Offshore Wind Energy Deployment in the European Union

Concerted Action for Offshore Wind Energy Deployment (COD)

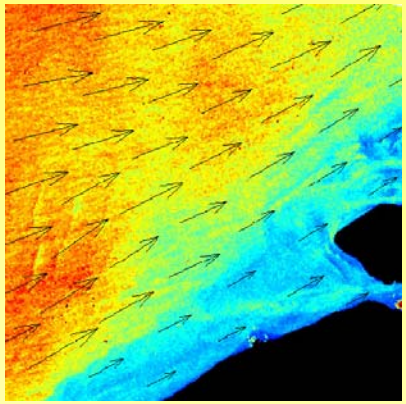
Grid Integration of Offshore Wind Farms

Achim Woyte

Copenhagen Offshore Wind 2005

28 October 2005

Introduction



Achim Woyte
3E sa, Brussels, Belgium

- **High-end consultancy**
- **Operational services**
- **Technology watch and innovation**

➔Grid and market integration of renewable energy generation

➔3E represents Belgium in the COD project

Special thanks to Helen Snodin and Paul Gardner (Garrad Hassan)

Presentation Overview

- Objectives & approach
- 2 cases
- Country groupings
- Trans-European power exchange
- Conclusions

Grid Integration: Objectives & Approach

- Review of national grid studies
- Collection of key data
- Significant items
  - plans & prospects
  - power system & bottlenecks
  - grid codes & balancing arrangements
  - offshore cabling
  - market aspects
- Limited comparability

➔ Country groupings

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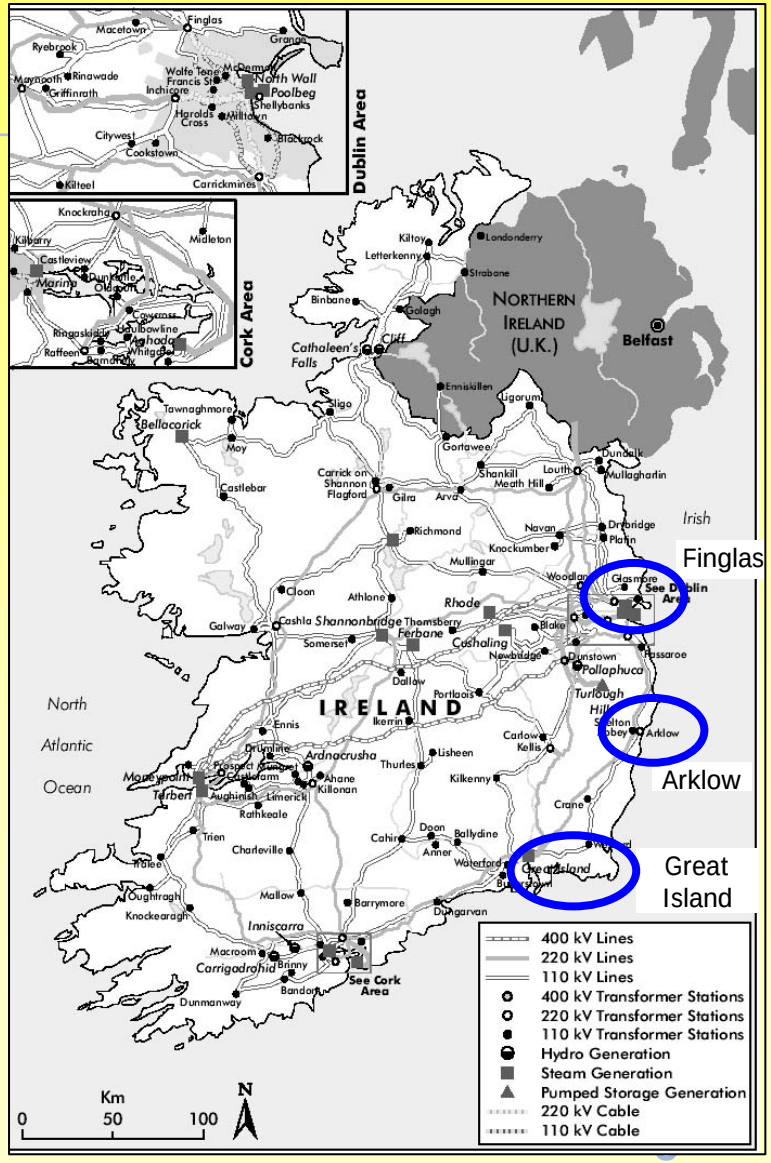
Case - British Isles - Ireland

- **First projects: East coast**
  - **1370 MW (2010), later up to 3000 MW**
  - **min. load (RoI) 1500 MW**
- **Grid bottlenecks**
  - **locally**
  - **can delay the process**
- **Grid control issues**
  - **frequency control**
  - **balancing: TSO**
- **Forecasting required by Grid Code**



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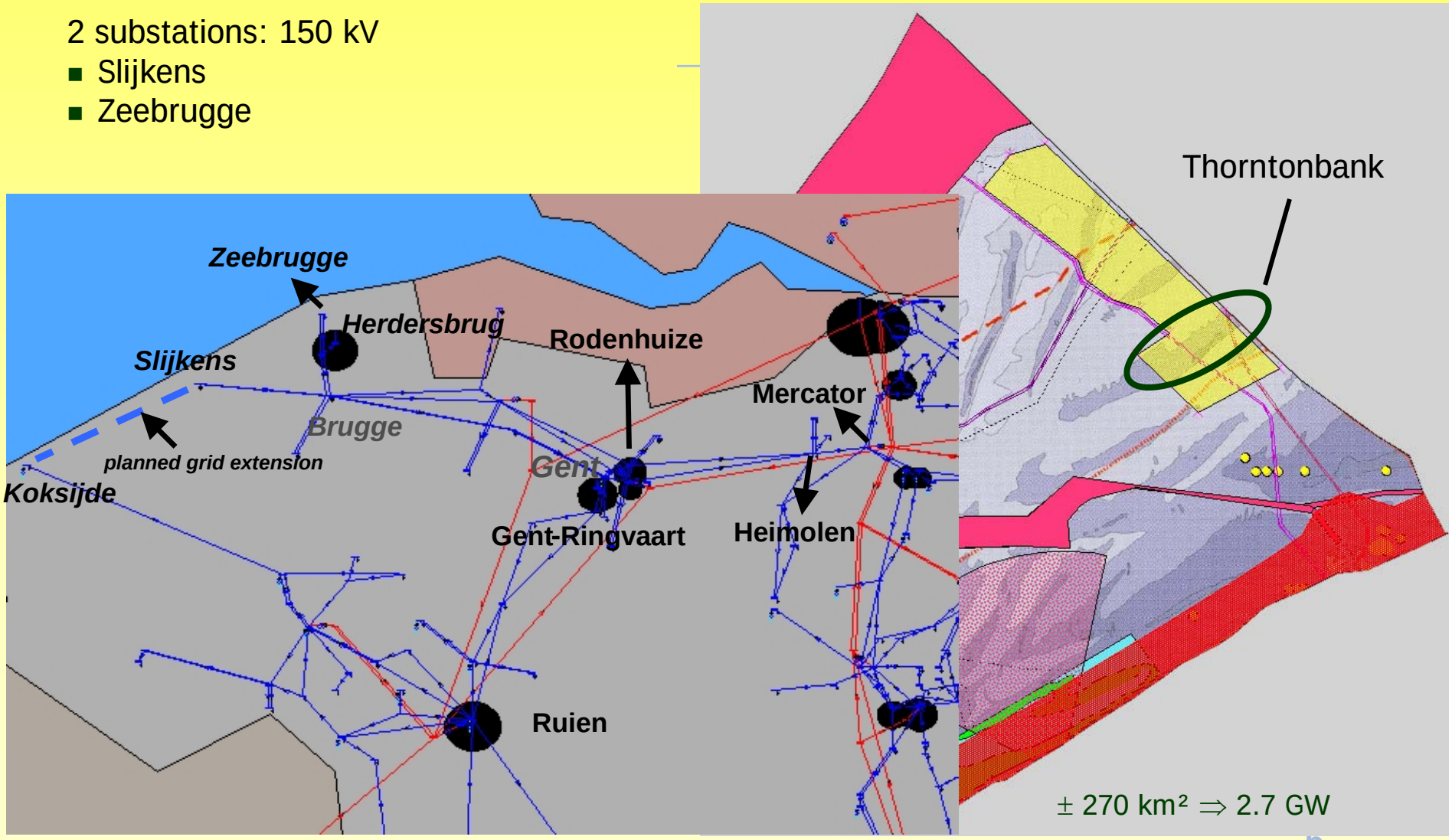
Case - UCTE - Belgium

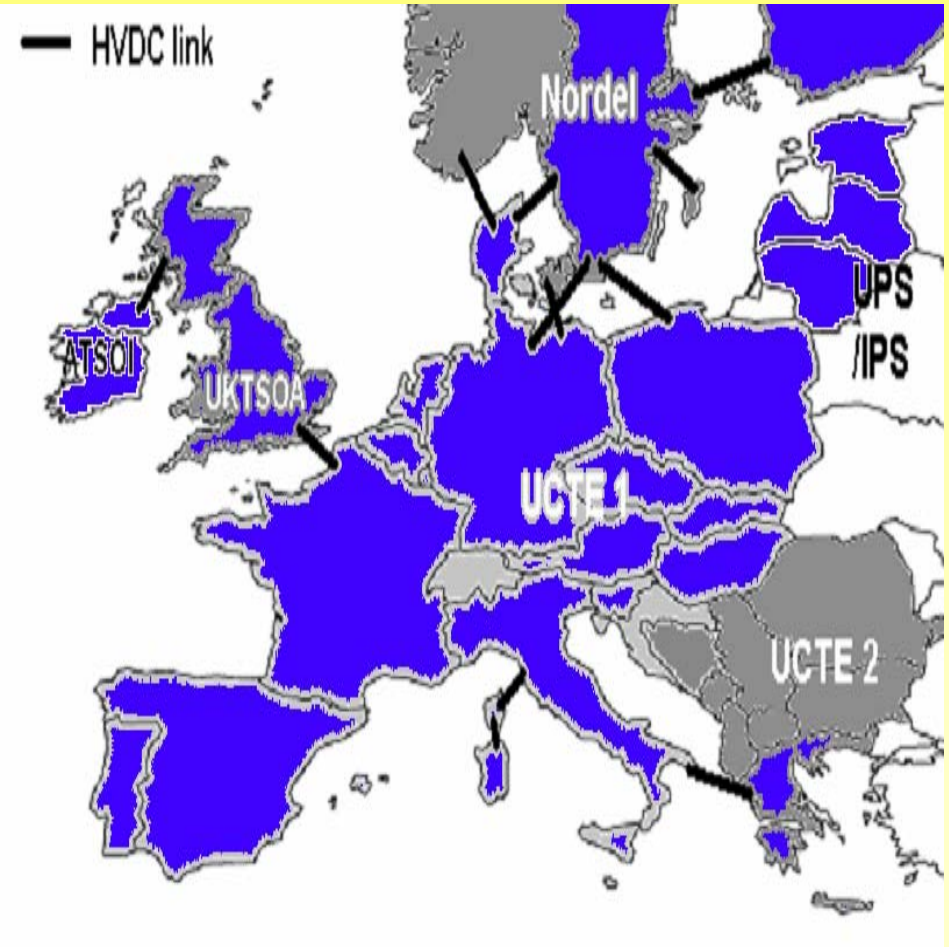
2 substations: 150 kV

- Slijkens
- Zeebrugge



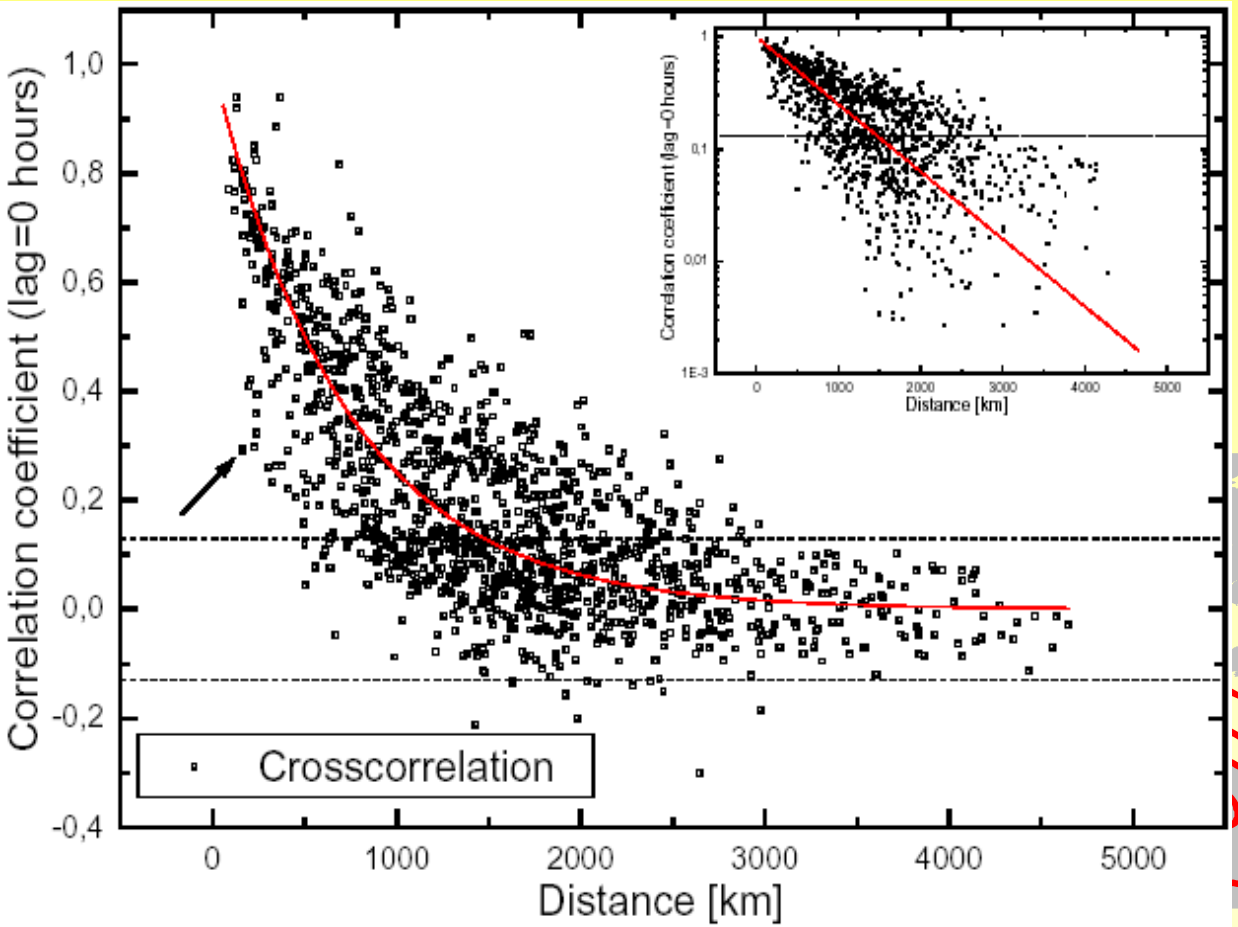
Courtesy of K. Purchala

Country Groupings by Synchronous Zones

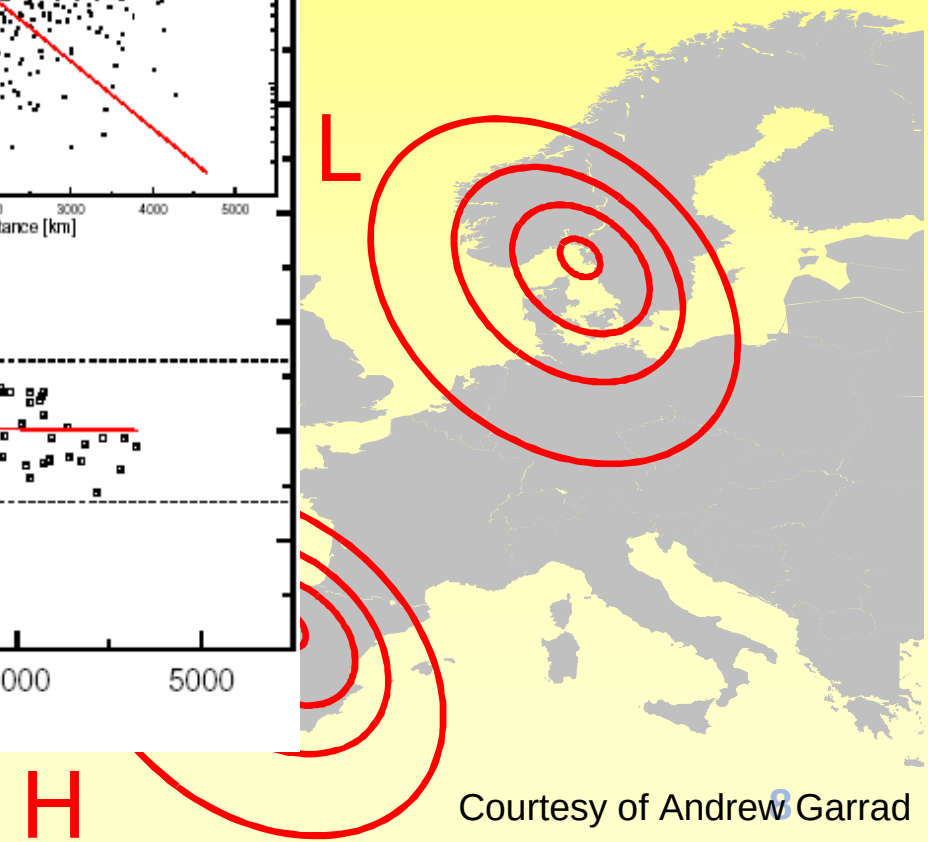


- **Different accents**
  - **Central/Western Europe**
  - **British Isles**
  - **Scandinavia**
- **Common issues**
  - **grid reinforcement**
  - **grid code requirements**
  - **offshore cables**
  - **grid access, pricing & balancing**
  - **Trans European power exchange**

Spatial Decorrelation
… becomes interesting over large distances

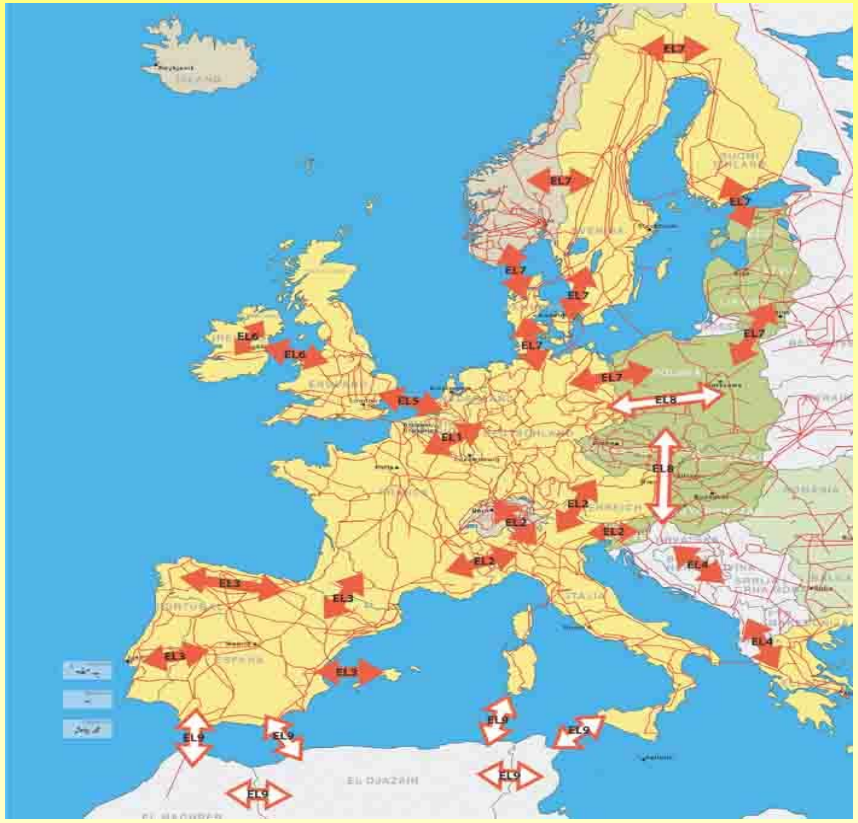


Courtesy of Gregor Giebel



Courtesy of Andrew Garrad

Transmission Grids
… should link control zones over large distances



Priority axes TEN-E action (CEC, DG TREN)

- **Trans European Networks (TEN-E)**
  - **priority axes:**
    wind is regional rationale
  - **should become transcontinental**
- **Interconnector capacity needs to be allocatable to wind power**
- **International markets for balancing power**

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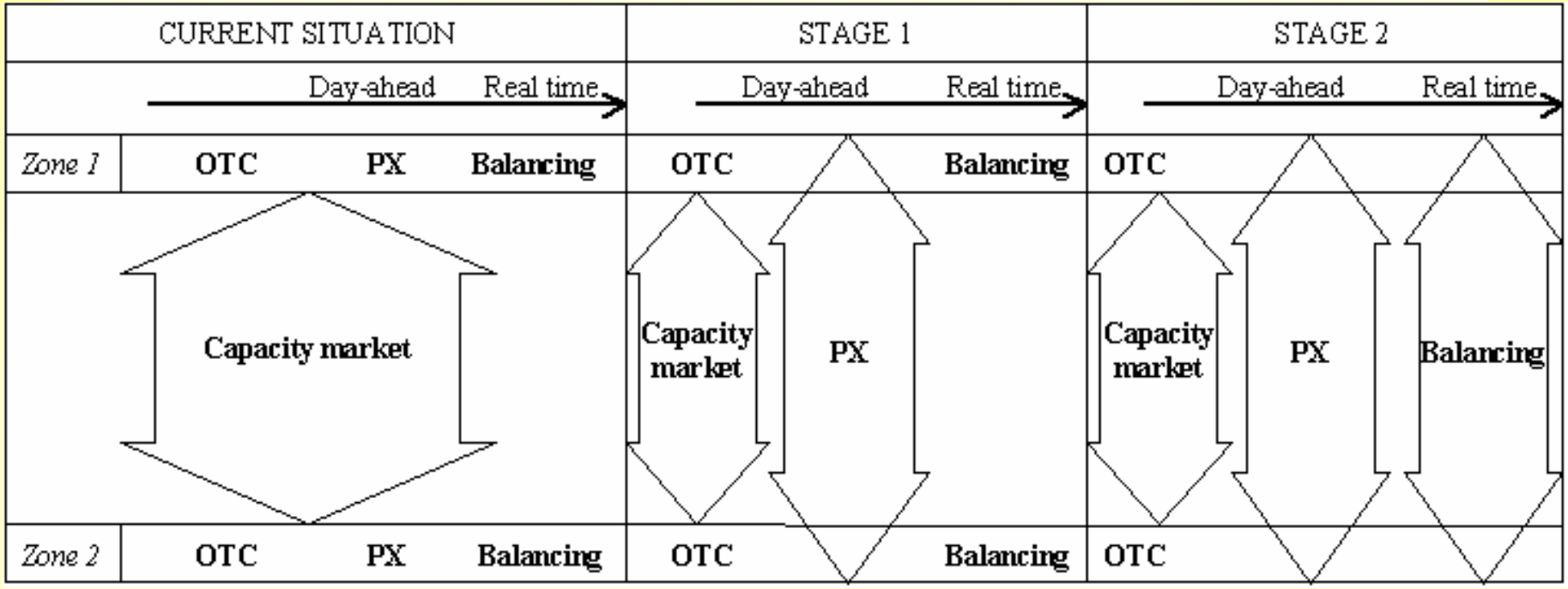
Markets
… are needed for transcontinental balancing

- **today: coupled via capacity markets**
  - **long-term to day-ahead, no intra-day allocation**
- **future: markets should be coupled**
  - **as close as possible to real time**

Courtesy of L. Meeus



Conclusions & Recommendations I

- **Country groupings**
  - **Synchronous zones, TEN-E priority axes, geography**
  - **Common issues with different accents**
- **Grid reinforcement**
  - **impasse between TSOs and developers**
  - **back up and share investment risk by governments**
- **Grid codes**
  - **harmonize control capabilities**
  - **TSO-specific set points**

Conclusions & Recommendations II

- **Common offshore cables**
  - **facilitate common infrastructures**
  - **possible kick-off for offshore grids**
- **Access, pricing and balancing**
  - **enable markets for wind energy**
  - **support short-term forecasting**
- **Trans European Power Exchange**
  - **create interconnector capacity**
  - **allocate it close to real time**