

Market integration: the Dutch- Belgian French market and beyond

7th Cambridge – MIT
electricity policy conference
London, 28 September 2007

**Bert den Ouden, CEO, APX
Group**

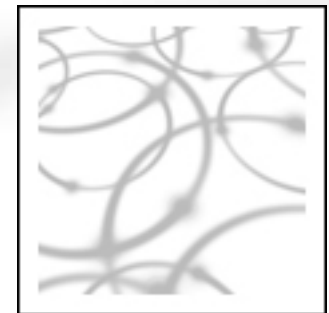
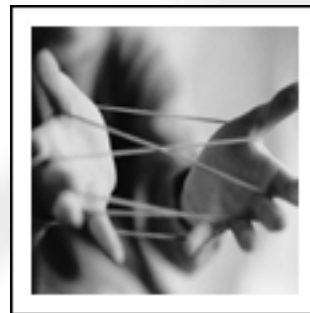
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apx Group
**A VITAL LINK IN
ENERGY TRADING**

Agenda

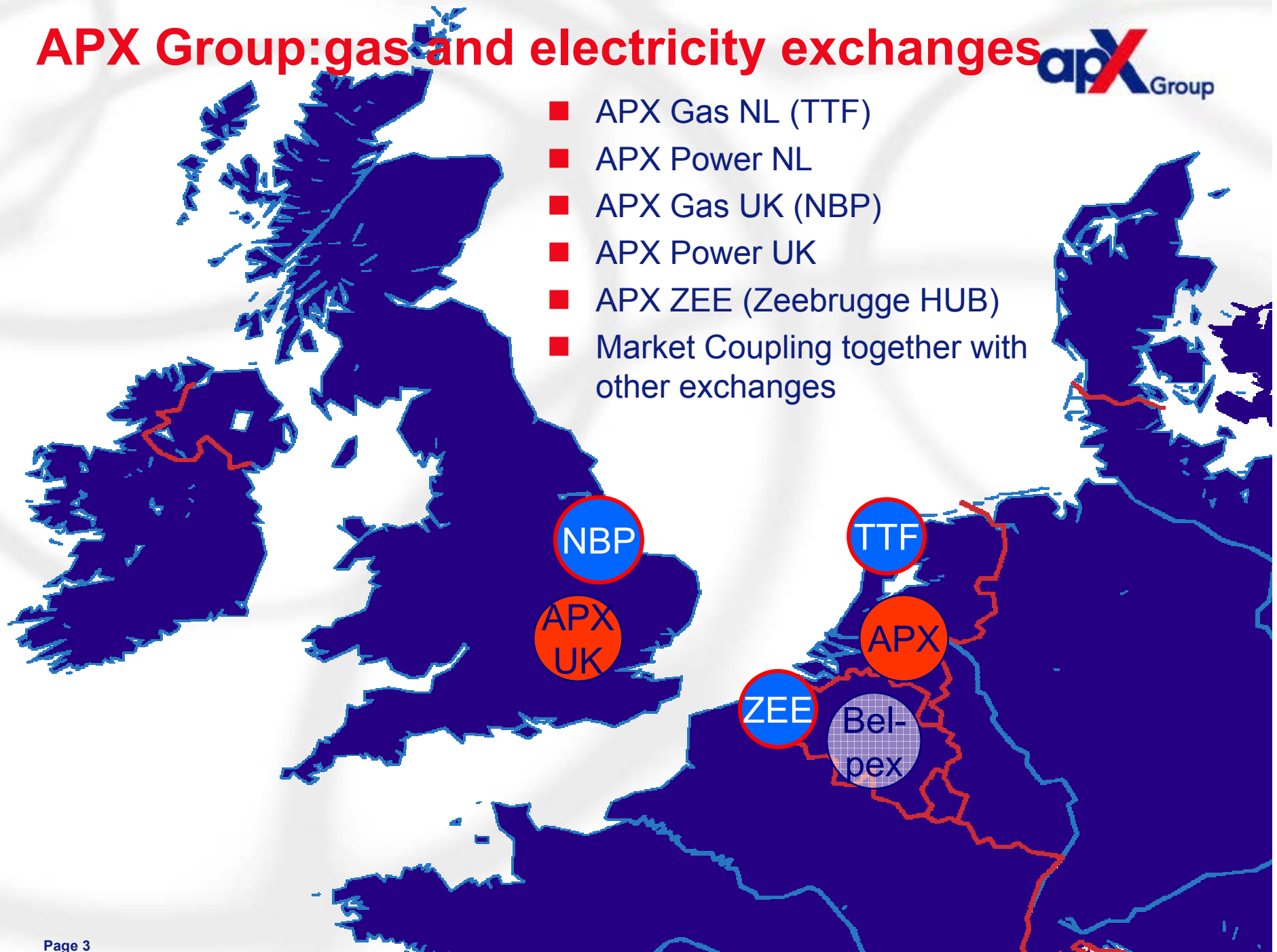
- Introduction APX
- Market Coupling NL-B-Fr
- CWE market coupling NL-B-Fr-D-Lux
- Inter-regional matters: CWE-Nordic coupling and BritNed



APX Group: gas and electricity exchanges



- APX Gas NL (TTF)
- APX Power NL
- APX Gas UK (NBP)
- APX Power UK
- APX ZEE (Zeebrugge HUB)
- Market Coupling together with other exchanges



Corporate overview



Operations:

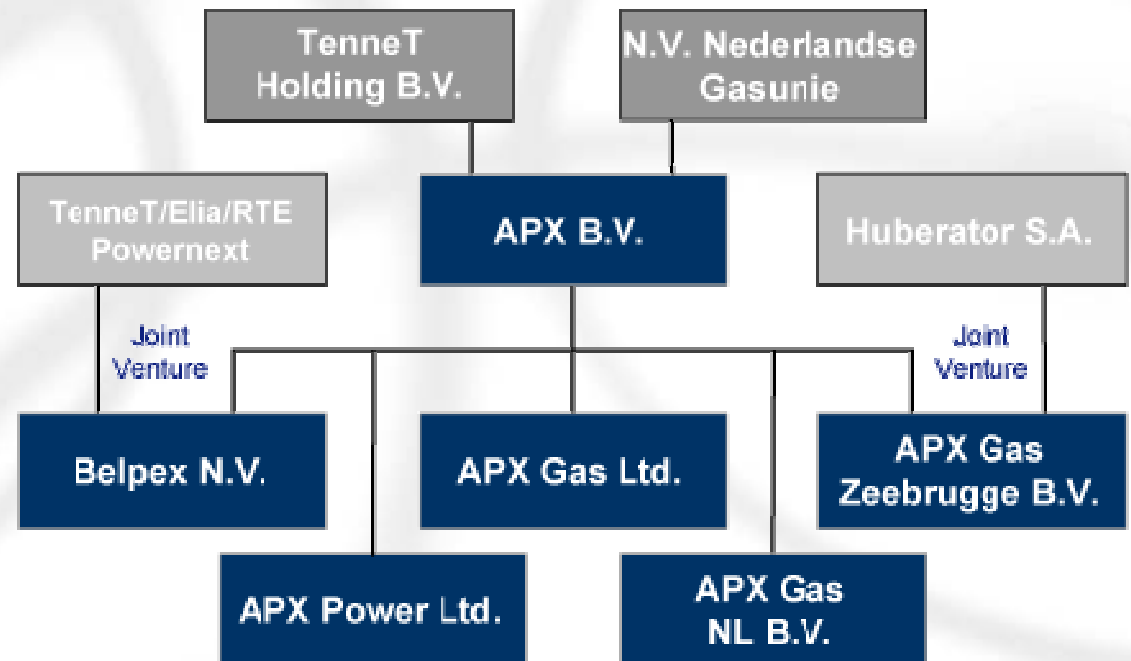
- 5 markets on line
- service activities
 - Operations (Belpex)
 - Market coupling (TSO's)
 - Carbon clearing
- 206 gross memberships

Traded (2006):

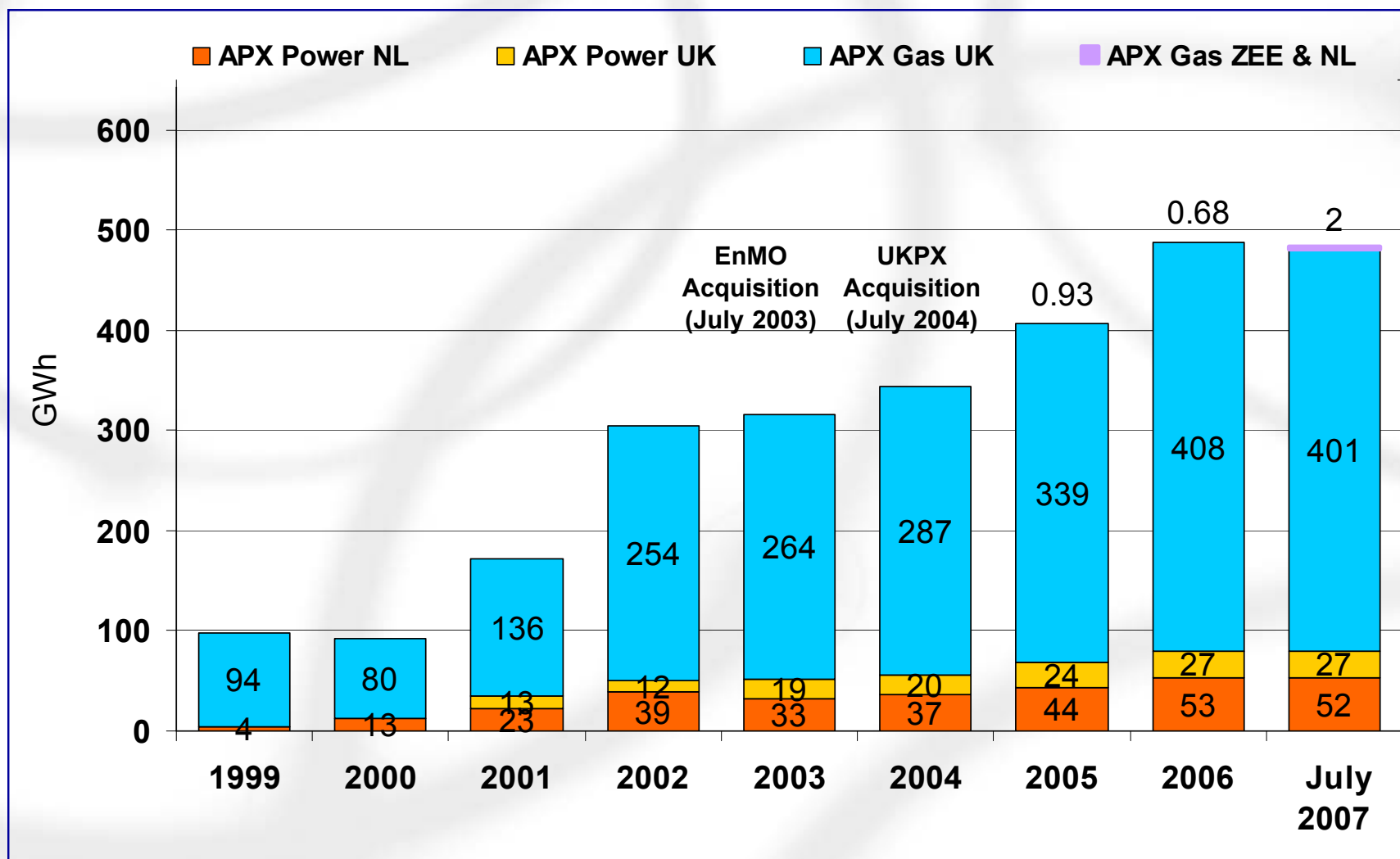
- 178 TWh of energy
- € 5.3 billion of contracts
- 10% of UK gas demand
- 18% of NL power demand

Corporate:

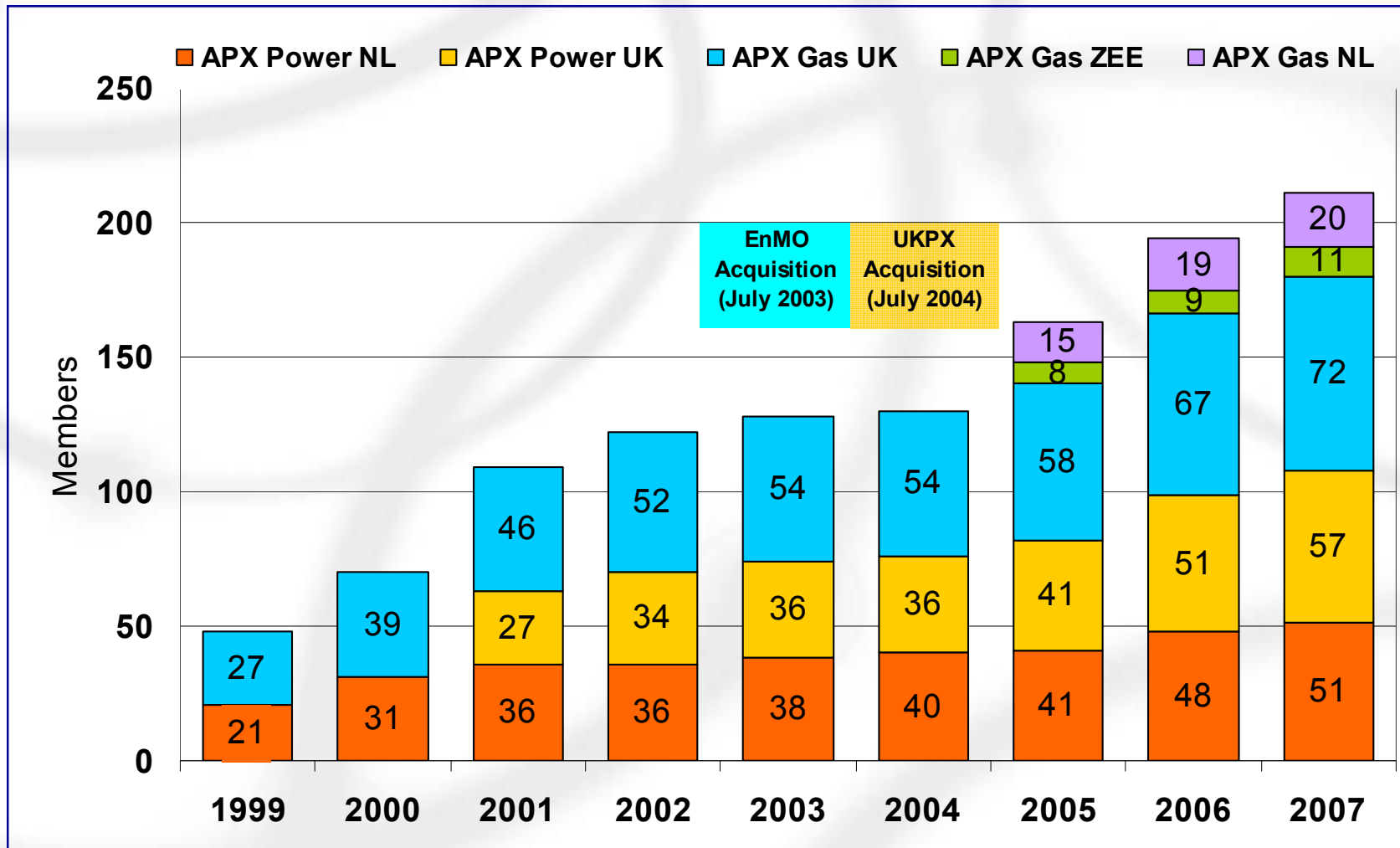
- Anglo-Dutch management
- Positive financial results
- Shareholders TenneT (74.5%, Transmission System Operator NL) and Gasunie (25.5%, Gas infrastructure company NL)



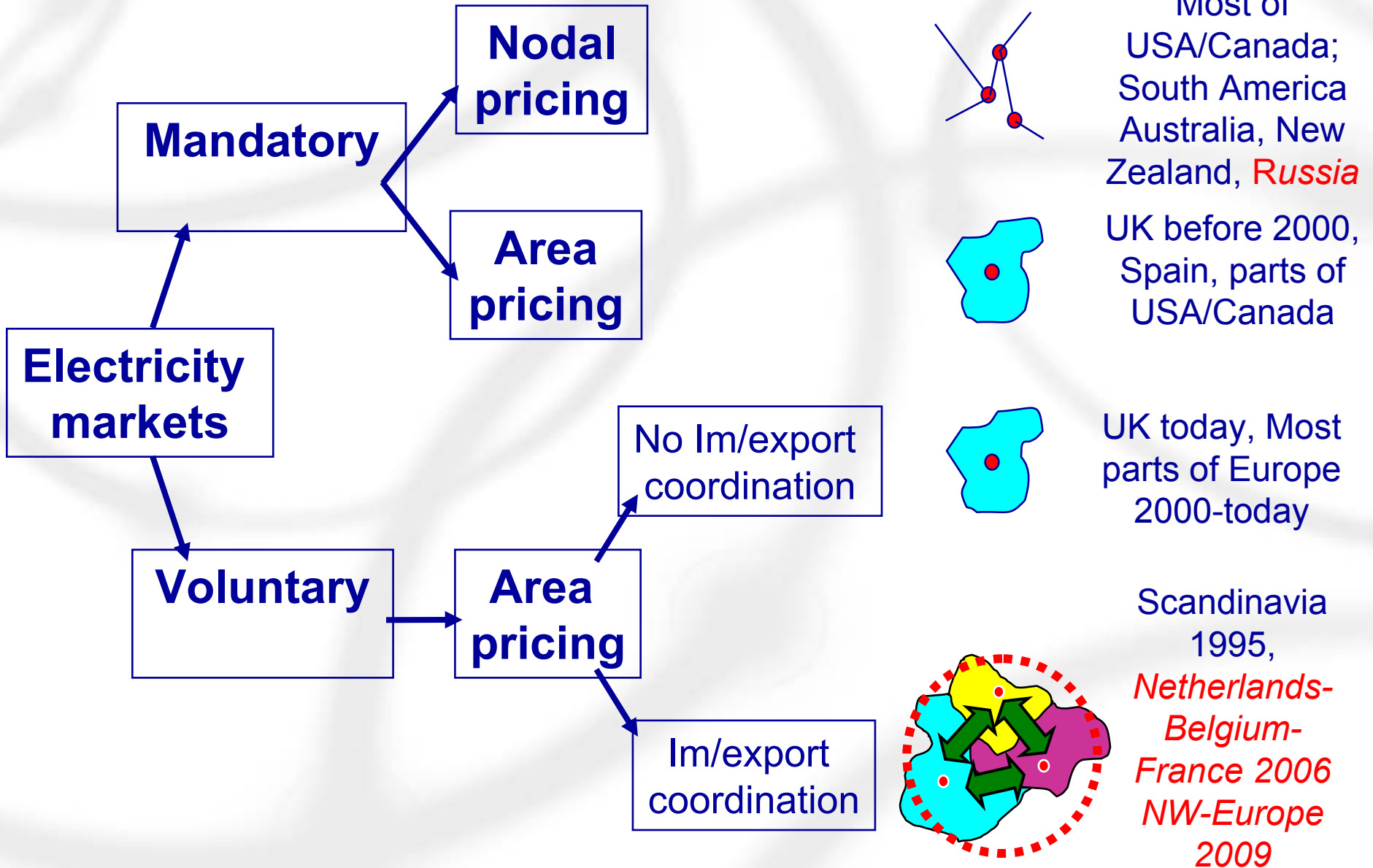
APX Group volumes: Yearly Average GWh/day 1999 to 2007 (July)



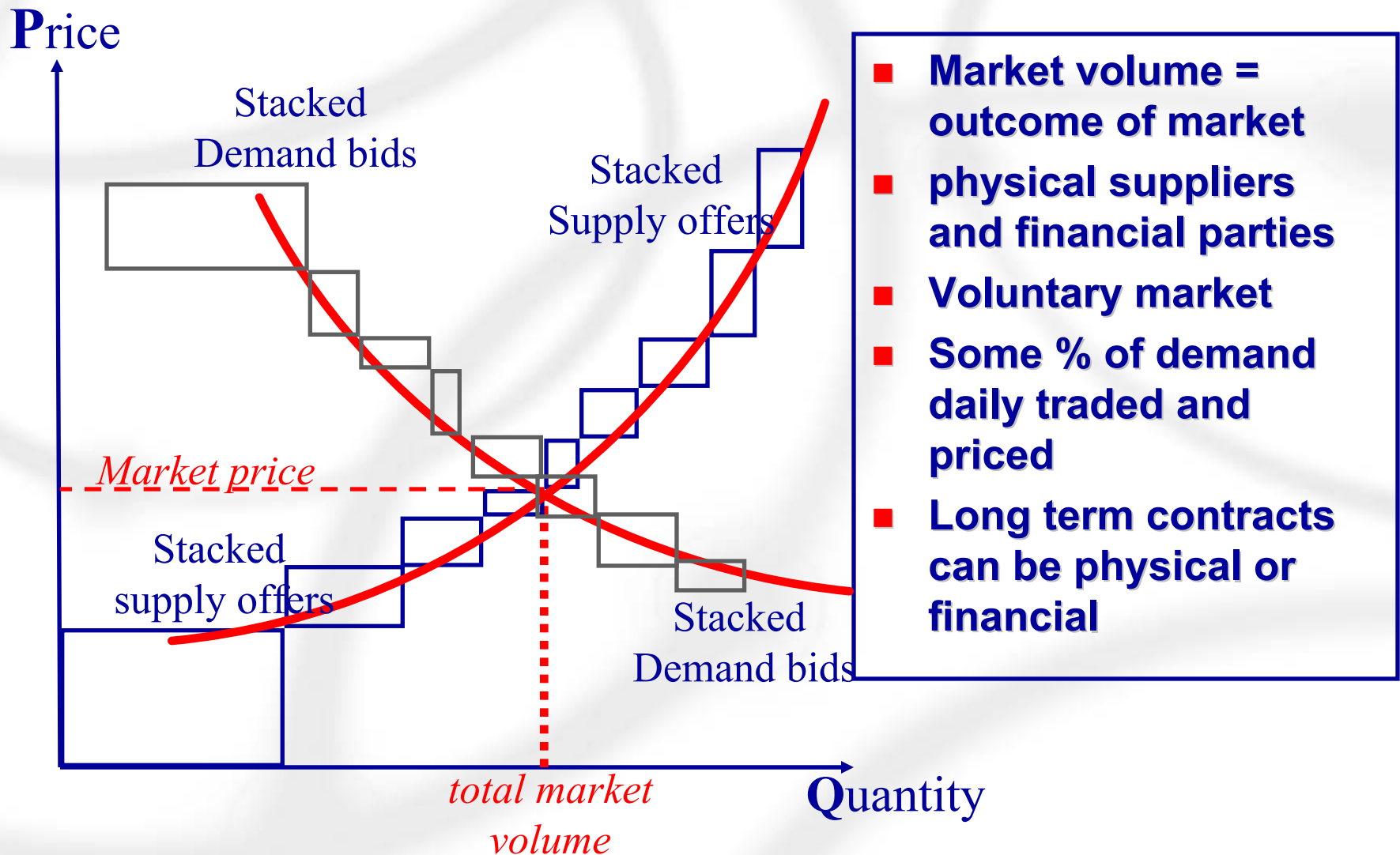
Development of APX Group Members per Market 1999 to 2007 (July)



Types of electricity markets



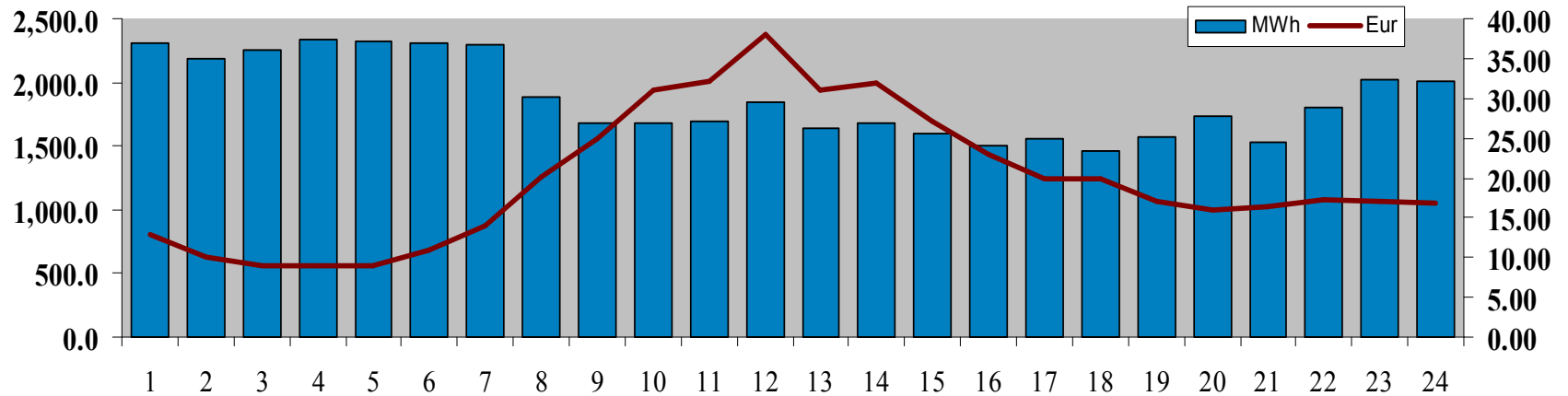
Day-ahead spot market, area-based



Hourly day-ahead scheme + blocks



Demand
Blocks
example

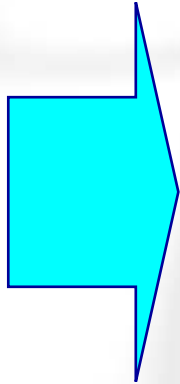
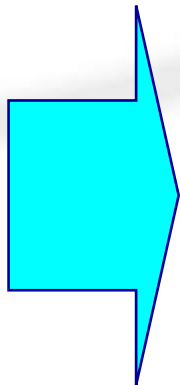


Supply
Blocks
example



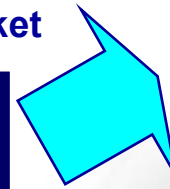
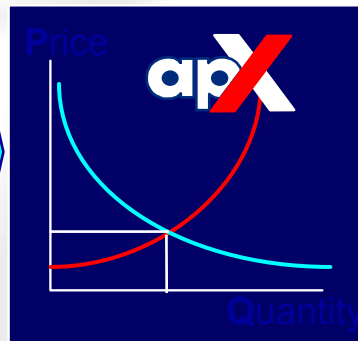
Daily schedule

Traders

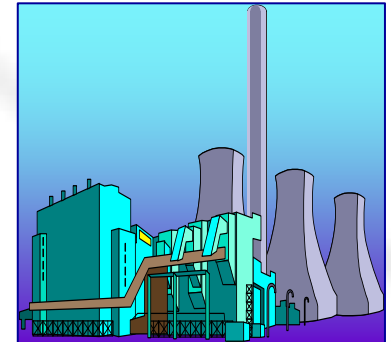
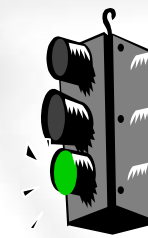


Bilateral contracts

**Exchange:
day-ahead market**



**Grid company
check**



Prepare

**11:00
Trading**

**12:00
E-program**

**16:00 OK
E-program**

**00:00: Delivery +
balancing market**

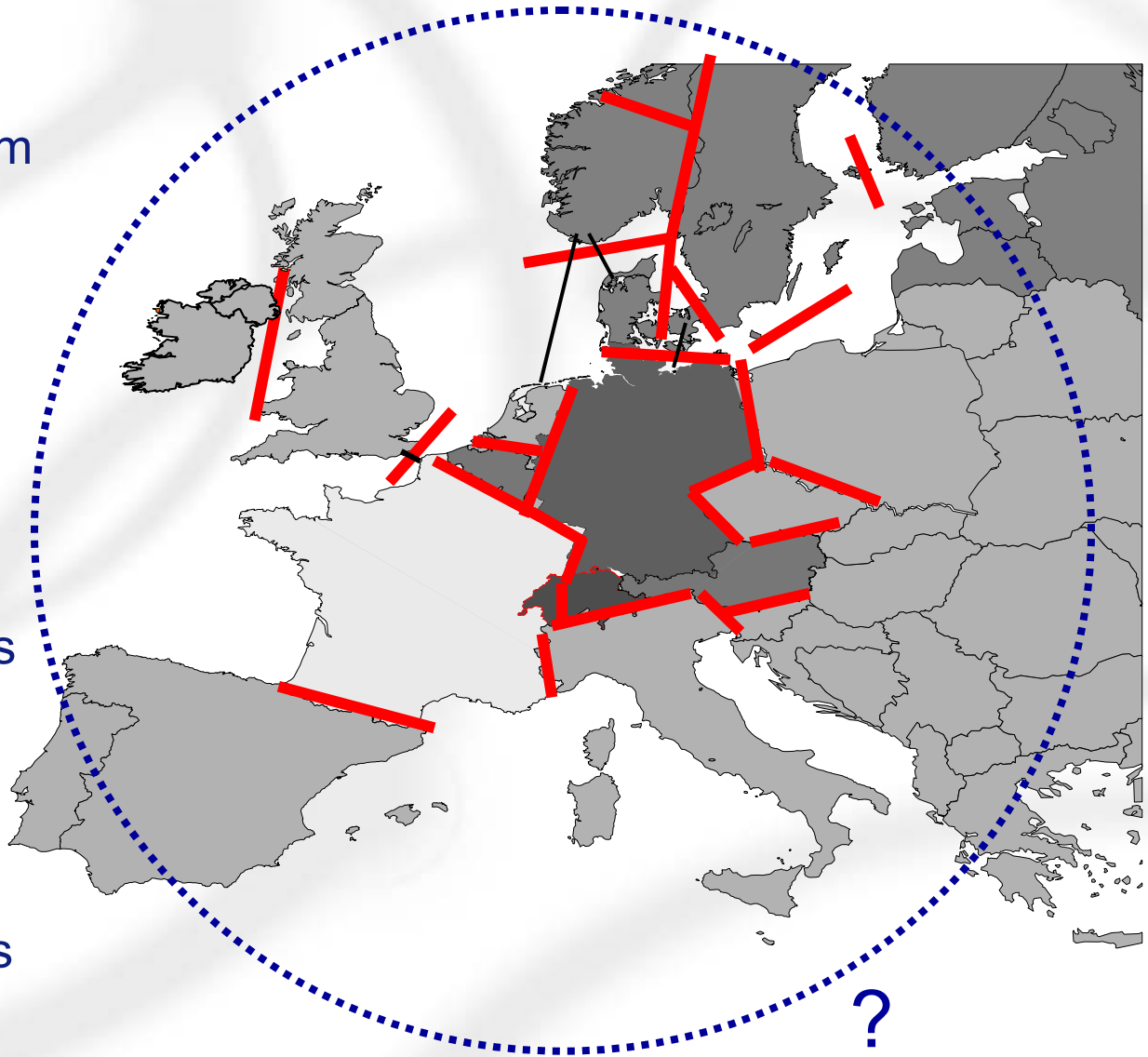
European electricity market

Achievements

- Free customers
- Transmission System (grid) operators
- Efficiency of utilities
- Role of regulators

Shortfalls

- Volatile prices
- Low liquidity
- Transparency issues
- Inefficient use of transportation
- High level of market concentration
- Market power issues



→ Fragmented market

Market Coupling removes fragmentation

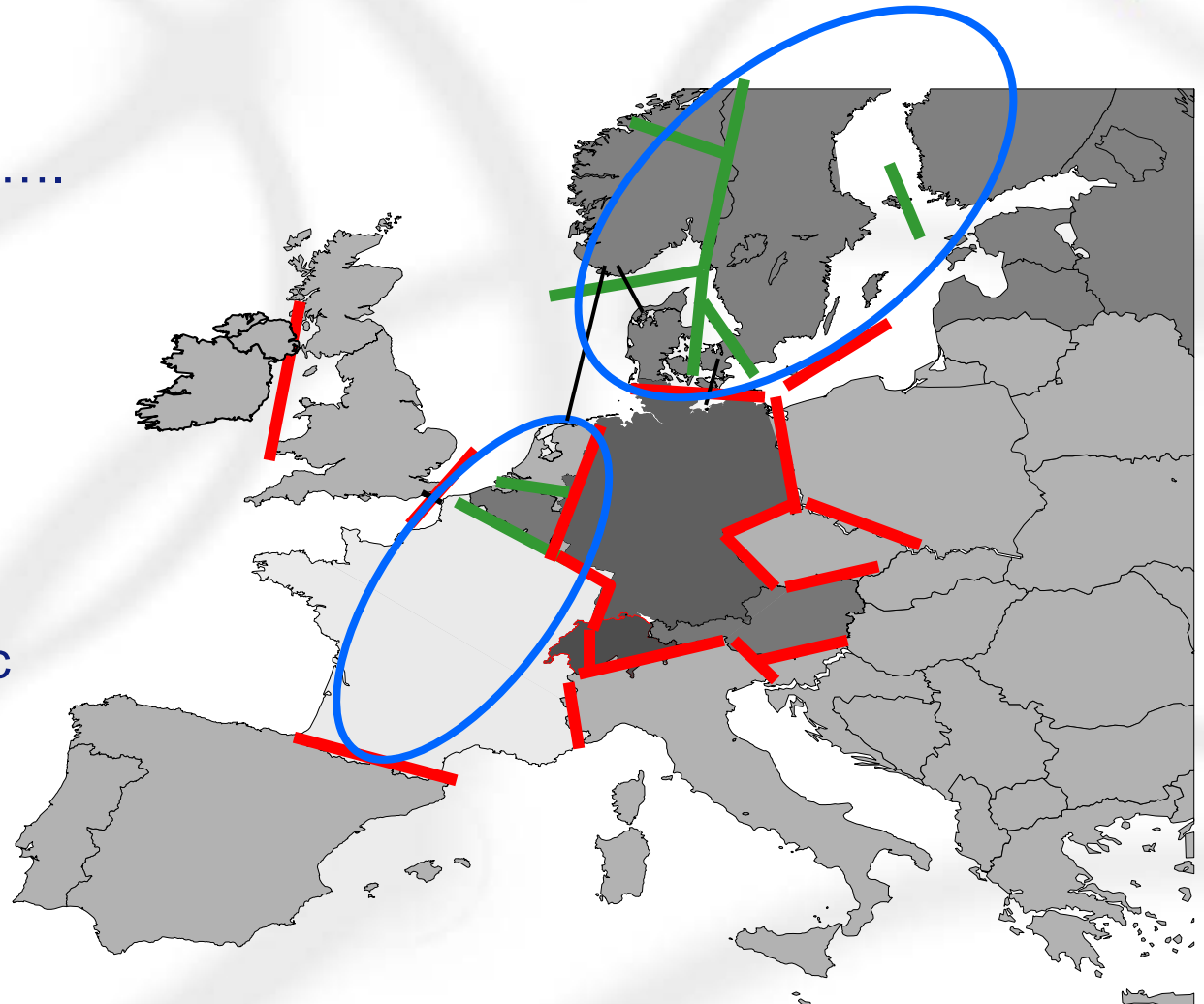


Infrastructure

- Build more capacity....
and/or
- Make better use of
existing capacity!
- → Market Coupling

Initiatives

- Scandinavia (Nordic
Europe): from 1992
- New region:
 - Netherlands
 - Belgium
 - France



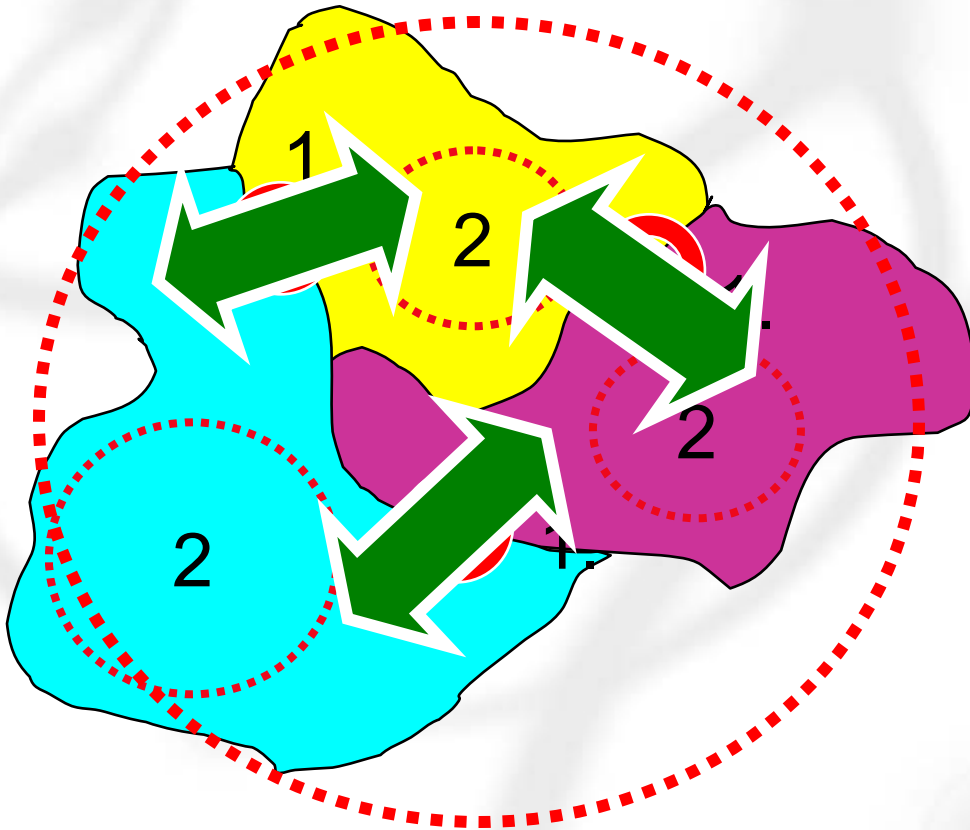
— Transport limitation
○ Integrated market

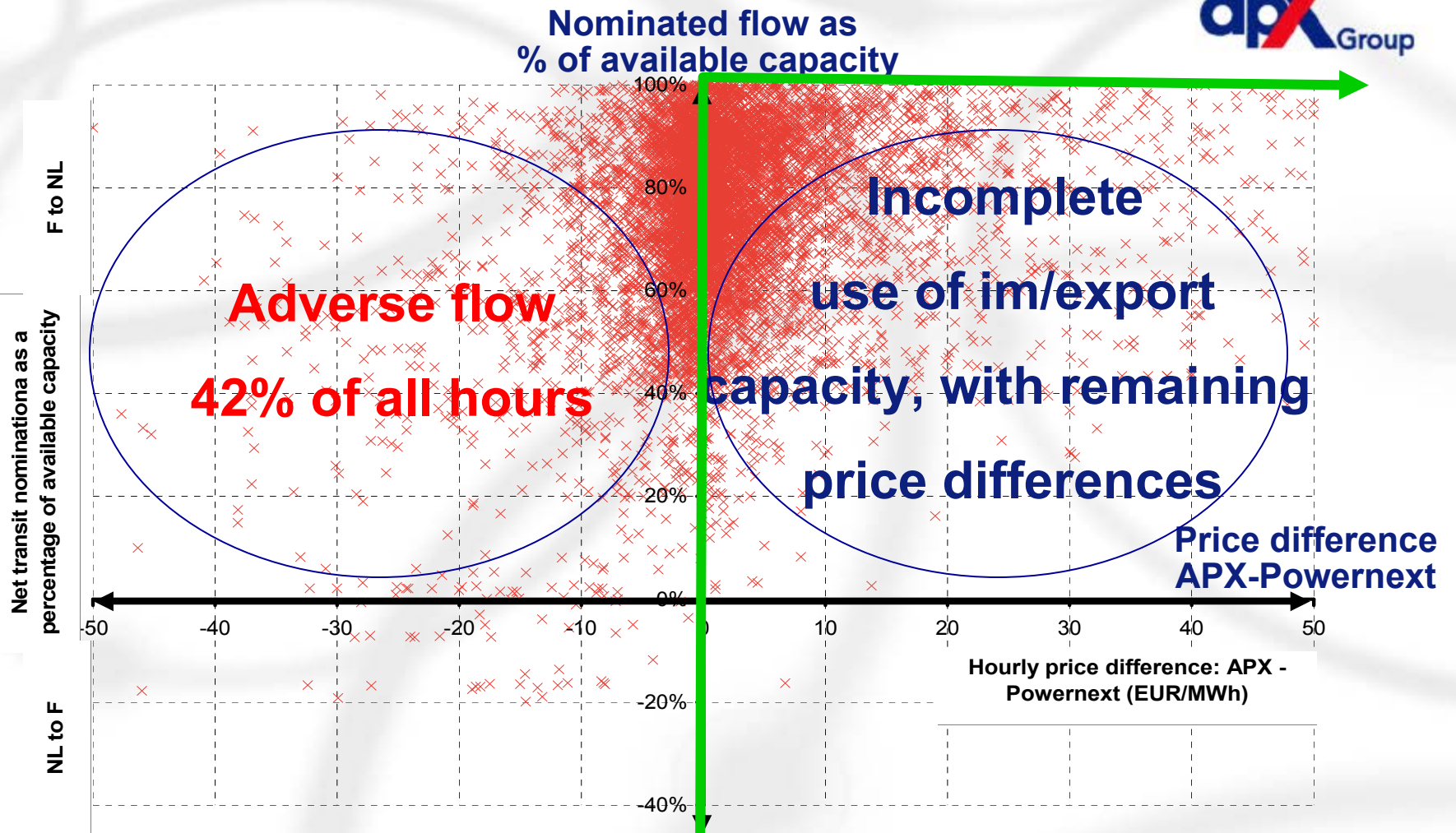
Explicit auctions → Market Coupling

Explicit daily auctions:

- Risks of 2-step trading of capacity / energy
- No guarantee use it or lose it
- Im/exports not always in right direction (low → high price)
- Different to transfer power across successive borders
- Not all market participants participate in cross-border
- Area prices separate, even when there is no constraint

→ Integrate by market coupling

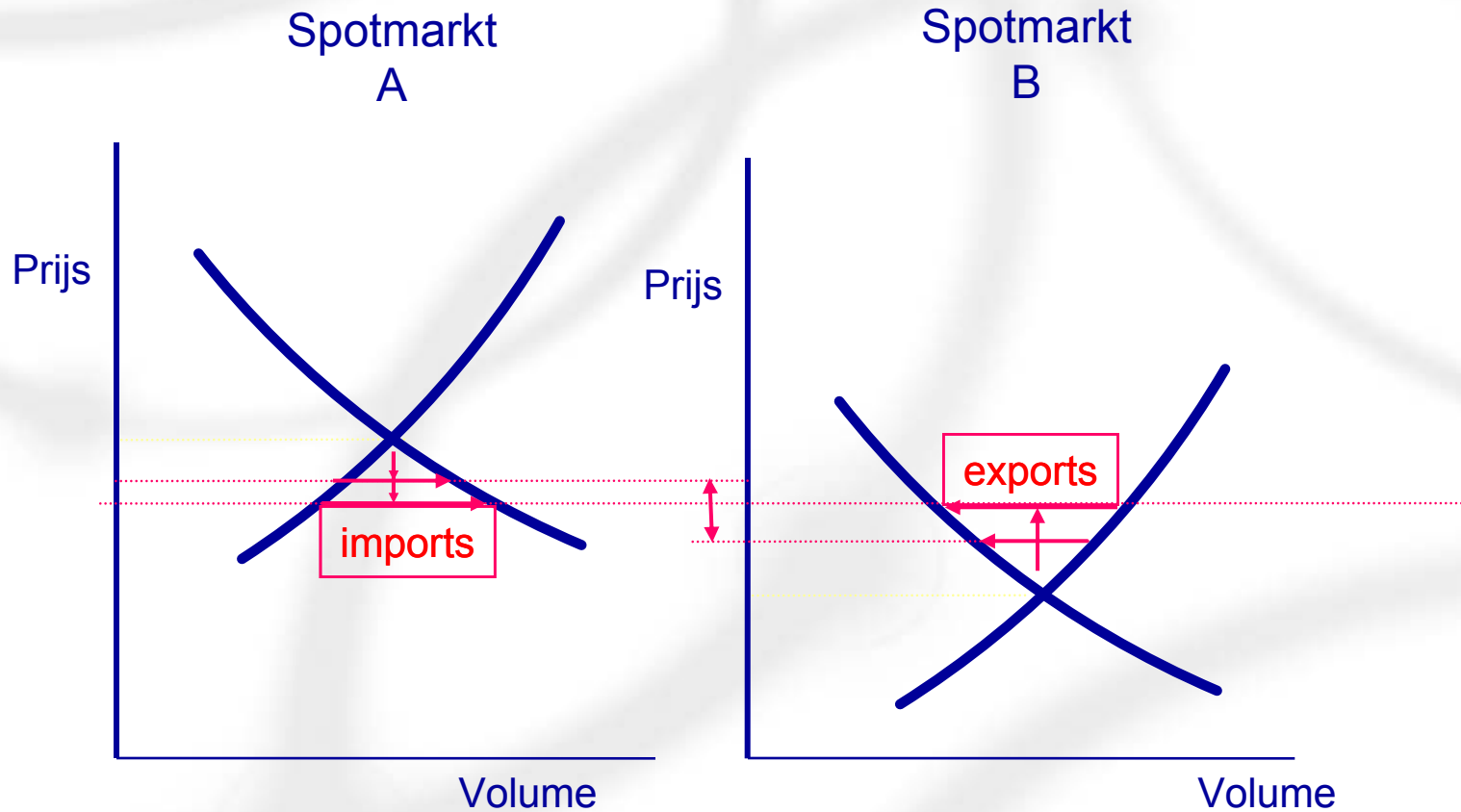




Hourly utilization of transit capacity between Netherlands and France, 2005 Source: Frontier Economics


Marktkoppeling

(3) Bij voldoende capaciteit: 1 geharmoniseerde markt met 1 prijs



Advantages of Market Coupling

- Removes unnecessary risks of trading short-term transmission capacity and energy separately
- Guarantees the optimal utilization of transmission capacity
- Less prone to market abuse since capacity cannot be hoarded
- All market participants benefit from cross-border capacity
- Encourages liquid, robust spot markets

A large red arrow pointing from the list of advantages towards the text box on the right.

Optimal use of capacity
(particularly when prices are close)

Single market
(when there is sufficient capacity)

Market Coupling solution Netherlands-Belgium-France

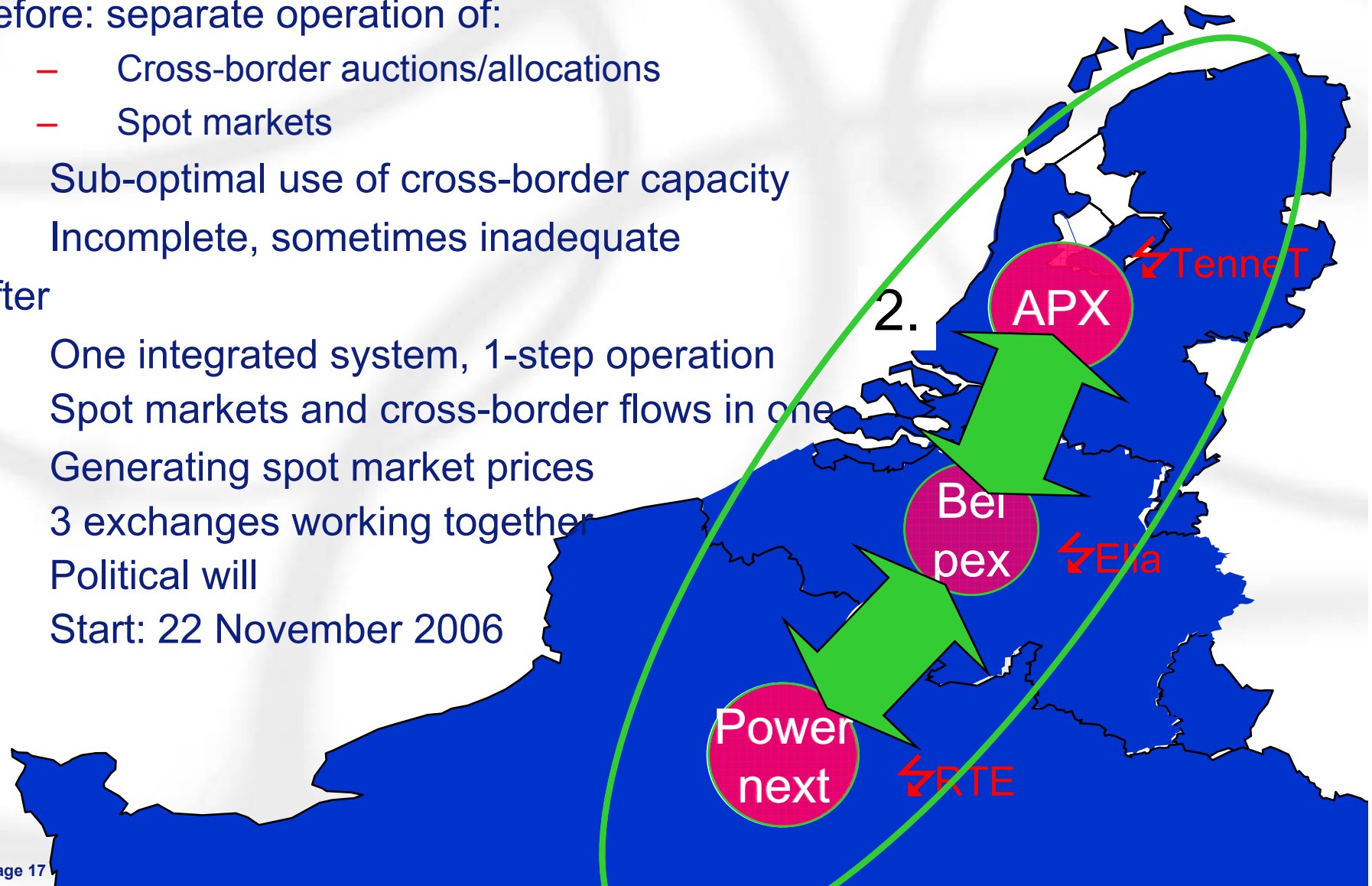
Before: separate operation of:

- Cross-border auctions/allocations
- Spot markets

- Sub-optimal use of cross-border capacity
- Incomplete, sometimes inadequate

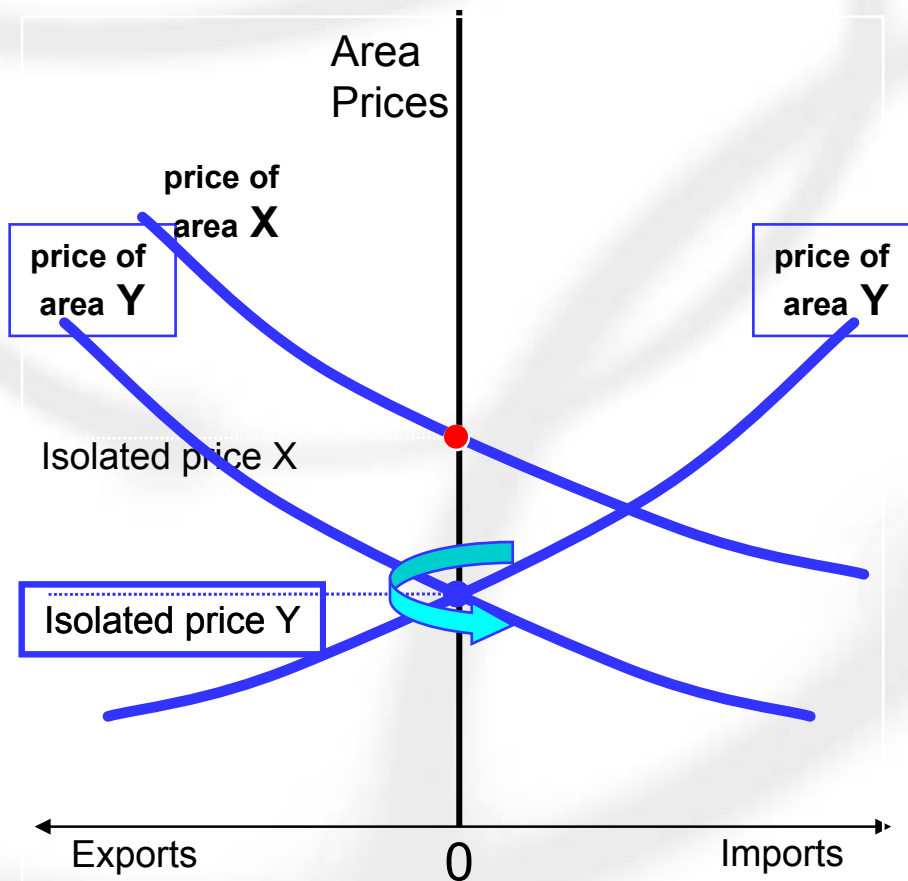
After

- One integrated system, 1-step operation
- Spot markets and cross-border flows in one
- Generating spot market prices
- 3 exchanges working together
- Political will
- Start: 22 November 2006



Decentralized market coupling

Mechanism

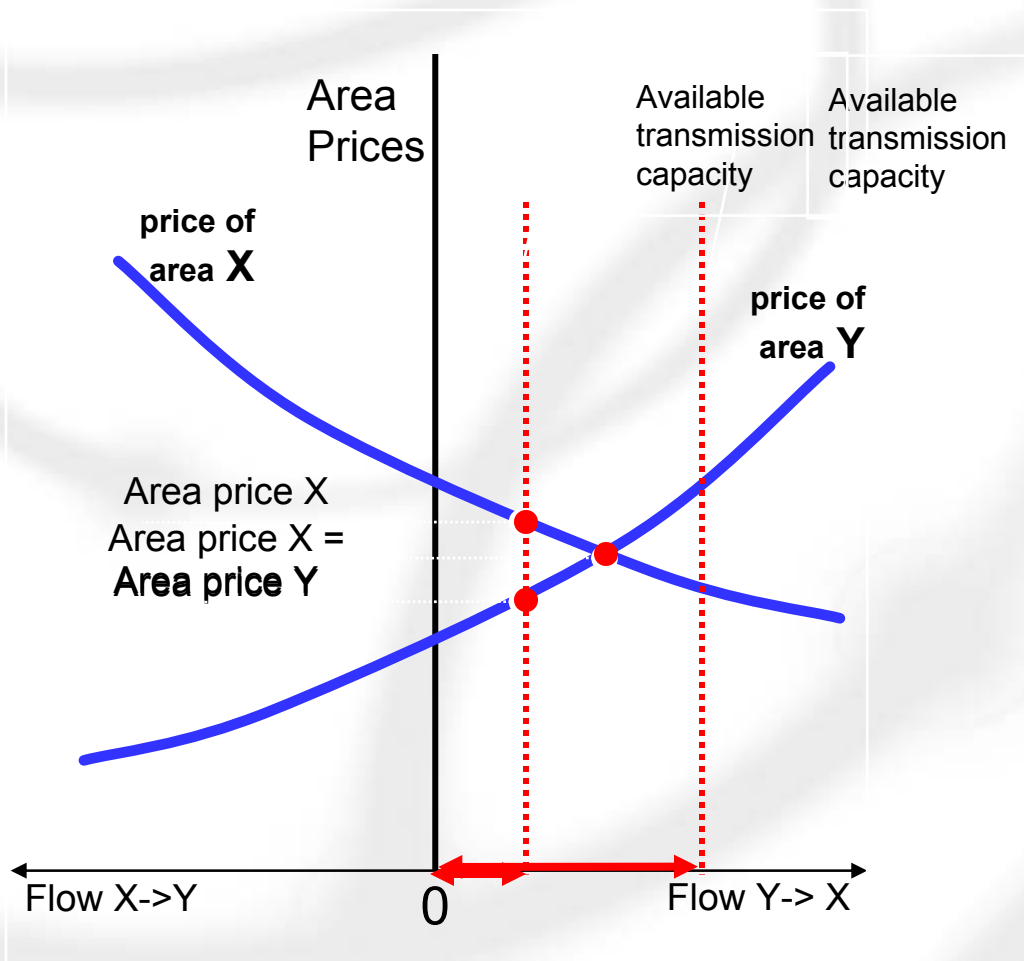


Hourly “NEC” curves

(Net Export/import Curve)

- Start: exchange price without im/exports
- Price influence (down or up) on potential im/exports
- Each exchange produces NEC curves, based on bids in its area
- Can be done with different exchanges and systems

Decentralized market coupling: unconstrained/constrained



Unconstrained case:

Enough transmission capacity

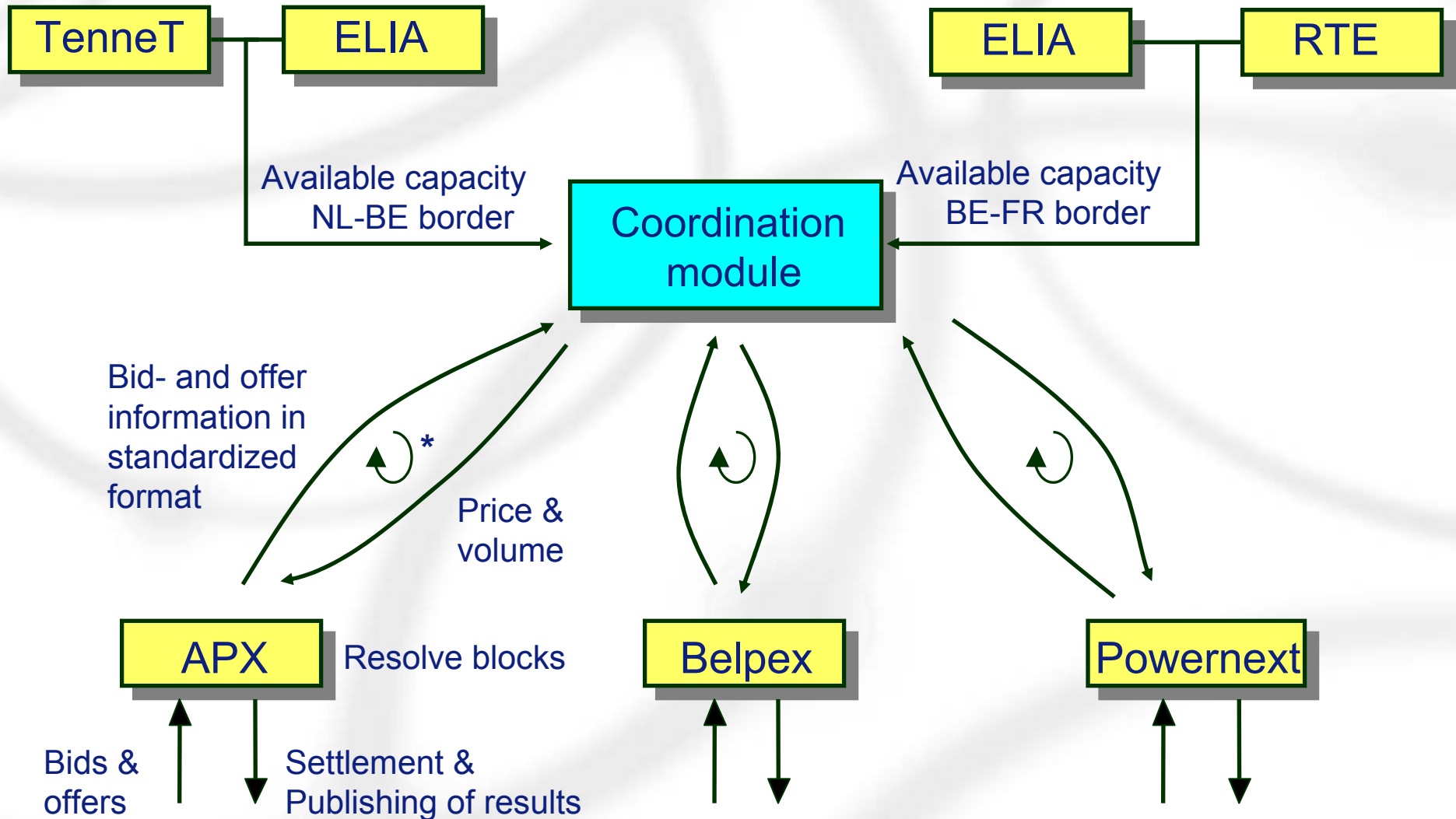
Price for both areas identical:
enough capacity to set one
price at intersection of curves

Constrained case:

Limited transmission capacity

Prices for areas differ: set at
max. im/exports; congestion
revenue

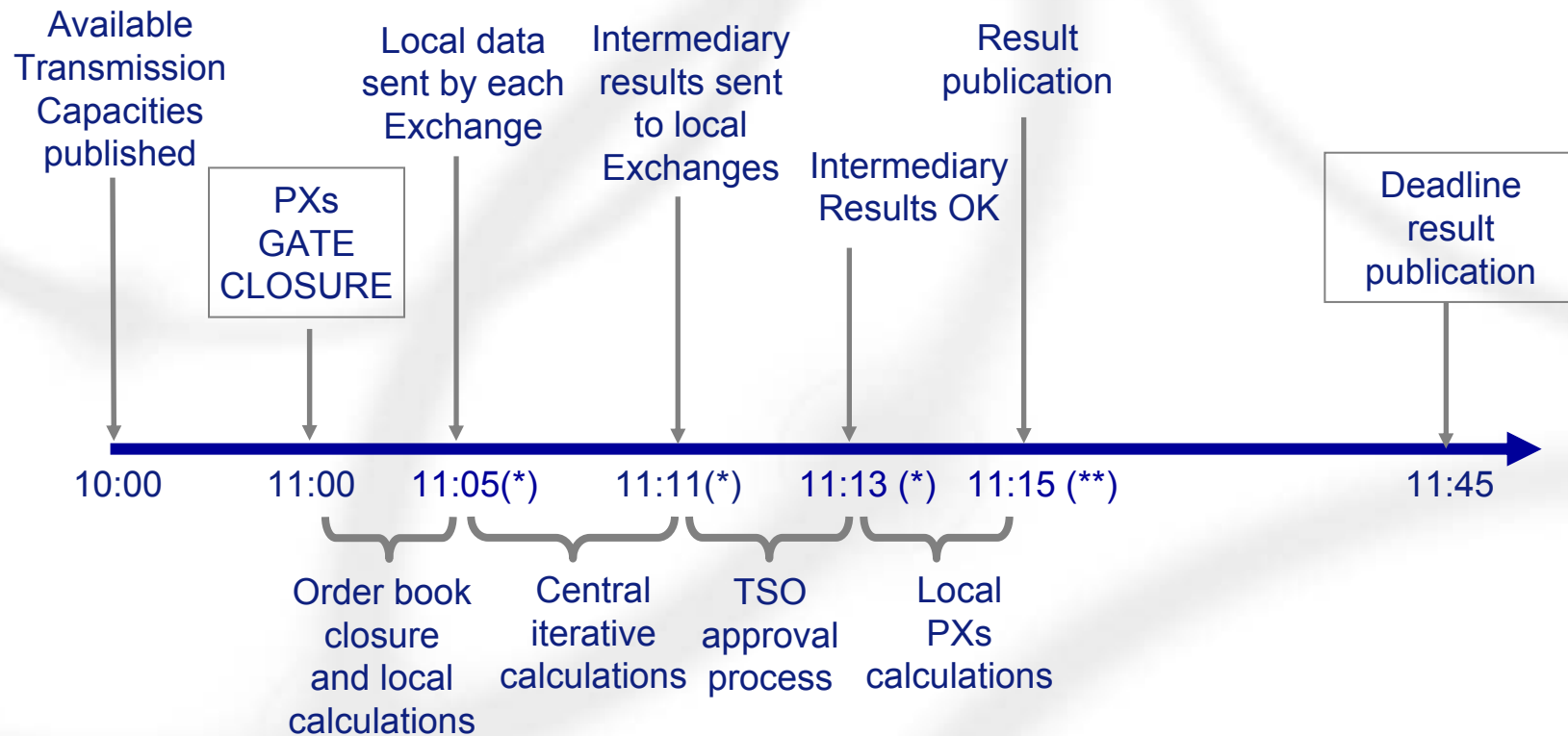
TLC technical solution



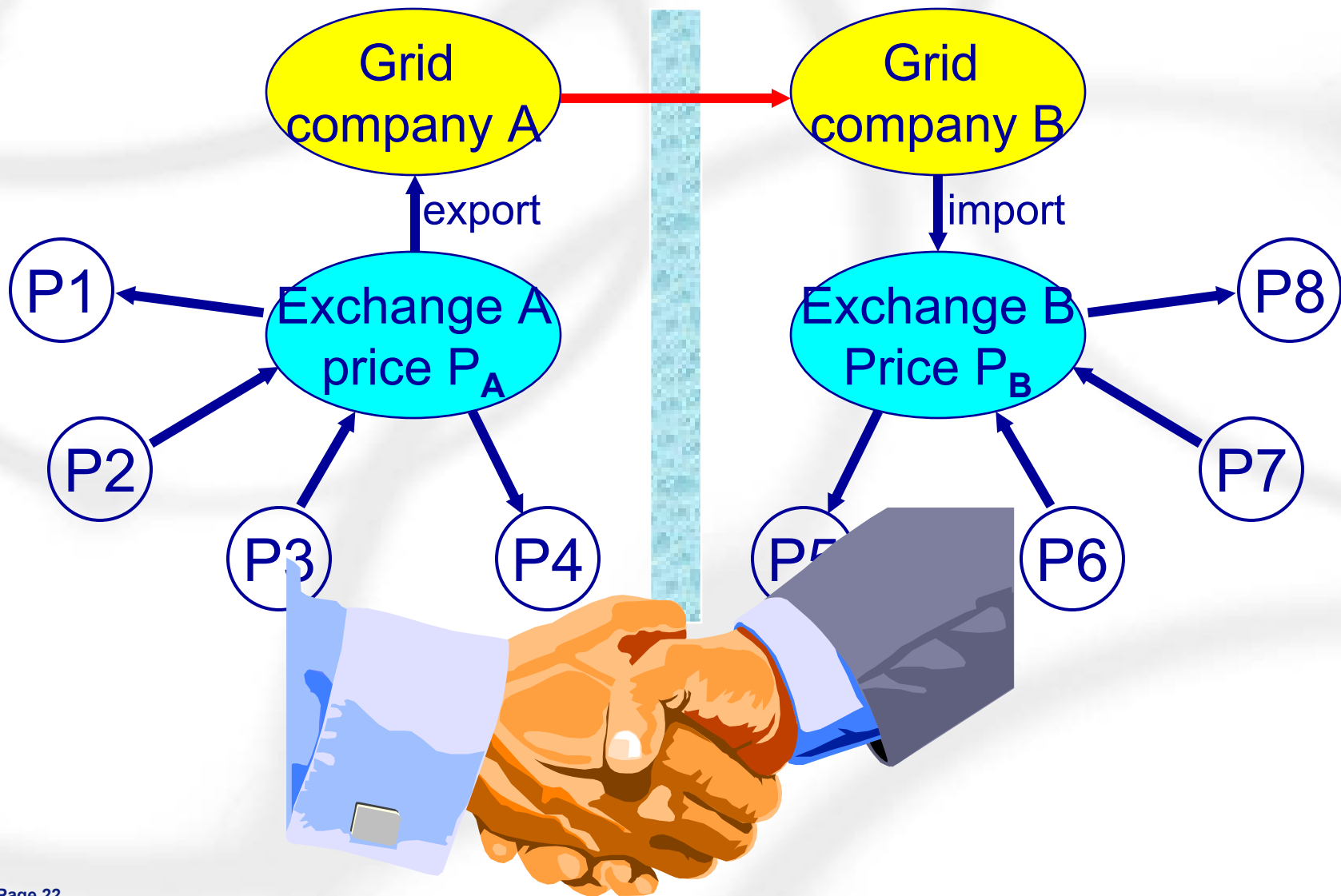
Market Coupling Daily Process



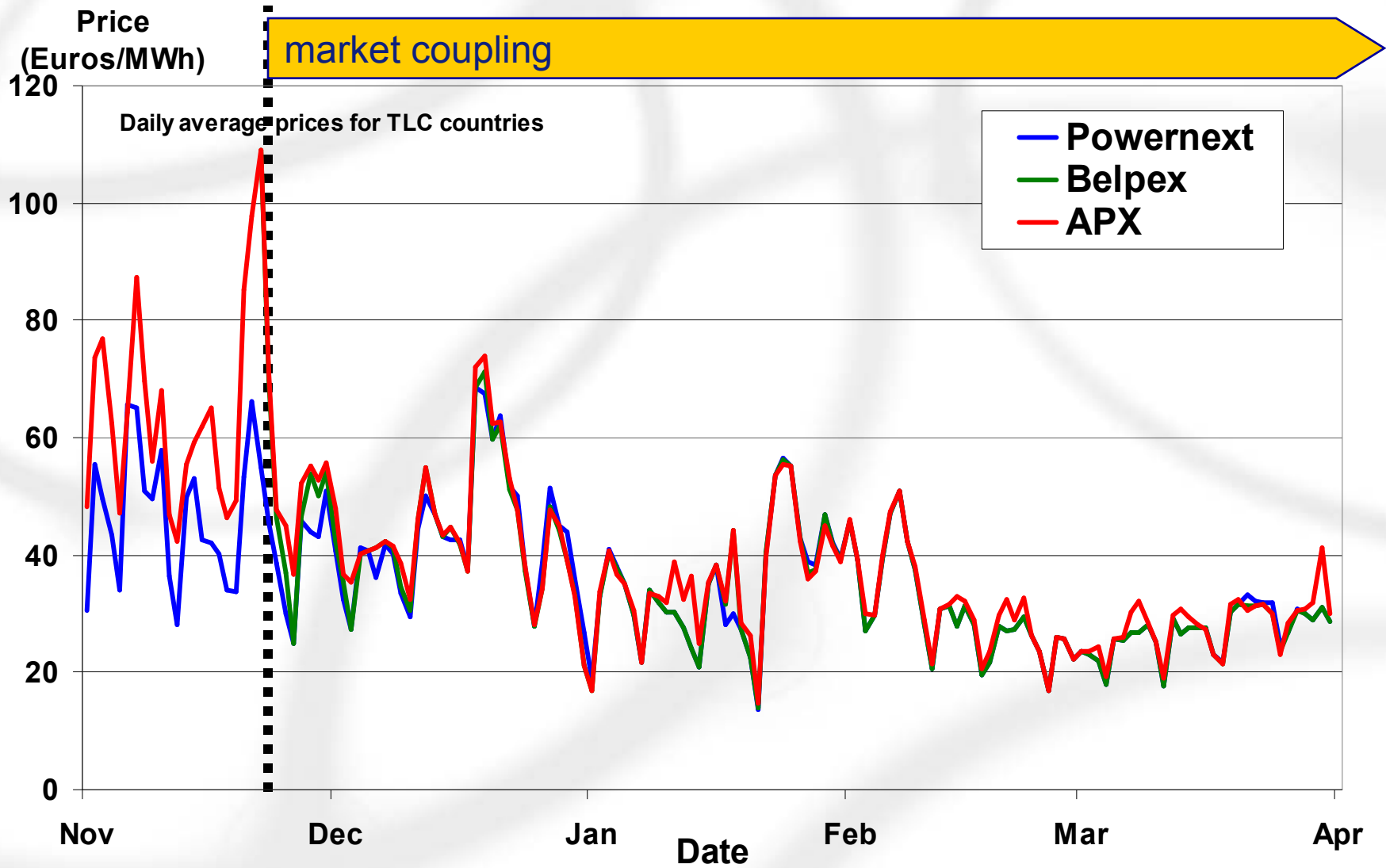
- TLC PXs harmonised Gate closure to 11:00am
- Average publication time results: 11.15 am
(Target time 11:30am, latest possible publication 11:45am)



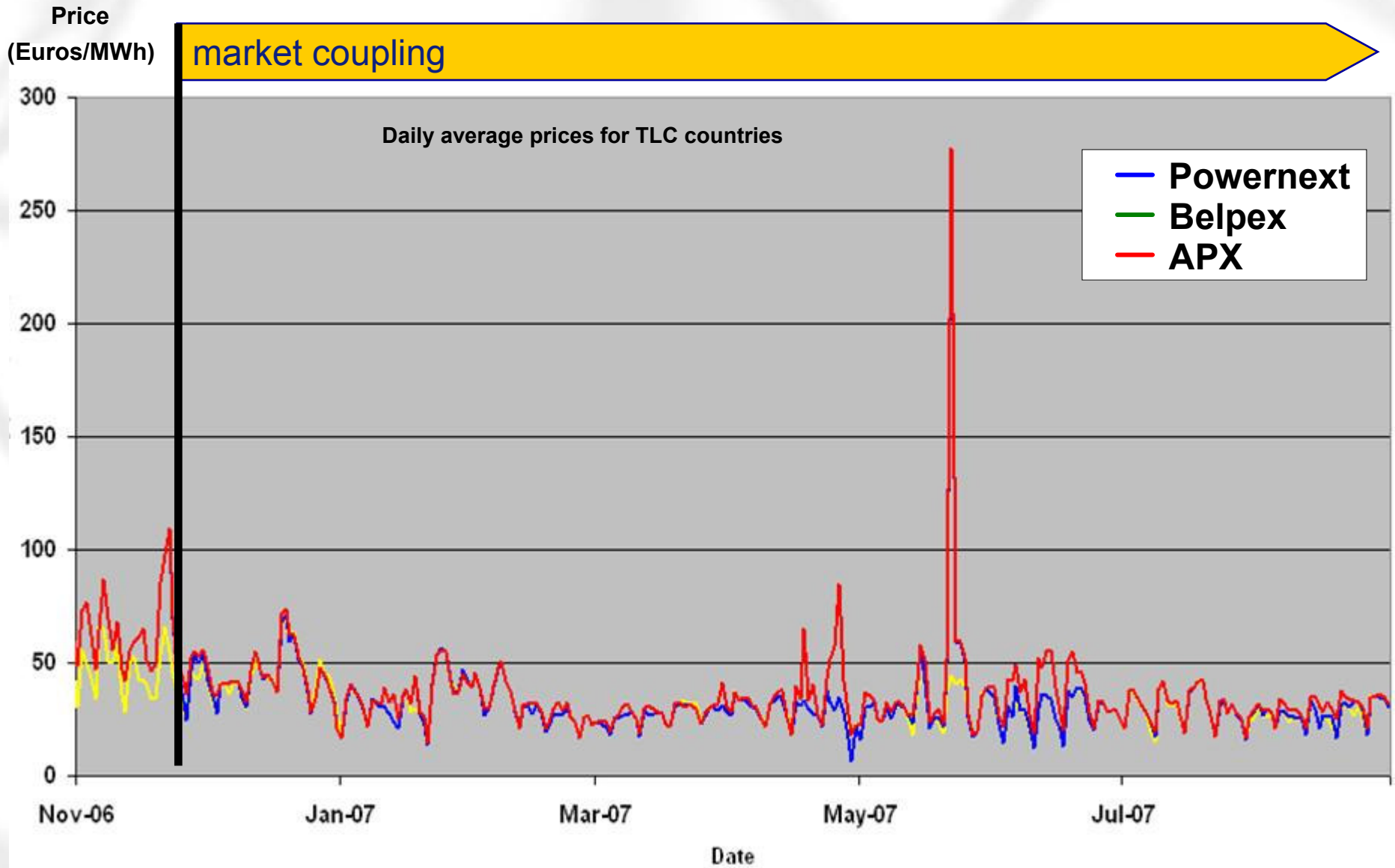
Import and export: co-operation between exchanges and grid companies



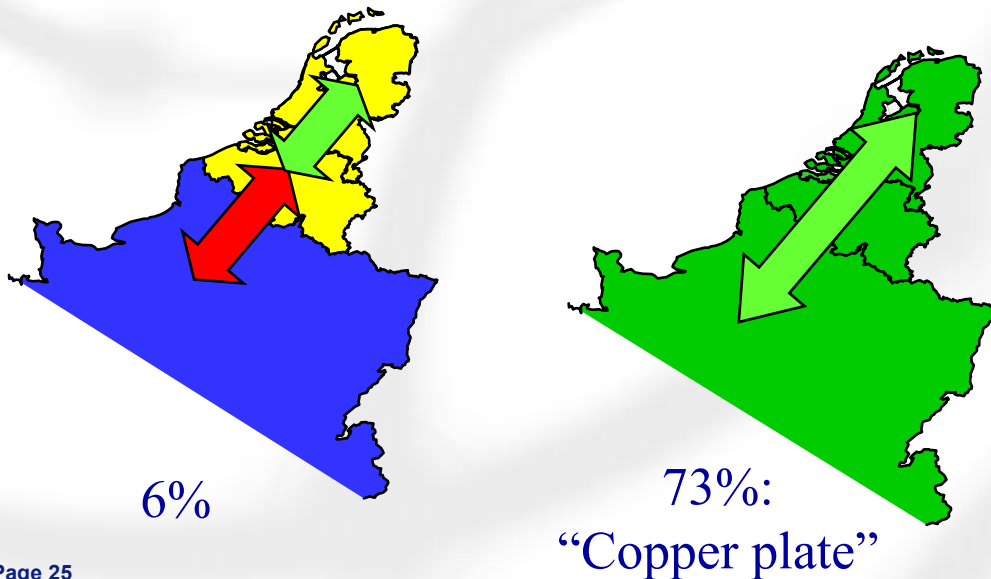
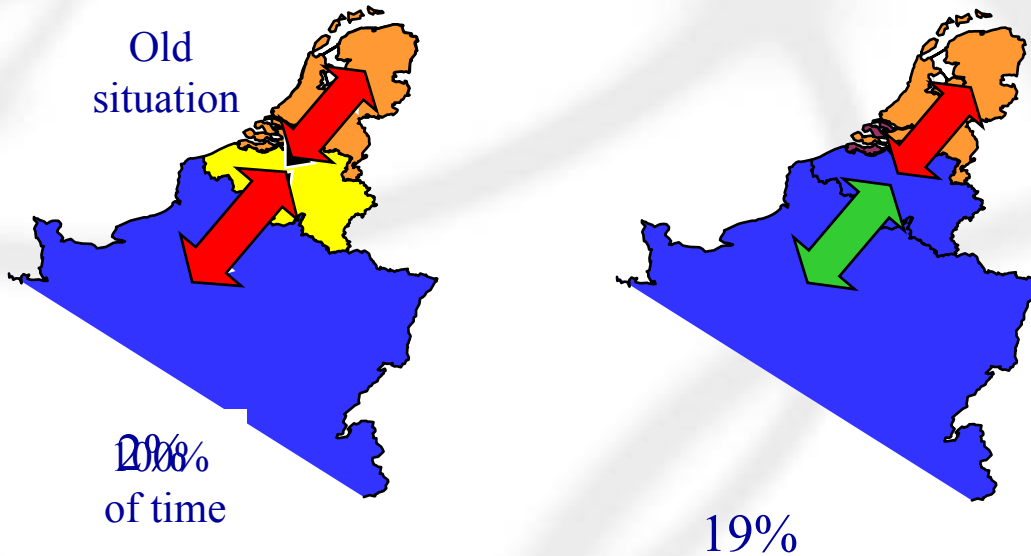
Price convergence



Price evolution



Achievements of market coupling: integration of price areas



Either prices will converge 100%, or prices diverge – but then the transmission capacity used for 100%

→ Better price index

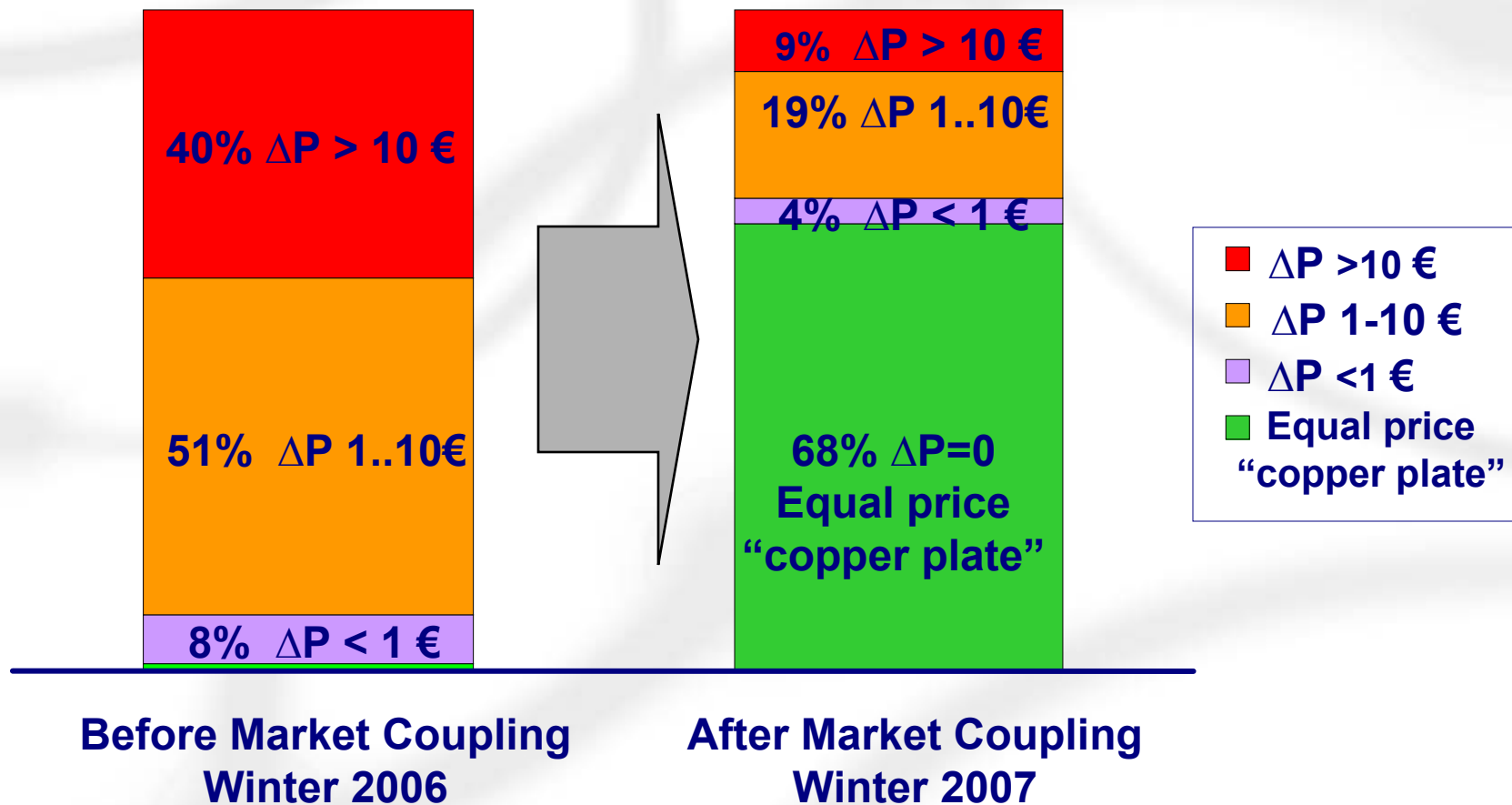
→ Better efficiency and better economic results

→ Better basis for long-term contracts & investments

Shown are the data for January 2007
Percentages vary each month

Achievements of market coupling: Price difference Netherlands-France

Hourly price difference, €/MWh

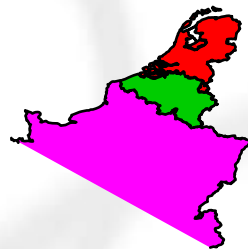


Exchanges becoming price areas

Percentages nov 06 – aug 07

Possible outcomes of TLC

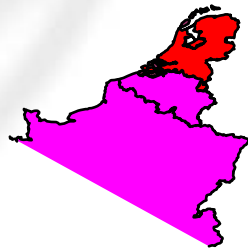
1. BE-NL and FR-BE borders congested: 3 price areas



2%

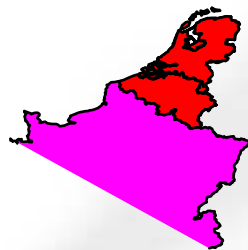
With the old method: only outcome 1, even if there was enough transmission capacity to bring the prices together

2. BE-NL border congested: 2 price areas



12%

3. FR-BE border congested: 2 price areas



28%

Today, either prices will converge fully, or transmission capacity will be fully utilised

4. No congestion: 1 single market

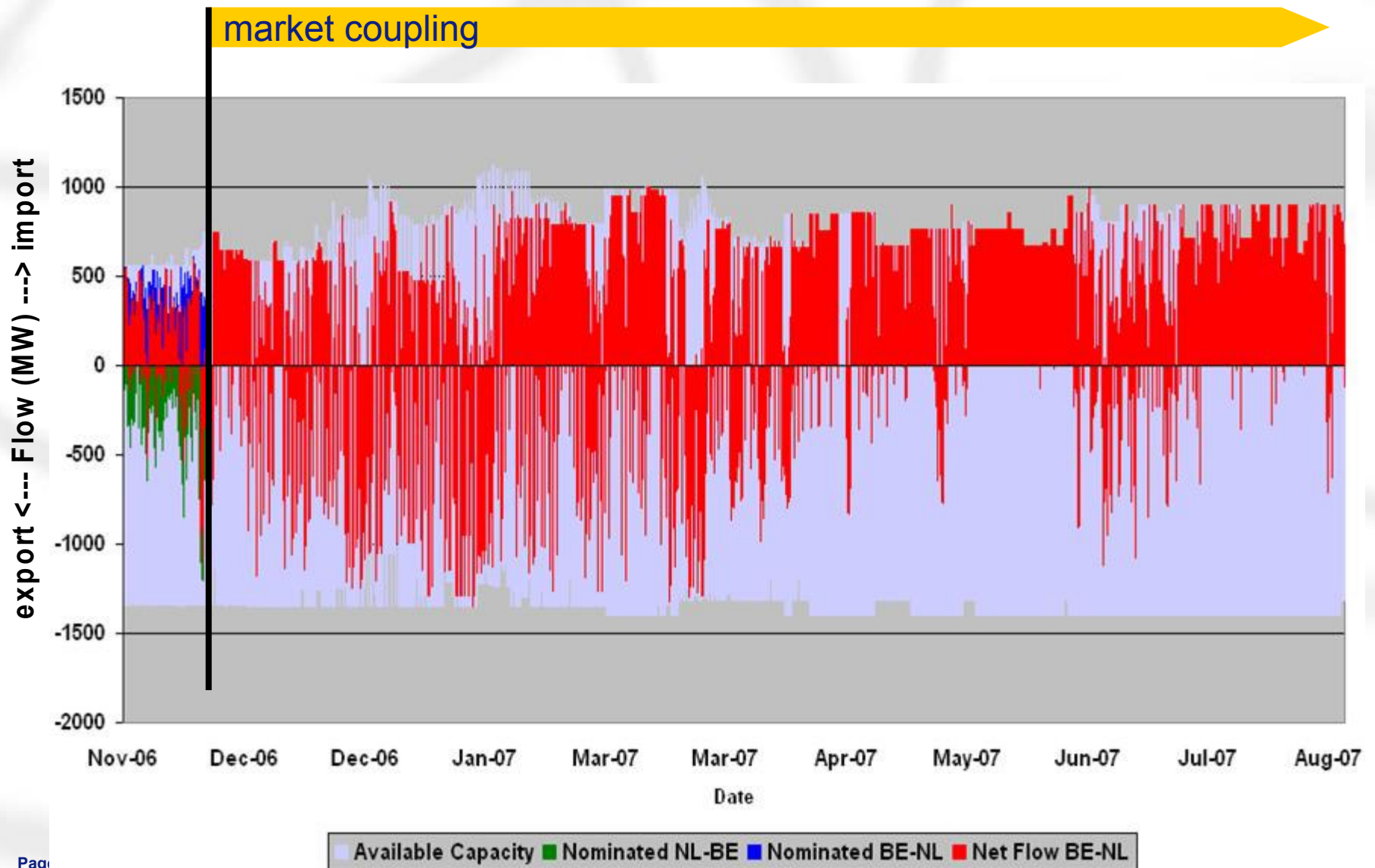


58%

Import/export utilization before and after



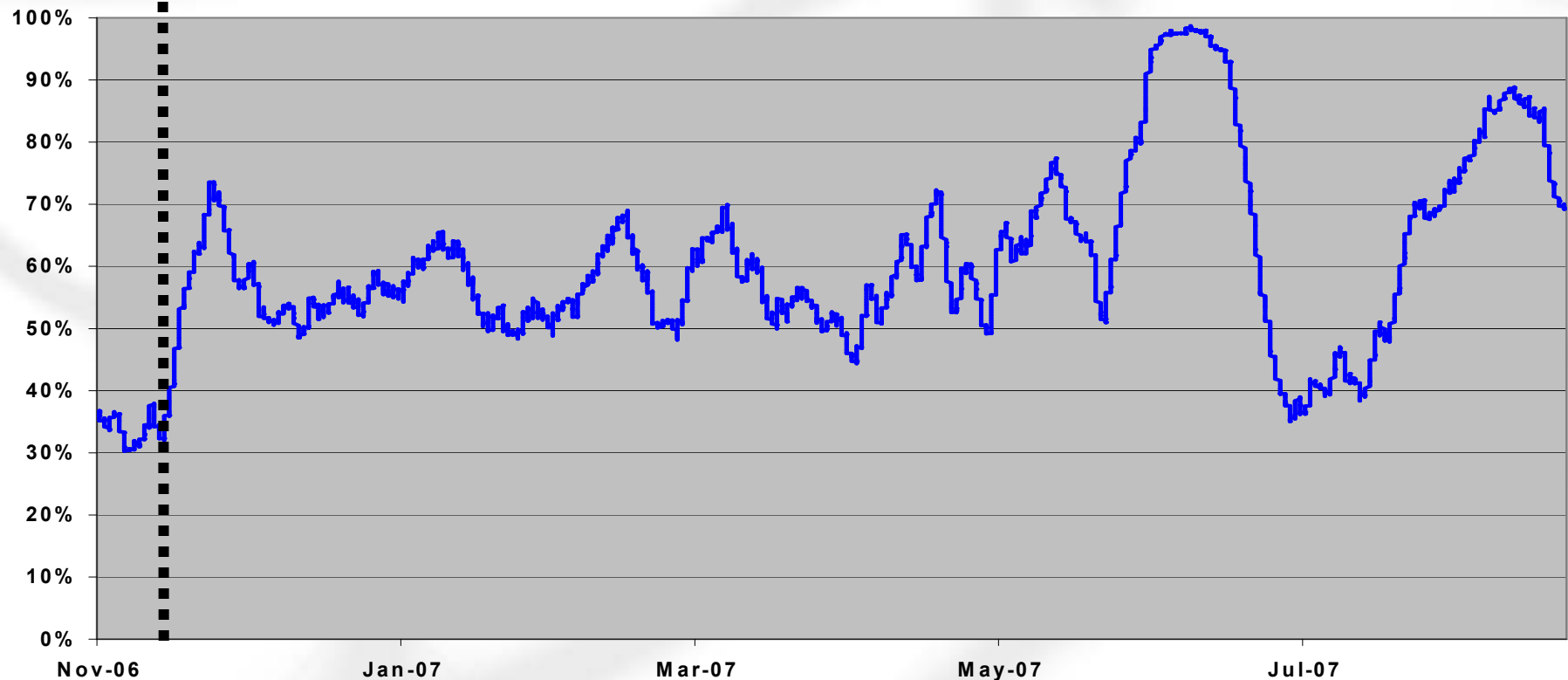
Utilisation of day-ahead capacity on the Belgian- Dutch border



Achievements of market coupling: utilisation of border interconnector

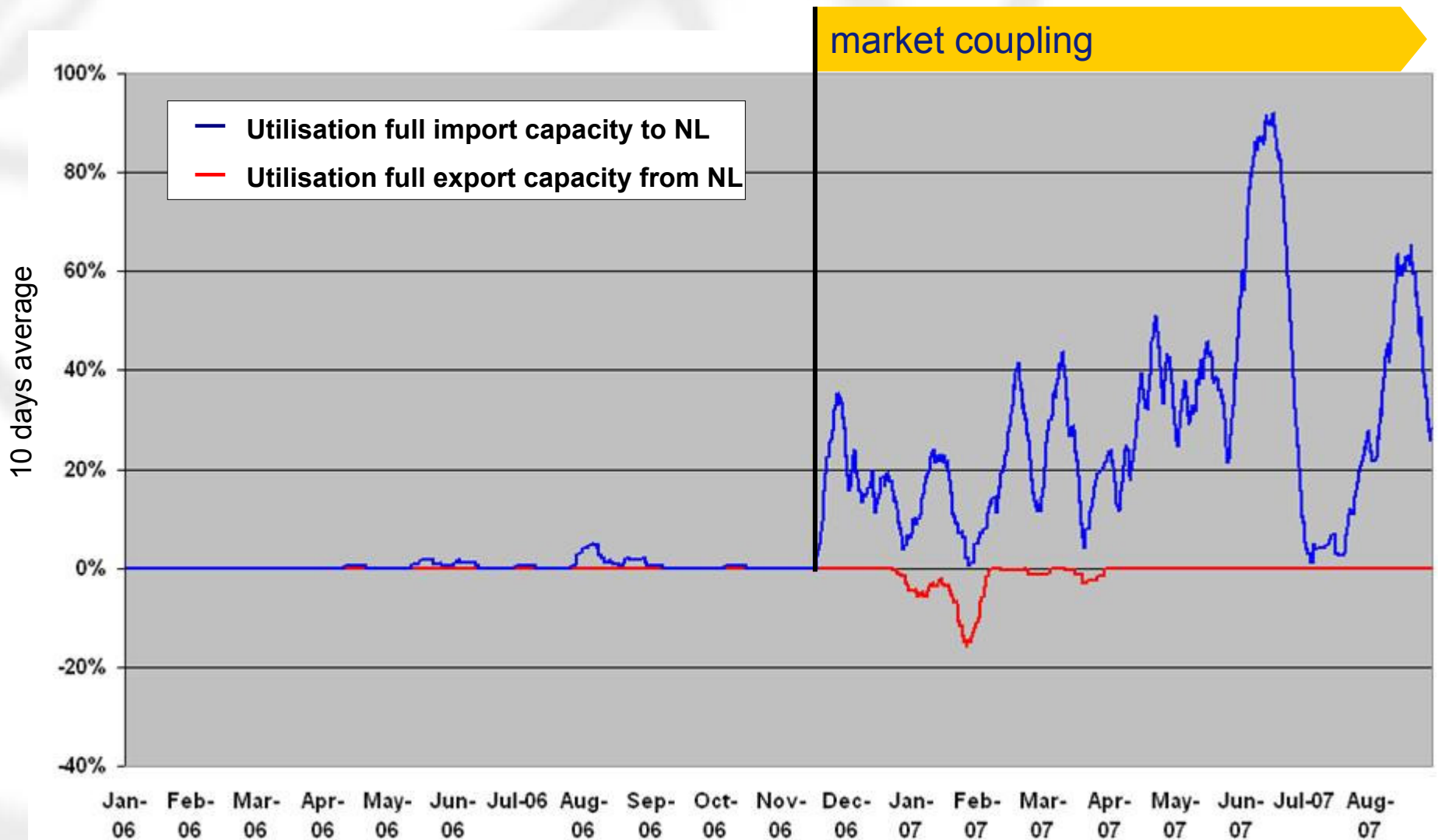
market coupling

Utilisation percentage of Belgian-Dutch border
10-day moving average, November 2006-August 2007



— Average border utilisation

Time % of fully utilized border capacity: Dutch-Belgian border Jan 2006 – May 2007



TRILATERAL COUPLING OF THE BELGIAN, DUTCH AND FRENCH ELECTRICITY MARKETS



Press Briefing - Résidence Palace, Brussels - 14 February 2007

Mix of implicit and explicit auctions

Nordic model:

only daily cross-border

- No auction of long-term capacity
- All capacity daily allocated in market “splitting”
- Long-term contracts are financial

Central European model:
mix of daily and long-term

- Explicit auction for monthly/yearly capacity
- Daily capacity auction, explicit or implicit (=market coupling)
- Both physical and financial cross-border contracts

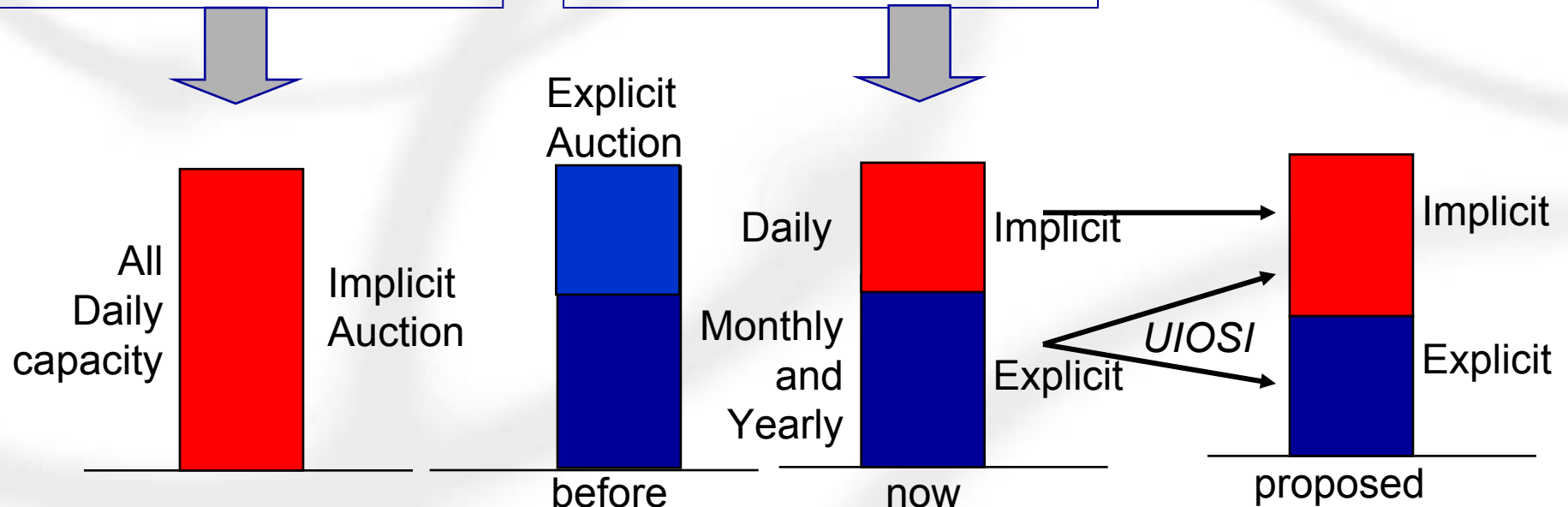
Future:

Use It Or Sell It?

Parties submit explicit capacity back to TSO, receive implicit auction revenue

→ Use as FTR

(Financial Transmission Right)



Market Coupling becomes bigger

- Scandinavia (Nordic Europe): from 1992
- Realized: (2006): France, Netherlands, Belgium
- Now: same countries plus Germany and Luxemburg: Memorandum of Understanding signed on 6 June 2007

European energy commissioner Piebalgs welcomes the Memorandum of Understanding



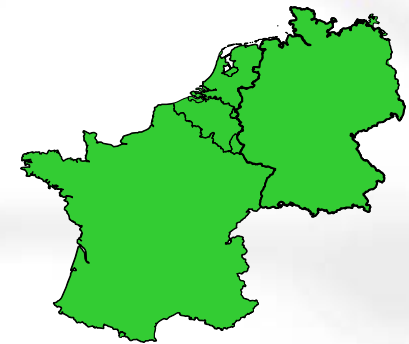
— Transport limitation
○ Integrated market

Memorandum of understanding



MoU signed between CWE parties on 6 June 2007

- Ministries
- Regulators
- TSOs
- Exchanges
- Industry associations

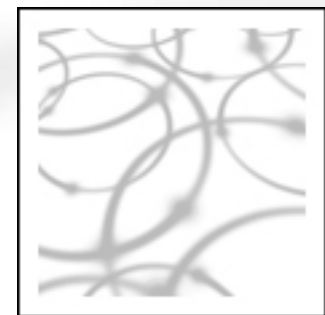


Main features:

- Market coupling of CWE region plus adjacent regions likely to be already coupled (i.e., Nordic) plus other committed countries
- Introduction: 1 January 2009
- Capable of extension on other borders – other regions
- Flow-based transmission solution is the objective
- Possible intermediate step (based on individual border capacities)

Key issues

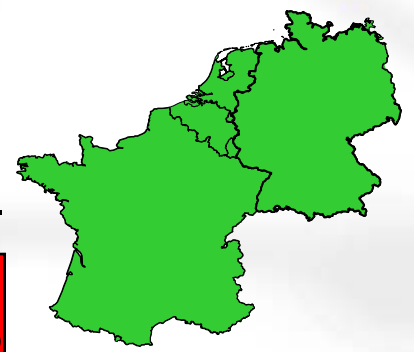
- Technical solution
- Governance framework
- Project organisation



Price convergence simulation for coupling in CWE region (NL-B-Lux-D-Fr)

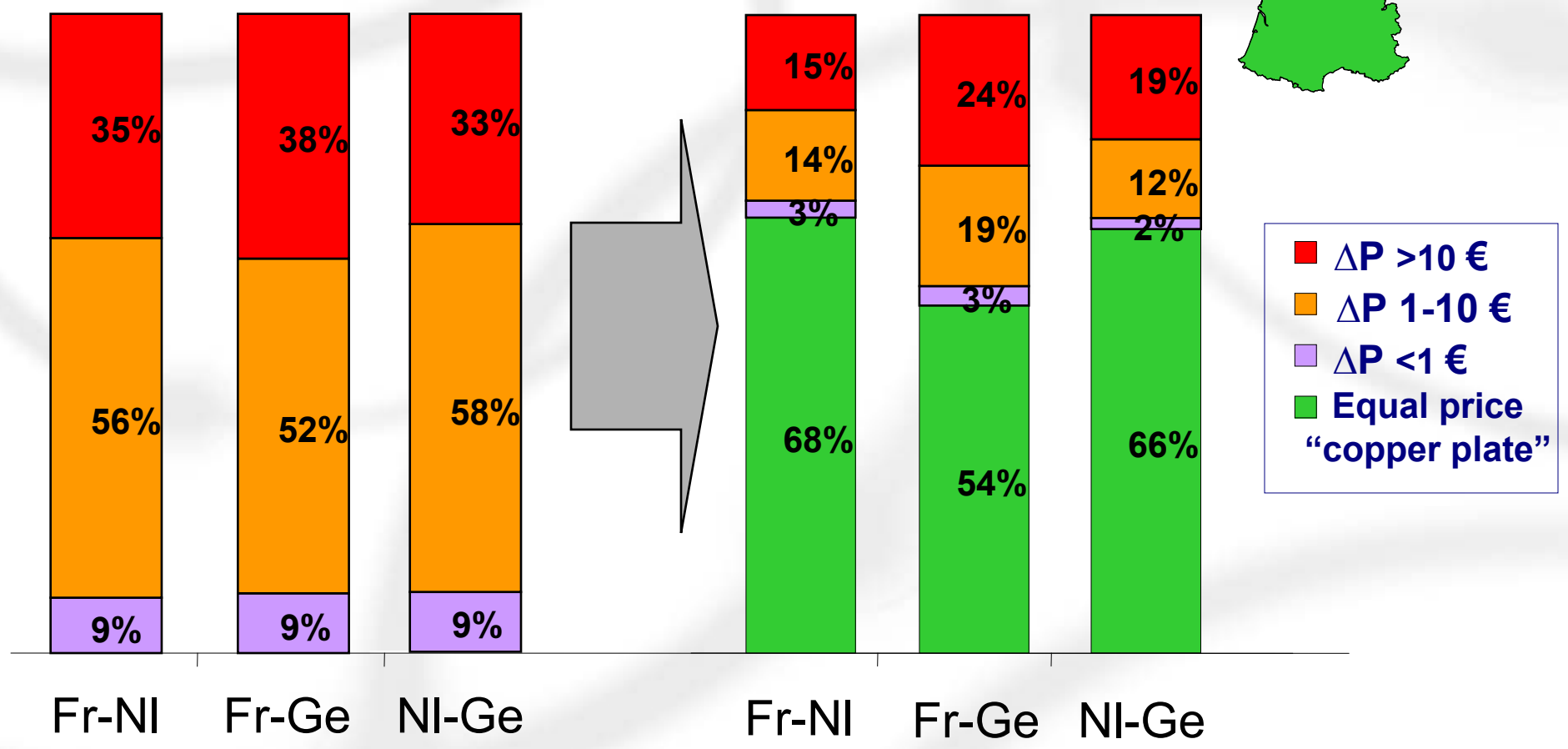


Hourly price difference, €/MWh



Results Historically

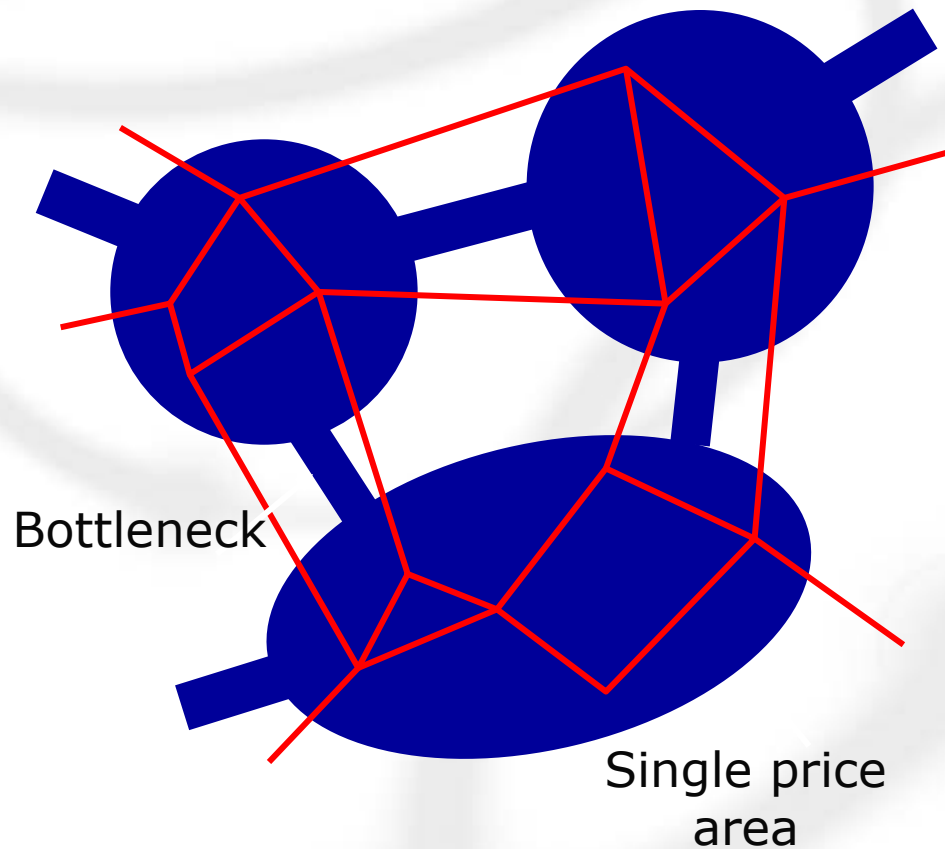
Simulated coupling



* by APX
Page 35

** simple daily ATC capacities like used in the explicit auctions (not flow-based)

Flow-based transmission model



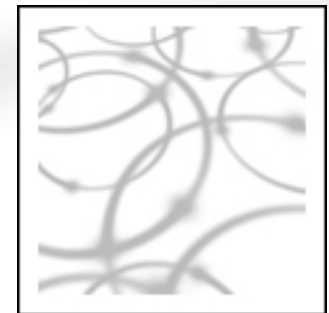
- Market Coupling can be based on
 - Available transmission Capacity (ATC), Border-by-border
 - Power Transm. Distr.Factors
- Capacities/flows modeled as areas linked by bottlenecks; PTDFs used to calculate flows
- Physical electrical flow paths taken into account (loop flows), not “contract path”
- Maximises use of inter-area transmission capacity

But ...

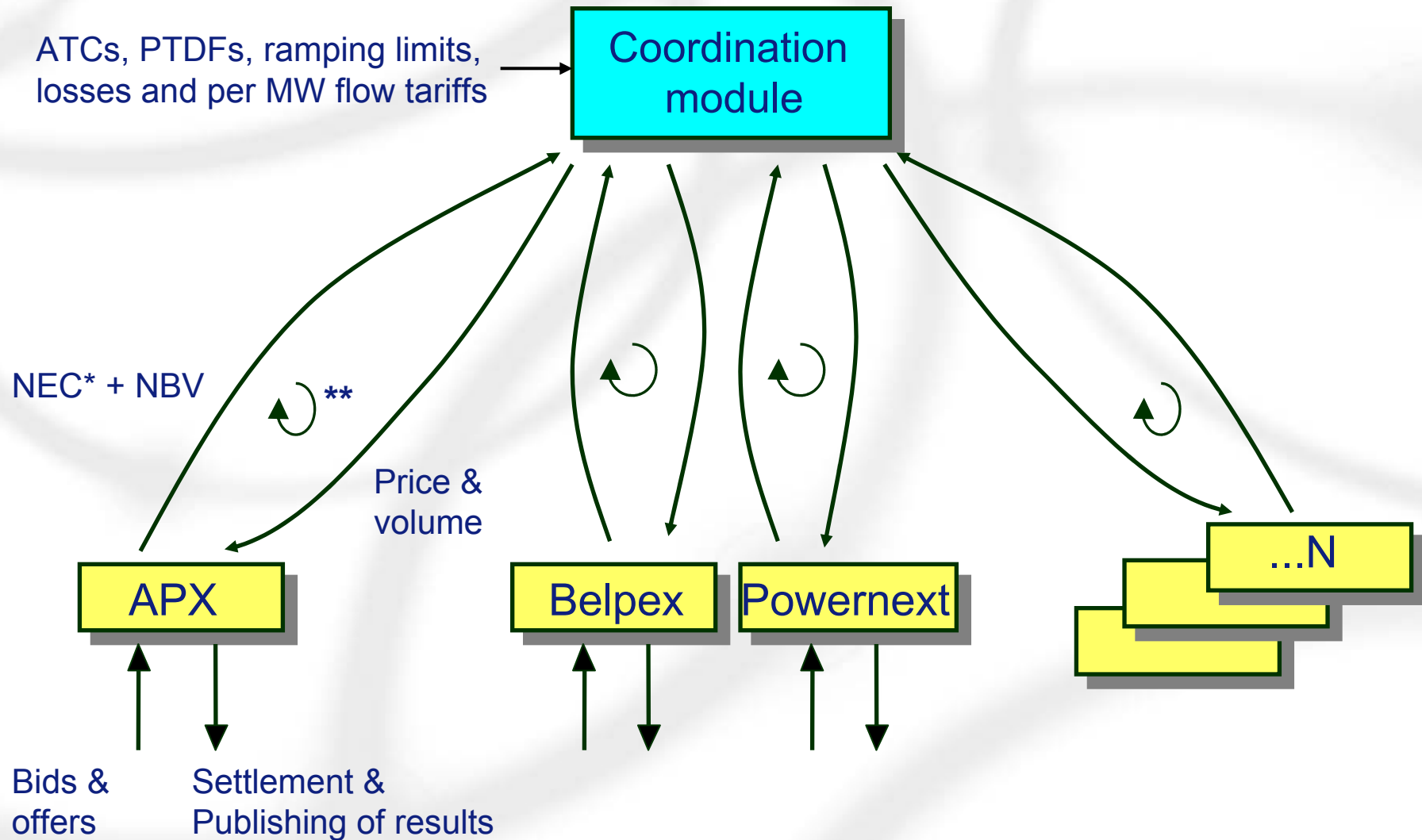
- Are countries the right areas?
- More detailed model? Internal constraints?
- Allocation/use of revenue?

Added functionality

- Extendable to N-markets
- Support for meshed networks with both AC and DC lines
- Use of PTDF matrices for AC lines (optional)
- Ramping on DC lines
- Losses over DC lines
- Per MW flow tariffs
- (Price difference bids for ATC modeled lines)
- (Exotic block bid formats)



Multilateral Market Coupling (MLC)



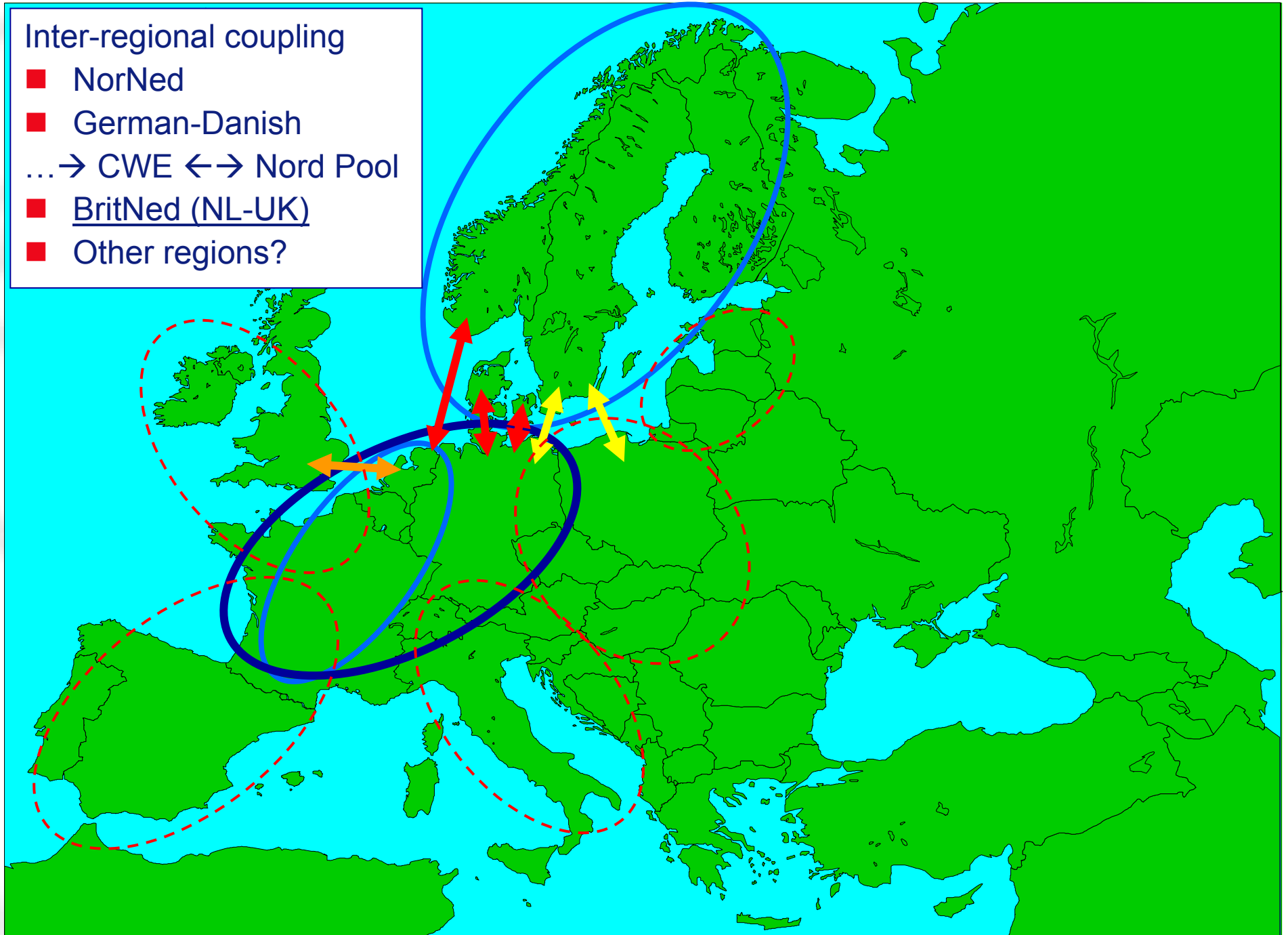
Bids & offers
Settlement & Publishing of results

* NEC = Net Export Curve

** = Iterative calculations

Inter-regional coupling

- NorNed
- German-Danish
- ... → CWE ← → Nord Pool
- BritNed (NL-UK)
- Other regions?



How to couple the regions

Option type 3: Inter-Regional Coupling (MC Dome variant)

