Current and future challenges of TSOs in the European Market design

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27 September 2016

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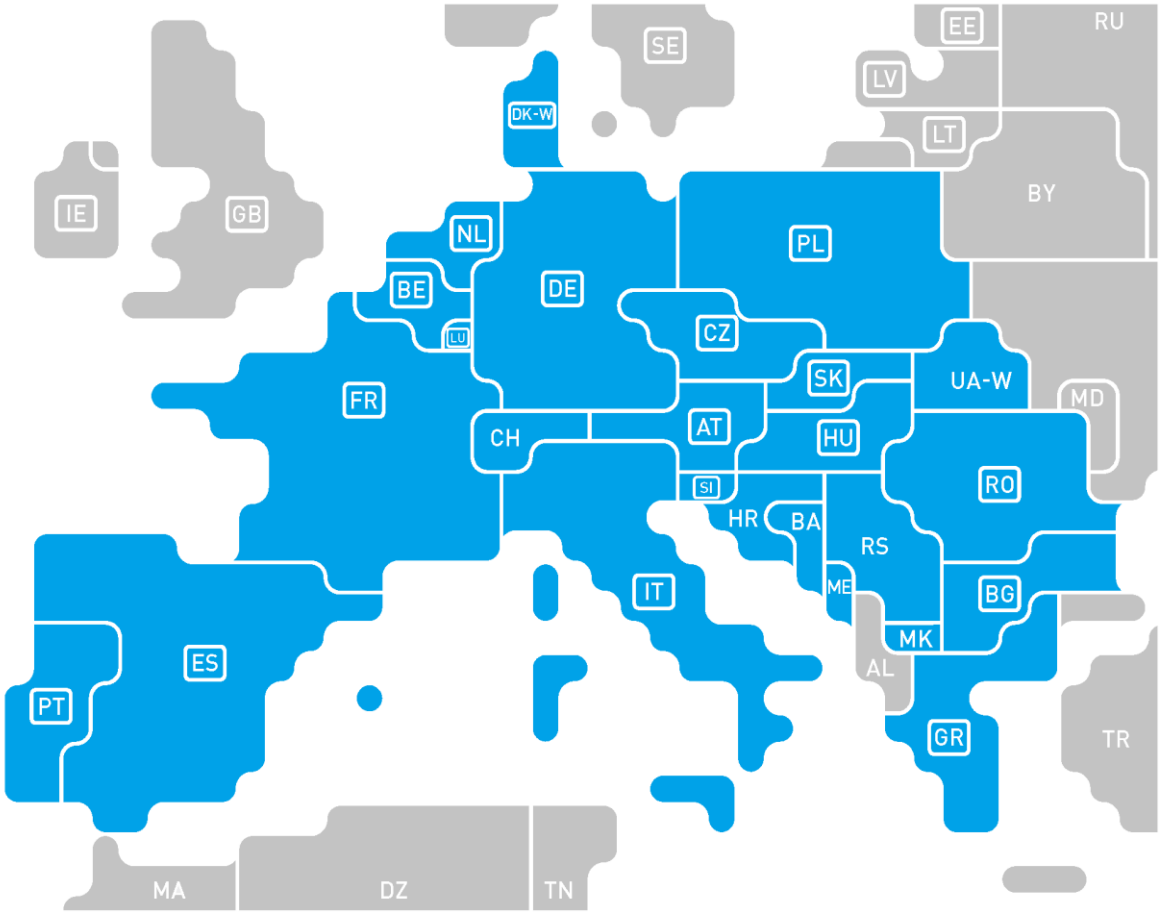
Since 1956:
The integrated European Electricity System



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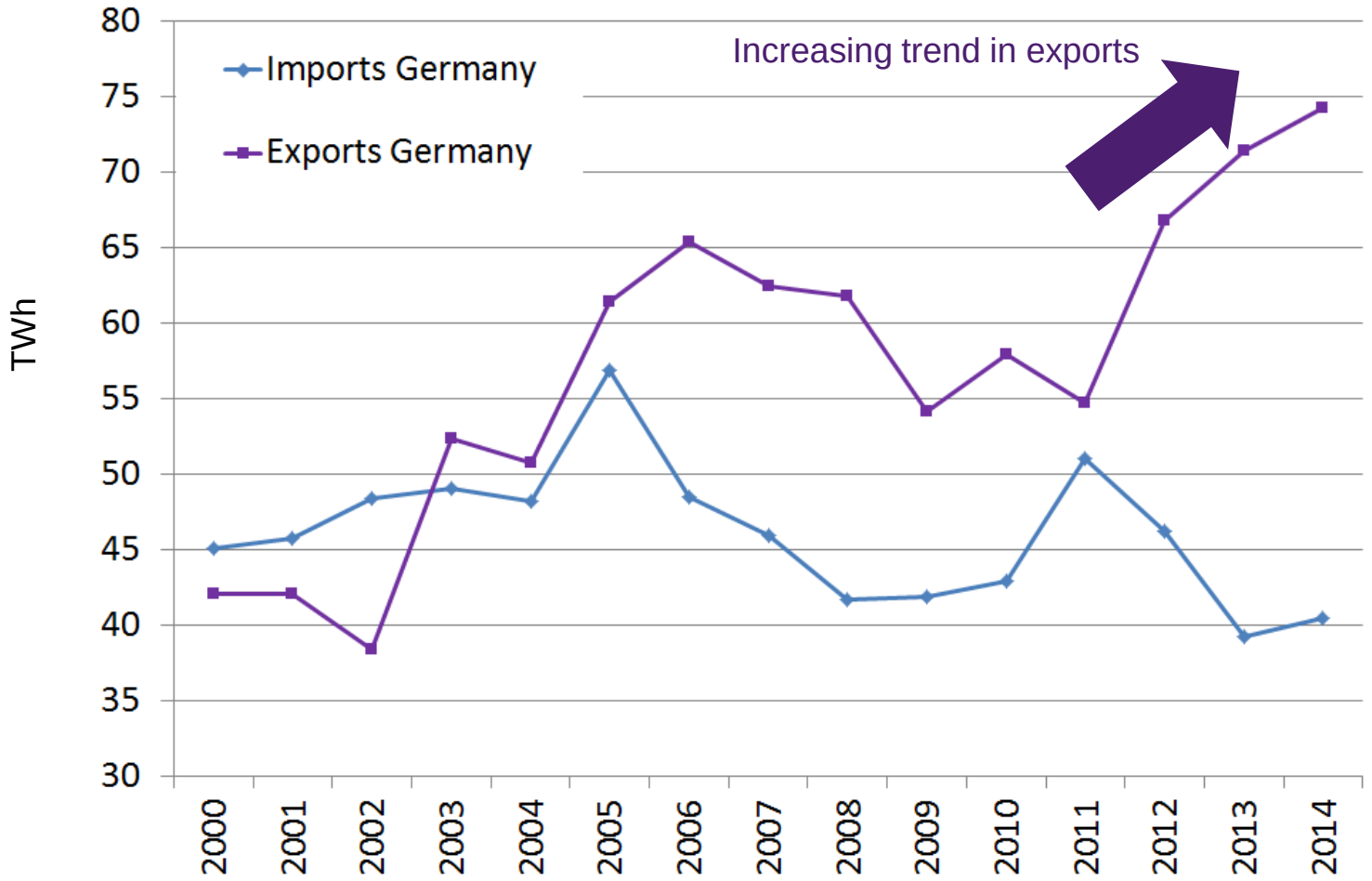
Trend towards a more dynamic system
Electricity Exchanges Germany until 2014



Source: Eurostat

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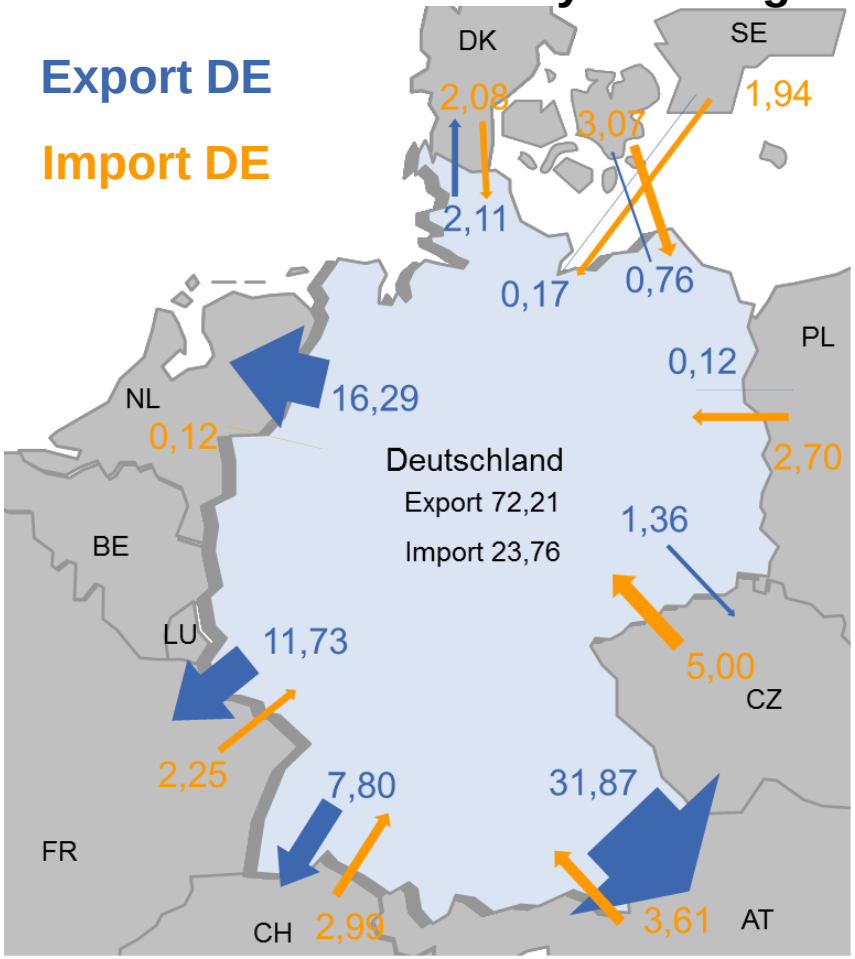
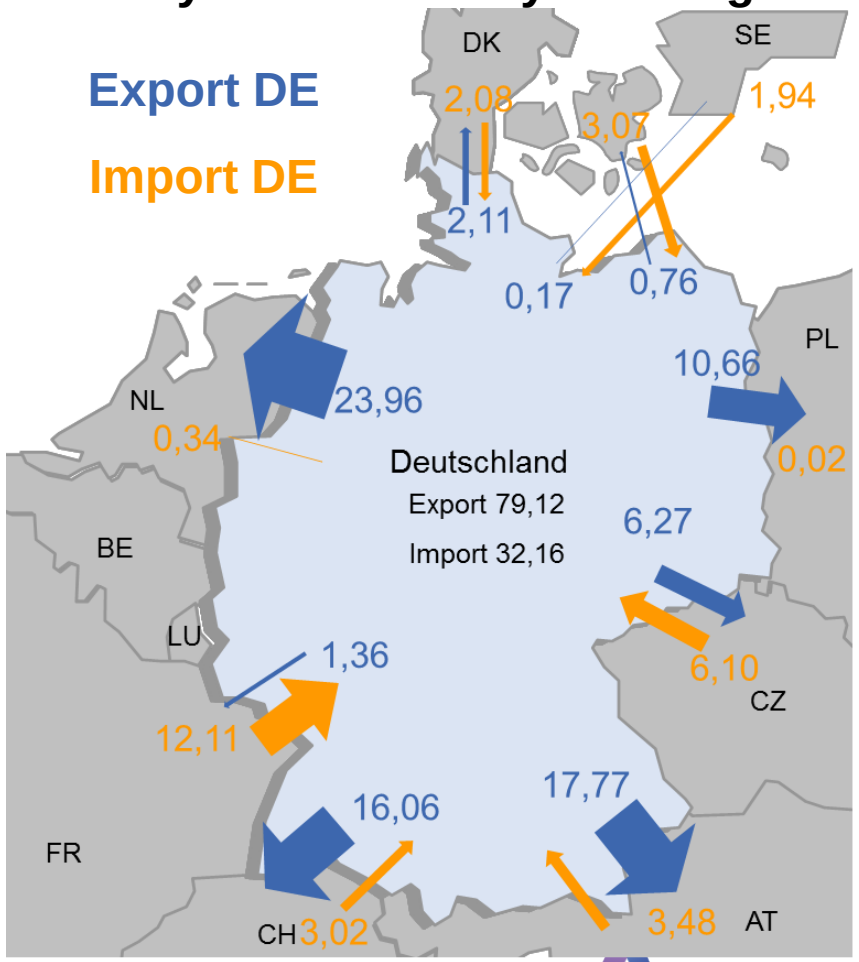
Trend towards a more dynamic system
Electricity Exchanges Germany in 2015

Commercial electricity exchange



Physical electricity exchange



Values in TWh - time period: Jan 2015 – Dec 2015; source: Amprion

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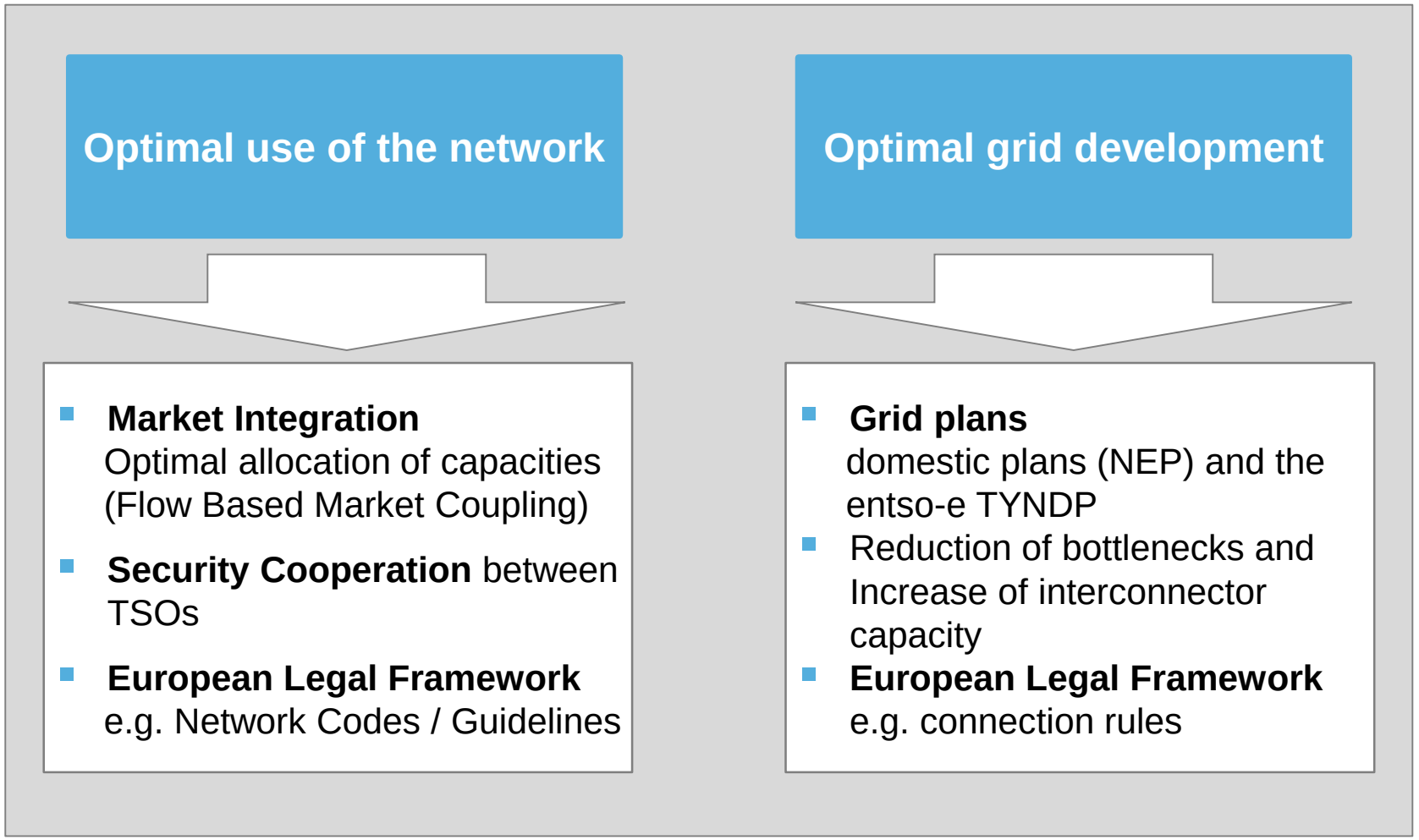
TSOs accommodate a more dynamic system



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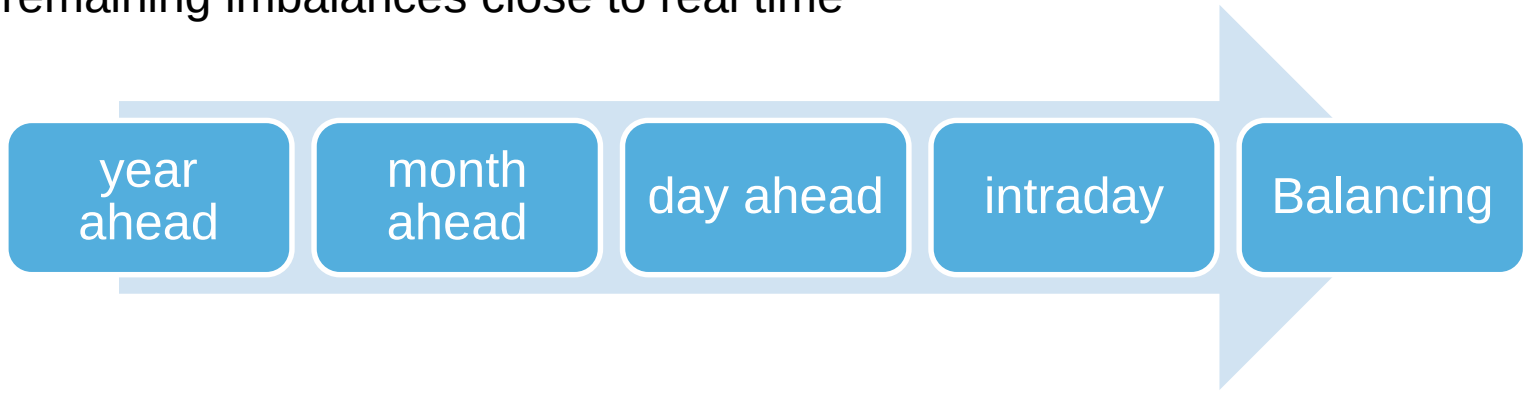
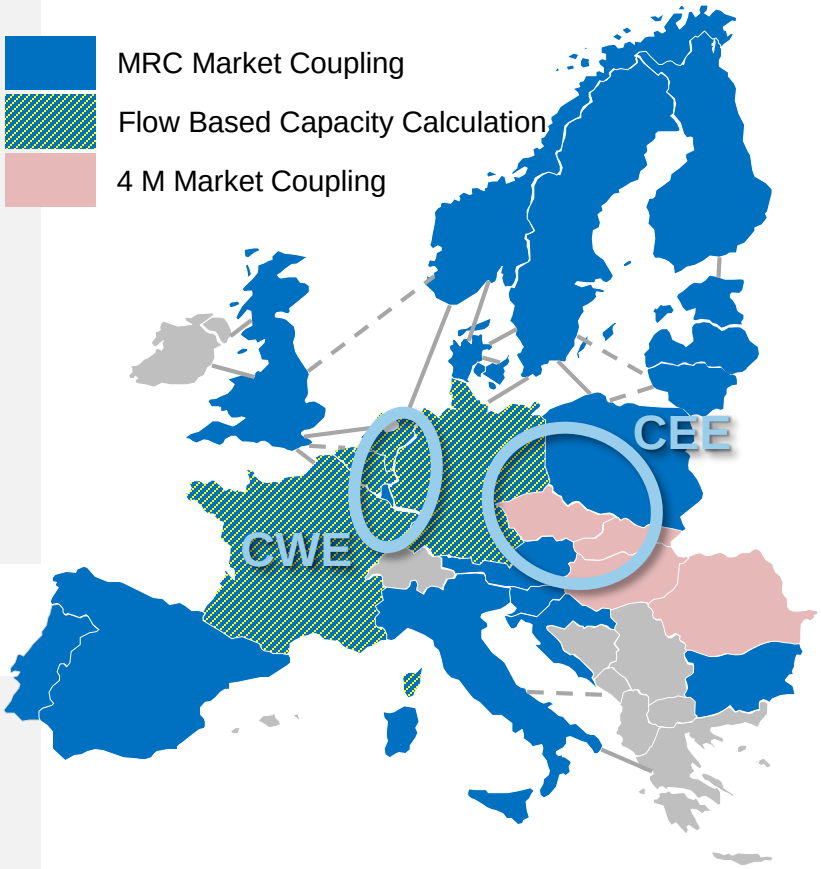
Electricity Market Integration in Europe

- The **emergence of European electricity markets** is a positive outcome of over a decade of successive **European Energy Liberalization**
- Organized market segments have been established for **various timeframes**
- Electricity can be traded across many borders with long lead-times (**year** and **month ahead**) and shorter lead-times (**day-ahead** and **intraday**) ahead of delivery
- Cross Border **Balancing** markets aim at procuring reserves to cover remaining imbalances close to real time



European Day Ahead Market Coupling Initiatives
A brief History

- TLC – Trilateral Market Coupling 2006
- MoU CWE Market Coupling 2007
- CWE Go Live 2010
- NWE Go Live Feb 2014
- SWE Integration May 2014
- The overall pan-European Market coupling: Multi-Regional Coupling (MRC)
- Already today MRC covers 75% of electricity consumption in Europe ➔ 2500 TWh



Flow Based Market Coupling (FBMC)

- Start of the CWE Market Coupling using the ATC-method for capacity calculation (FBMC)
- 7 years of development, incl. 2 years parallel run of ATC and flow based capacity calculation
- CWE - FBMC Go Live des in May 2015

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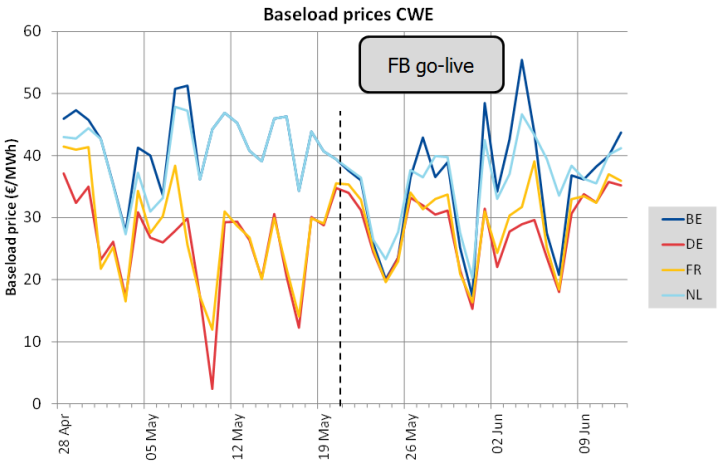
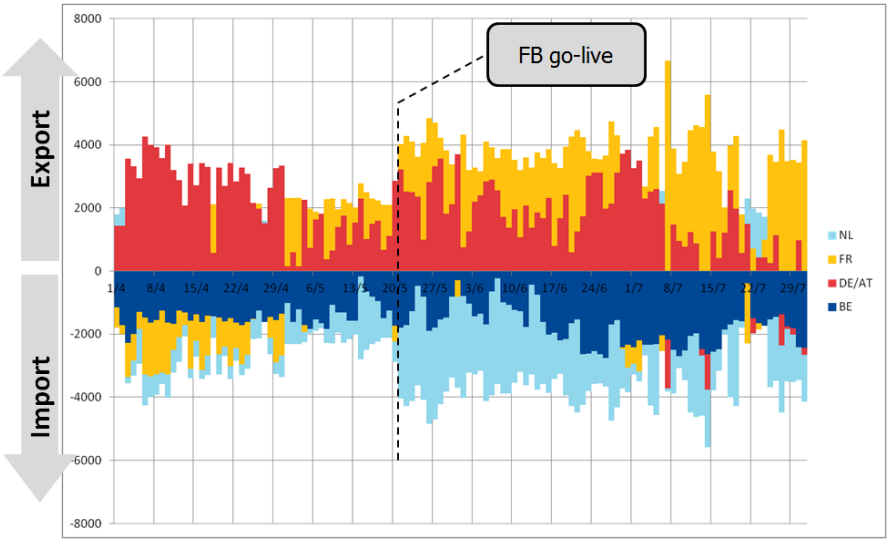
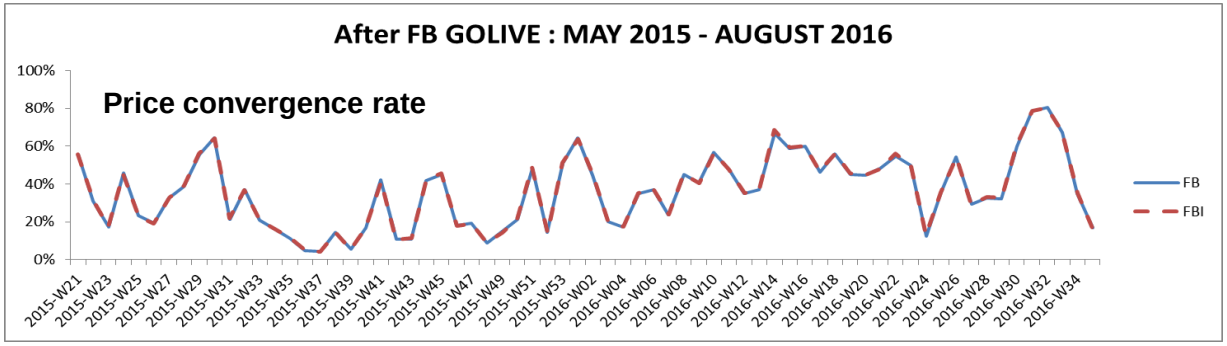
Result of the CWE Market Coupling
Price convergence in CWE



Market prices converge



Energy exchange increases



„copperplate“

Contradicting effects, e.g. volatile renewable injections

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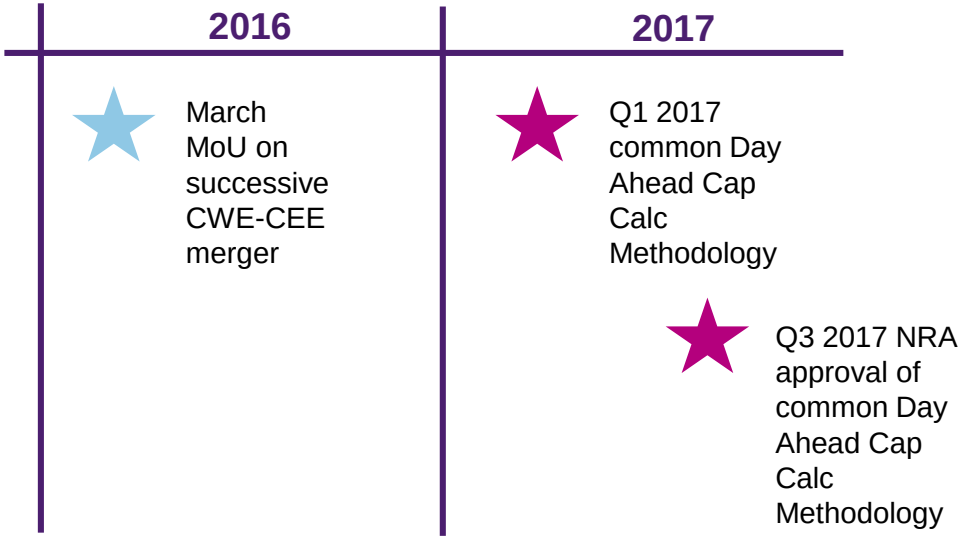
Day Ahead Market Coupling initiatives the next steps

MRC extension

- Successive integration of CWE and CEE capacity calculation regions
  - March 2016 signature of a Memorandum of Understanding (MoU)
  - Approval of a joint FB capacity calculation methodology envisaged for 2017



- Integration of the 4 M market coupling
- Continuous improvement of the FB Algorithm (use of PSTs, transformers, etc.)

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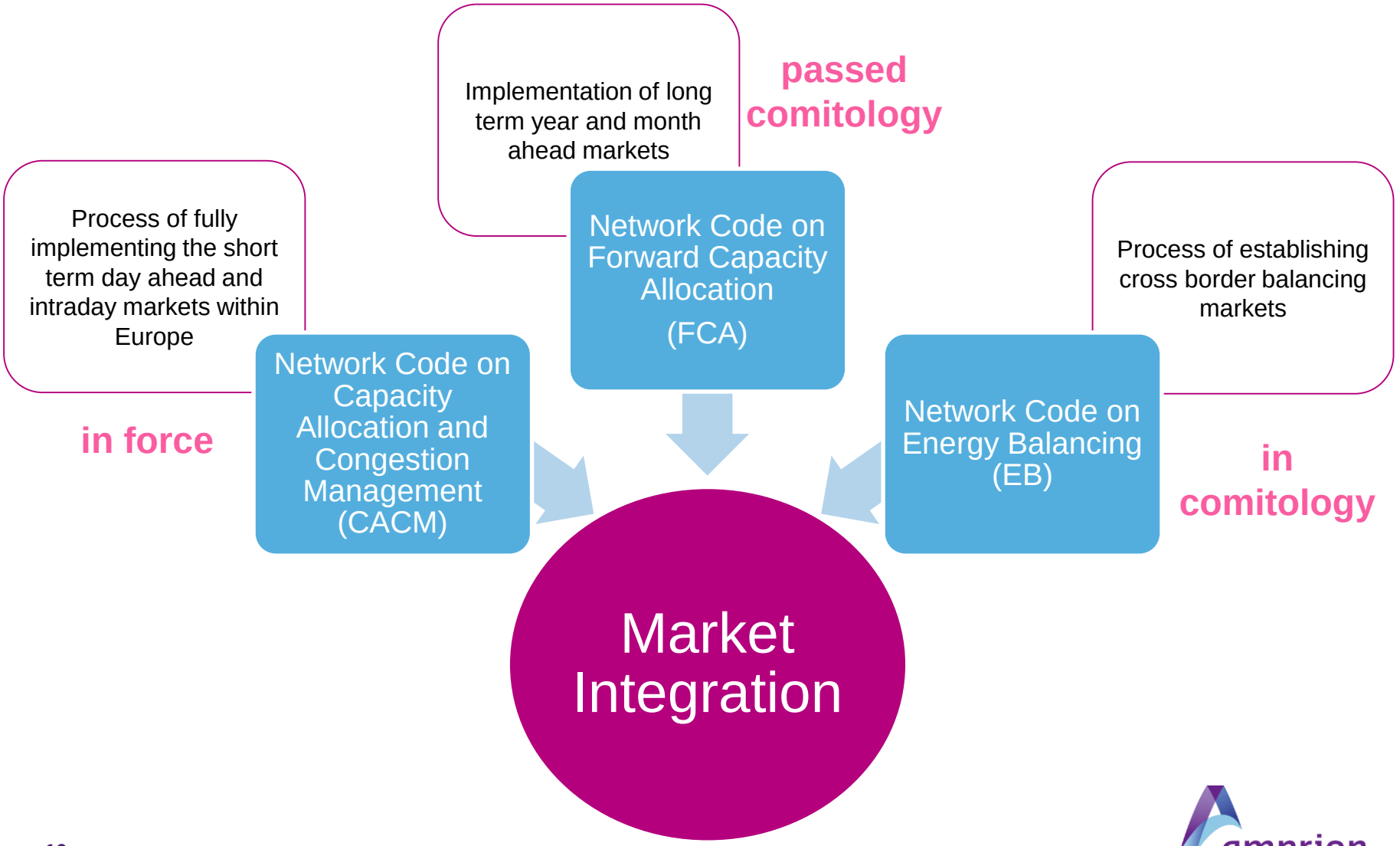
European Legal Framework: Market Integration specified in the Network Code framework



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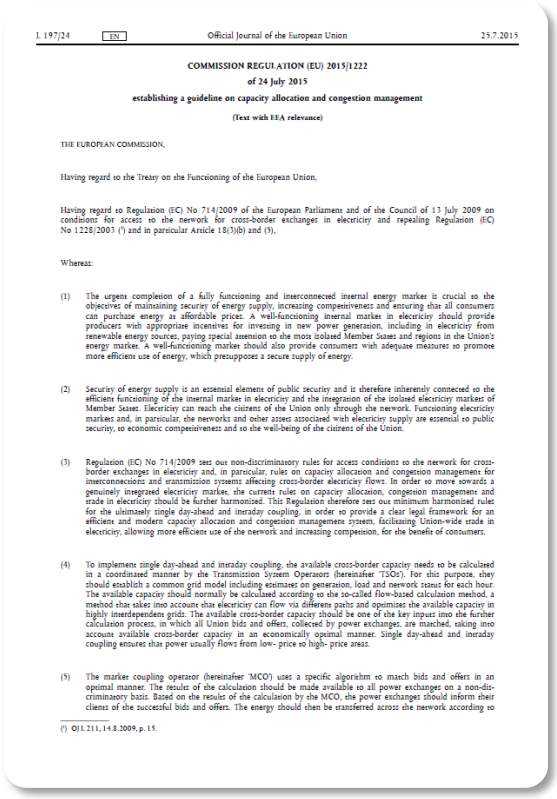
European Legal Framework for the Day Ahead and Intraday Market: CACM Guideline 2015/1222



L 197/24 EN Official Journal of the European Union 25.7.2015

COMMISSION REGULATION (EU) 2015/1222
of 24 July 2015
establishing a guideline on capacity allocation and congestion management
(Text with EEA relevance)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation (EC) No 1228/2003 (1) and in particular Article 18(3)(b) and (5),

Whereas:

(1) The urgent completion of a fully functioning and interconnected internal energy market is crucial to the objectives of maintaining security of energy supply, increasing competitiveness and ensuring that all consumers can purchase energy at affordable prices. A well-functioning internal market in electricity should provide producers with appropriate incentives for investing in new power generation, including in electricity from renewable energy sources, paying special attention to the most isolated Member States and regions in the Union's energy market. A well-functioning market should also provide consumers with adequate measures to promote more efficient use of energy, which presupposes a secure supply of energy.

(2) Security of energy supply is an essential element of public security and is therefore inherently connected to the efficient functioning of the internal market in electricity and the integration of the isolated electricity markets of Member States. Electricity can reach the citizens of the Union only through the network. Functioning electricity markets and, in particular, the networks and other assets associated with electricity supply are essential to public security, to economic competitiveness and to the well-being of the citizens of the Union.

(3) Regulation (EC) No 714/2009 sets out non-discriminatory rules for access conditions to the network for cross-border exchanges in electricity and, in particular, rules on capacity allocation and congestion management for interconnections and transmission systems affecting cross-border electricity flows. In order to move towards a genuinely integrated electricity market, the current rules on capacity allocation, congestion management and trade in electricity should be further harmonised. This Regulation therefore sets out minimum harmonised rules for the ultimately single day-ahead and intraday coupling, in order to provide a clear legal framework for an efficient and modern capacity allocation and congestion management system, facilitating Union-wide trade in electricity, allowing more efficient use of the network and increasing competition, for the benefit of consumers.

(4) To implement single day-ahead and intraday coupling, the available cross-border capacity needs to be calculated in a coordinated manner by the Transmission System Operators (hereinafter 'TSOs'). For this purpose, they should establish a common grid model including estimates on generation, load and network status for each hour. The available capacity should normally be calculated according to the so-called flow-based calculation method, a method that takes into account that electricity can flow via different paths and optimises the available capacity in highly interdependent grids. The available cross-border capacity should be one of the key inputs into the further calculation process, in which all Union bids and offers, collected by power exchanges, are matched, taking into account available cross-border capacity in an economically optimal manner. Single day-ahead and intraday coupling ensures that power usually flows from low- price to high- price areas.

(5) The market coupling operator (hereinafter 'MCO') uses a specific algorithm to match bids and offers in an optimal manner. The results of the calculation should be made available to all power exchanges on a non-discriminatory basis. Based on the results of the calculation by the MCO, the power exchanges should inform their clients of the successful bids and offers. The energy should then be transferred across the network according to

(1) OJ L 211, 14.8.2009, p. 15.

- Development of methodologies and regulatory approvals in several areas, e.g.
  - Common Grid Model
  - Capacity Calculation regions and methodologies
  - Redispatching of cross border relevance
  - Day Ahead and Intraday Market features, e.g. Algorithm requirements
  - Congestion Revenue Distribution
  - Bidding Zone Configuration
  - Monitoring
- Successive implementation over the next years

2016 → **2017** → **2018** → **2019**

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Optimal grid development: complete alignment of European and German grid planning

- German Grid development plan (NEP) and the entso-e 10-Year Network Development Plan (TYNDP) are released in 2 year time intervals

- development of new projects
- assessment of their impact on the electricity system (e.g. n-1 criterion)

- Evaluation of projects based on a cost-benefit analysis
- No identification of new measures (apart from interconnector projects)

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The Amprion cross border grid development Projects of Common Interests

- EU regulation 347/2013 is the basis for identifying **Projects of common Interest - PCI**
- Criteria for obtaining PCI Status:
  - Capacity Increase of at least 500 MW at one border
  - Project demonstrates positive impact on RES integration
  - Positive Cost Benefit Analysis result (TYNDP)

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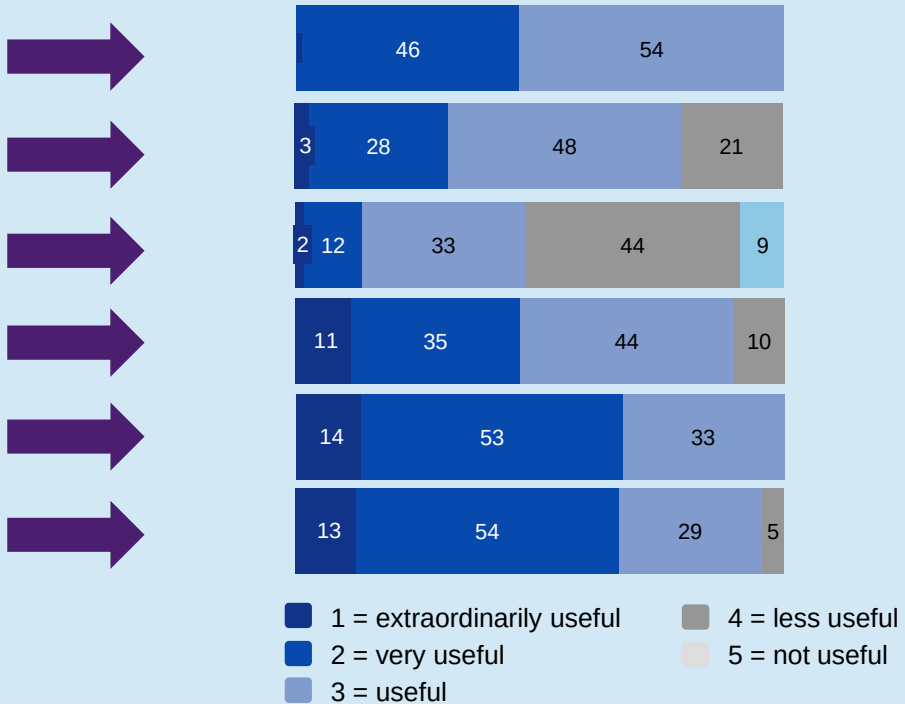
European Market Integration
The opinion of our customers

measure	not known	known
European Market Coupling	44%	57%
Introduction of Network Codes	33%	67%
Further strengthening of ENTSO-E an ACER	16%	84%
Regional cross border cooperation	36%	64%
Increased cooperation in the European Balancing Market	18%	82%
TYNDP	44%	56%



Our customers are aware of the ongoing European initiatives.
There are diverse views on their usefulness.

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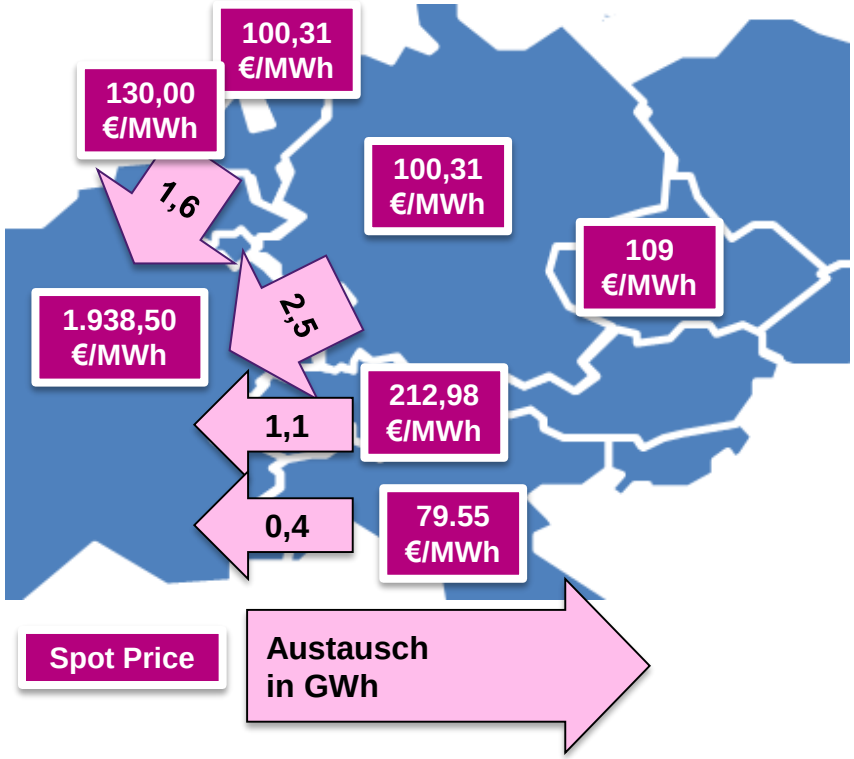
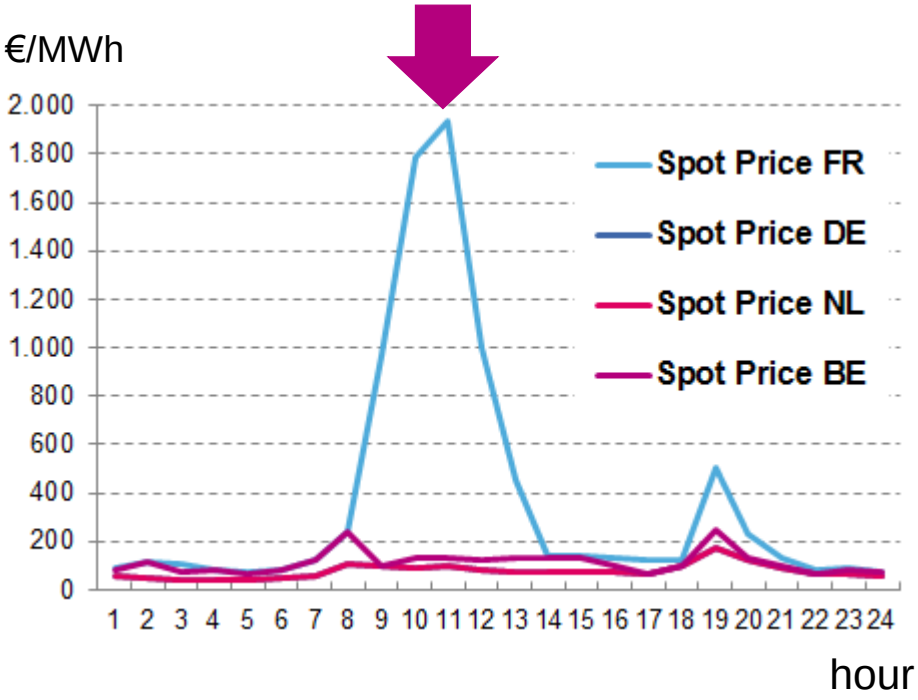
The European dimension of Generation adequacy is a further challenge: France 2012

09.02.2012 10:00-11:00 Uhr



Feb 09, 2012



Also in scarcity situations, electricity exchanges are determined by market results

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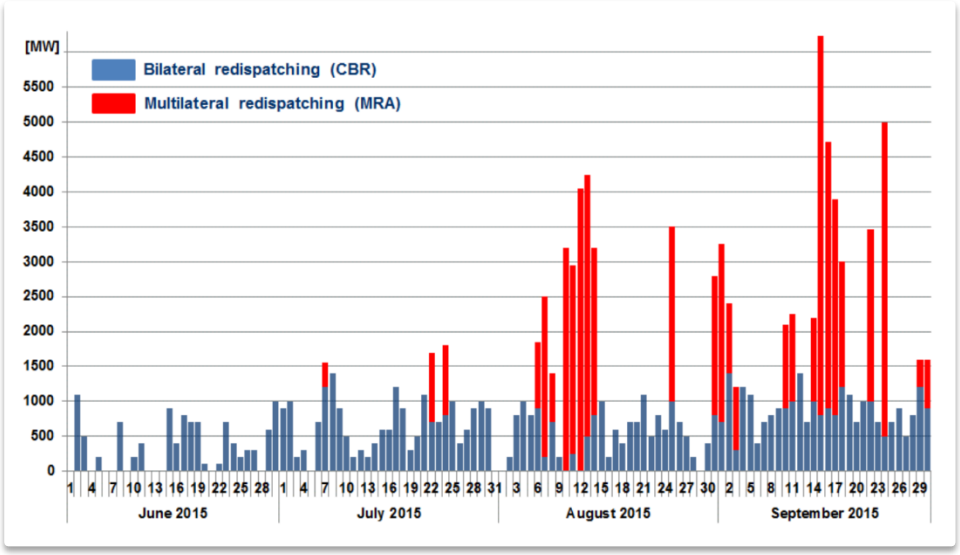
The European dimension of Generation adequacy is a further challenge: Poland 2015



Source:
ENTSO-E winter outlook 2015/16
& summer review

- Heatwave in August 2015
- Unavailability of Generation facilities
- Additional network constraints
- Measures taken by the Polish TSO PSE:
  - Domestic Redispatching
  - Demand Side Management
  - Cross Border Redispatching

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A brief Summary …

- A more dynamic system is emerging
- TSOs accommodate a more dynamic system: Security Cooperation, Grid development, Market facilitation – today and in future
- A European legal framework covering all aspects is already in place

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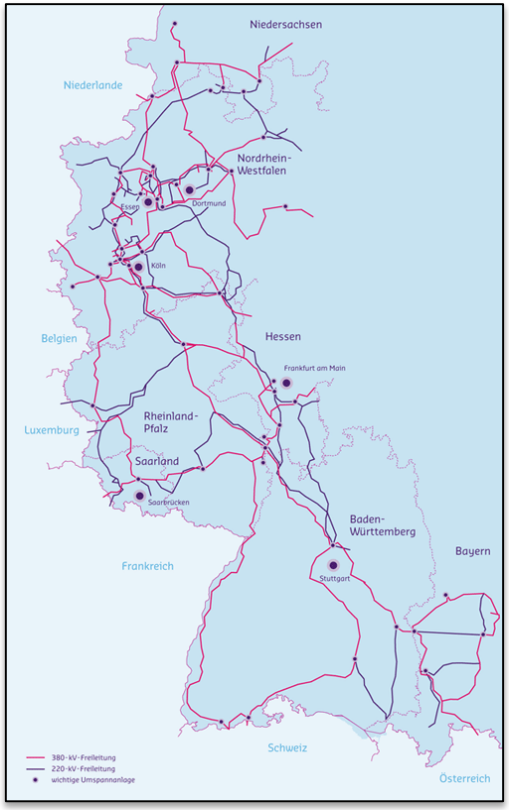
Amprion in Europe



SECURITY SERVICE CENTRE

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TSC
Transmission System Operator Security Cooperation

JAO
Joint Allocation Office

entsoe
Reliable Sustainable Connected

XBID

NWE Market Coupling
CWE Market Coupling

Thank you for your attention !

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