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Hydropower Investment Promotion Project (HIPP)

COMPETITIVE ENERGY MARKETS AND CROSS-BORDER TRADING

JAN ZAKRAJŠEK

TBILISI, AUGUST 2010

OUTLINE

- **C**OMPETITIVE ENERGY MARKET
- **M**ARKET DESIGN
- **W**HOLESALE ENERGY MARKET
- **E**U ENERGY MARKET
- **S**EE ENERGY MARKET
- **C**ROSS-BORDER CONGESTION MANAGEMENT METHODS
  - **I**MPLICICIT ALLOCATIONS
  - **E**XPLICIT ALLOCATIONS
  - **M**ARKET COUPLING/SPLITTING

WHY TO INTRODUCE COMPETITIVE ENERGY MARKET?

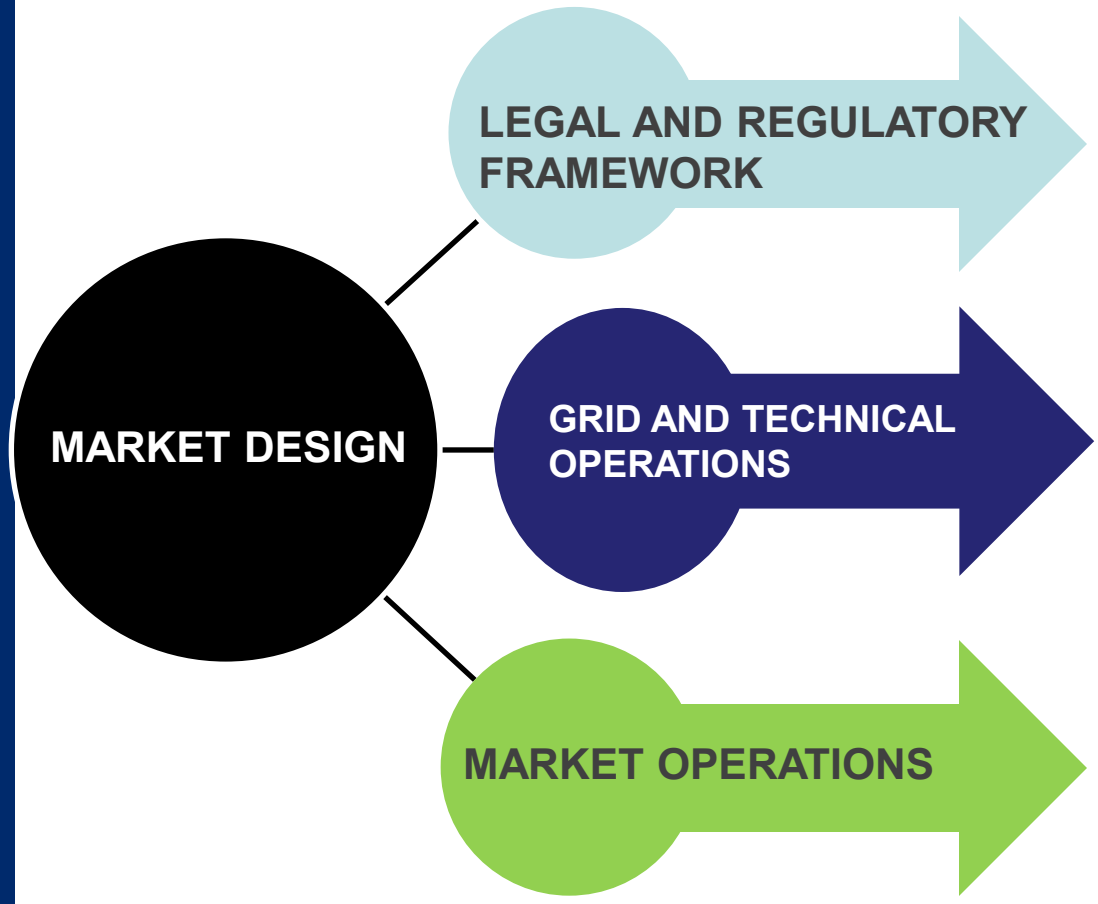
- Benefits of introducing competition
  - Efficiency
    - Lower costs > Add value > Increase margins > Economic growth > Social welfare
  - Fair market price
    - Clear signal for investors > New investments > Economic growth > Social welfare

MAIN PRINCIPLES OF COMPETITIVE ENERGY MARKET

- Transparent and non-dicriminatory access (exit) to the market
- Availablility and accuracy of market information
- Efficient administration and market operations
- Managing the risks
- Legal unbundling and privatisation of commercial services

MARKET DESIGN FRAMEWORK

Market design shall deliver the results set by the energy policy.



- ❑ Energy licensing
- ❑ Tariffication
- ❑ Green mechanisms
- ❑ Environmental issues
- ❑ Infrastructure investment
- ❑ Transmission rights
- ❑ CB capacity allocations
- ❑ Ancillary services
- ❑ Balancing requirements
- ❑ Imbalance settlement
- ❑ Scheduling protocols

REGULATORY FRAMEWORK OF COMPETITIVE MAREKT (I/II)

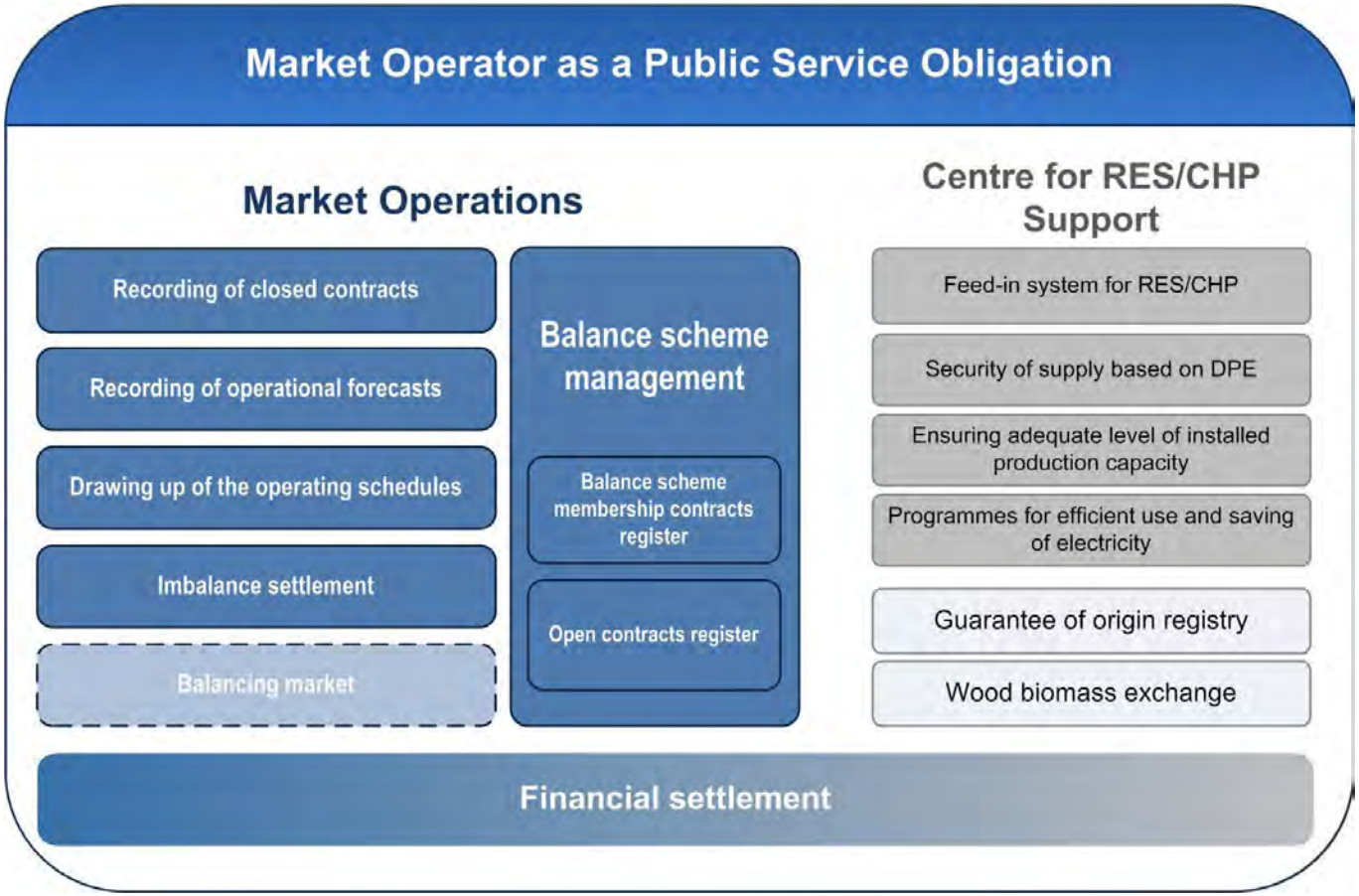
- **Government**
  - Energy Act
- **Ministry**
  - Decrees on Performance of Public Services - TSO, DSO, MO
  - Decrees related to Small Renewable Producers
  - Decree on the Licenses for Energy Activities
- **Regulator Agency**
  - Methodologies for Grid Fee calculation
  - Rules for obtaining and revoking energy license

REGULATORY FRAMEWORK OF COMPETITIVE MAREKT (II/II)

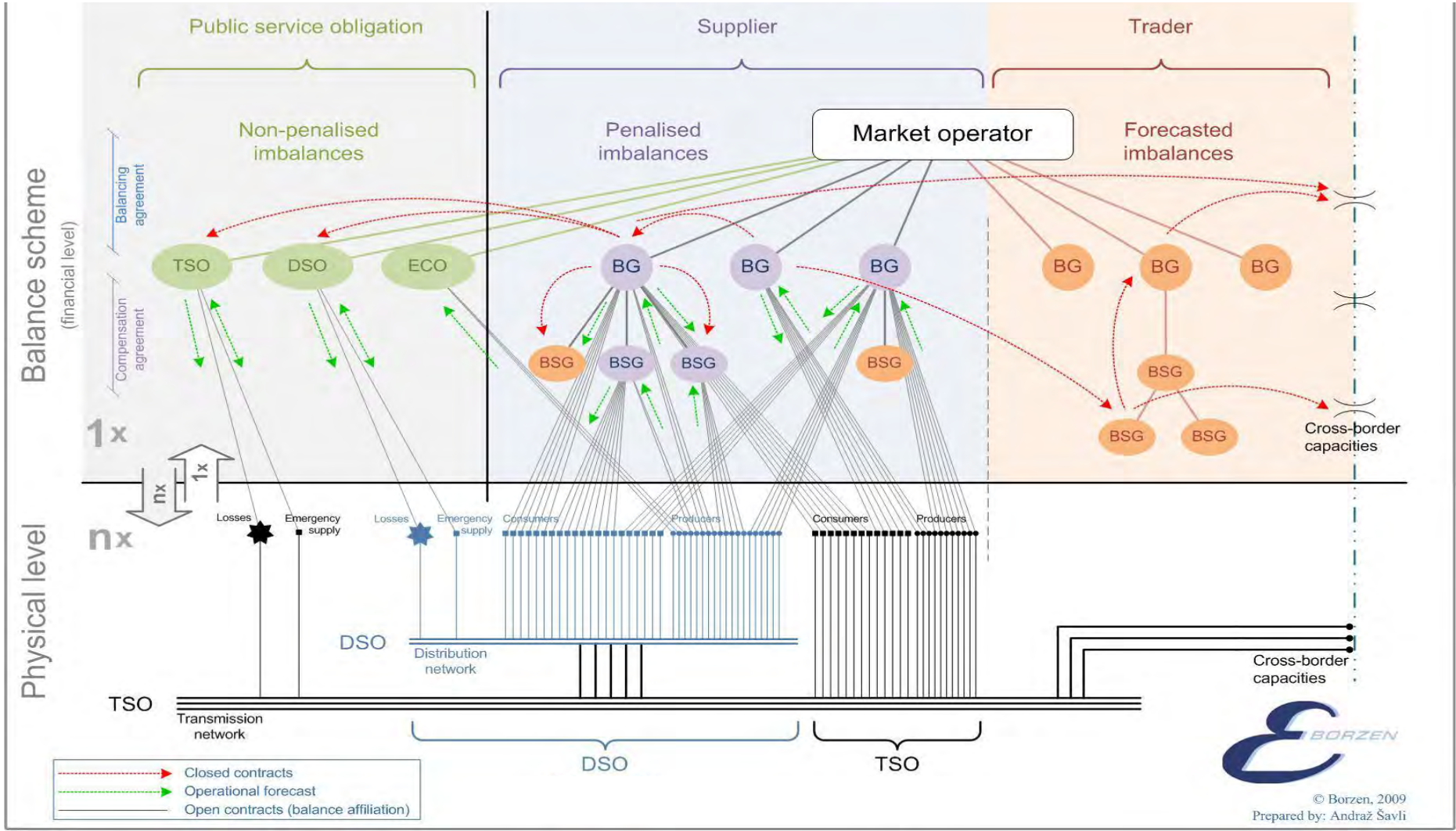
- **Transmission System Operator**
  - Transmission Grid Code (approved by REG + GVT)
  - Rules on Access to Cross-border Capacity (approved by REG + GVT)
- **Distribution System Operator**
  - Distribution Grid Code (approved by REG + GVT)
- **Market Operator**
  - Market Rules (approved by REG + GVT)
  - Balancing Market Rules (approved by TSO + REG)
  - Renewables Support Scheme Code (approved by GVT)

THE ROLE OF MARKET OPERATIONS

Example of Slovenian Market Operator BORZEN



EXAMPLE OF BALANCE SCHEME (BORZEN, SLOVENIA)



WHOLESALE ENERGY MARKET

An opportunity for buyers and sellers to:

- Compare prices and search for arbitrage opportunities
- Estimate portfolios:
  - Sell surpluses
  - Buy deficits

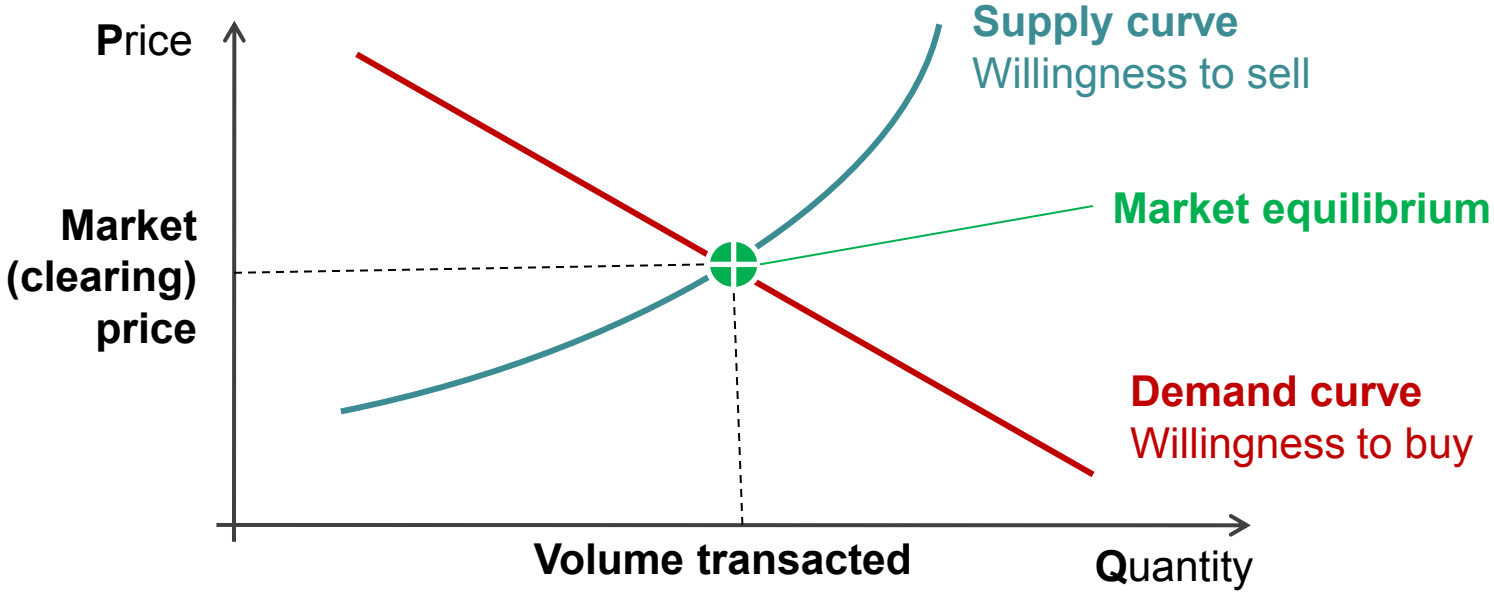
The result is a **market equilibrium** between supply and demand.

WHOLESALE ENERGY MARKET II/II

Market equilibrium

– brings economic and social welfare

- Market price
- Volume transacted

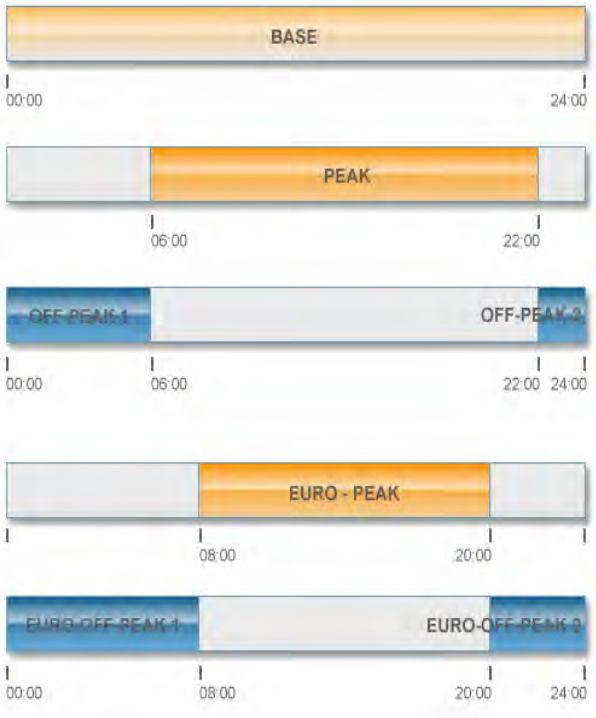


PRODUCTS DEFINITION

- **Physical hourly products**
  (00-01, 01-02, 02-03……. 23-00)

- **Physical block products**
  Base, Peak , Off-peak, EU-peak, EU-Off-peak…

- **Financial products**
  Futures, Forwards, Options, etc.



MARKET RELATIONSHIPS

- **Bilateral**
  - Market participants are concluding transactions bilaterally
- **OTC**
  - Concluding transactions through intermediate/broker

    GFI, ICAP, SPECTRON, etc.
- **Organized wholesale markets**
  - Mandatory Pool

    HTSO - Greece, NordPool - Scandinavia , Opcom – Romania
  - Power Exchange

    SouthPool - Slovenia, EEX - Germany/France, EXAA - Austria, etc.

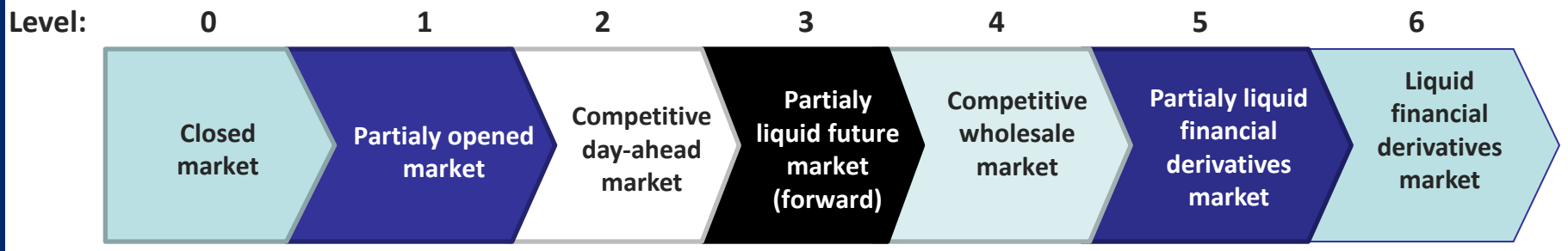
MARKET RELATIONSHIPS

Market	Bilateral markets	Brokerage (OTC)	Organized wholesale markets
Relationships	Bilateral relationships / Agreements, EFET	Intermediaries / Brokers	Exchanges
Regulation	Non-regulated	Non-regulated	Regulated
Products	Non-standardized products, EFET	Standardized and non-standardized products	Standardized products
Partner	Known partners	Anonymity varies	Anonymity
Principle	Phone, email	Phone, email, platform	Online platform
Prices	Non-transparent prices	Non-transparent / Transparent prices	Transparent prices
Costs	No transaction costs	Low transaction costs	Transaction costs
Risk	Counterparty risk	Counterparty risk	No counterparty risk
Admission	No admission	Simple admission	Complex admission

MARKET TIMEFRAME

Intra - Day	Day and Week Ahead	Long term (M,Q,Y,2Y,3Y)
Physical market	Physical market	Financial and physical market
Hourly products	Hourly and block products	Physical and financial products (futures, options…)
Continous trading/ Auctioning	Auctioning / Continous trading / Bilateral	Continous trading / Bilateral
Imbalance settlement	Portfolio management	Risk management
Operational dependence	Weather and operational dependence	Long-term planning

MARKET DEVELOPMENT



- Non-liquid bilateral market
- Few (private) market participants.

- Liquid day-ahead bilateral market
- Partialy liquid organised DAM
- Some (private) market participants

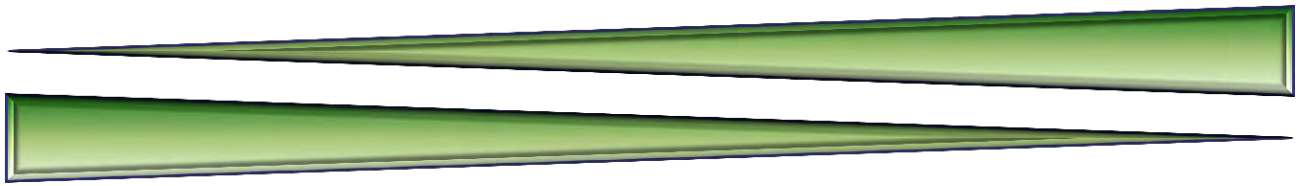
- Sufficient market volume on DAM
- Increased number of market participants
- Development of a price index

- Introduction of long term products
- Portfolio management development

- Liquid day ahead and long term market
- Many market participants
- Perfect competition

- Market participants with a need for a risk management products

- Market participants with a need for a complex risk management products



Financial vs. physical trading ratio	~0:1	~0:1	~1:1	~3:1	~5:1	>10:1

EU ENERGY MARKET

- **European market EU-27**

  450 million customers, total consumption 3.000 TWh

- **Liberalization process**

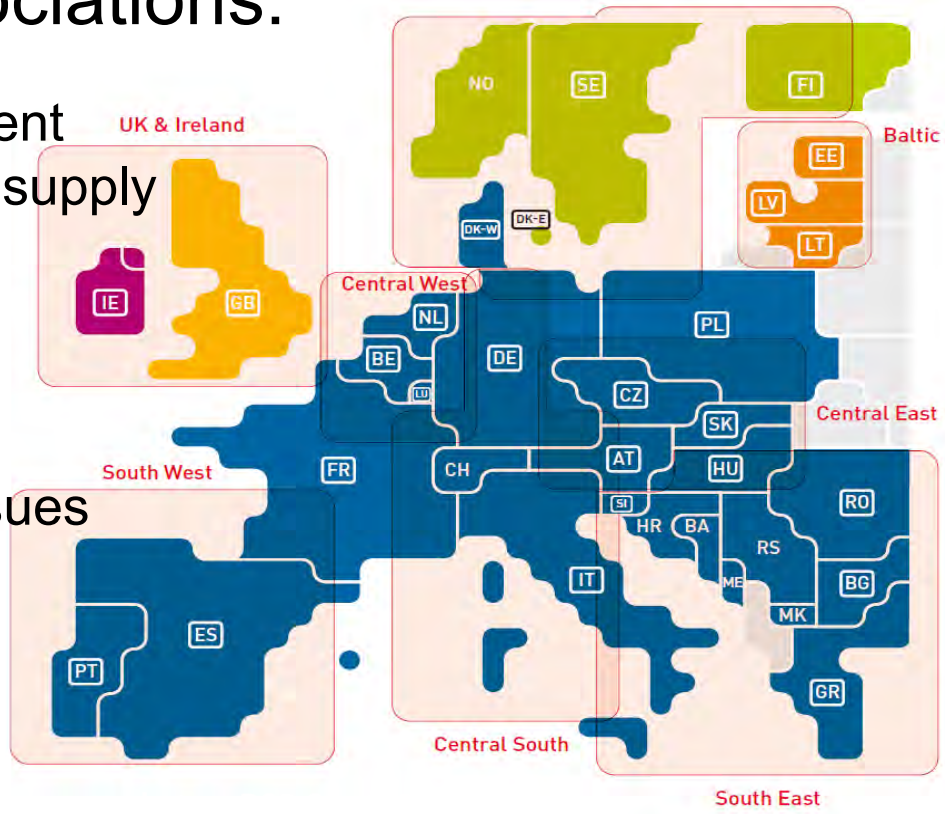
  Started in 1990's with rules for the internal market in electricity, Directive **96/92/EC** and Directive **2003/54/EC.**

- **The internal energy market** contributes to:
  - establishing healthy competition,
  - securiting of energy supplies,
  - reinforcing the competitiveness of the European economy, and
  - a better use of existing cross-border capacities.

Transmission System Operations – ENTSO-e

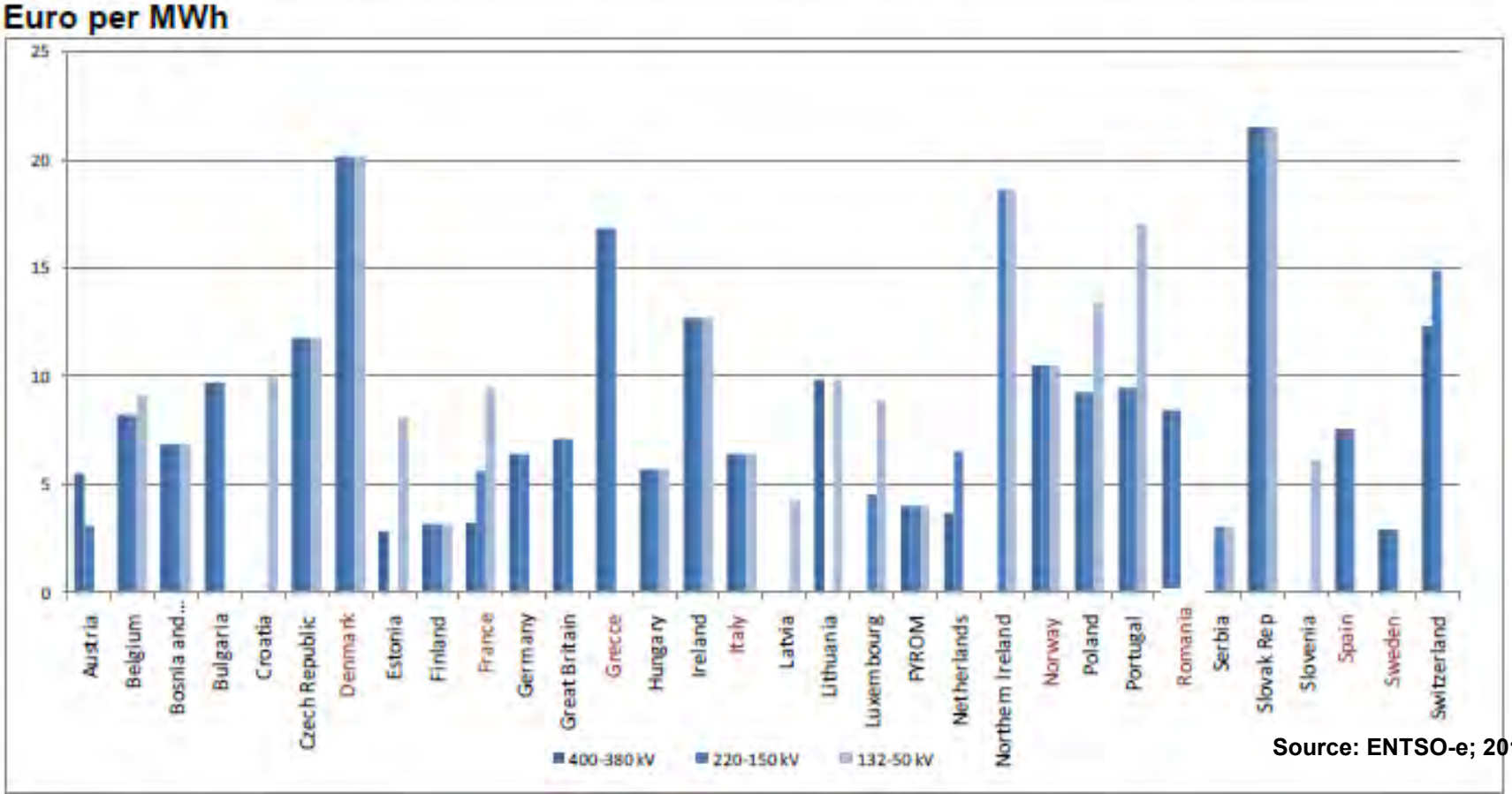
- Performed by 42 TSOs from 34 countries
- Activities among 6 associations:

- Reliable operations and management
- Technical evolution and security of supply
- Market integration
- Network development statements
- Network codes
- Consultation with stakeholders and
- Positions towards energy policy issues



Transmission System Operations – ENTSO-e

Comparison of transmission tariffs: sum of generation and load fees

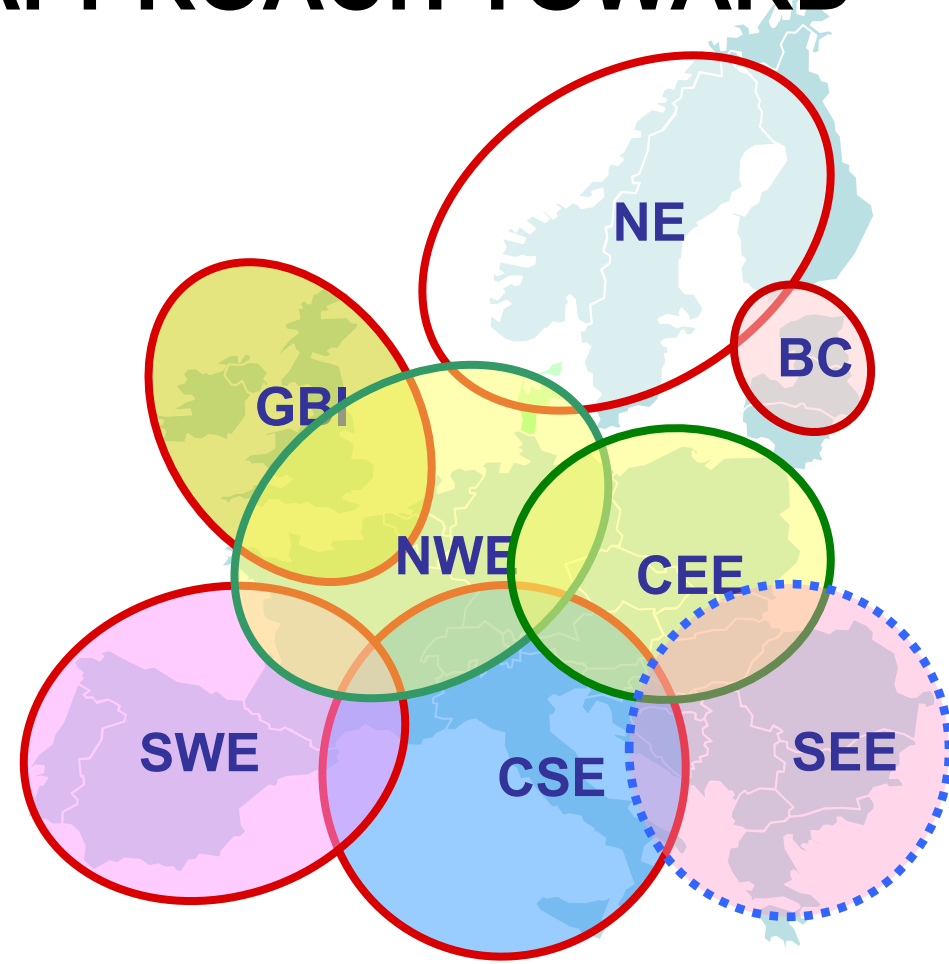


Source: ENTSO-e; 2010

REGIONAL MARKET APPROACH TOWARD SINGLE MARKET

A STEP-BY-STEP APPROACH

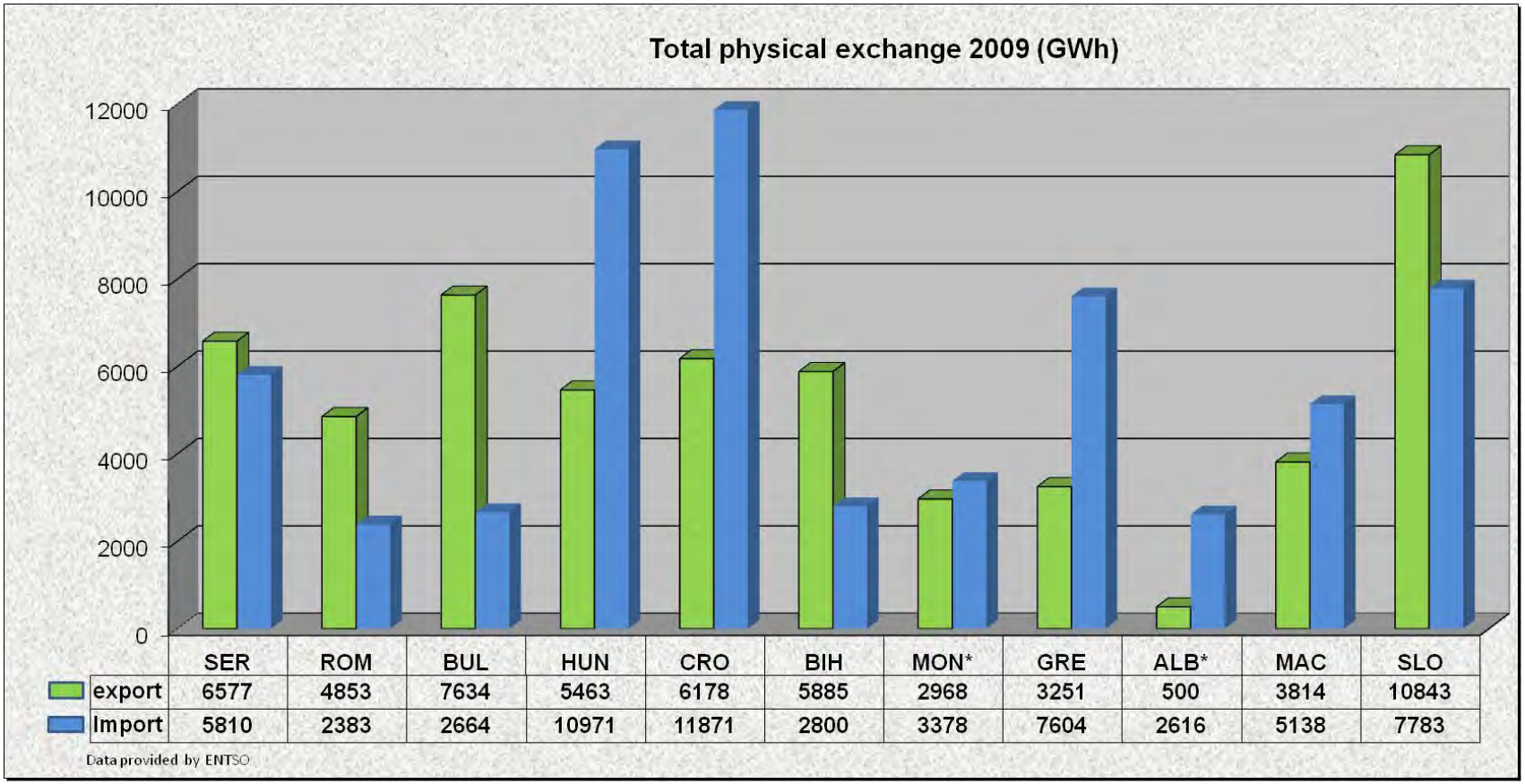
- MARKET OPENING
- HARMONISATION OF MARKET RULES / DESIGNES
- HARMONISATION OF NETWORK TARIFFICATION SYSTEMS
- HARMONISATION OF CONGESTION MANAGEMENT METHODS



SEE CROSS-BORDER TRADING

Total physical export in SEE was 58 TWh in 2009

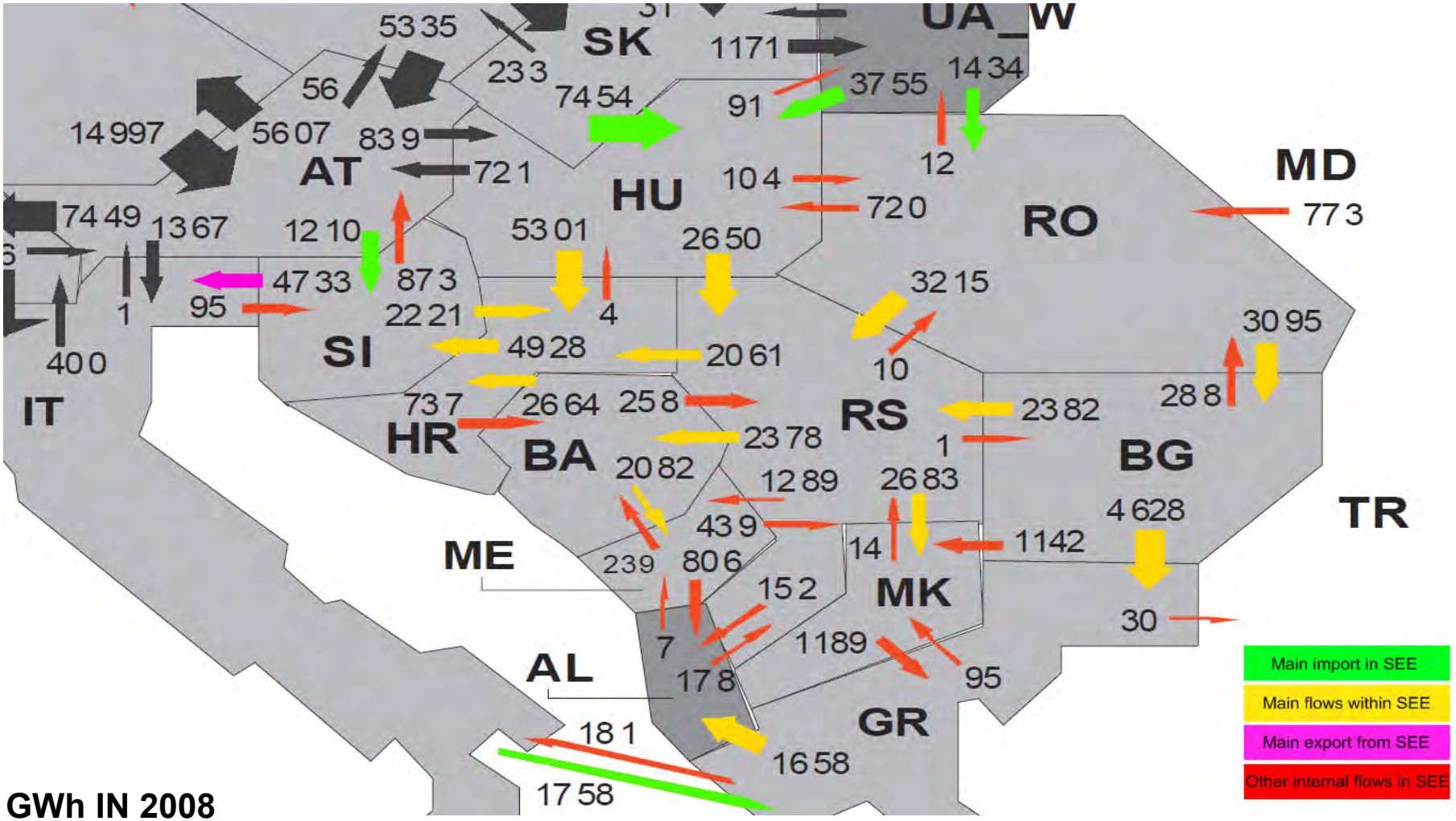
Total physical import in SEE was 63 TWh in 2009



	SER	ROM	BUL	HUN	CRO	BIH	MON*	GRE	ALB*	MAC	SLO
export	6577	4853	7634	5463	6178	5885	2968	3251	500	3814	10843
Import	5810	2383	2664	10971	11871	2800	3378	7604	2616	5138	7783

Data provided by ENTSO

CROSS-BORDER FLOWS IN SEE



GWh IN 2008

CROSS-BORDER CONGESTION MANAGEMENT METHODS

TRANSMISSION CAPACITY DEFINITION

Total transfer capacity (TTC)

Is the maximum exchange program between two areas

Transmission reliability margin (TRM)

Is a security margin that incorporates uncertainties about the calculated TTC values

Net transfer capacity (NTC)

Defined as NTC=TTC–TRM, is the maximum exchange program between two areas compatible with security standards

Already allocated capacity (AAC)

Is the total amount of allocated transmission rights including capacity or exchange programs.

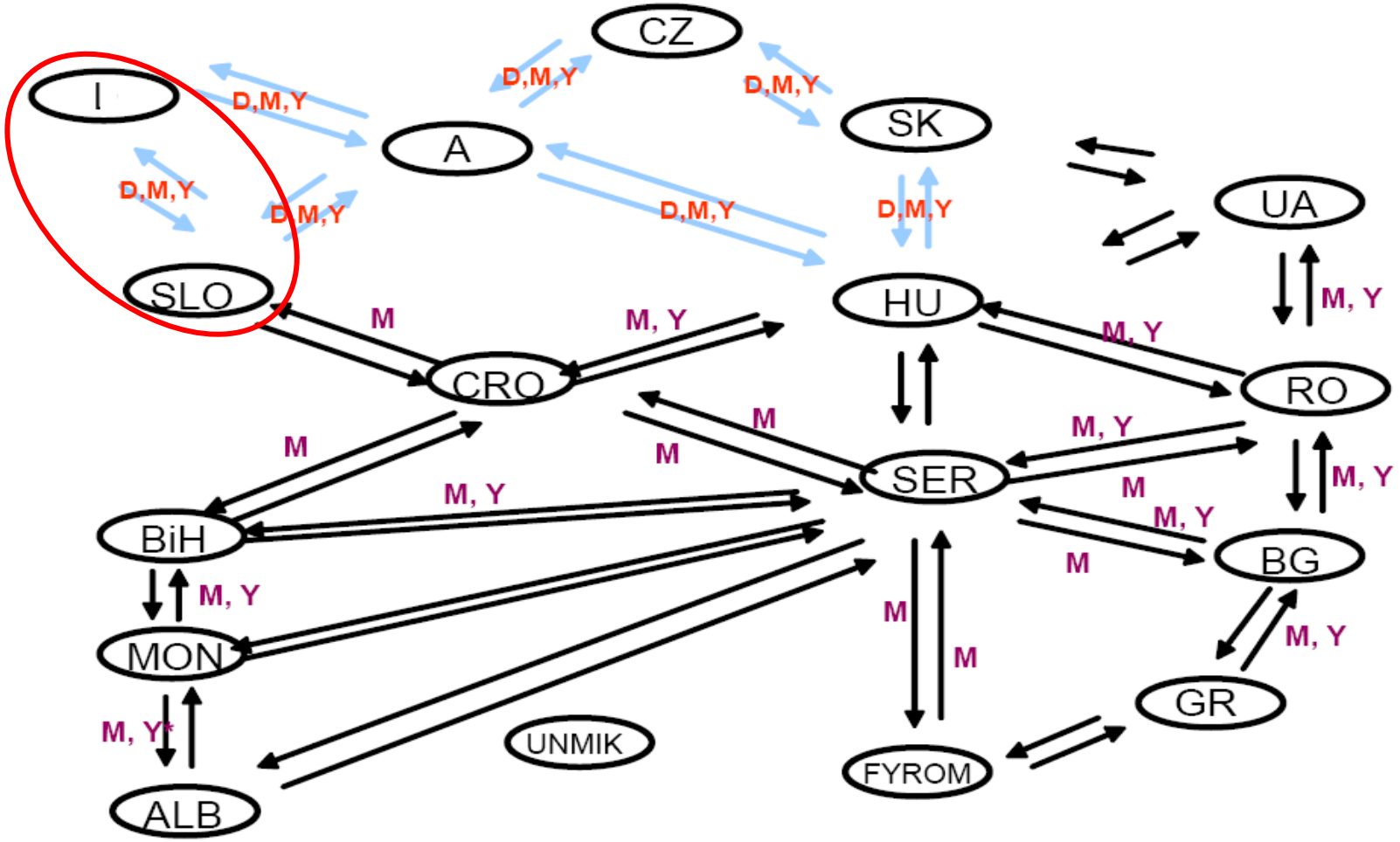
Available transmission capacity (ATC)

Defined as ATC=NTC–AAC, is the portion of NTC that remains available after each phase of the allocation procedure for additional commercial activity.

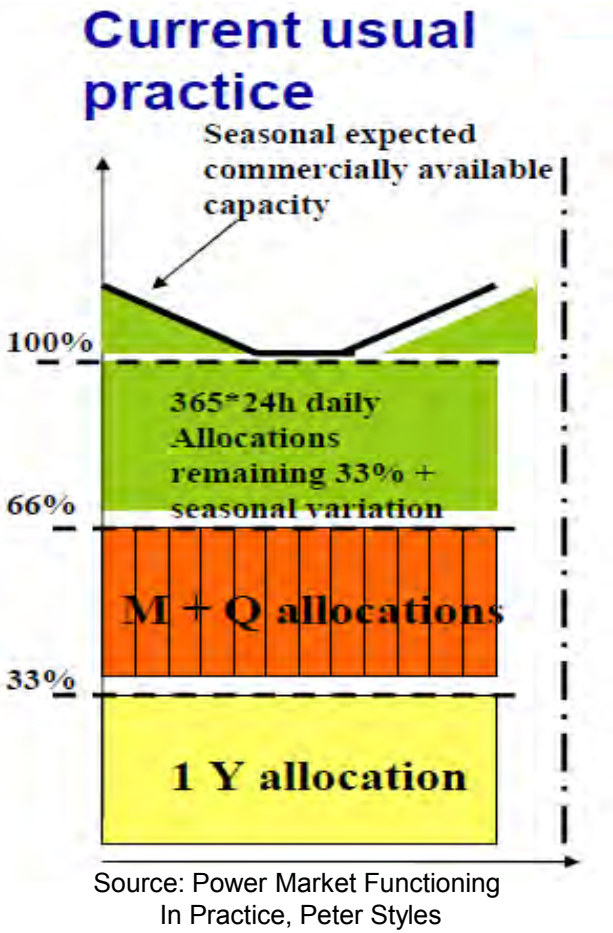
RIGHTS AND OBLIGATIONS ARISING FROM ALLOCATED PTR

- Gives the right to the holder for nomination of cross-border contracts,
- Gives the right and obligation to the holder to notify (schedule) the cross-border transfer,
- Allow the holder to use it or not (UILI or UISI conditions)

Capacity Allocation in SEE and CEE



Timeframe of allocated CB capacity



Source: Power Market Functioning In Practice, Peter Styles

- **Yearly** > UIOSI on monthly basis
- **Quarterly** > UIOSI on monthly basis
- **Monthly** > UIOSI on daily/weekly basis
- **Weekly** > UIOSI on daily basis
- **Daily** UIOLI
- **Intra-Daily** UIOLI
- **Balalancing**

Level of coordination (I/II)

– **Unilateral Allocation**

The issuer of cross-border rights is offering only the share 'belonging' to the market it represents

– **Joint Allocation**

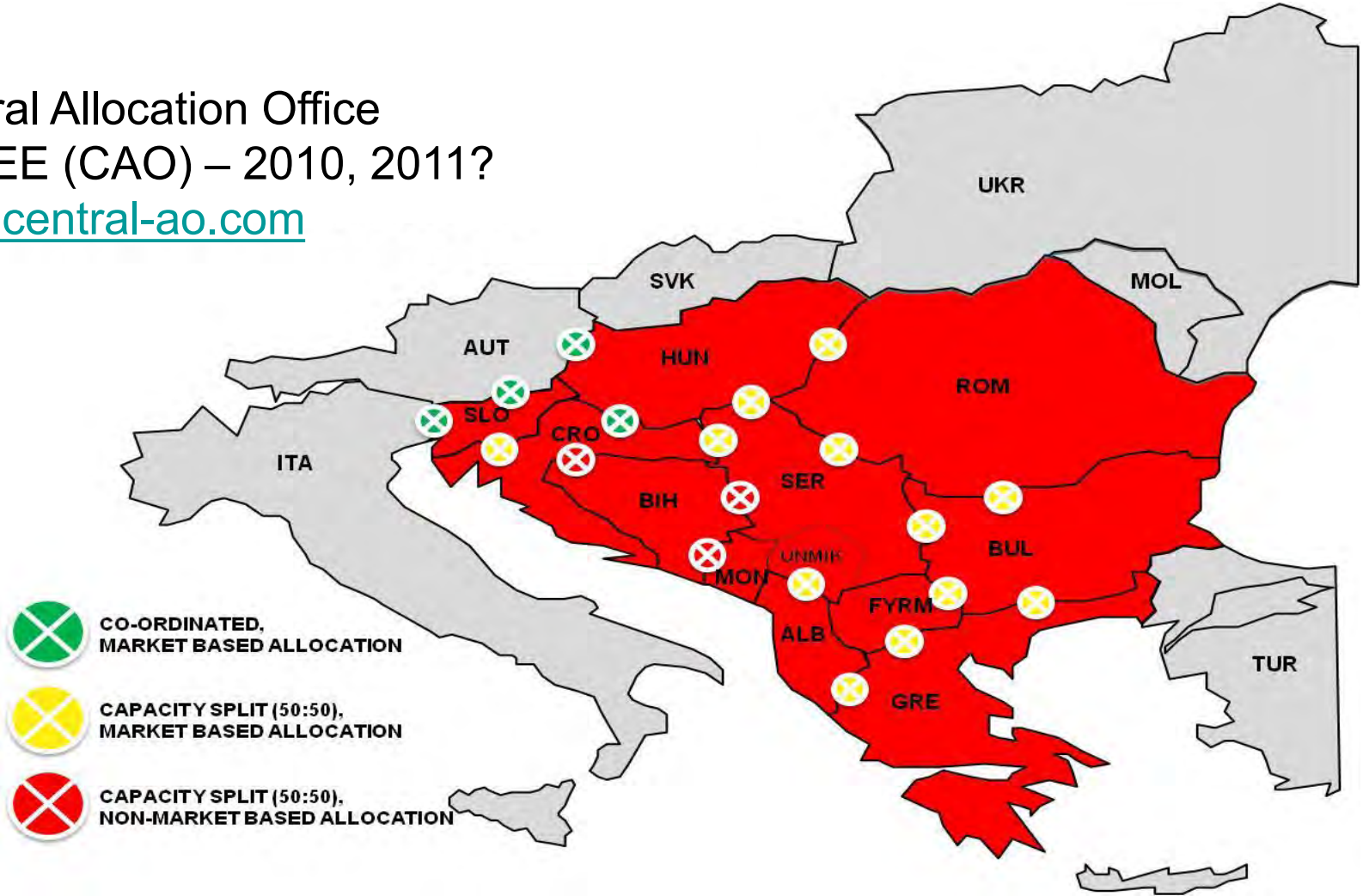
All the rights between the markets involved are offered by a single issuer

– **Coordinated Allocation Mechanism**

All the rights between the markets involved are defined and offered in full coordination

LEVELS OF COORDINATION IN SEE

Central Allocation Office
for SEE (CAO) – 2010, 2011?
www.central-ao.com



TRANSMISSION GRID MODELLING

- Market model of the transmission grid is the basic input to any capacity allocation and use:
  - **Zonal model**, introducing market zones, where transfers are not affected by congestions in transmission grid within
  - **Nodal model**, each node in the transmission grid is a separate market zone
- In Europe, market zones generally coincide with individual TSO'scontrol zones(with notable exception of the Nordic markets and, in some respects, Italy)

TRANSMISSION GRID MODELLING

- Available capacities for commercial transfers between the markets can be calculated in different styles:
  - interconnection-centric: **NTC / ATC**
  - flow-based: **PTDF & BC (CAO)**
- In Europe, only interconnection-centric approach is used (for the momment)

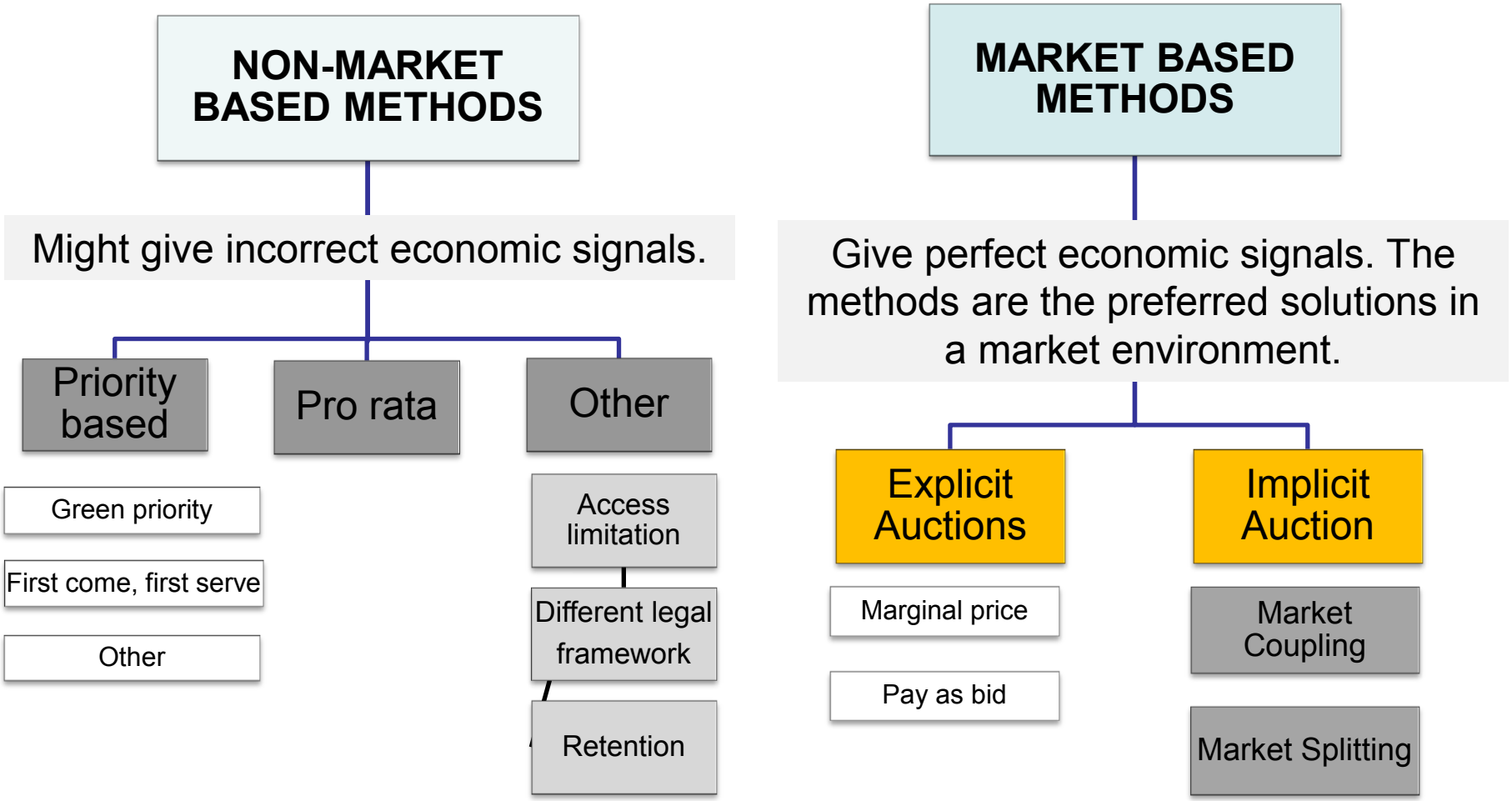
FIRMNESS OF THE CAPACITY

- Firmness defines whether the issuer can curtail the capacity allocated:
  - **Firm** – no curtailment/withdrawal/cancellation is possible•
  - **Non-firm** – subject to 'Force Majeur'and possibly a wider range of conditions
- Main issues:
  - Market Coupling is only possible with firm capacity
  - 'Force Majeur' definitions vary substantially and auditability of reasons for its execution is very limited
  - Compensation in case of curtailment is subject to individual product definitions (according to rules for allocation)

Criteria for evaluation of congestion management methods

- Market-based
- Fair and non-discriminatory
- Economically efficient
- Transparent
- Feasible
- Compatible with the market structure

CAPACITY ALLOCATION METHODS



Non – market based allocation methods

PRIORITY BASED

- The method is non-discriminatory, transparent and easy to implement compared to other mechanisms.
- Most common is *first come, first serve* – chronological ranking of reservations until all the capacity is allocated.
- They usually favour domestic entities and long-term trade
- Drawback: they do not give any economic incentive to other market players.

Non – market based allocation methods

PRO RATA

- Based on *principle of pro-rata curtailment* of transactions
- All transactions are partially curtailed – proportionally to the requested capacity.
- This method *provides no incentives* toward the efficient use of the grid.
- *Pro rata cause unwanted behavior* – market players secure the desired quantity by overestimating capacity needs. With this method some anti-gaming measures, such as obligations to use all designated capacity should be introduce.

Non – market based allocation methods

OTHER

- ACCESS LIMITATION: This method applies to DC interconnectors with ownership that differs from linked networks. A few users may retain benefits from cross-border trade.

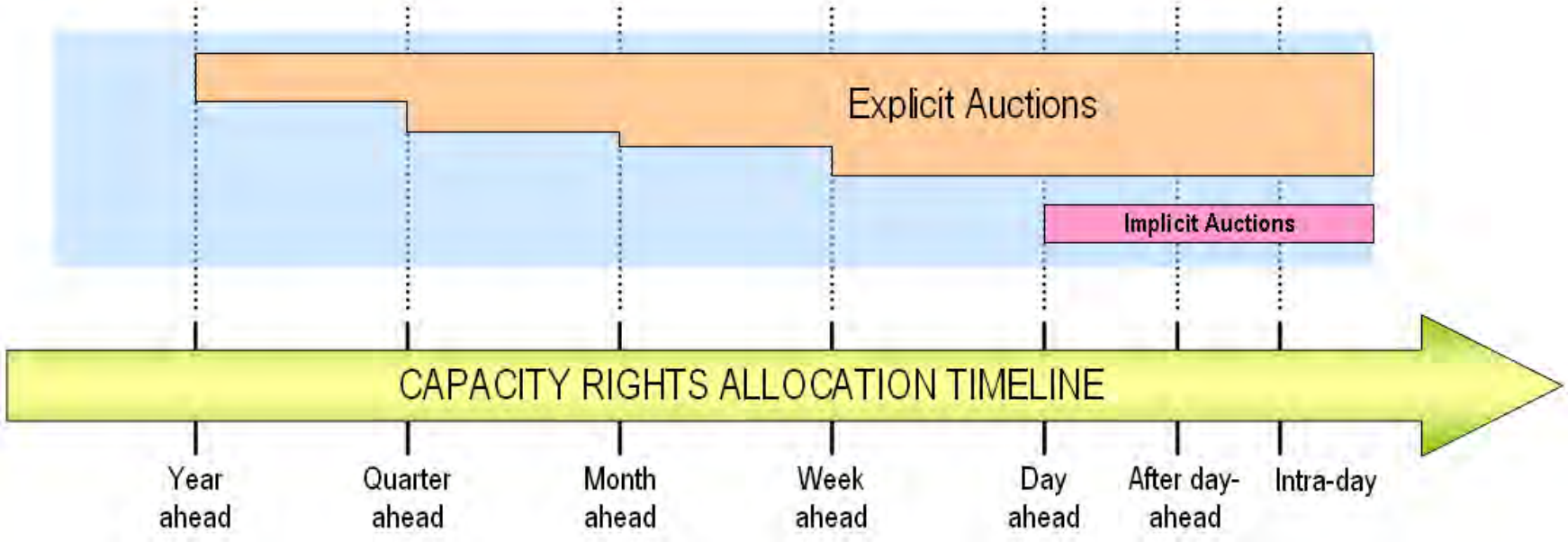
- DIFFERENT LEGAL FRAMEWORK: This method applies to countries such as Switzerland and Russia, that are not EU member states and that do not follow EU legislation.

- RETENTION: In this case the capacity is reserved for vertical integrated utilities.

Market based allocation methods

AUCTIONING

- Explicit auctions (capacity only)
- Implicit auctions (capacity is a by product)



Market based allocation methods

EXPLICIT AUCTION I/II

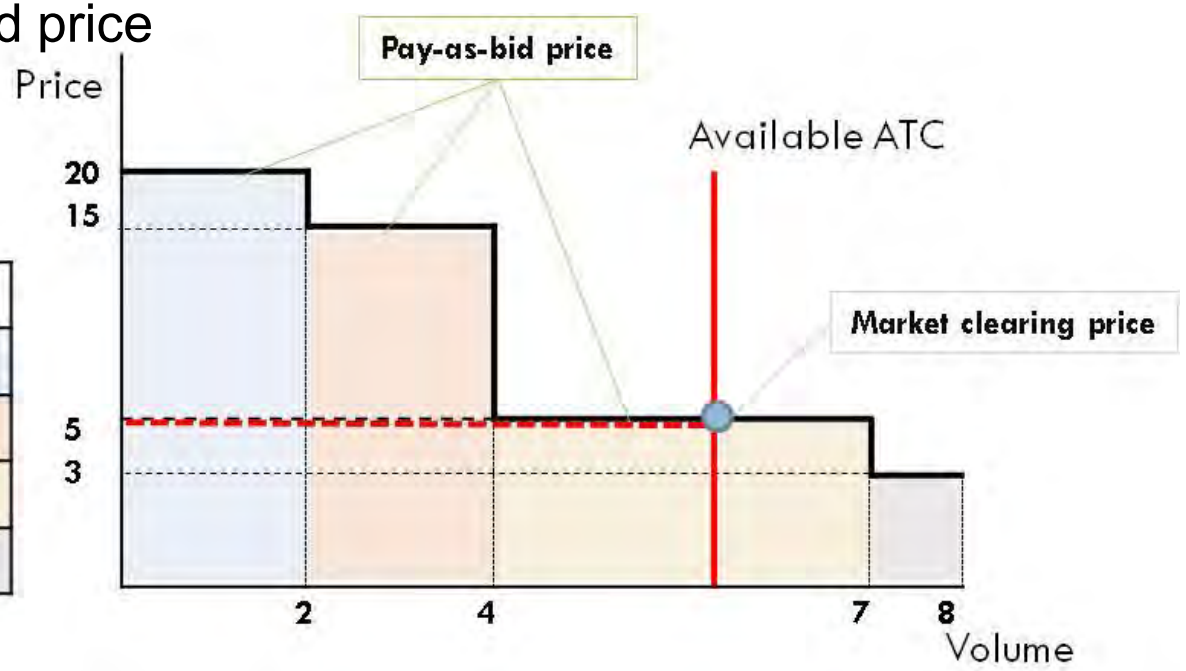
- Explicit auctions make a distinction between transmission capacity and energy. Only transmission capacity is allocated.
- Capacity is not coupled to energy:
  - Advantage: Easier to introduce; in case of low liquidity of the market or no PX on one (both) side(s) of the border)
  - Disadvantage: capacity has to be valued under high price uncertainties → lead to unused arbitrage possibilities

Market based allocation methods

EXPLICIT AUCTION II/II

- Two different price-setting mechanisms:
  - Market clearing price (prefered)
  - Pay-as-bid price

Bid	Price	Vol.
1	20	2
2	15	2
3	5	3
4	3	1



Market based allocation methods

IMPLICIT AUCTION I/III

- Implicit auctions do not make a distinction between energy and transmission capacity.
- Transmission capacity is a by-product, although they bring congestion revenue to TSO if congested.
- Bids are standardizided as to allow the use of netting
- No inefficient capacity reservations are necessary
- Directions of power flows are dictated by the market
  - Energy flows from the lower price market to the higher price market

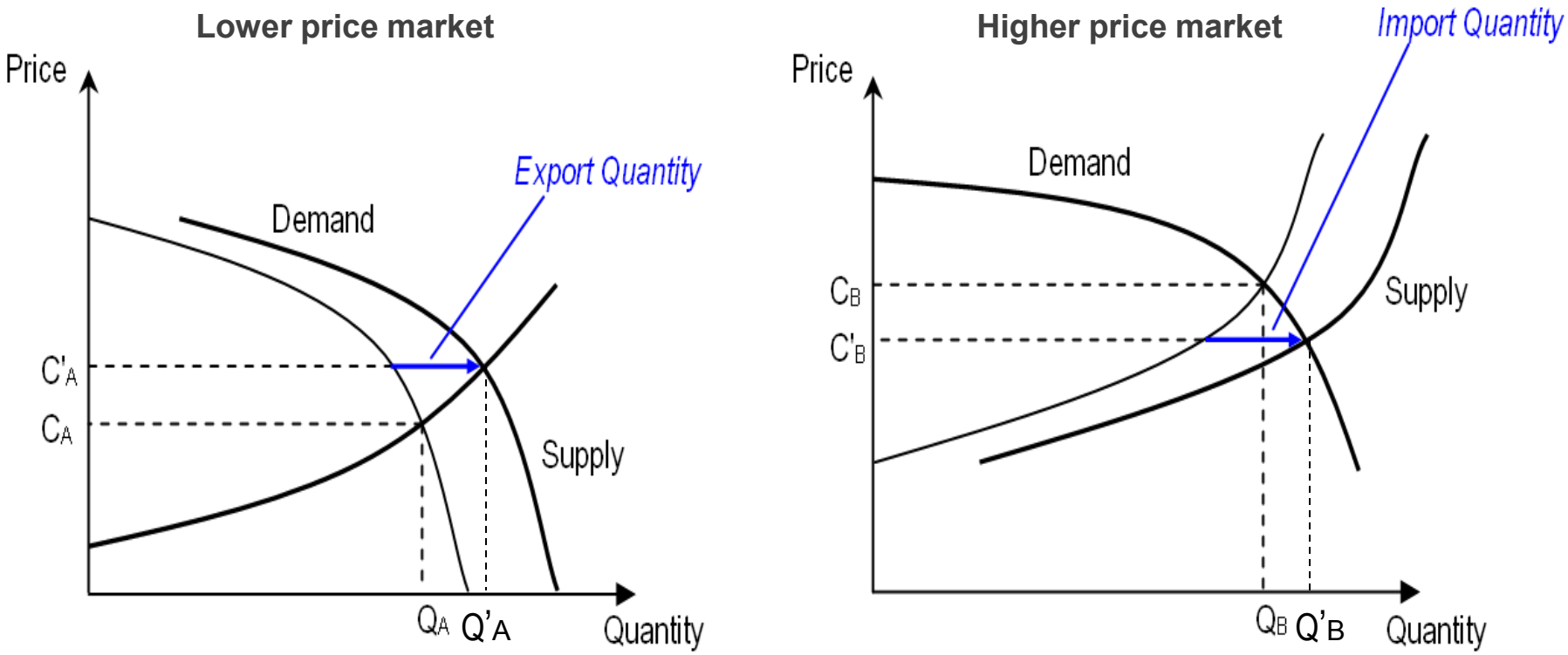
Market based allocation methods

IMPLICIT AUCTION II/III

- If enough transmission capacity exists market prices in each area become equal, otherwise
- Higher market price is obtained in the area downstream of congestion, and lower in the area upstream.
- Demand and supply in regional markets are matched based on submitted bids in all areas

Market based allocation methods

IMPLICIT AUCTION III/III

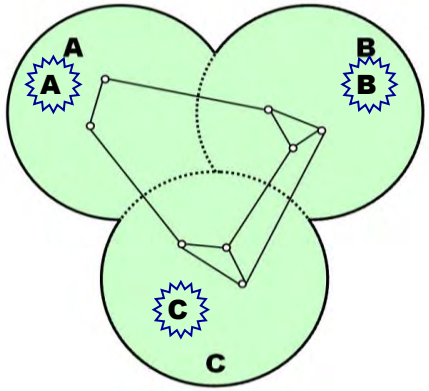


Market based allocation methods

Method	*Advantages*	*Disadvantages*
Explicit	▪ Easier to introduce	▪ A distinction between transmission capacity and energy ▪ Capacity has to be valued under high price uncertainties ▪ Lead to unused arbitrage possibilities
Implicit	▪ 1 product ▪ No inefficient capacity reservations are needed ▪ Alleviate market players of extra costs ▪ Flows are dictated by the market (A>B)	▪ More complex harmonization and introduction

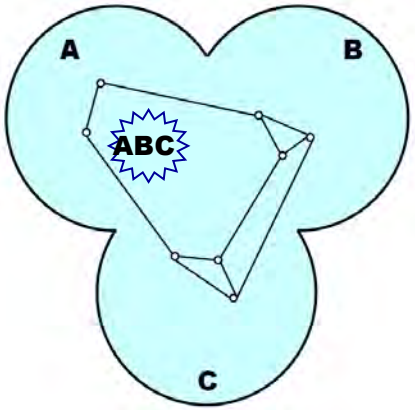
Two types of market integration with implicit auctions

- Market integration can be either centralized or decentralized, i.e. “market splitting”or “market coupling”
- Trading can be organized by one or by several exchanges in cooperation



Market Coupling

(e.g. FR-BE-NL, SLO-ITA 2011)



Market Splitting

(e.g. Nord Pool)

What is Market Coupling?

- Day-ahead trading where supply and demand can meet
- Comprises two or more bidding areas (countries)
- The purpose is maximization of economic surplus of all participants: cheaper generation in one country can cover more valuable demand in another country and vice-versa
- If there is no congestion, there is only one price for all of the bidding-areas.

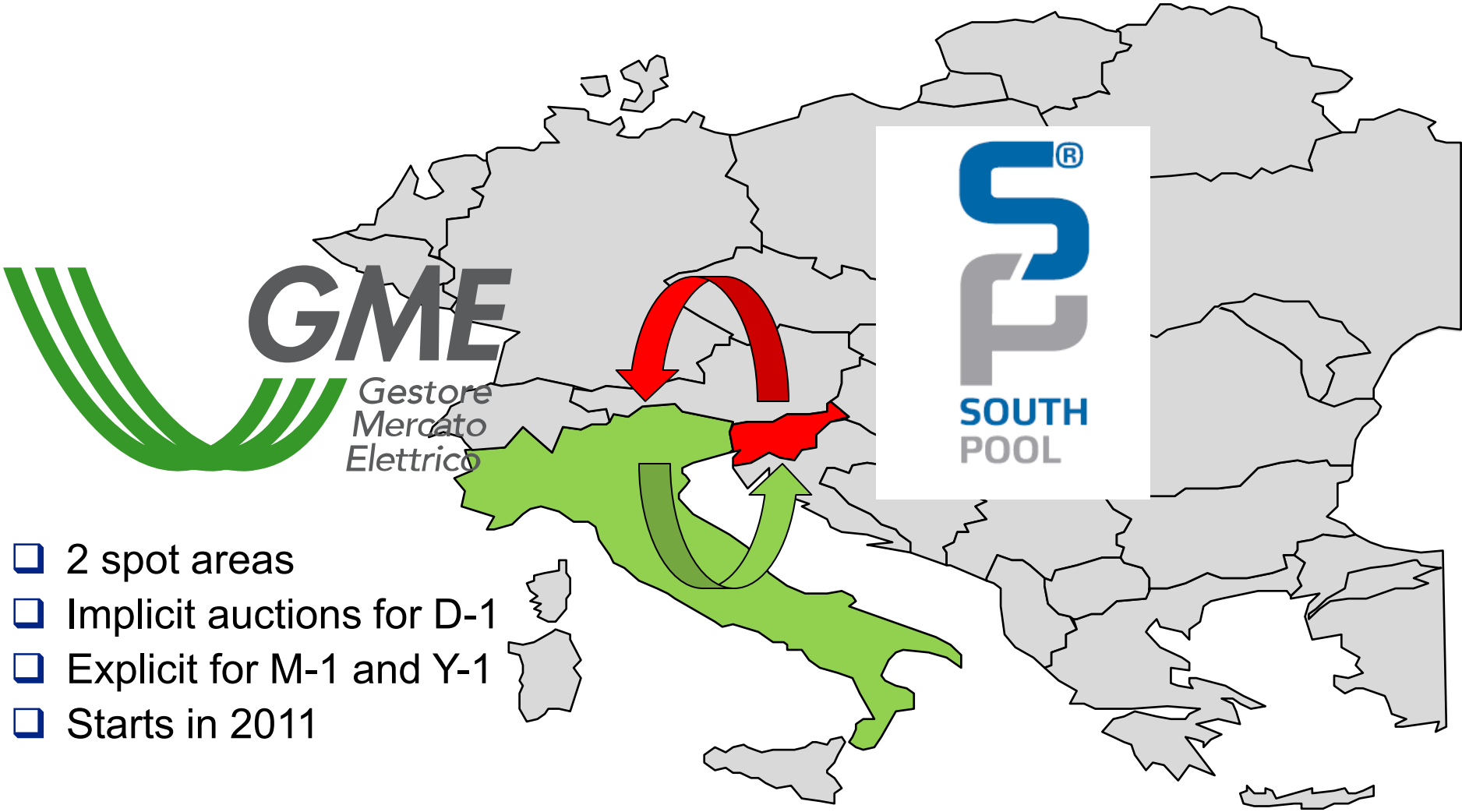
Positions on Market Coupling/ Implicit Auctions

EC: ***Market Coupling has "…the highest potential of truly integrating the European electricity market through implicit auctions at the day-ahead stage."; while explicit auctions "…often lead to inefficient use of interconnection capacity and preventsmarket integration."*** *(Report on the experience gained in the application of the Regulation (EC) No 1228/2003 "Regulation on Cross-Border Exchanges in Electricity", 2007)*

ERGEG: ***"…it is now widely recognized that for the day-ahead timeframe, implicit allocation methods are more efficient than explicit auctions and should be the target mechanism for all regions for the day-ahead timeframe."*** *(ERI Convergence and Coherence Report,2007)*

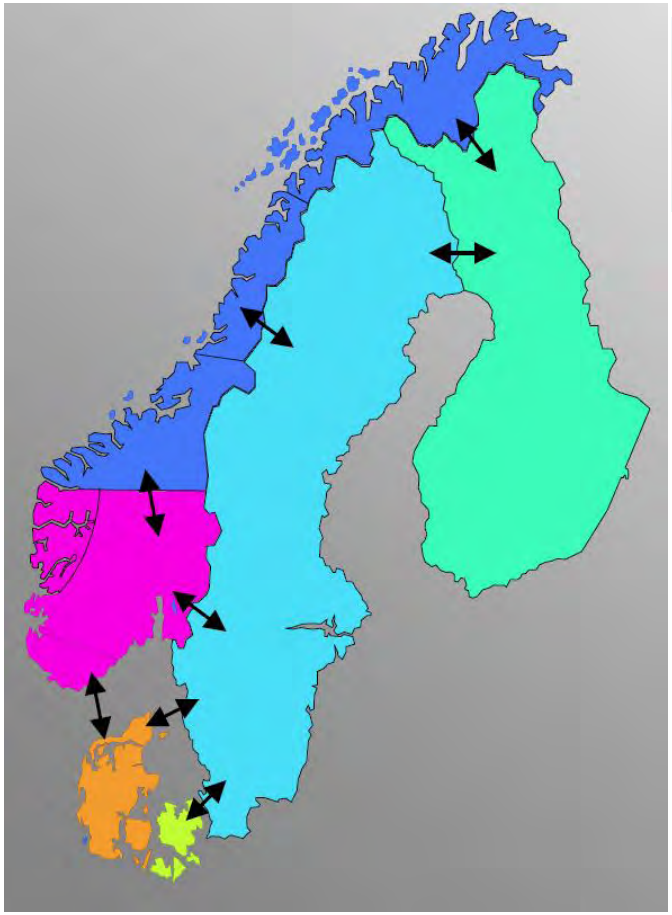
ETSO & EuroPEX jointly about flow-based market coupling: ***"…integrated markets are in general more efficient than separate ones, but accept that coupling of regional markets is the most realistic way of achieving efficiency benefits in the short and medium term."*** *(Flow-based Market Coupling–Interim report, 2004)*

Market Coupling between SLO and ITA



- 2 spot areas
- Implicit auctions for D-1
- Explicit for M-1 and Y-1
- Starts in 2011

NordPool – Market Splitting



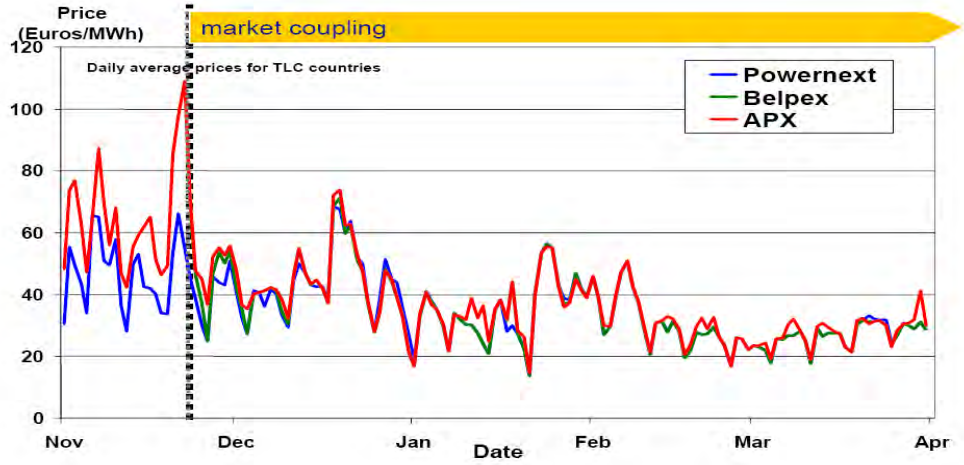
NASDAQ OMX COMMODITIES

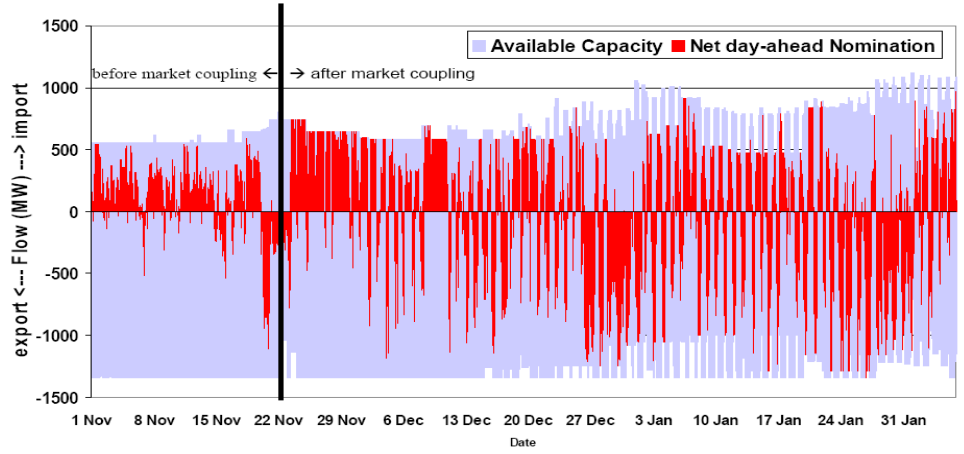
NORD POOL
NORD POOL ASA
building a secure market

- ELSPOT - 6 DAM areas
  - Norway – Statnett (two bid areas)
  - Sweden – Svenska Kraftnät
  - Finland – Fingrid
  - Denmark – Jutland & Zealand (two bid areas)

Trilateral Coupling of The Belgian, Dutch and French Electricity Markets

- FR-BE-NL: 3 spot areas
- Implicit auctions for D-1
- Explicit for M-1 and Y-1





Thank you for your attention!

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Jan Zakrajšek

E-mail: jan_zakrajsek@yahoo.com

Phone: +386 41 561 709