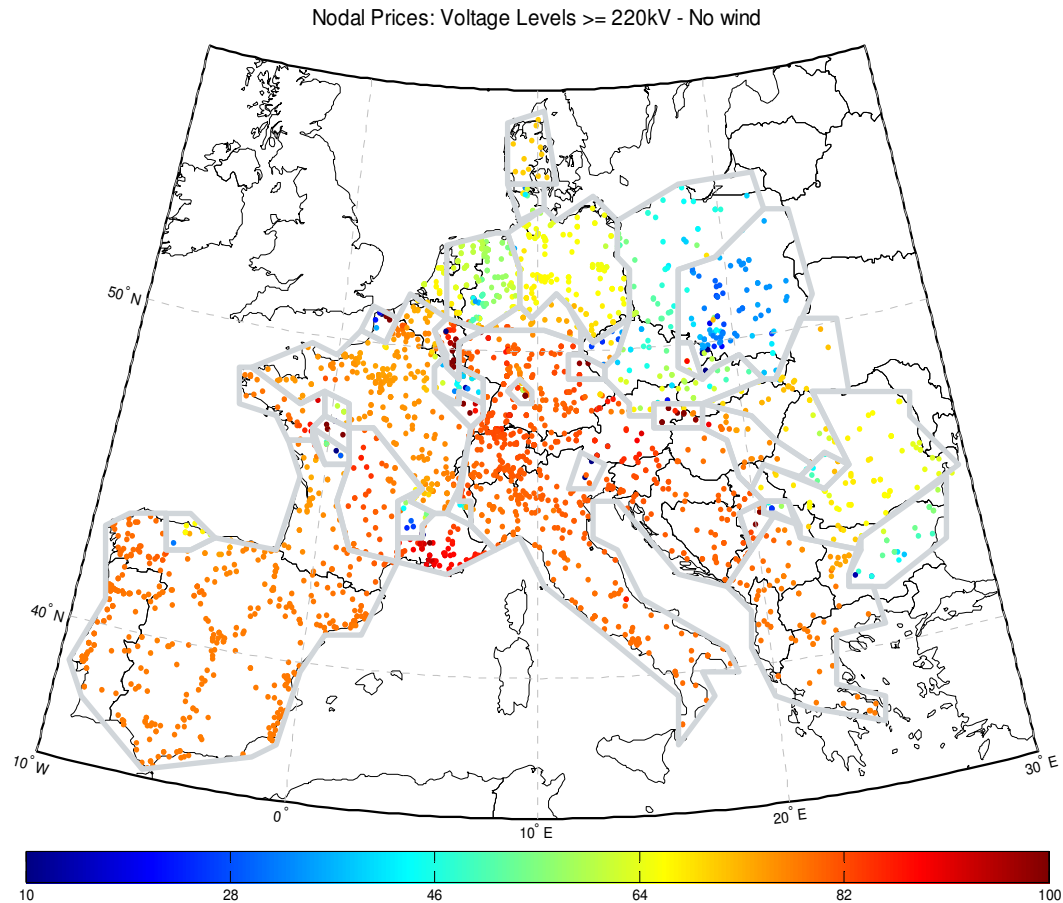
- Transmission not allocated within market – TSO have to buy back capacity  
-> inefficient, costly and creates opportunities for gaming.



# 3

## Zones for zonal pricing do not match national borders

No wind



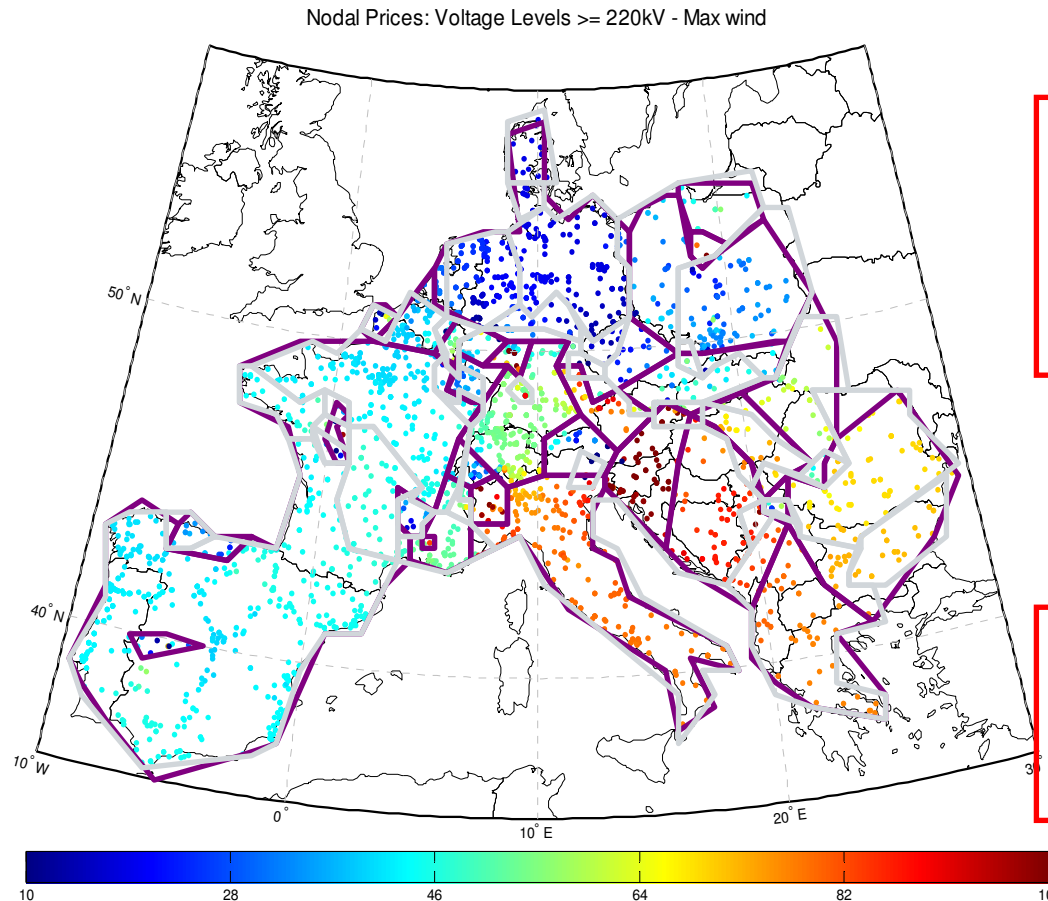


# 3

## And zones with similar price change with wind output



Max wind



Suitable zones in congested network can change hour by hour

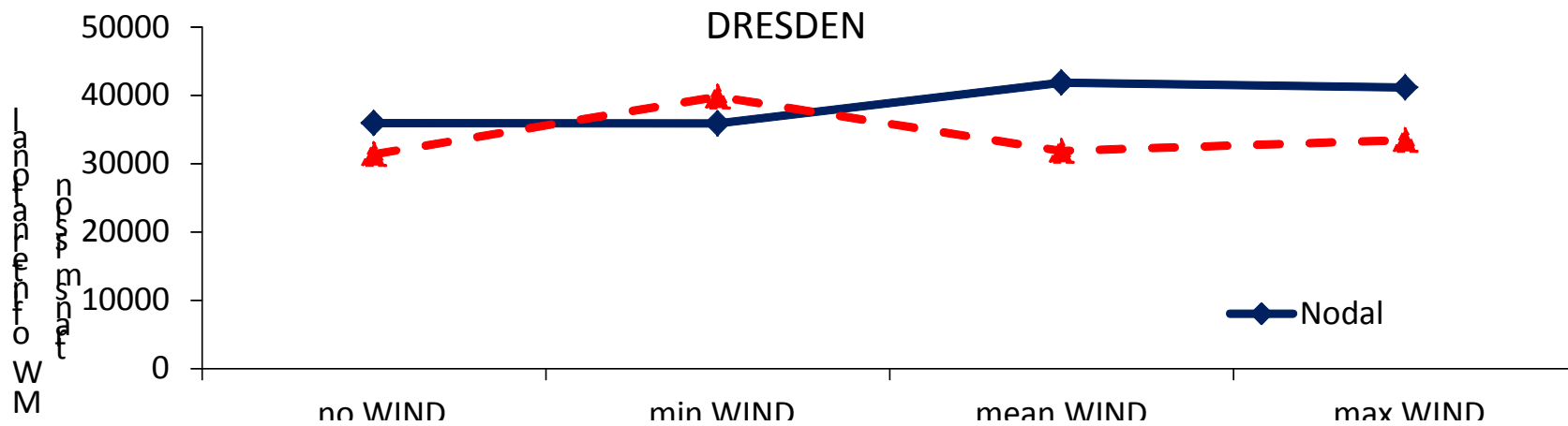
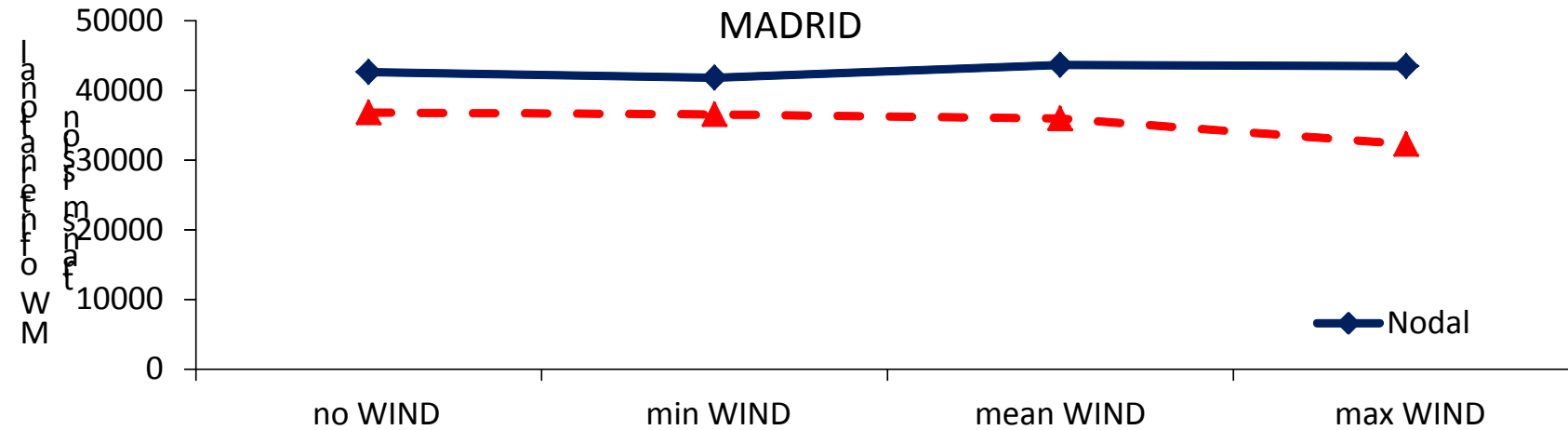


How small do they have to be to be stable?



# 3

## Constraining flexibility

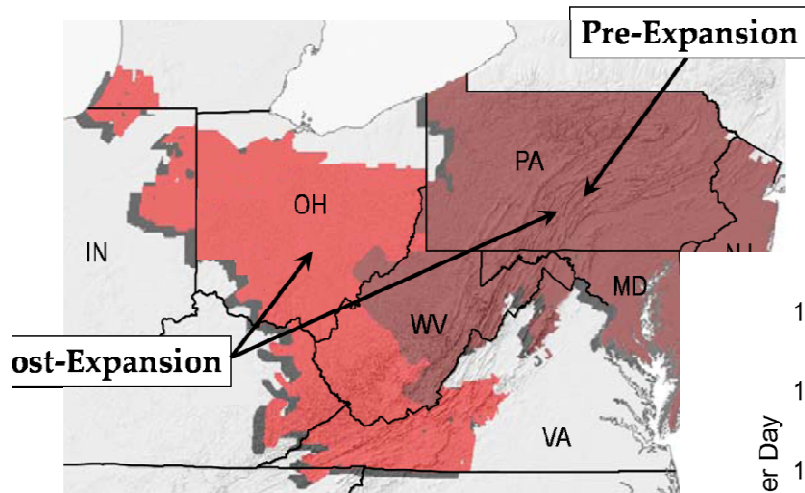


Annual savings 0.8-2 billion Euros from better system operation



## 3

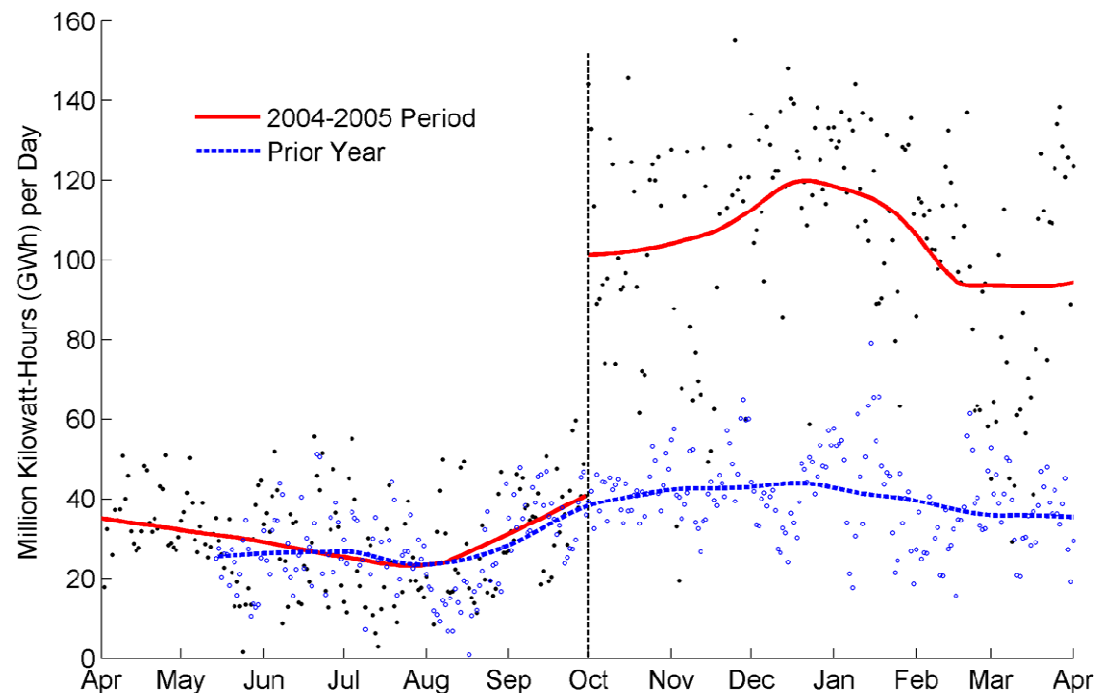
# Efficiency improvement with shift to nodal pricing



Studienergebnisse:

- Bilateral Handel konnte nur 40% d. Effizienzgewinne des LMP-basierten Marktes erreichen
- Inkrementeller Nutzen der LMP Markt Integration = \$180 Mio. jährlich, Barwert über 20 Jahre ist \$1.5 Mrd.

AEP / Dayton / ComEd Integration in den PJM Markt



Source: Erin T. Mansur and Matthew W. White, "Market Organization and Efficiency in Electricity Markets," March 31, 2009, Figure 2, pg 50, discussion draft, (erhältlich unter <http://bpp.wharton.upenn.edu/mawhite/>). (basierend auf Präsentation von Andy Ott, PJM)

## 3

## Evaluation of congestion-management approaches



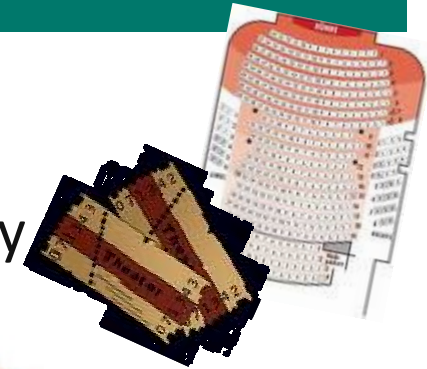
	(i) Integration with domestic congestion management	(ii) Joint allocation of international transmission rights	(iii) Integration with day ahead energy market	(iv) Integration with intraday/ balancing market	(v) Transparency of congestion management
Bilateral transmission rights auction	No	No	No	No	No
Joint multi-country auction of NTC rights	No	Yes	No	No	No
Multi-region day-ahead market coupling (zonal pricing)	No (only at zonal level)	Possible	Yes	No	No
Nodal pricing	Yes	Yes	Yes	Possible	Yes



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# 4

## The European process of advancing market design

- **The European process of advancing market design**
- **The draft proposal by ENTSO-E from 23.3.2012**

# 4

## How far have we progressed towards implementation?

“.. no later than 12 months after the entry into force .... all System Operators of each Capacity Calculation Region shall produce a common methodology ...”

“Each System Operator shall submit the methodology to their National Regulatory Authority for approval.”

“Within 4 months ... National Regulatory Authorities shall accept or reject the proposal”

*Source: Grid code proposal (ENTSO-E)*

“... require the use of either a Flow-Based (FB) method or an Available Transfer Capacity (ATC) method for capacity calculation at each zone border for a given timeframe

*Source: Framework guidelines (ACER)*

....

**Both methods shall be described in the CACM Network Code(s).**

...

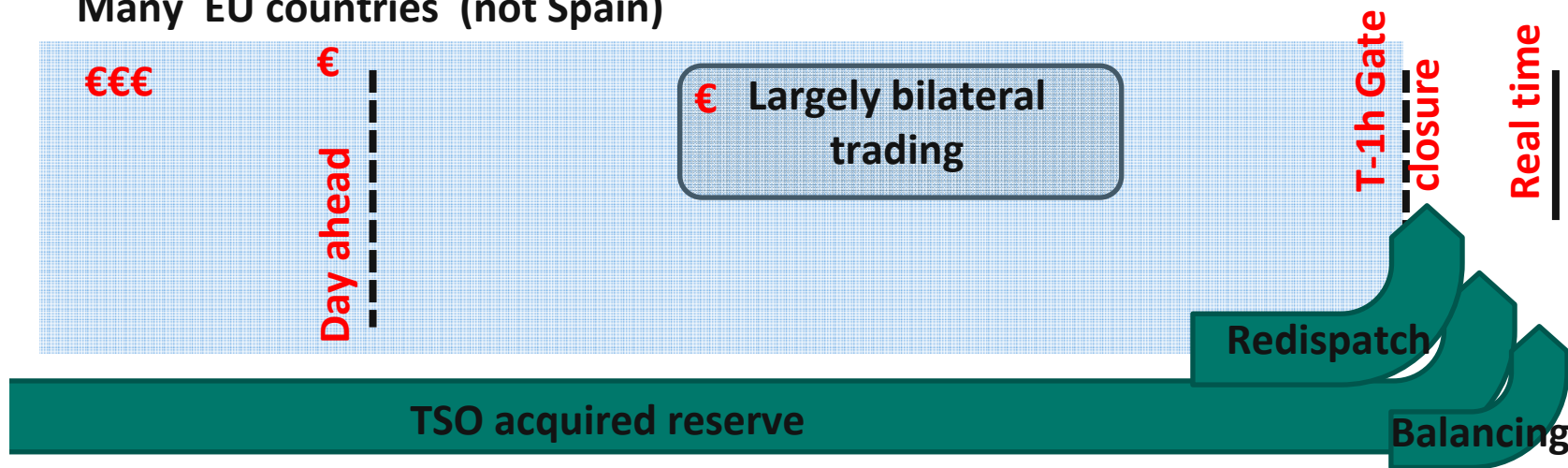
**The process to develop in detail and implement the pan-European target model, including the process to develop the rules for matching and accepting bids in the shared order book, shall be led by ENTSO-E,** include the participation of PXs and the consultation of market parties and be subject to NRAs approval. In particular, NRAs require a good understanding of the options and associated costs and benefits for each significant step in the implementation of the approved intraday roadmap.



## 5-1

## Challenge for secure system operation – timely information

Many EU countries (not Spain)

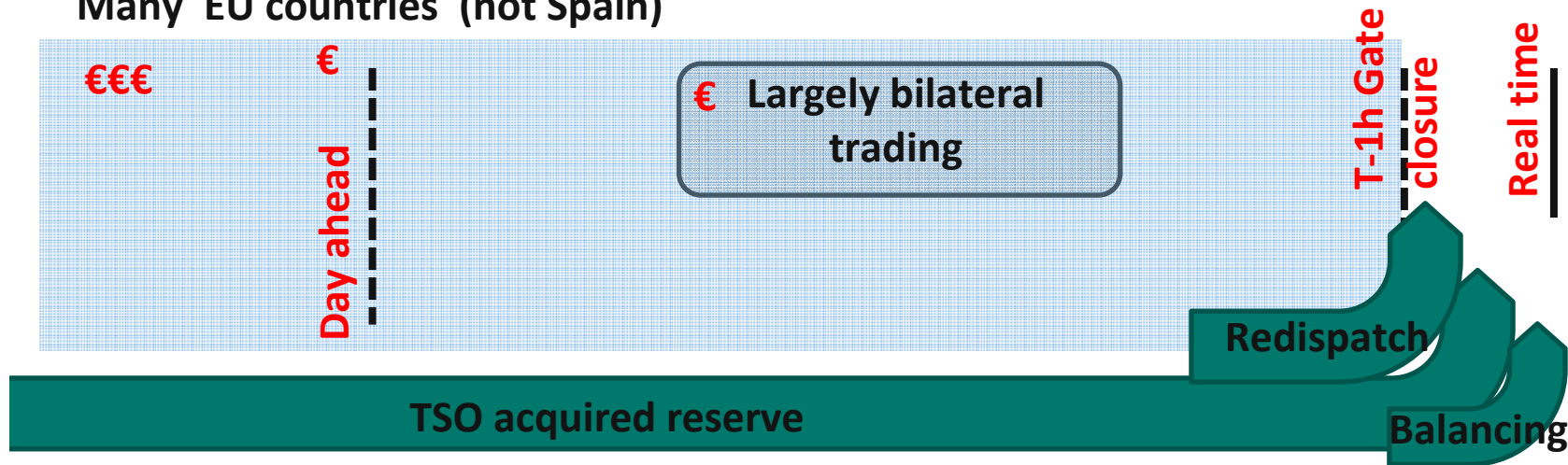


- What impacts have intraday transactions on flows?
- How high are balancing requirements to back-up nominations?
- What re-dispatch will neighbors pursue?

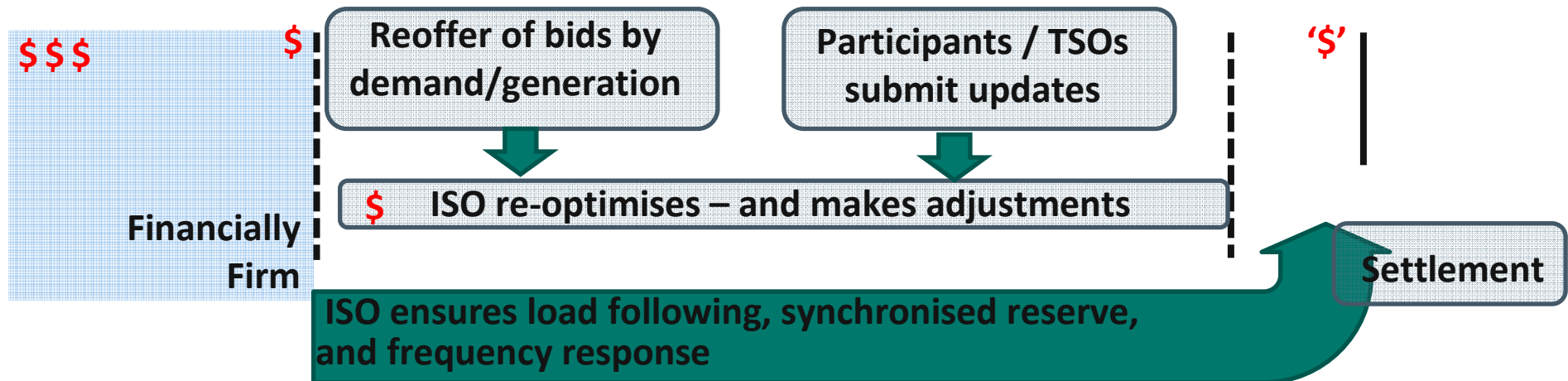
# 5-1

## Intraday capacity assessment

Many EU countries (not Spain)



ISO – using nodal pricing



**Requirements formulated in  
Framework Guidelines**

**CACM Network Code(s) shall ensure:**

- max flows/transmission capacity reassessed sufficiently often within the intraday time frame
- to take into account information from possible outages, variable generation (e.g. wind, solar) ...

- shall make use of locational information on relevant generation and consumption units, through a detailed common grid model
- use of locational information in the grid model for the assessment of system security at the allocation stage (FB)
- Long-term capacity calculation methodologies shall be fully compatible with short term capacity calculation

**Grid code: GSK not even mentioned?**

The CACM Network Code(s) shall also envisage that, where there is sufficient liquidity, **regional auctions may complement the implicit continuous allocation mechanism.** Where implemented, implicit auctions should have adequate bidding deadlines to provide the necessary flexibility to the market and be coordinated with, and linked to, the pan-European target model.

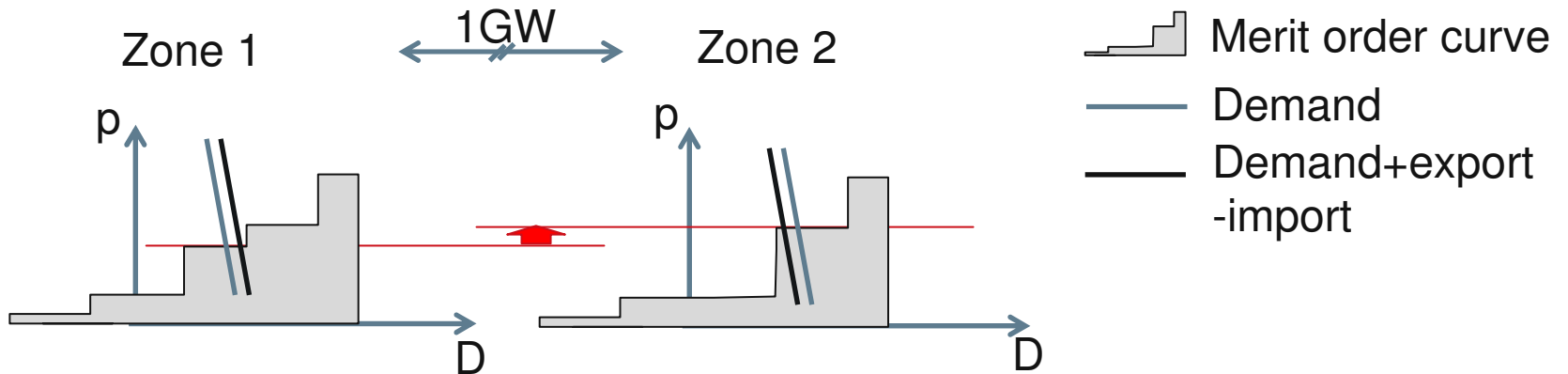
### Article 72

#### PRICING OF INTRADAY CAPACITY

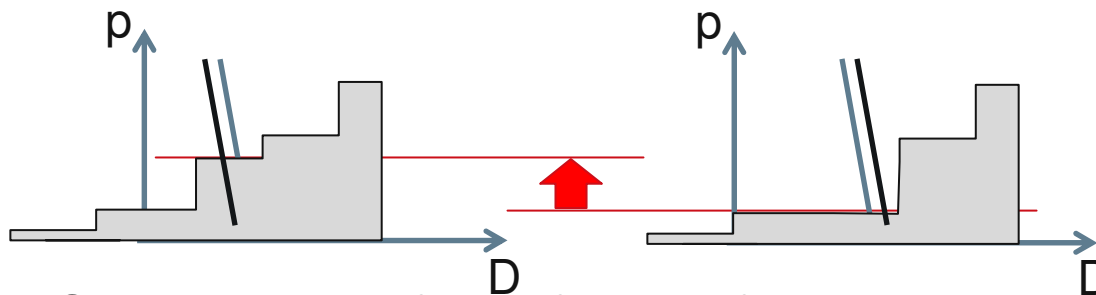
1. **Intraday Cross Zonal Capacity shall be priced at Bidding Zone Border(s) reflecting Market Congestion.**
2. Where appropriate, the Intraday capacity pricing shall be included within the Continuous Trading Matching Algorithm.
3. In order to reflect the actual specific network and market situation, the Intraday Cross Zonal Capacity price shall be based on actual Orders
4. The methodology for pricing shall be developed ....

# 5-2

## Market-based intraday allocation

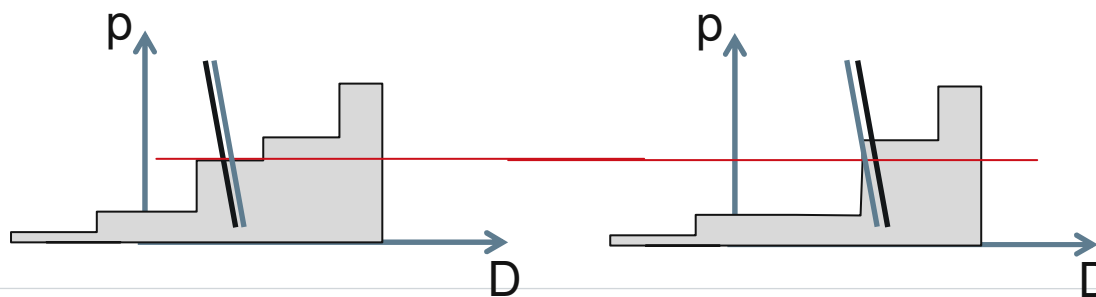


Option 1: Large increase of wind forecast for zone 2



(1) First come first serve:  
 Trader gets T at 0 price  
 Captures T value  
 (2) Fixed fee for T  
 How to determine price?

Option 2: Small increase of wind forecast for zone 2



(3) Efficient T use could  
 require price = 0

**Article 33****DETERMINATION OF BIDDING ZONES**

Bidding Zones shall be defined in a manner which:

- (a) **promotes efficient congestion management and secure network operation** within and between Bidding Zones;
- (b) enhances **Social Welfare**;
- (c) **reflects structural congestion** in the European network;
- (d) adequately takes into account **adverse effects of internal transactions on other Bidding Zones**;
- (e) is **consistent for all Capacity Calculation Timeframes**; and
- (f) ensures that **each generation and load unit shall belong to only one Bidding Zone for each Market Time Period**.

**Article 34****CRITERIA TO DEFINE AND ASSESS THE EFFICIENCY OF ALTERNATIVE BIDDING ZONE CONFIGURATIONS**

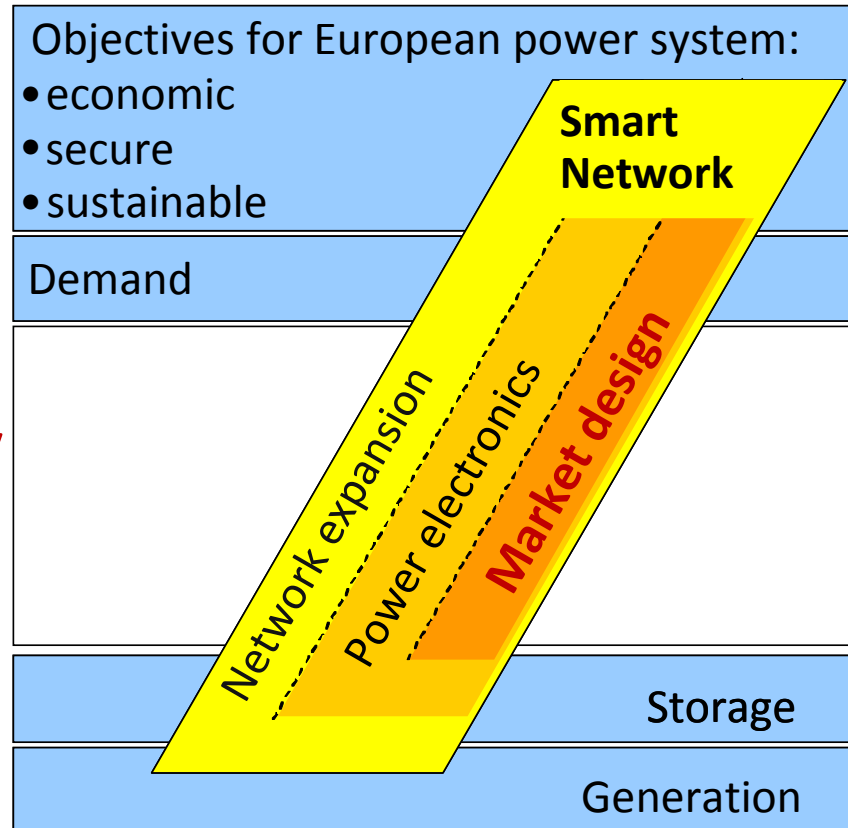
1. Bidding Zones shall be **sufficiently stable and robust over time**.
2. When Bidding Zone configuration is assessed, at least the following criteria shall be considered:
  - (a) ensure **operational security and security of supply**;
  - (b) **avoid extensive or inefficient corrective** measures;
  - (c) the location and frequency of congestion, provided that:
    - Structural congestions influence the delimitation of bidding zones; and
    - .. ongoing investment may relieve existing congestions.
  - (d) **effects of internal transactions on other zones**;
  - (e) size of **uncertainties in Cross Zonal Capacity** Calculation;
  - (f) **market efficiency** (economic surplus, firmness costs in accordance with Article 93, market liquidity, competition, correctness of price signals)
  - (g) **impact** on the operation/efficiency of **balancing** mechanisms and imbalance settlement processes.

# 6

## Conclusion

**use grid across Europe  
effectively to lower  
costs and emissions**

**match physical reality  
to ensure continuity**  
•for contracts  
•for investments  
•for innovation



**create transparency  
to decide on and  
communicate  
grid expansions**

**operate DC lines  
to support  
European market**

**shield RE projects  
from grid delays**

**Effective power market design necessary, not sufficient, to decarbonize power.  
Is the current design open for renewables?**

Vielen Dank für Ihre Aufmerksamkeit.

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