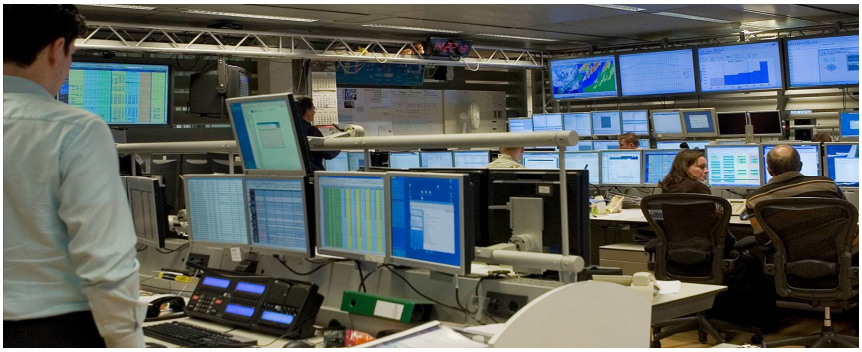
Electricity Exchange set-up and Market Coupling Arrangements



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2. Transmission capacity involved in the market coupling
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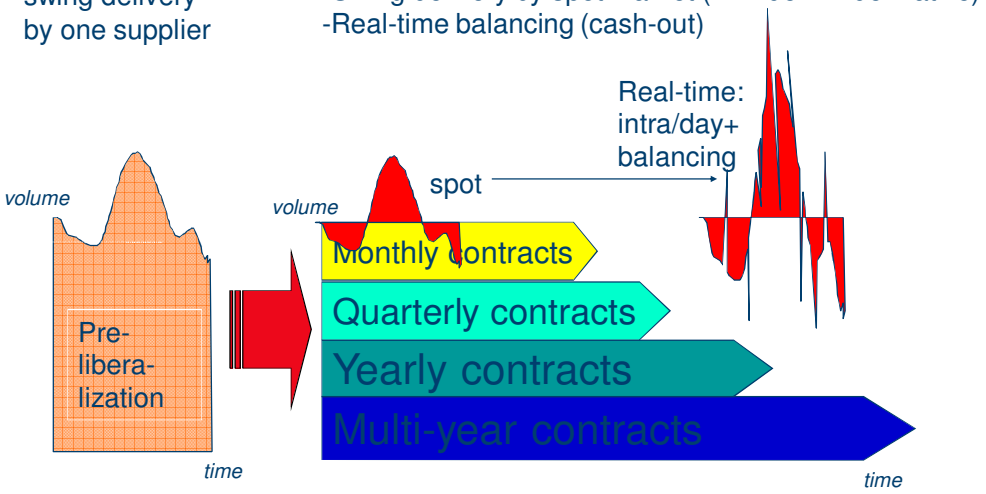
8. Any other

Part 1: General Introduction
Day-ahead market and Market Coupling

A portfolio-driven market

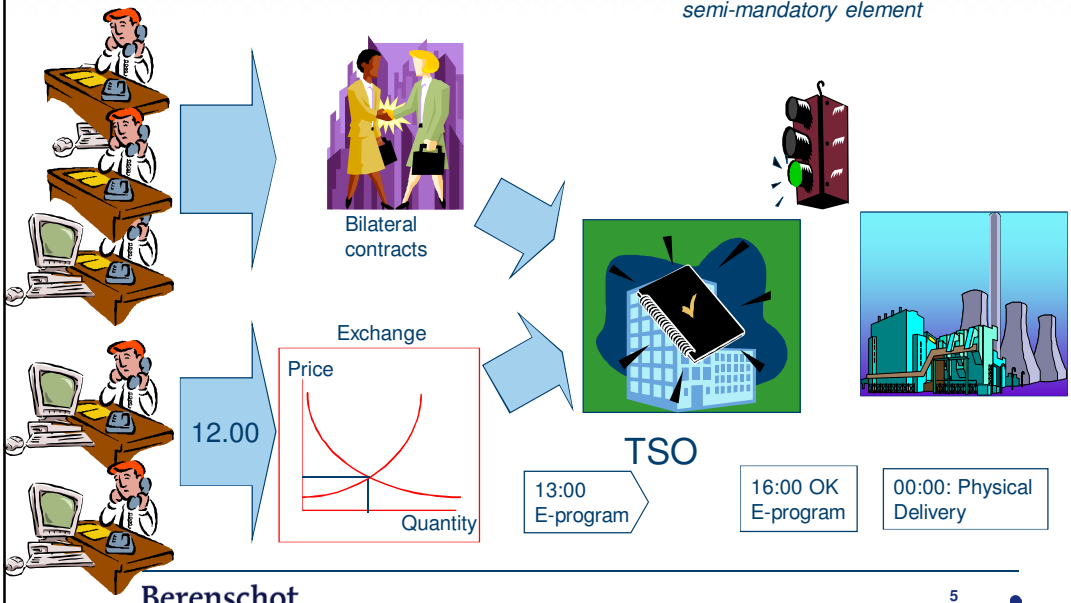
Full-service contract:
Main volume and swing delivery by one supplier

Portfolio contracts system:
- Main volume covered by standardized contracts, bilateral or exchange-traded
-Swing delivery by spot market (→ index → derivative)
-Real-time balancing (cash-out)

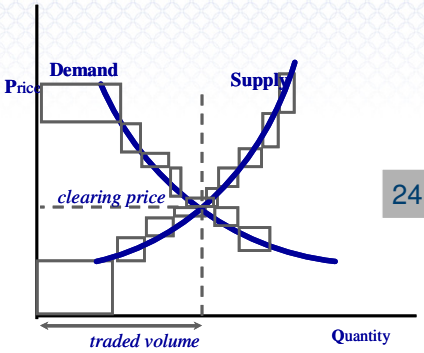


The voluntary* market model (most European countries today)

* *Market Coupling creates a semi-mandatory element*

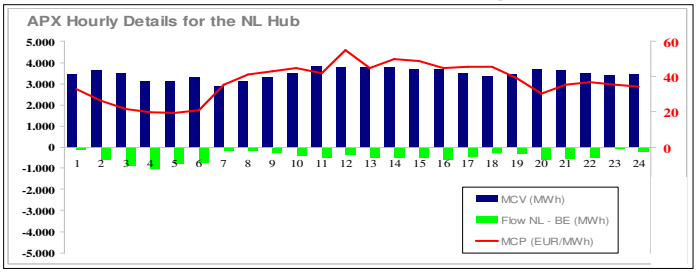


Auctioned spot market

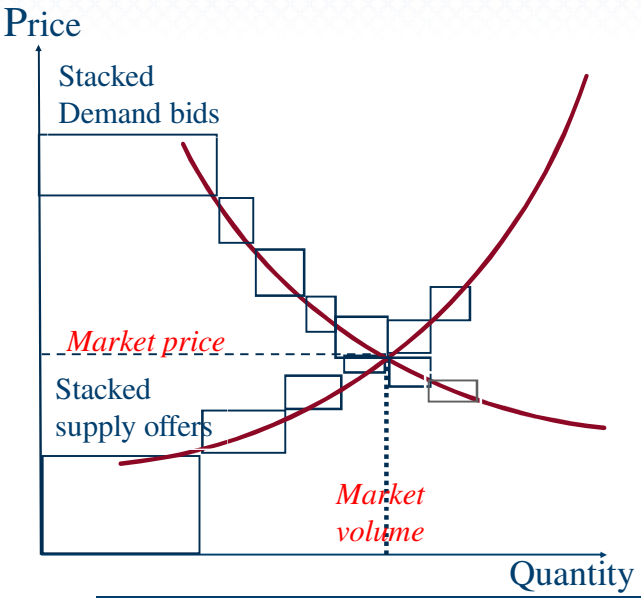


24 x

- Double-sided auction system
- Hourly day-ahead contracts (MWh)
- 24 x → different result each hour
- Physical delivery
- Central counter party: APX
- Equilibrium price each hour (Euro/MWh)
- Hourly volumes/prices published
- Integrated with cross-border auction

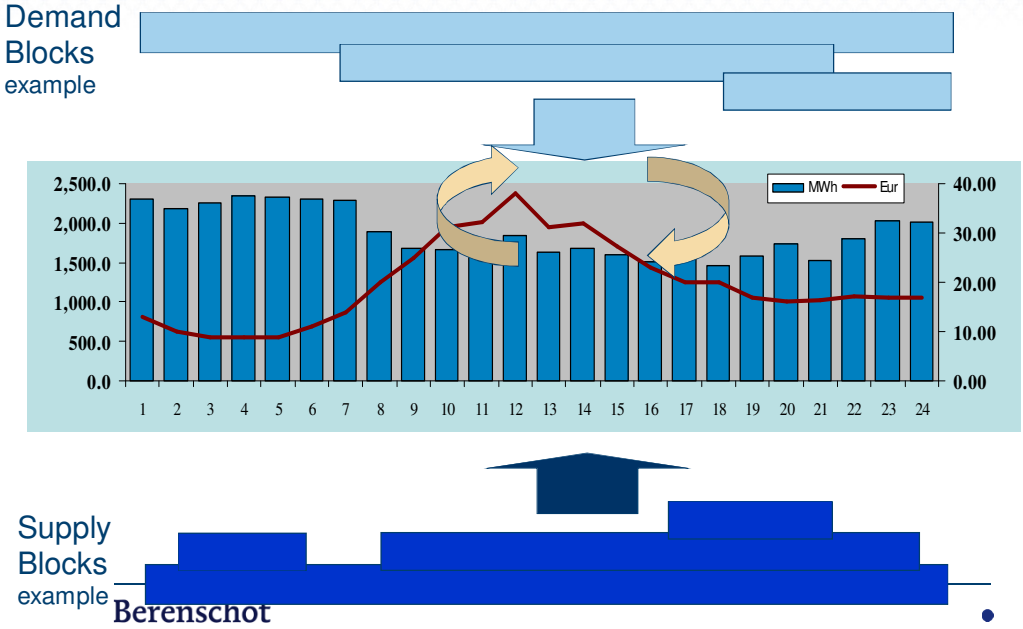


The auction traded market: Day-ahead spot market, area-based

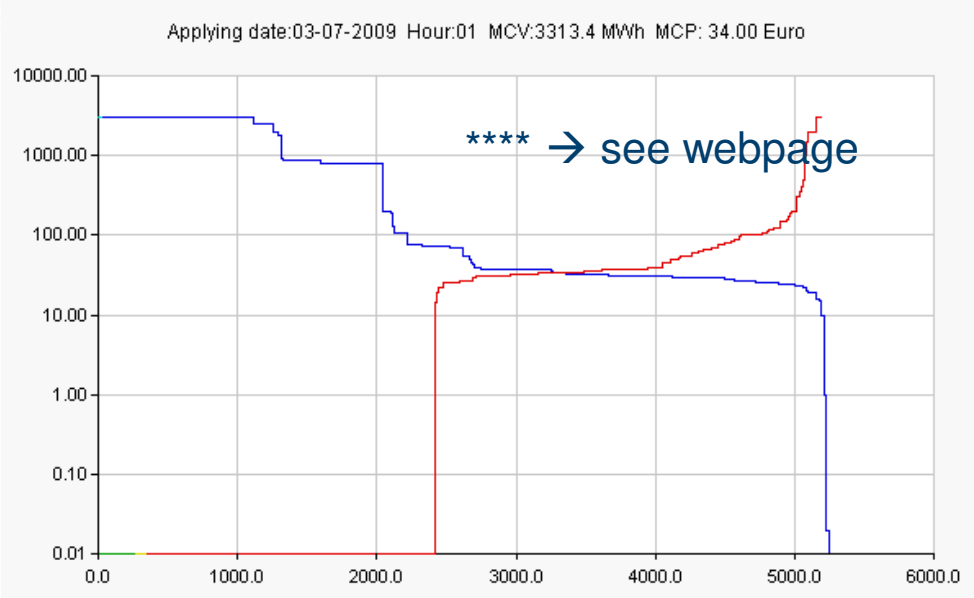


- Double-sided auction:
  - Supply side bids
  - Demand side bids
  - Batch process
- physical supply and buy/sell based on earlier OTC contracts
- ~ 35% of demand daily traded and priced (Dutch market)

Hourly bids and flexible block bids, user-defined e.g. for thermal power: system iteration

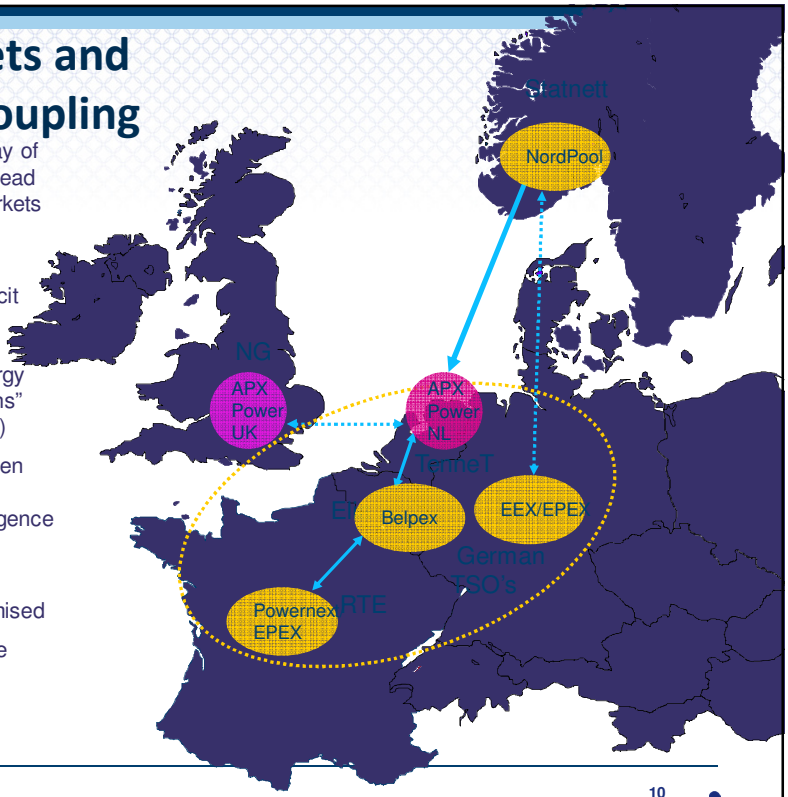


Transparent publication of the curve of ALL supply and demand bids on the website

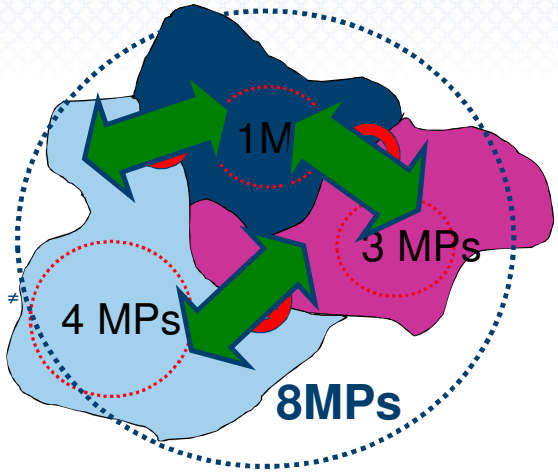


Spot Markets and market coupling

- Market coupling is a way of linking separate day-ahead (auction-style) spot markets using cross-border transmission capacity
- Conducted as an "implicit auction": transmission capacity allocation is integrated with the energy market ("explicit auctions" sell capacity separately)
- Price differences between each spot market are minimised, with convergence at times when there is sufficient capacity
- Capacity usage is optimised
- Perfect Market arbitrage
- Integrated market



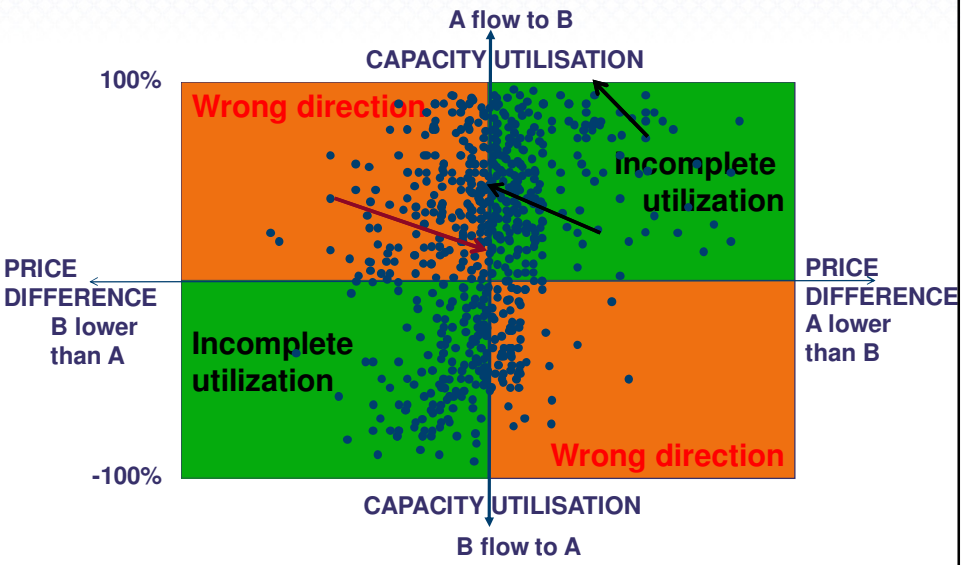
Explicit auctions disadvantages



Explicit daily auctions:

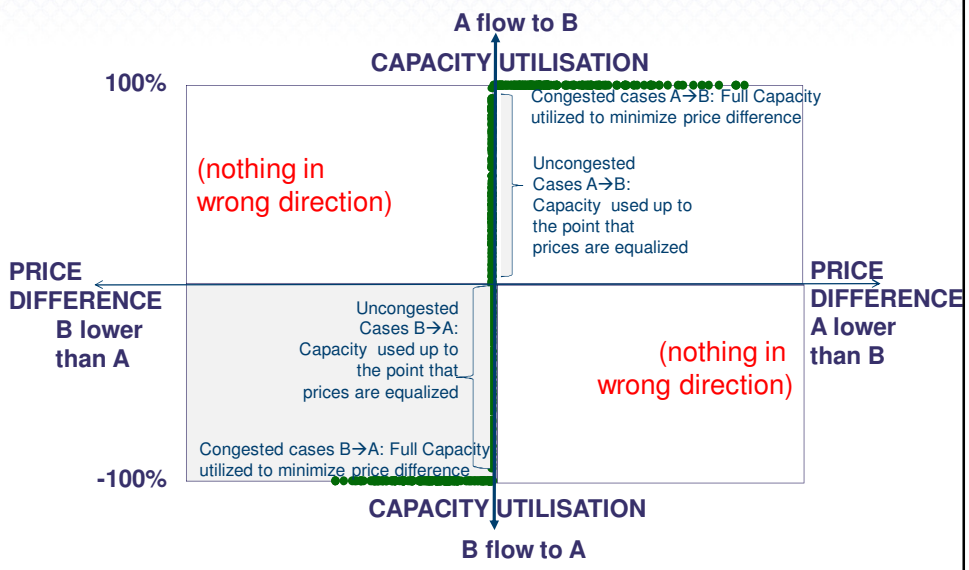
- Parties have to buy border capacity before daily market
- Risks of 2-step trading of capacity / energy → High risk premiums
- No guarantee use it or lose it → Incomplete capacity use
- Im/exports not always in right direction → Adverse scheduling
- Difficult to pass successive borders → Pancaking of costs & risks
- Area prices separate, even when there is no constraint → Fragmented market
- Low number of market parties in each area → Market dominance

Hourly Capacity Utilisation – Explicit Auctions



Hourly Capacity Utilisation - Coupled

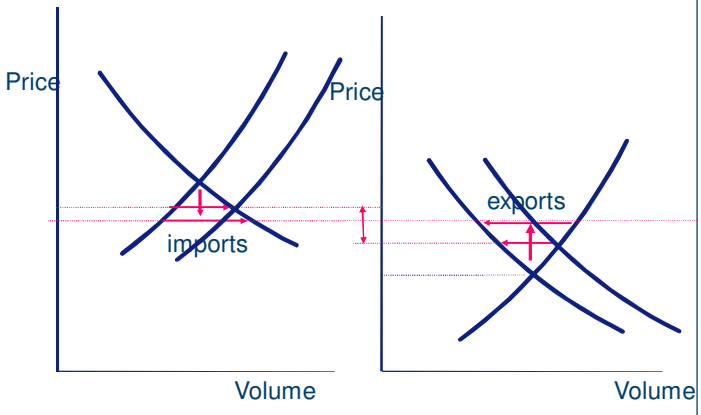
Optimal utilisation (same price unless congested)



Target model: Market coupling

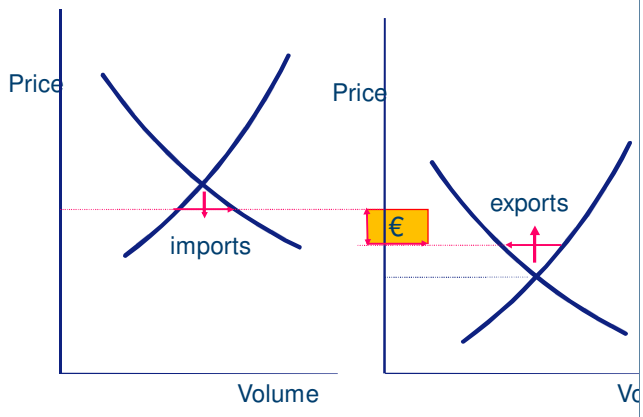
Day-ahead auction A

Day-ahead auction B



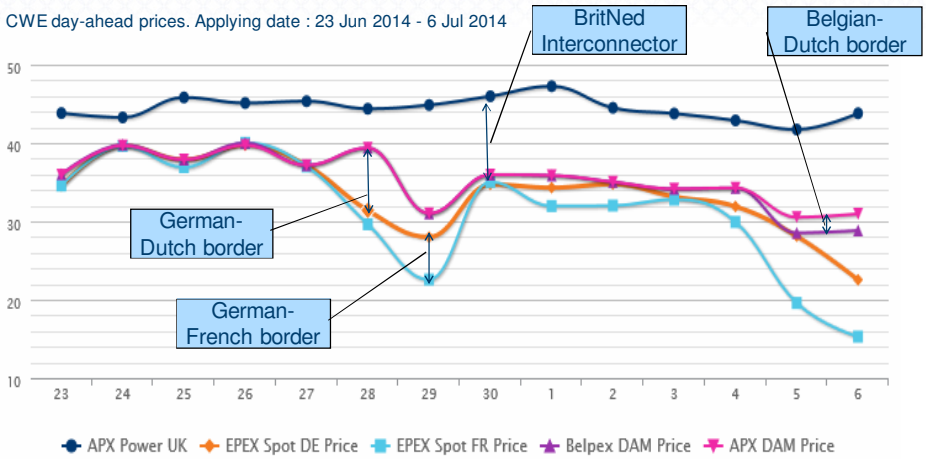
- Two markets, sharing their order books
- Connected through interconnector
- Flows are resulting from market forces
- Flows in right direction
- Optimal utilization
- Border flows through the daily market
- Better liquidity, lower volatility, robust index
- Integrated market
- Higher # of players in integrated area
  → better competition!

Market Coupling Revenue



- Market Coupling is an auction:
- Revenue if area prices differ
- Income = ΔP*Flow(Im/exports)
- Flow goes through exchange
- Income goes to TSO
- Can go to parties submitting LT capacity in market coupling:
  - Original LT contract owners (after transfer to CFD)
  - Use It Or Sell It Parties
- No Revenue if ΔP = 0
- In most of EU countries congestion income has a regulated destination:
  - Build new capacity
  - Give back to market parties (grid tariff reduction)

Examples of Interconnector income

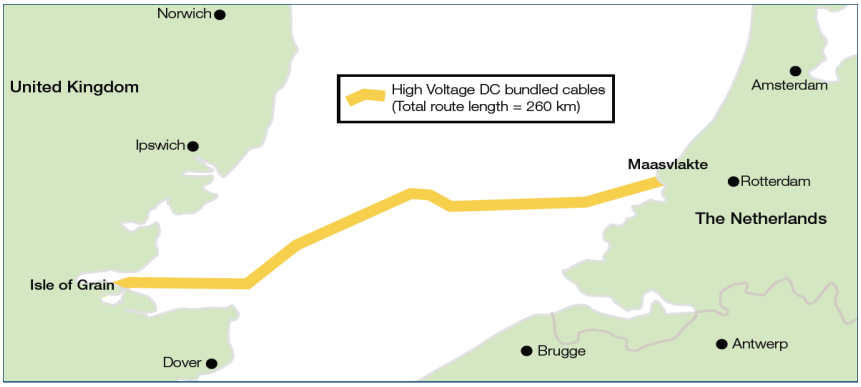


Advantage of market coupling on new interconnector:

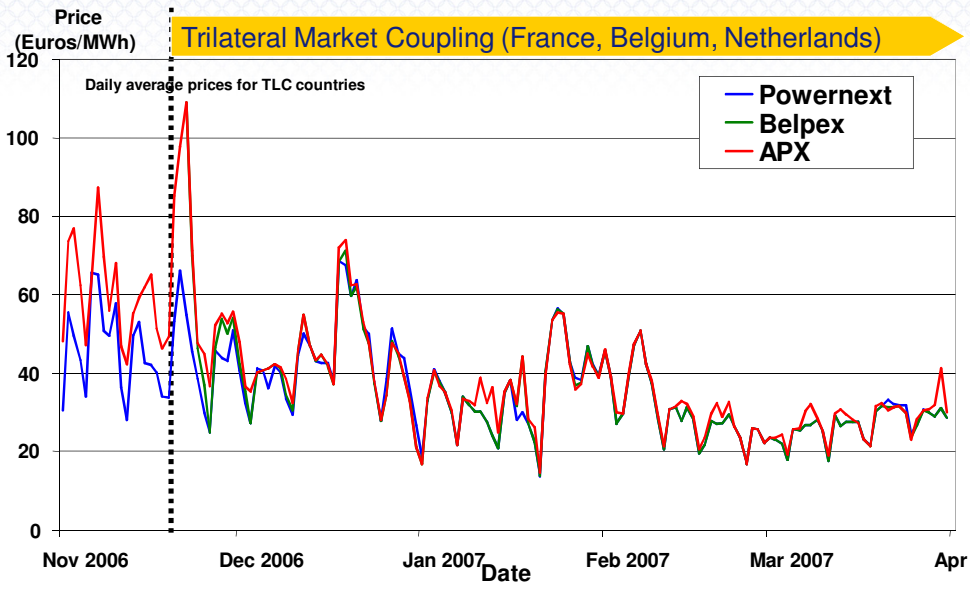
- If the prices differ, all income goes to TSO / interconnector investor
- if the markets converge, the price difference is really zero → one big market

Introduction BritNed

- BritNed is a joint development between National Grid and TenneT
- 260km, 1000 MW, HVDC Interconnector UK and Netherlands,
- APX provided initial market coupling solution for BritNed:
  - Implicit auction to link the UK and Dutch day-ahead power markets
  - Market coupling now part of NWE (North West European Electricity Market)
  - 300 MW for daily market coupling + LT capacity auctions

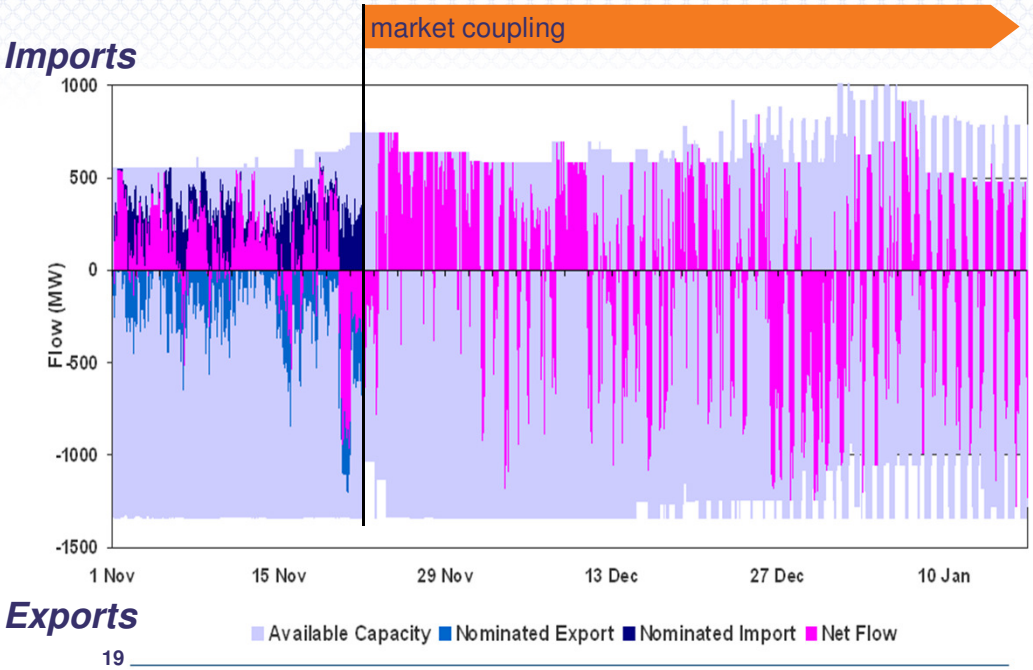


Prices after First market coupling 2006



Convergence France, Netherlands, Belgium

More Import and Export flows



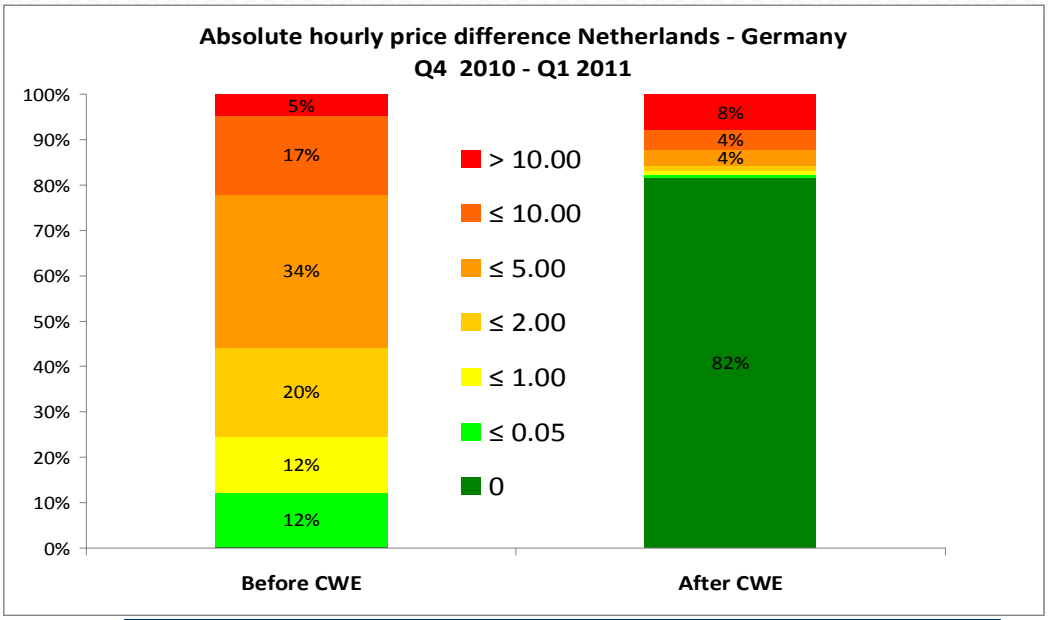
Support from European Commission

Press Briefing - Résidence Palace, Brussels - 14 February 2007
European energy commisioner Piebalgs hailes the result of Trilateral Market Coupling

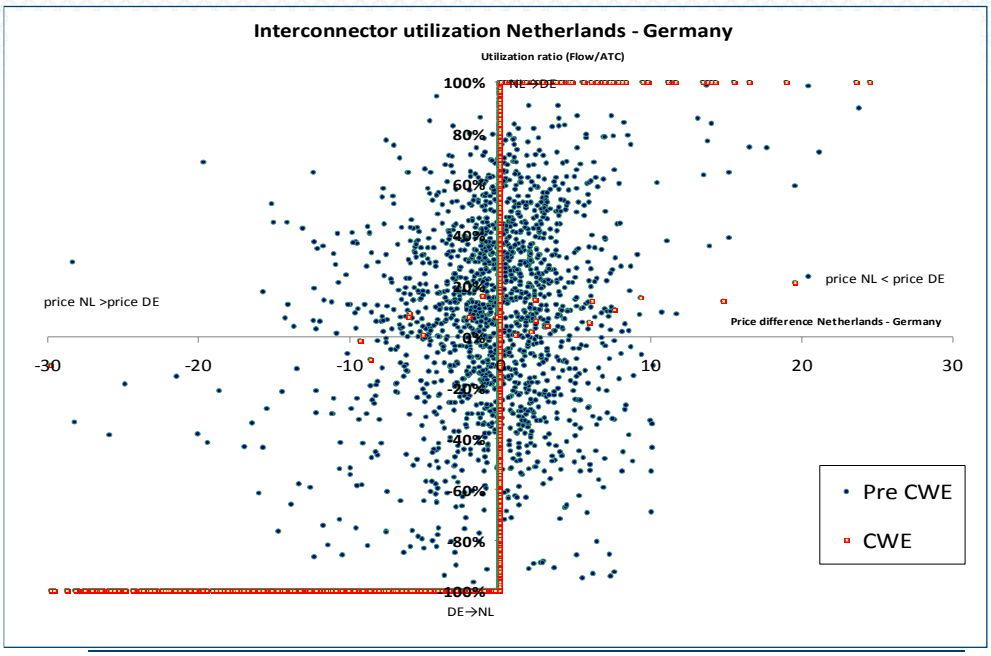
That's why it became European "target model"

Signing of the Memorandum of Understanding for Market Coupling in the "Pentalateral" region: Central Western Europe, (CWE)

Next success: Convergence Netherlands-Germany after CWE Market Coupling in 2010

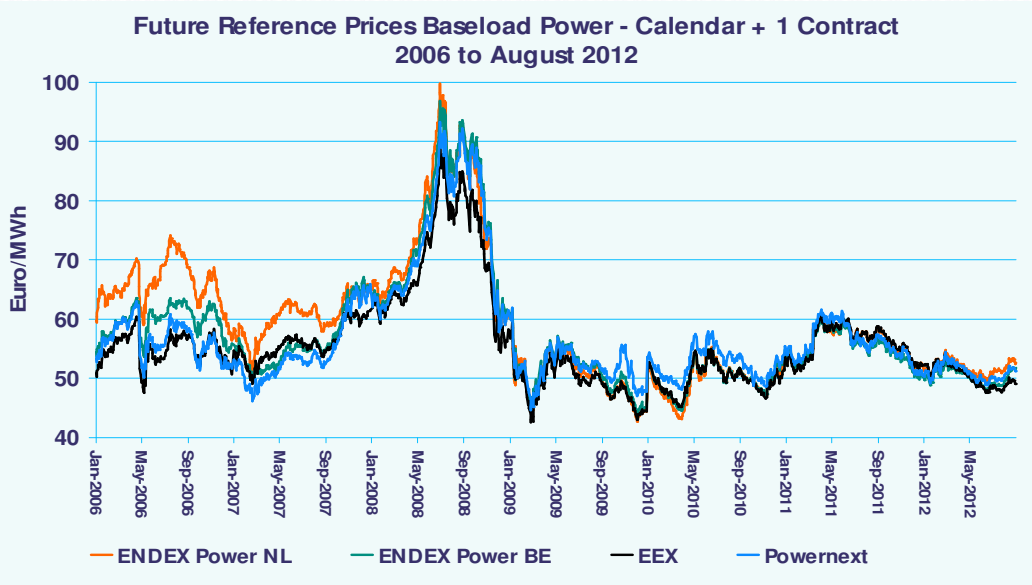


Interconnector utilization and flow consistency



ENDEX Power Futures and other exchanges

Calendar +1 baseload contract

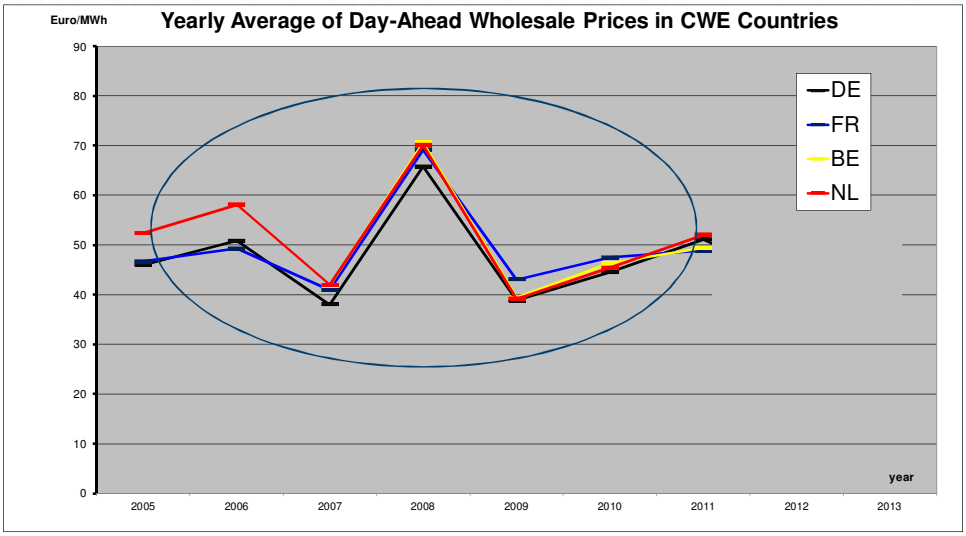


Volume power markets

Today's volume, North-West European (NWE) Power exchanges

EPEX Germany	640 GWh/day
EPEX France	220
EPEX Zwitserland	55
APX Netherlands	130
APX Belpex	40
APX UK	70
N2EX UK	200
Nord Pool Spot	800

Market coupling Convergence



yearly average of day-ahead wholesale prices in CWE countries. Source: APX;EPEX

Part 2 Transmission capacity involved in the market coupling

Which capacity: different models

Nordic Model (Nord Pool: Scandinavia, Finland, Baltics):

- NO long-term bilateral cross-border contracts
- NO capacity provided on a yearly or monthly basis
- ALL cross-border capacity reserved for daily market coupling ("Market splitting system")

→System supports a very liquid spot market; almost no bilateral / OTC

→System prohibits long-term physical trade; one has to do that financial

Central European model (All other countries)

- NO long-term bilateral cross-border contracts
- Yearly or monthly capacity auctioned, for part of total capacity
- Daily market coupling: reserved cross-border capacity: in practice about 40% of total on most borders

→ System facilitates a fairly liquid spot market plus some OTC trading

What has happened with the Long-term contracts / reservations that existed before the liberalization?

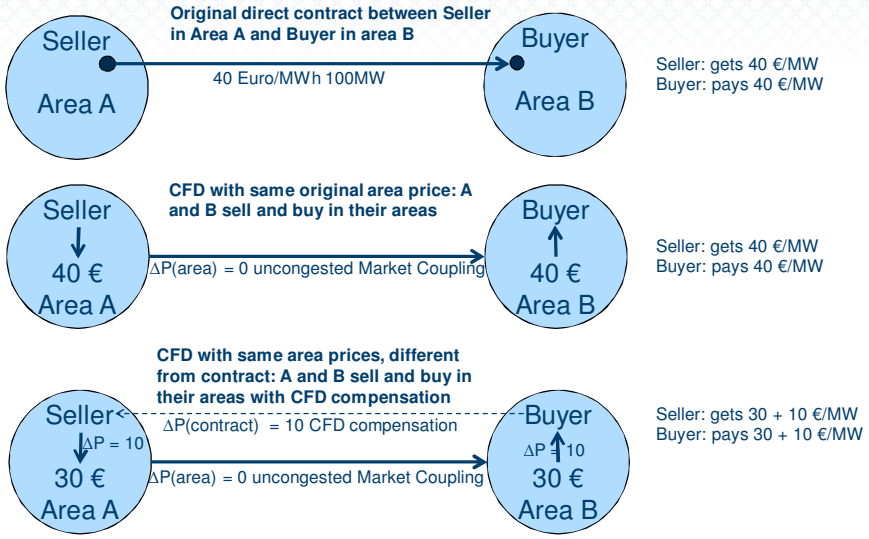
Nordic Model (Nord Pool: Scandinavia, Finland, Baltics):

- Most LT contracts converted in “Contracts For Differences” (CFD’s):
  - Contract price transferred into price difference with local spot markets
  - Contract capacity into daily market coupling; value goes to the contract parties
- → Result for contract parties is financially the same as before!
- → Capacity comes available for the market coupling / spot market

Central European model (All other countries)

- Most existing LT contracts were eradicated by European Court
- Reasoning: those pre-liberalization contracts became unjustified after the liberalization: continuation of the capacity reservation would block access of new parties
- The TSO’s took this old capacity together with any unused, other or new capacity and put everything into allocation based on auctions

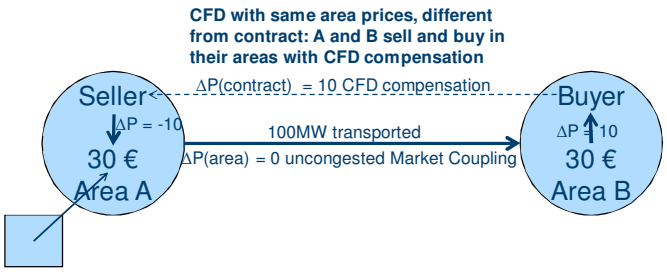
Contract for Differences



Contract for Differences

Seller: gets 40 €/MW
Buyer: pays 40 €/MW

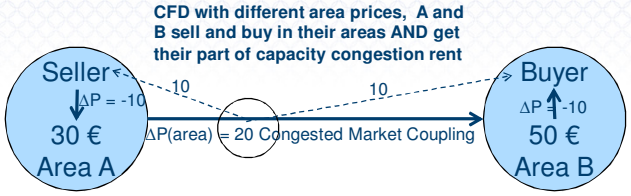
Seller: gets 40 €/MW
Buyer: pays 40 €/MW



Seller: gets 30 + 10 €/MW
Buyer: pays 30 + 10 €/MW

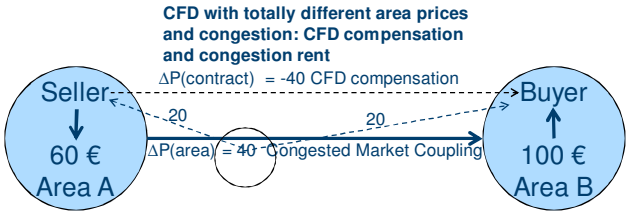
ADDITIONAL POSSIBILITY
If the Seller chooses NOT to sell for 30 €:
- Buyer still gets his power for 40 € /MWh
- Seller gets 10 €/MWh for not producing
- Another market party in Area A supplies the 100MW for 30 €/MWh

Contract for Differences, continued



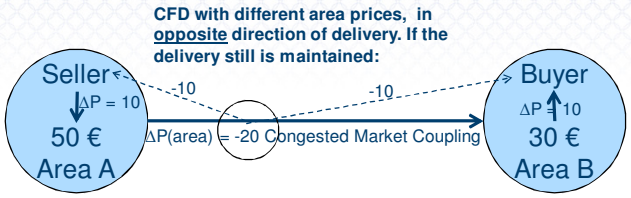
Seller: gets 30, gets 10 €/MWh = 40
Buyer: pays 50, gets 10 €/MWh = 40

ADDITIONAL POSSIBILITY
If the Seller chooses NOT to sell for 30 €:
- Buyer still gets his power for 40 € /MWh
- Seller gets 10 €/MWh for not producing
- Another market party in Area A supplies the 100MW for 30 €/MWh

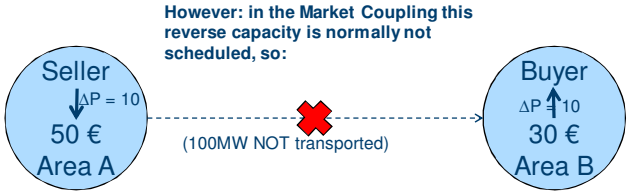


Average area price is (60+100/2) =80
- So CFD compensation is (80-40)/2 = 40
Congestion rent for both: (100-60)/2 = 20
→ Seller: gets 60 – 40 +20 = 40 €/MW
→ Buyer: pays 100, gets 40+20 = 40 €/MW

Contract for Differences, continued (2)



Seller: gets 50, rent -10 €/MWh = 40
Buyer: pays 30, rent -10 €/MWh = 40



Seller: gets 50 (better revenue)
Buyer: pays 30 (better price)

Instead of delivery to each other, Seller delivers in his area to others and Buyer buys in his area from locals

Conclusion, CFD contracts

Conversion from existing long-term delivery contracts in a Contract For Differences is very well feasible:

- The contract transmission capacity becomes available for the market coupling
- Contract Seller and Buyer can still deliver and get ALL their power
- Seller and Buyer also get the same financial result….or even better
- The arrangement opens more optimization possibilities
- The contract volume and prices can be optimized in the spot market

Capacity auctions → Market Coupling: evolution

Old situation:
All capacity explicitly auctioned
- Yearly
- Monthly
- Daily

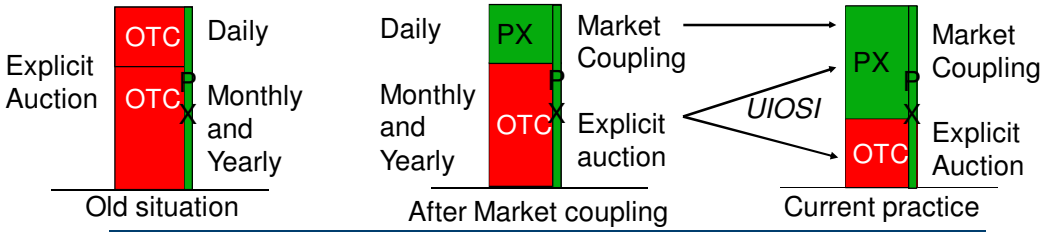
Experience: inefficient
- Much capacity unused
- Sometimes wrong direction
- Incomplete arbitrage
- Fragmented market

Central European model:
Mix of daily and long-term
- Explicit auction for monthly/yearly capacity
- Daily capacity auction is implicit (=market coupling)

Experience: very good
- All daily capacity used
- Always right direction (except monthly/yearly/OTC)
- Much better arbitrage
- Integrated market

Voluntary Use It Or Sell It:
Parties submit explicit capacity back to TSO, receive implicit auction revenue (if any)
- Parties do this voluntarily
- Avoid negative OTC revenue
- Financial Transmission Right

Experience: excellent
- More volume spot and market coupling
- Right direction also OTC
- Best possible arbitrage
- Most integrated market



First step in unlocking capacity: Use it Or Loose it (UIOLI)

Parties may own capacity, but they may not reserve it if they don't use it. Then it goes to the (spot)market

Practical arrangement:
- Parties have transmission capacity rights, either from
  - Legacy contract
  - Yearly or monthly capacity auction
- They have to schedule their flow to TSO early, e.g at 9.00
- Any remaining capacity becomes available to the exchange, for the Market Coupling

Result:
- Either the capacity is used - by the original owners
- Or….. the capacity is used - by the parties on the spot market
- (Or the market is so different that even the other parties don't need it)

Transmission capacity for the Market Coupling: possibilities

1. Existing transmission capacity: reserve a certain percentage (arranged in the law or in the “grid code”) There is always a certain free capacity, however small!
2. In the case of new capacity, it is always possible to allocate substantial percentage for the daily market coupling
3. Conversion of existing delivery contracts between areas into Contracts For Differences, with the transmission capacity submitted to the Market Coupling
4. Use It Or Sell It: parties can submit their capacity voluntarily

Part 3: Regulation

Regulation of Power Exchanges: very different from country to country

1. In some countries, the exchange is appointed by law.
   E,g. Belgian exchange Belpex appointed by Royal Decree
   Other examples: GME (Italy), OMIE (Spain/Portugal)
2. In the Nordic Countries, the exchange is a spin-off from earlier optimization initiatives in the energy sector (Stattnet Market), which was institutionalized later on.
3. In many other countries, there is/was no formal appointment: the power exchange was started alongside the OTC market. Over time, the liquidity on the power exchange increased, also because of a natural tendency for trade to concentrate on 1 market place.
4. In many cases the power exchange, although not formally appointed firsthand, got an official role in the Market Coupling. Examples: APX (Netherlands), EPEX (Germany, France), PolPX (Poland).
   In some of these cases, the exchange got mentioned in the "Grid Code" document establishing the market coupling.
   – Example: the Market Coupling arrangements the Dutch grid code mention APX as the exchange operating the market coupling

Nature of Market Coupling role

Market Coupling is a sort of give-and-take for exchanges

- Power Exchange mobilizes the bids and offers in the market for the Market Coupling: without this market participation, the Market Coupling would not work. Also, the exchange has to do substantial infrastructure investments and activities to participate in the Market Coupling
- On the other hand, Market Coupling implies for each exchange a additional volume, equal to the daily cross-border imports or exports. This is a substantial boost for the participation of market parties in the exchange
- Creating and maintaining the Market Coupling is a very big effort, but it gives the exchange a semi-monopoly status, as long as it is supported by the national regulation or the grid code.

Network Code on Capacity Allocation and Congestion Management

European Commission is preparing a Regulation establishing a Network Code on Capacity Allocation and Congestion Management

- According to known drafts, this regulates the “Market Coupling Operator” function. EU Member states are to appoint a “Market Coupling Operator”
- Also, this role should be susceptible to competition: any designated power exchange in one country can also be active in other countries

- However, this would in practice require many complicated arrangements in each bidding zone, like a “virtual hub” for every country. This would complicate the Market Coupling arrangements enormously
- Many debates: in some member states the Market Coupling Role is a formal monopoly, while in others it is not. This would be unfair competition.
- The gain of any such competition would be small. The cost may be quite high. It would also discourage the cooperation between the exchanges.

- Any competition gain (a few million at most) would not outweigh the economic benefit of market coupling (several hundreds millions of euros)

Part 4 Evolution of the Market Coupling

Evolution of Price Coupling

Core Member Markets

Associate Member Markets

Markets that could join next as part of an agreed European roadmap

Supported by Europex

europex
association of european energy exchanges

2006 Trilateral market Coupling

2010 CWE "Pentalateral" Market Coupling

2010 Interim Tight Volume Coupling

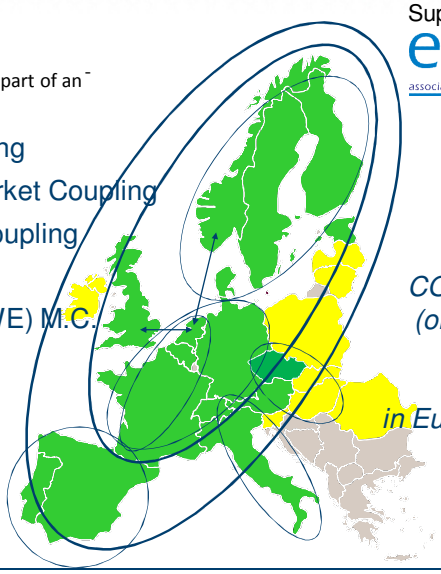
2011 BritNed coupling

2014 North West Europe (NWE) M.C. Based on PCR infrastructure

2014 Iberia joins NWE

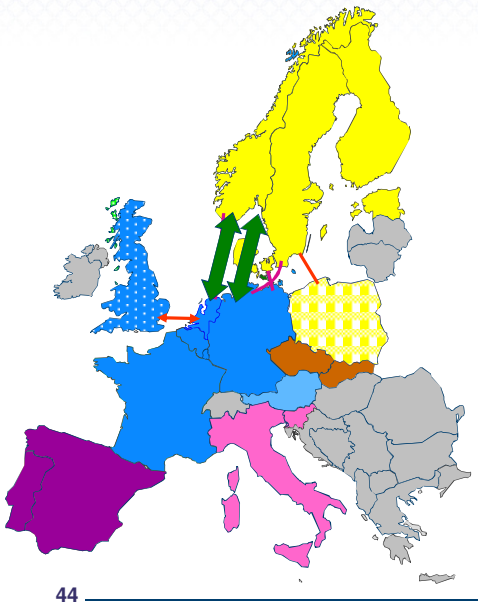
Other established regions:

- Italy/Slovenia → project to integrate with PCR
- Trilateral Cz-Slo-Hun



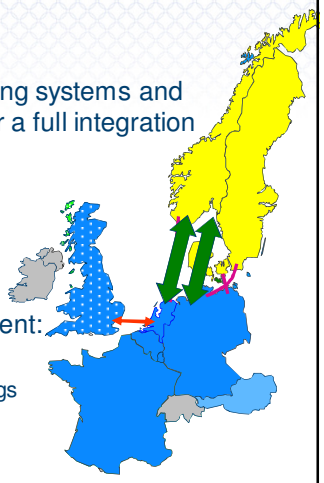
COSMOS algorithm (originally designed by Belpex) now changed in Euphemia Algorithm

Status 2010-2013: Volume Coupling CWE-Nordic



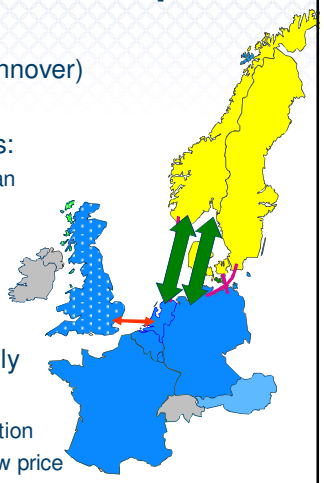
REGIONAL IMPLICIT AUCTIONS		
	CWE	Price coupling
	Austria	Coupled to GE/CWE (no congestion)
	BritNed	GB price coupled to NL/CWE
	Nordic + Estonia	Price coupling, also Poland via Swepol
	ITVC	Volume coupling CWE - Nordic
	Italy - Slovenia	Price coupling
	Mibel (Iberia)	Price coupling
	Czech - Slovak	Price coupling

Volume Coupling



- Temporary measure. Reason: Two existing Market Coupling systems and common interconnector or country in between; no time for a full integration
- In this case: 2010 launch of CWE Market Coupling
  - Trilateral Market Coupling included France, Belgium, Netherlands
  - CWE was built to include also Luxemburg and Germany
  - Germany was already coupled with Nord Pool through Denmark
  - Politically set deadlines did not allow for a full systems integration
- Thus, there was a clash of initiatives, technically inconsistent:
  - Impossible to include 1 country in 2 market coupling systems
  - Impossible to allocate interconnector capacity in 2 market couplings
- Possibilities:
  - Not realize CWE market coupling; Impossible as this was "officially adopted" from EU
  - Discontinue the Coupling between Germany and Denmark seen as less important. However this would imply a big problem for the Danish market
- German Regulator (Bundesnetzagentur) enforced intermediate volume coupling.
  - Included Danish-German borders / cables and also NorNed (Dutch-Norwegian interconnector)
- Intermediate situation ended early 2014 with NWE price coupling launched

How did the ITVC volume coupling work: 2 steps



1. Calculate Volumes between the 2 systems
- Each exchange sent all its bid data to a central office (Hannover)
- This calculated a semi-complete market coupling
- Outcome: flows across interconnectors between 2 regions:
  German-Denmark (land+2x sea), German-Swedish, Dutch-Norwegian
- Other outcomes from this calculation were not used

2. These flows substituted as fixed flows in the 2 systems:
- CWE Market coupling + Nord Pool , separately
- This generated the final results for both systems separately
- Price outcomes sometimes differed from the first:
  - Reason: different subsets of block bids can give different optimization
  - Sometimes: adverse interconnector flow e.g. from high price to low price
  - Incidental negative interconnector flow income for the TSO or interconnector operator

Results
- Sometimes sub-optimal, but with small impact. Plus a larger processing time…..
- **Biggest problem: not extendable! Not feasible for further European integration**
- Other problem: UK not fully integrated (only as subset of Dutch APX bidding zone)

Goals of NWE project

Same areas as volume coupling, initially. Improvements:

- Price coupling, one step process
- No inconsistencies, shorter processing time
- Full integration of UK markets
- Extendability: ready for further integration of other areas in Europe (therefore, OMIE was closely involved)

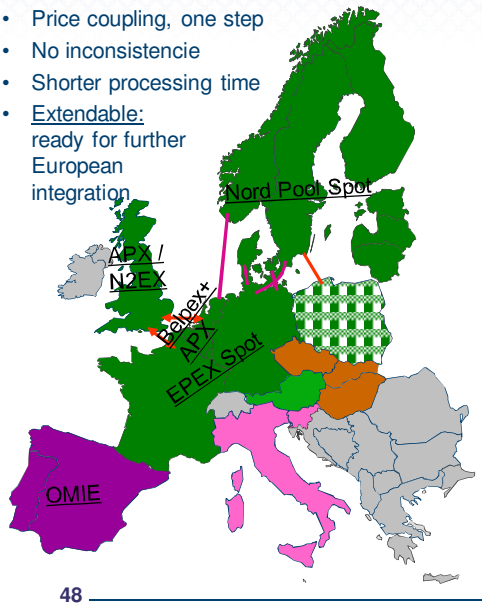
Main measures:

- PCR (Price Coupling of Regions) infrastructure
- NWE project first to use this new infrastructure, designed to cover all Europe
- The 2 UK exchanges also to be fully included (APX UK and N2EX):
  - Price coupling across UK interconnectors BritNed and IFA
  - A "virtual hub" in UK
- UK Virtual hub allowing competing exchanges in same area (only for UK):
  - Two bidding "areas", both covering all of UK, one for each exchange (APX UK and N2EX)
  - An infinite transmission capacity between these "areas".
  - Clearing and settlement arrangement between the exchanges
  - Outcome: same prices on both areas and both competing UK exchanges, with a certain volume mix.

NWE project result

Same areas as volume coupling!
Improvements:

- Price coupling, one step
- No inconsistencie
- Shorter processing time
- Extendable: ready for further European integration



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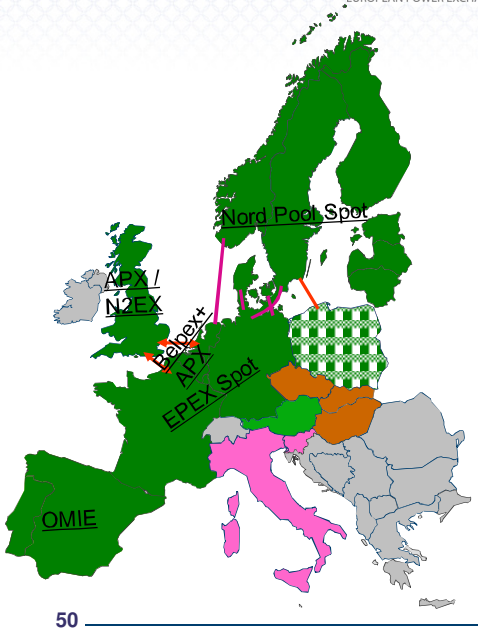
↔	**UK, BritNed / IFA**	GB in NWE price Coupling, "virtual hub"and 2 PX's
	Nordic + Baltics	Price coupling, part of NWE also Poland via Swepol
	NWE	Price Coupling
	Italy - Slovenia	Price coupling
	Iberia	Price coupling internally and to NWE
	Czech – Slovak-Hungary TLC	Price coupling

NWE based on PCR technology & arrangements

Price Coupling of Regions (PCR) includes:

- PCR is based on three main principles: a single algorithm, robust operation and individual Power Exchange accountability.
- Common agreement between all exchanges, with the following possibilities:
  - Be a Market Coupling operator (rotating system)
  - Be an exchange with your own system, without being a market coupling operator
  - Be an exchange with a system operated by other exchanges
- Common system between all exchanges
  - Common "Euphemia" algorithm including all specific features of the various power markets.
  - Decentralised sharing of data, providing a robust and resilient operation.
  - PCR "Broker and Matcher" system: exchange of anonymised orders and transmission capacities among the Power Exchanges to calculate area prices and transmission flows all bidding areas.
- Rotation of market coupling operation by the exchanges + individual accountability
  - Rotation currently: Amsterdam (APX), Paris (EPEX spot), Oslo (Nord Pool), Madrid (OMIE)
  - Individual accountability: at any time, each exchange has all the (anonymised) data and, if needed, could calculate (or verify) the whole result for all PCR and its (country) prices and flows
  - Important because some national regulators require full national autonomy!
- → Extendable System designed for full European integration

PCR project result + first next step: Iberia integrated



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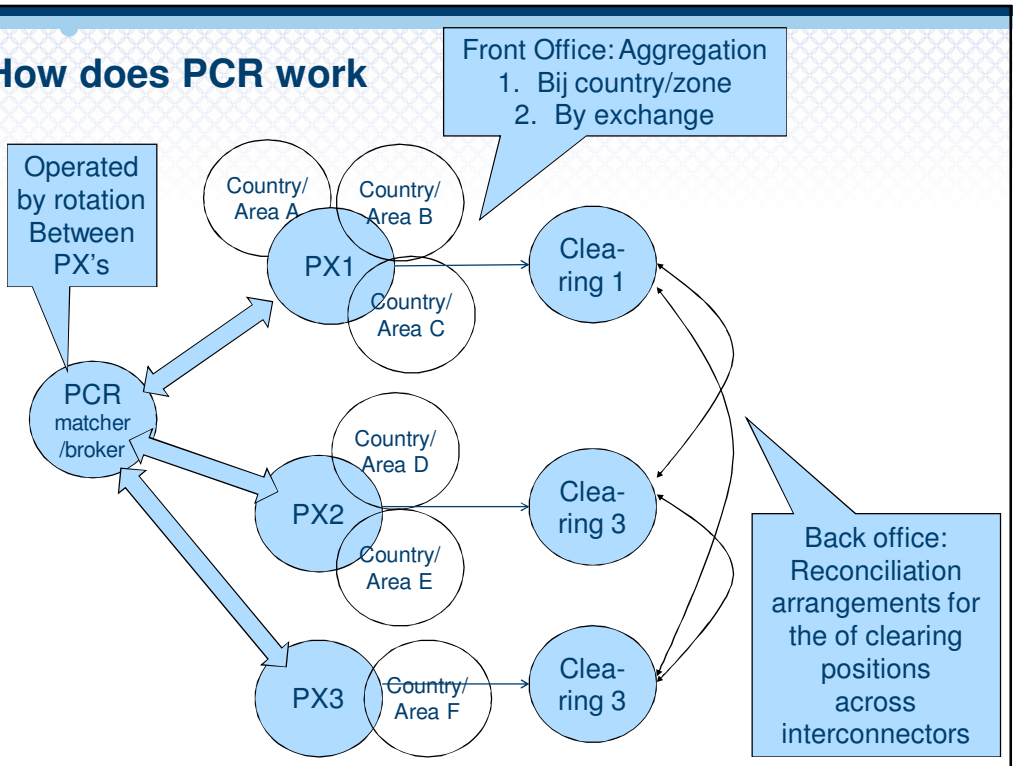
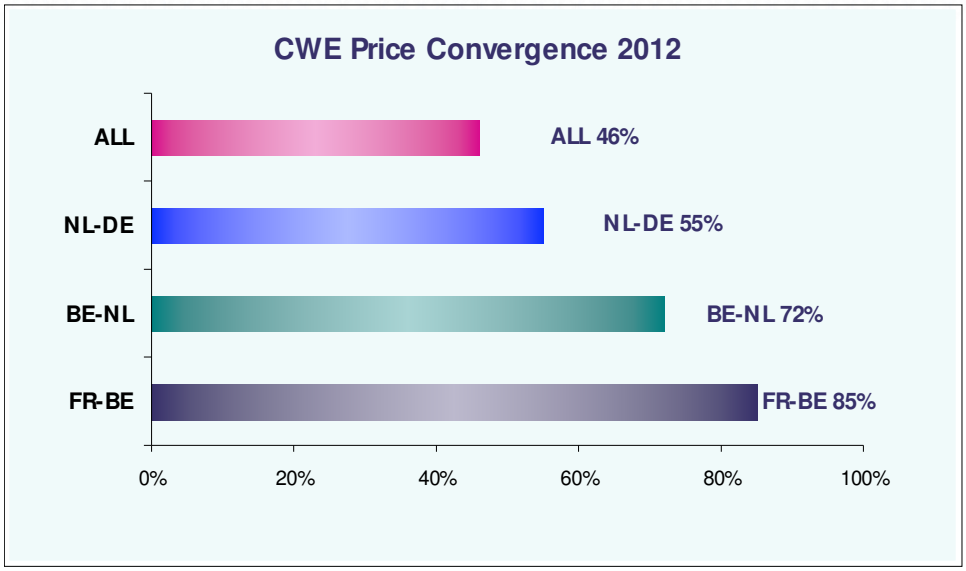
	Nordic + Baltics	Price coupling, part of NWE also Poland via Swepol
	NWE	Price Coupling
	Italy - Slovenia	Price coupling. Integration project with PCR underway
	Iberia	Price coupling internally and to NWE
	Czech – Slovak-Hungary TLC	Price coupling

How does PCR work

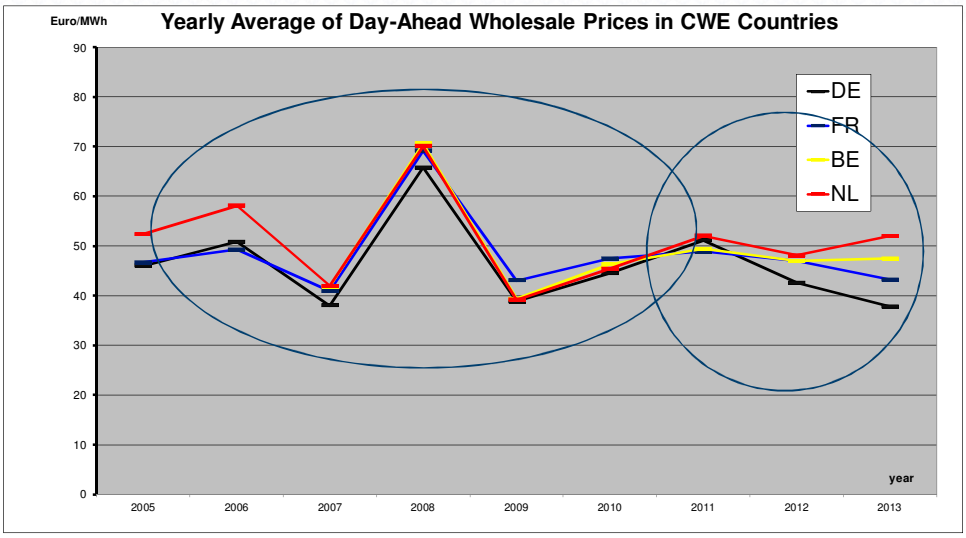


Part 5 Commodity Prices. Renewables Integration and new

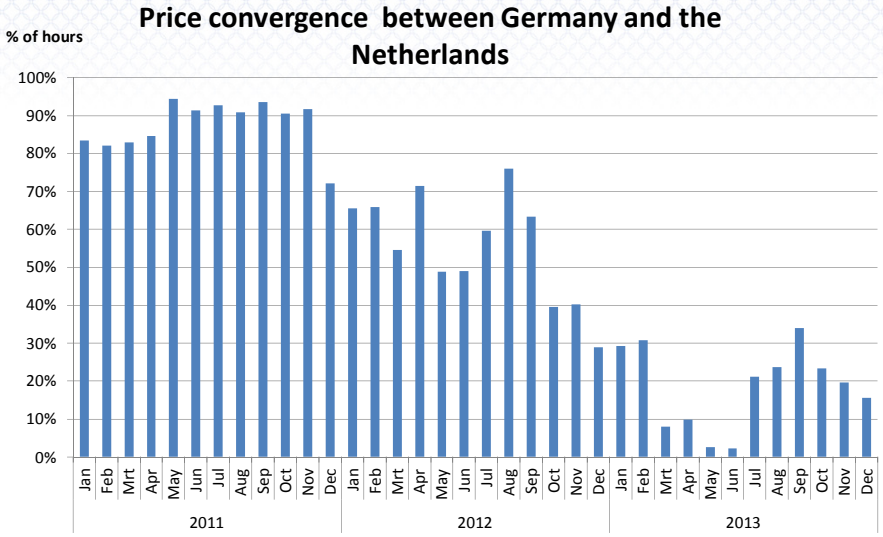
CWE Price Convergence 2012



Market coupling Convergenc and recent Divergence

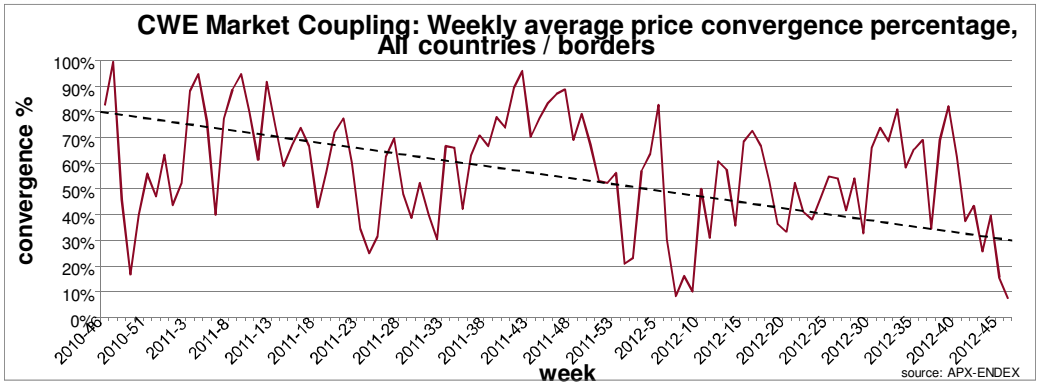


yearly average of day-ahead wholesale prices in CWE countries. Source: APX;EPEX



Price convergence between Germany and the Netherlands. Source: Berenschot (data: CWE Market Coupling data).

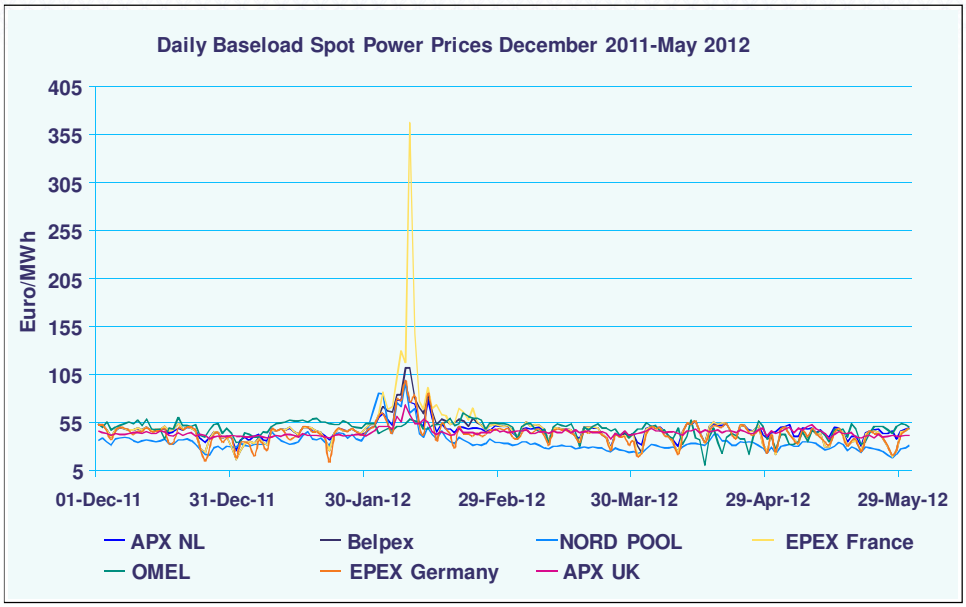
Despite Market Coupling: declining price convergence NW-Europe 80% (start CWE) → 2%



Causes:

- **divergent national policies (fuel mix, renewable energy, other,..)**
- **Different impact from coal prices impacted by shale gas**

Example of new incidental volatility…

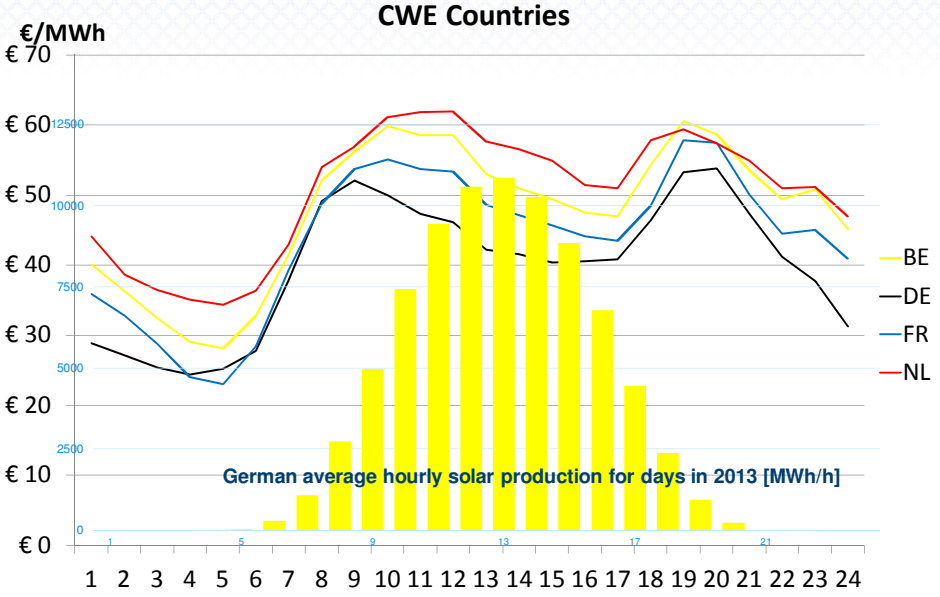


Causes for declining convergence

- Market Coupling functioning well:
- All interconnecting day-ahead scheduled fully for 100% in right direction
- Coupling reduces price differences to the minimum possible
- Without MC, the price differences would have been much higher

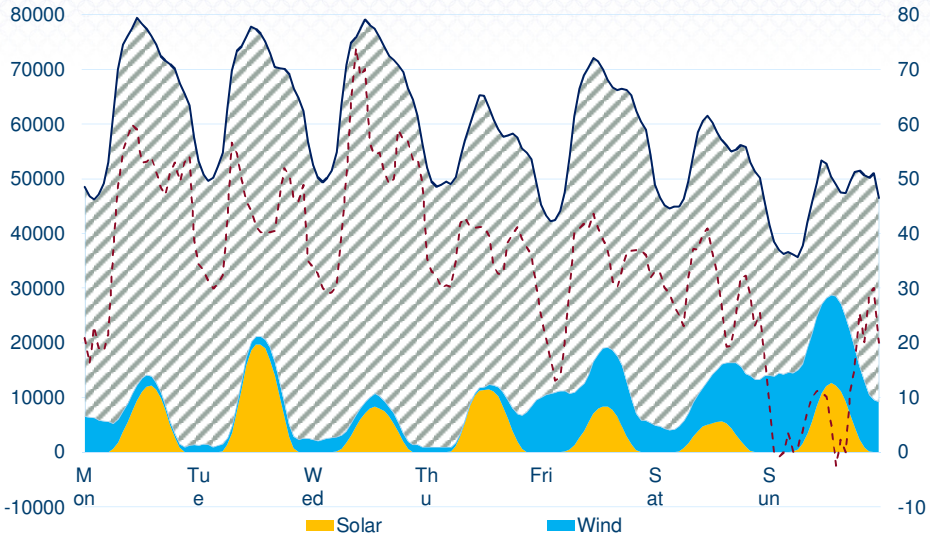
- Causes for declining convergence between EU members states:
- Differences in national policies especially renewables
- Impact global price hikes in gas (incl shale) and coal (impacted by shale) + differences in national fuel policies
- Decline of ETS price exposing differences in national fuel policies

Hourly average wholesale price on Tuesdays in 2013 in CWE Countries



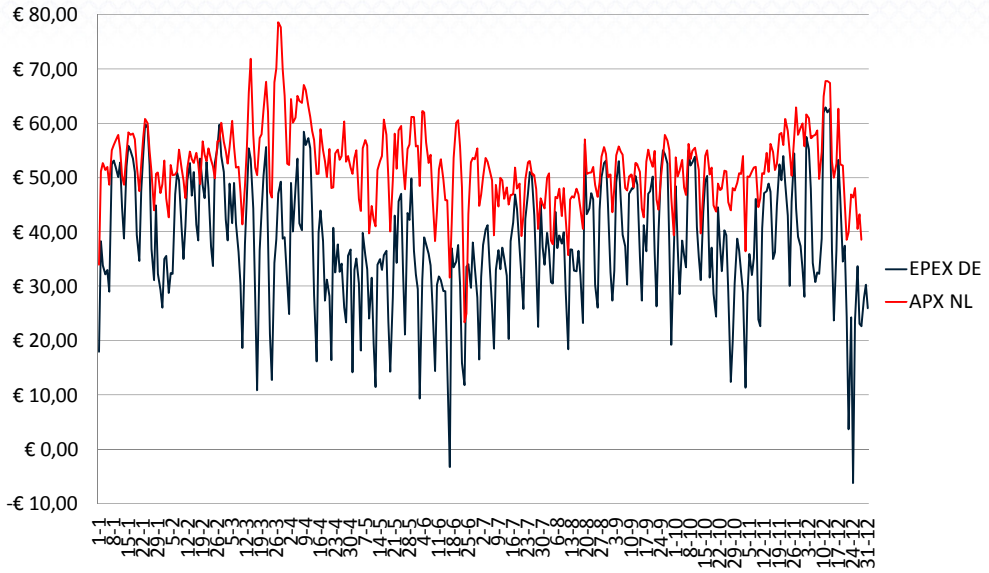
Daily price curve on an average Tuesday. Source: Berenschot (data: CWE Market Coupling data).

Variation of consumption and production over an exemplary week in Germany [MWh/h] [€/MWh]



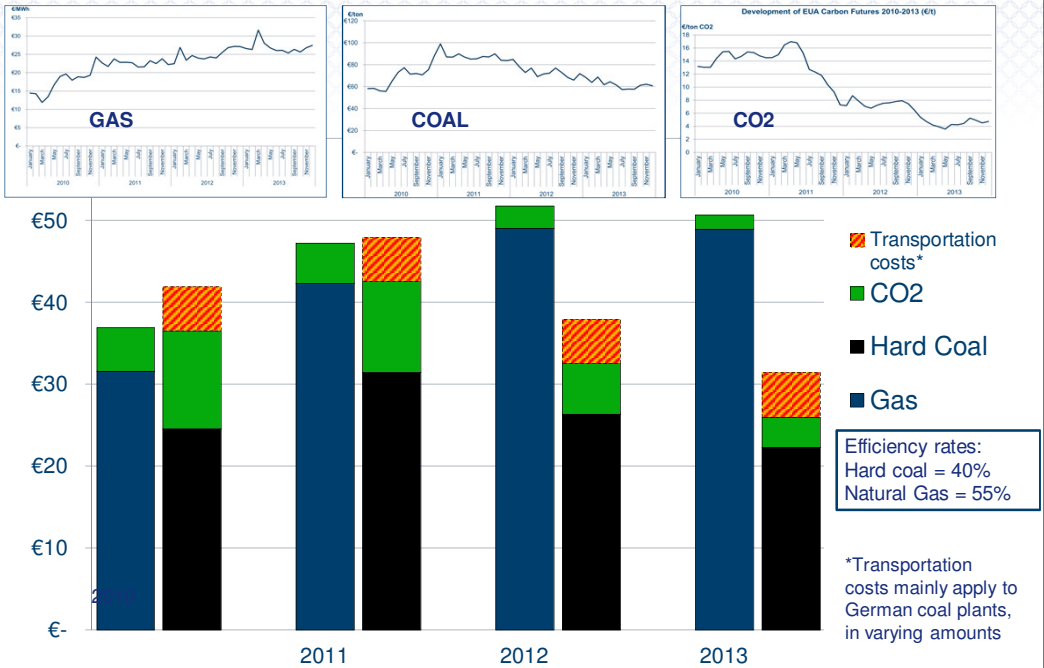
TMR: Infeed from solar and wind compared to consumption: IAEW Aachen (German TSO's; EPEX).

The year 2013 in daily detail: Daily average wholesale prices in Germany and in the Netherlands

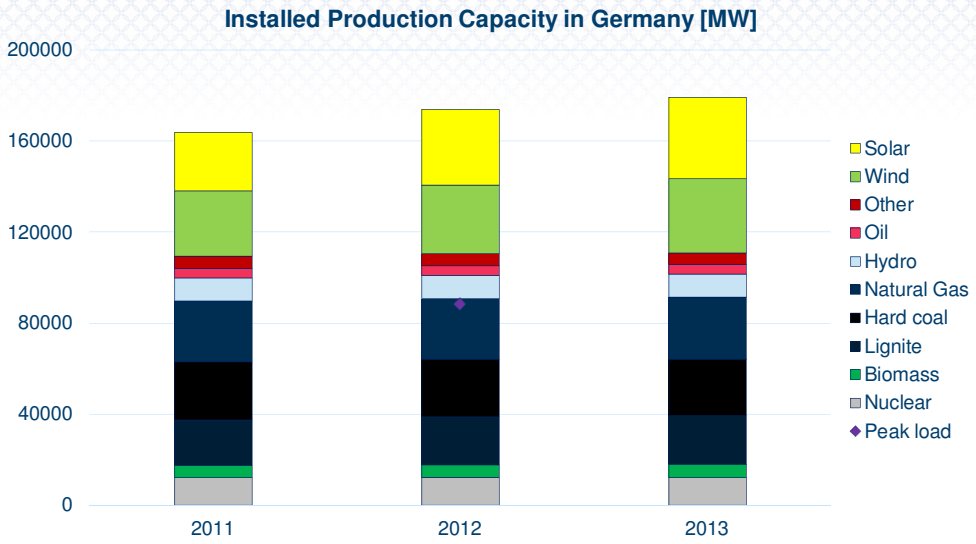


TMR: Daily prices in Germany and the Netherlands. Source: Berenschot (data: CWE Market Coupling data).

Marginal Generation Costs (€/MWh): gas vs. coal

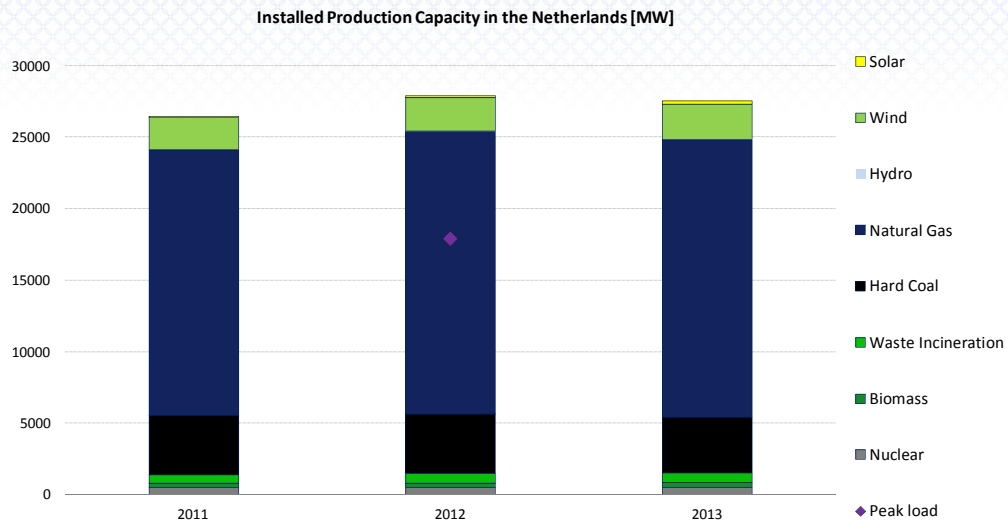


From "TenneT Market Review" B. den Ouden (Berenschot), Albert Moser (University Aachen), Erik van der Hoofd (TenneT), March 2013: http://www.tennet.eu/nl/about-tennet/news-press-publications/publications/technical-publications.html



Generation capacity in Germany and the Netherlands. Source: TenneT/IAEW Aachen (data TenneT; Bundesnetzagentur (2013 preliminary data).

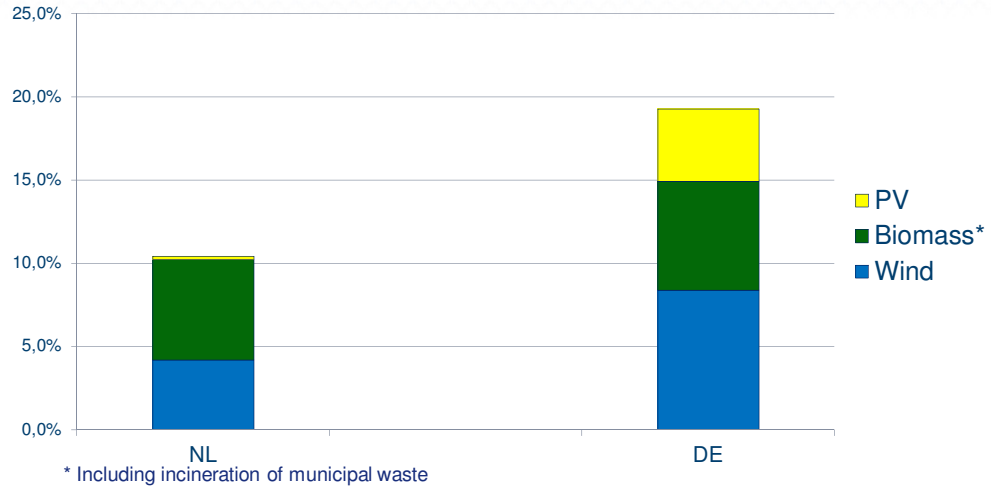
Berenschot



Generation capacity in Germany and the Netherlands. Source: 2013 TenneT Market ReportIAEW Aachen (data TenneT; Bundesnetzagentur (2013 preliminary data).

Berenschot

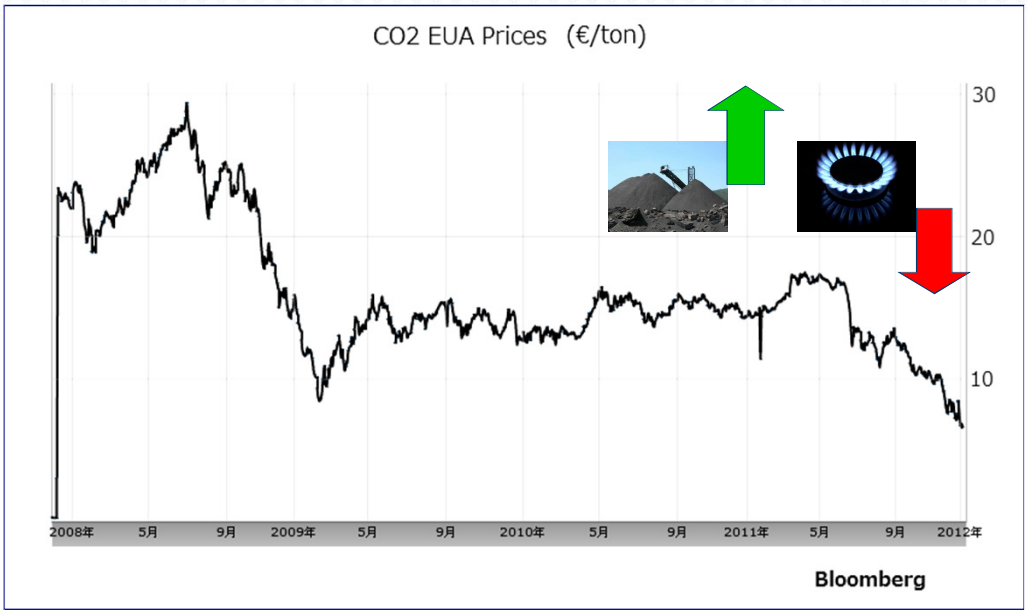
Contribution of renewable energy production to total electricity consumption 2012



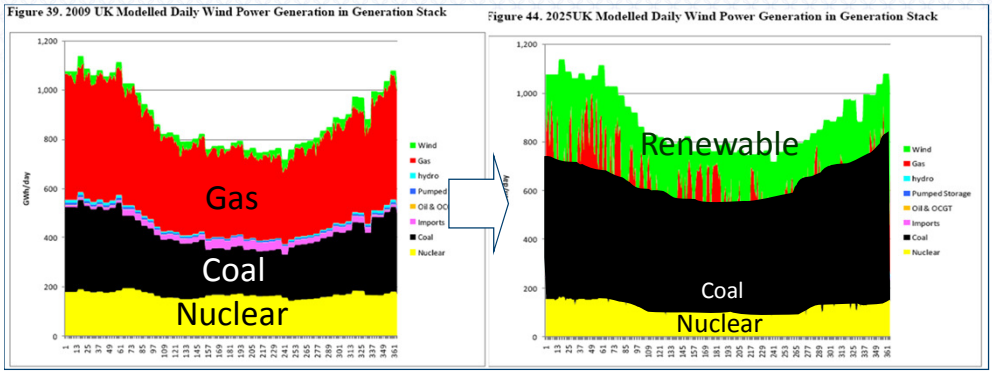
* Including incineration of municipal waste

Electricity production from renewable energy sources divided by the national electricity consumption for Germany and for the Netherlands. TenneT Market Review 2013 Source: Berenschot (data CBS; AGEB).

CO2 prices declining….



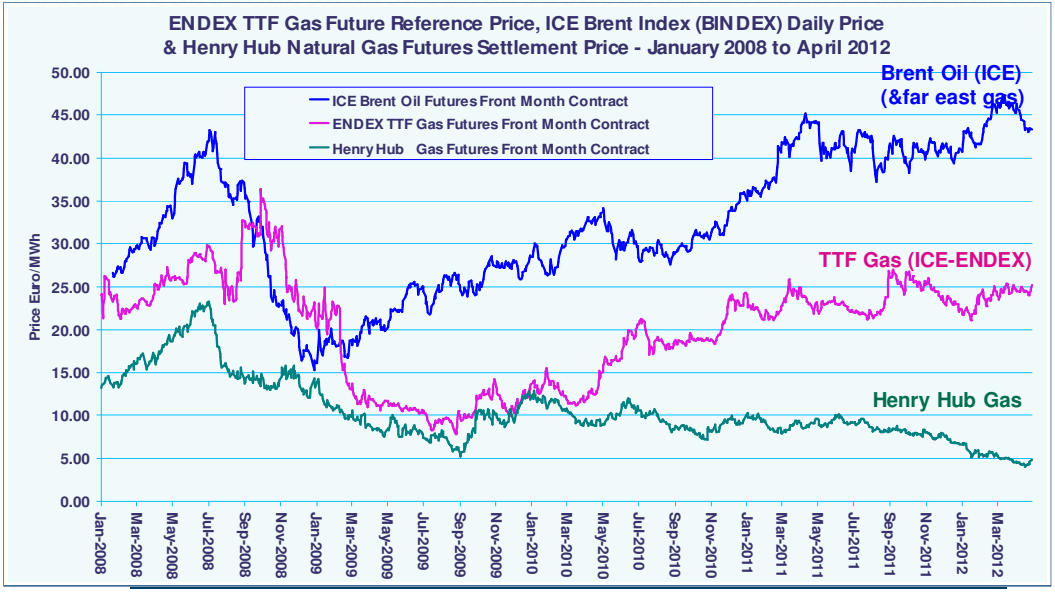
Gas squeezed out by coal…



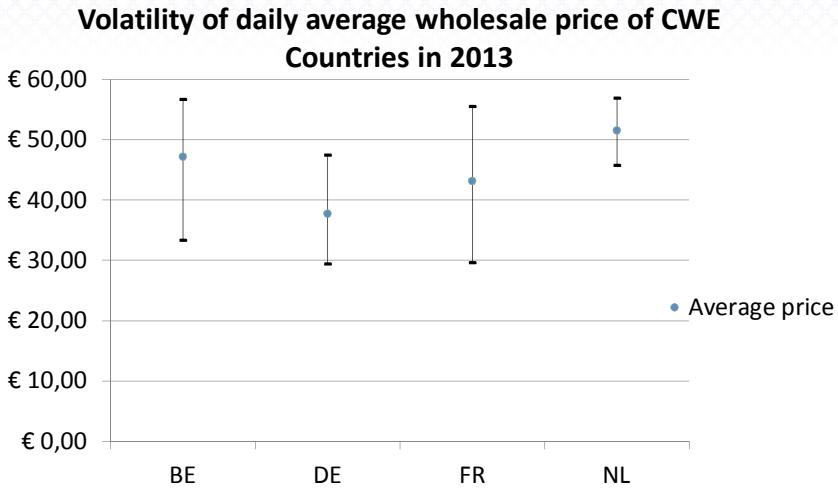
World Coal price pushed down by US development of shale gas
Europe: gas-fired generation squeezed between coal and renewables….
Gas plants see a large reduction in operational hours

Gas needed for system flexibility, back-up for renewables…
Countries scrambling for capacity mechanisms….<u>but individually</u>
→ One (national) intervention leading to the next!
EC started to criticize national interventions….late in the process

The shale gas revolution

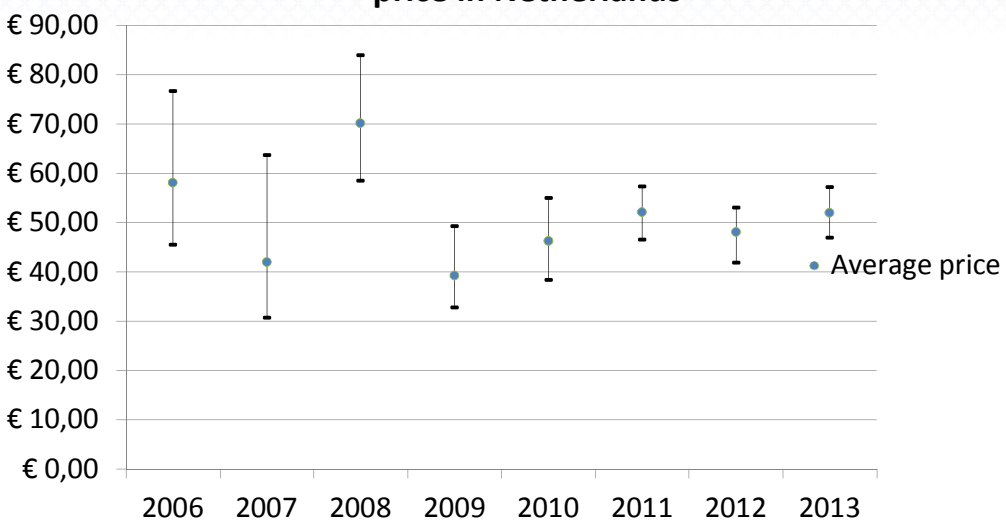


Part 6 Volatility and interconnectors



From: TenneT Market Review, March 2014
Volatility of electricity prices in 2013 in CWE countries. Source: Berenschot (data: CWE Market Coupling data)

Development of volatility of daily average wholesale price in Netherlands

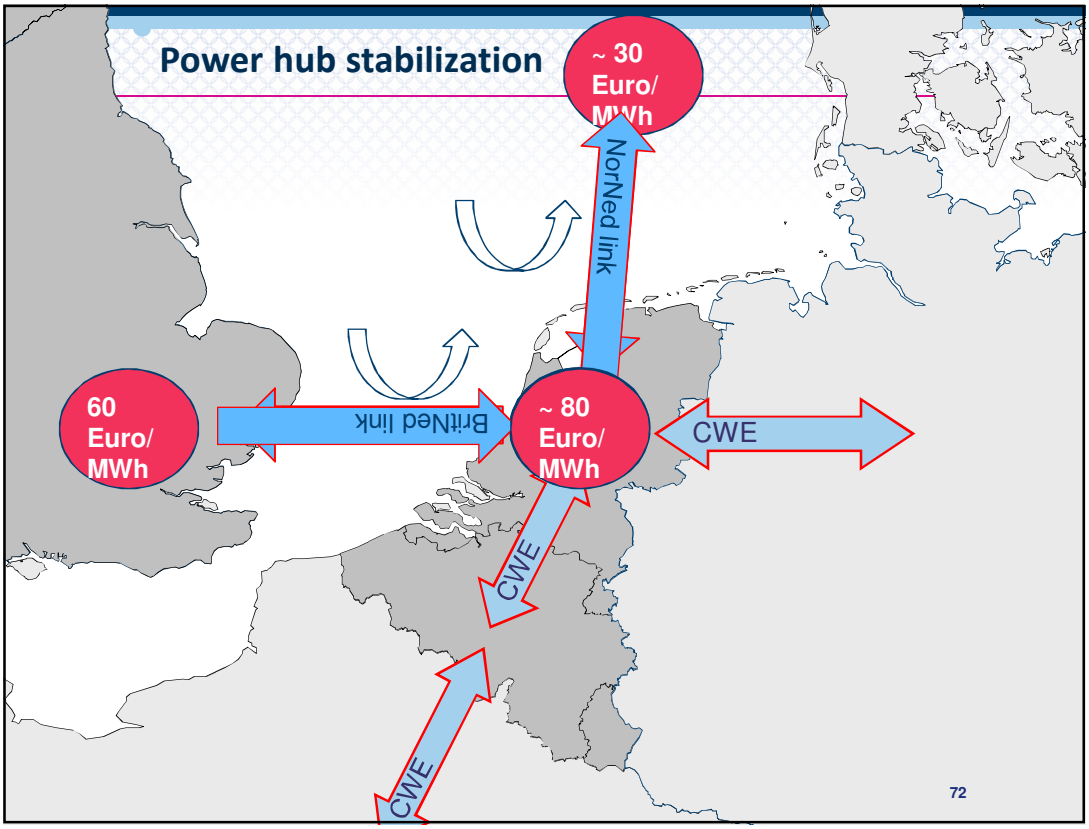


From: TenneT Market Review, March 2014

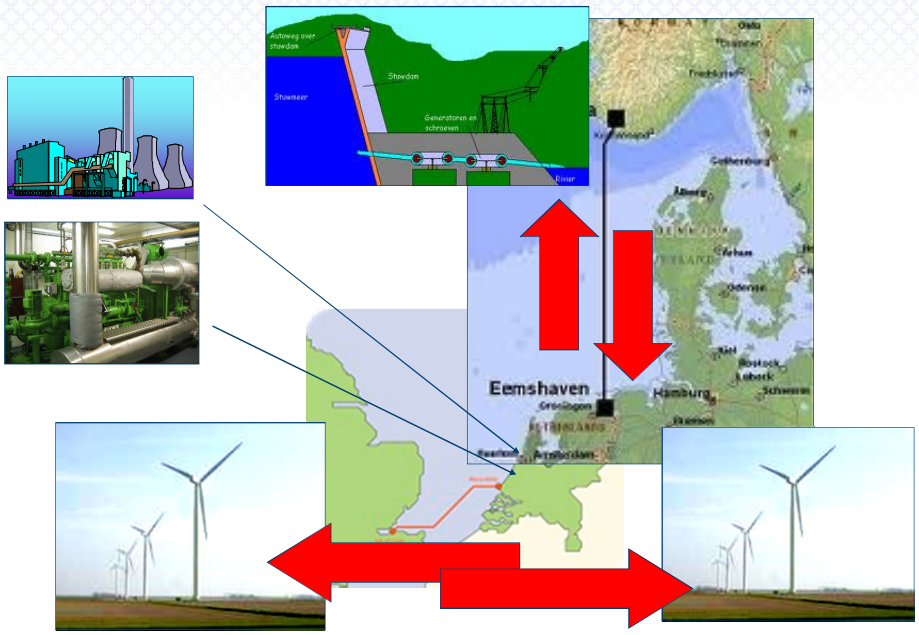
Volatility of electricity prices in the Netherlands over the years. Source: Berenschot (data: CWE Market Coupling data)

Berenschot

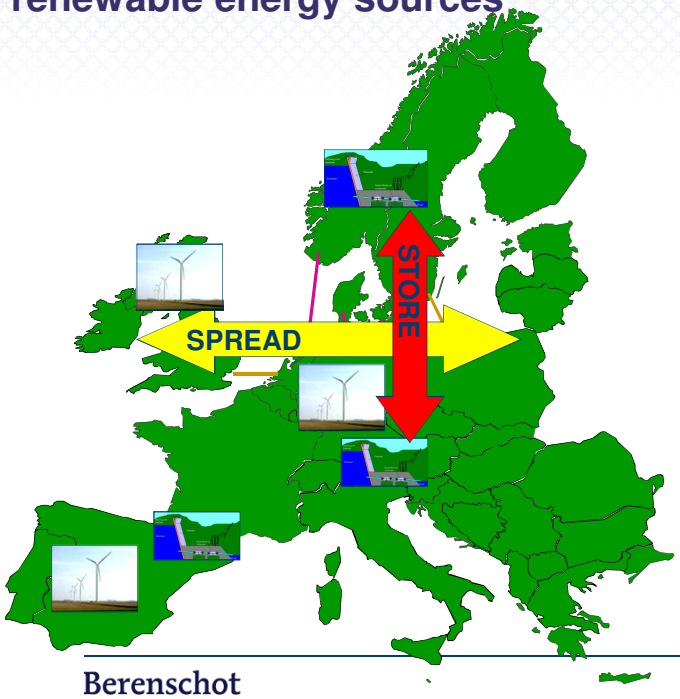
Power hub stabilization



A smart international market



Market Coupling can help to "spread and store" renewable energy sources



Efforst of exchanges and TSOs, supported by the market:

-**Infrastructure (investments)**

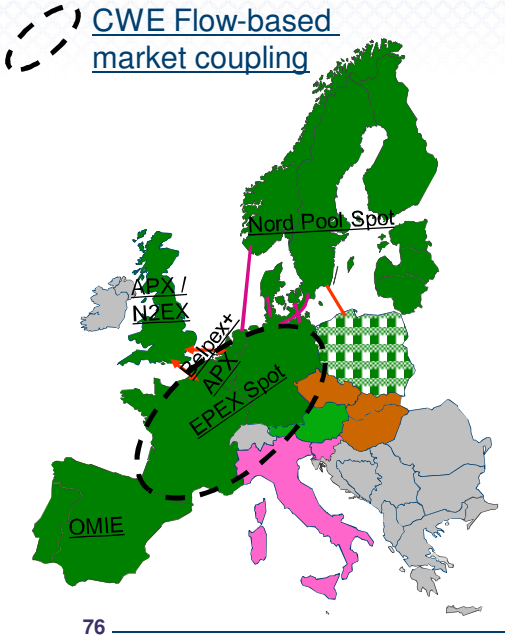
-**Maximum utilization of infrastructure (market coupling)**

Bridge the naturally occurring differences: huge task

Need to discuss consistency in energy policies

Part 7 The future steps in Market Coupling

CWE Flow-based market coupling



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	NWE	Price Coupling
	Italy - Slovenia	Price coupling
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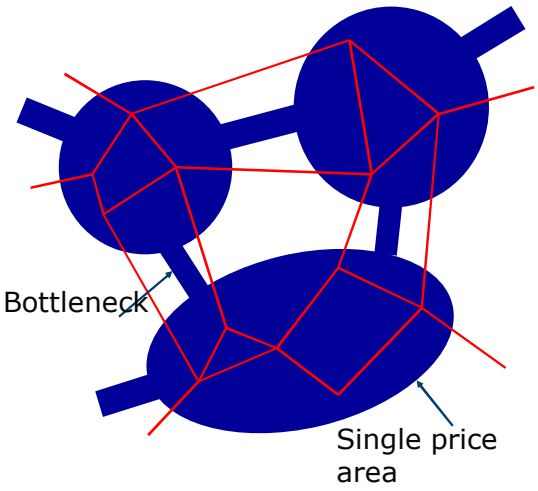
	Czech – Slovak-Hungary TLC	Price coupling

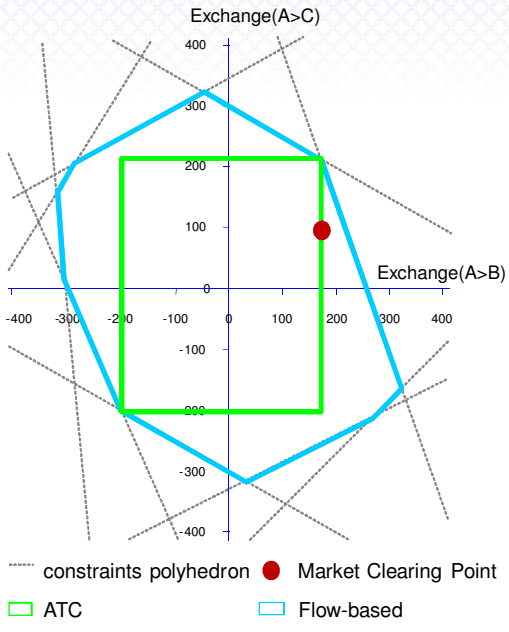
Flow-based market coupling



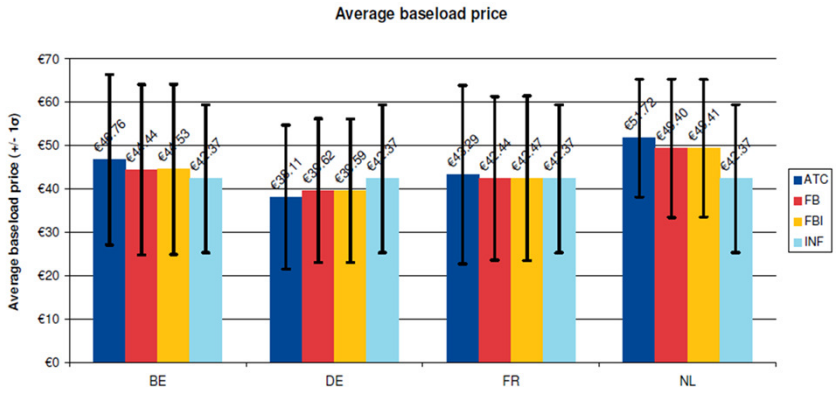
- Market Coupling can be based on
  - Available transmission Capacity (ATC), Border-by-border
  - Power Transmission Distribution Factors (PTDF's)
- Capacities/flows modeled as areas linked by bottlenecks; PTDFs used to calculate flows
- Physical electrical flow paths taken into account (loop flows),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

Next step: a flow-based Market Coupling

- ATC congested
  - 4 different prices in CWE (divergence) or
  - partial convergence (e.g. 2 prices DE/NL and BE/FR)
- FB not congested
  - 1 single price in CWE
- ATC MC and FB MC do not provide the same solution
  - Price convergence in FB
  - Higher welfare in FB



Market Coupling, flow-based parallel run: changes in country-based wholesale prices and price volatility

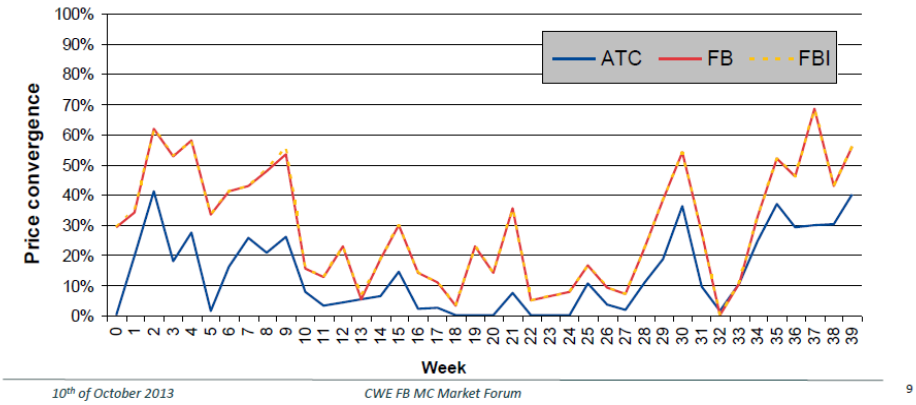


Flow based project, external "parallel run"

Price convergence since the beginning of 2013

- This overview on the percentage of time with a single CWE price shows an **almost continuous higher price convergence under FB** than under ATC

Price convergence

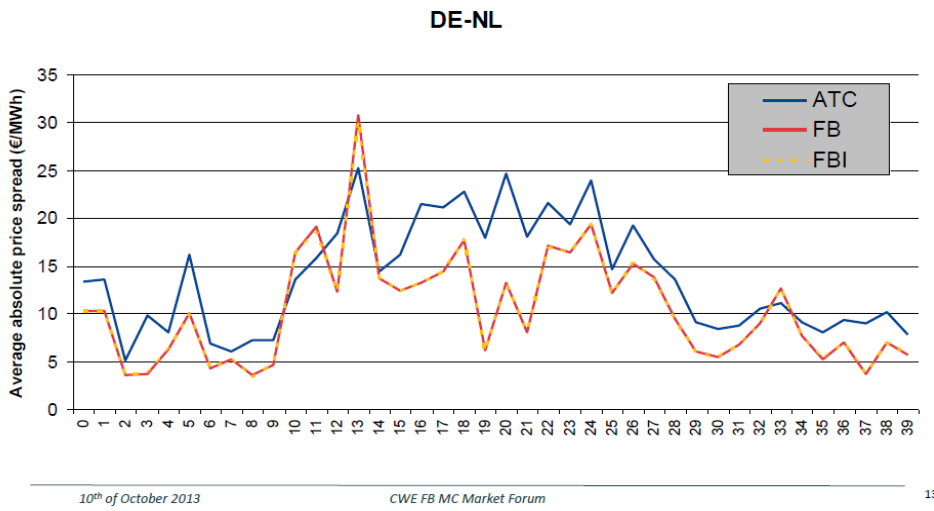


10th of October 2013 *CWE FB MC Market Forum* 9

→**Full convergence better under FB than under ATC: Percentage roughly doubled**

Flow based: external “parallel run”

Cross border spreads DE-NL



→Cross-border spread much smaller under FB than under ATC

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