

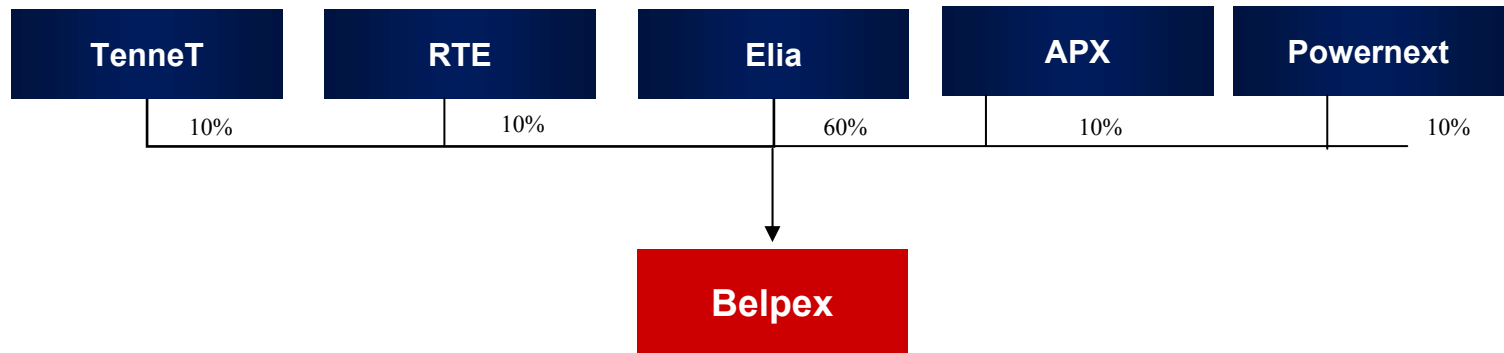
BELPEX

General introduction

Linking partners in power

- **Power markets in Belgium and view for Europe**
- **Regional market coupling**

- Shareholders structure

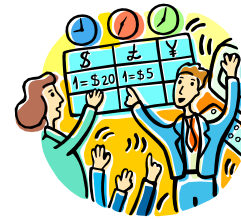


- Activities:

- Day-ahead and intraday electricity market
 - Since 2006 (Continuous markets: March 2008)
 - 2008: 15% of the Belgian load
- VPP auctions
 - Since 2005
 - Service provider for Electrabel



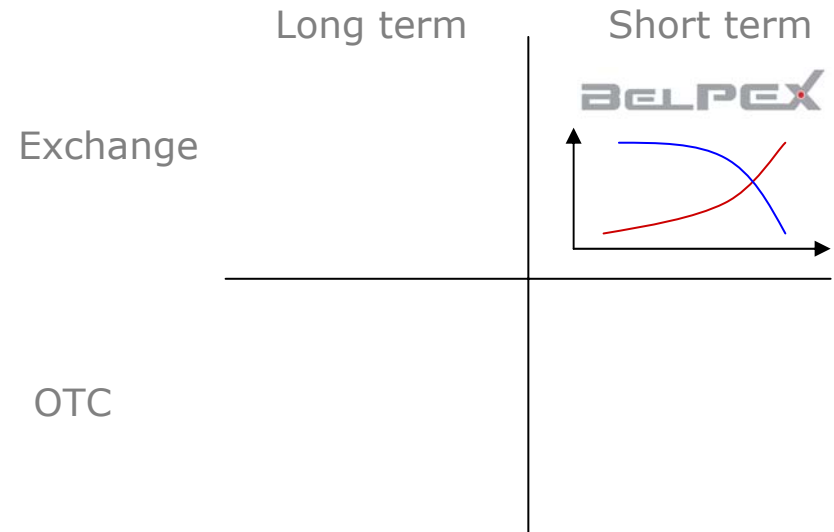
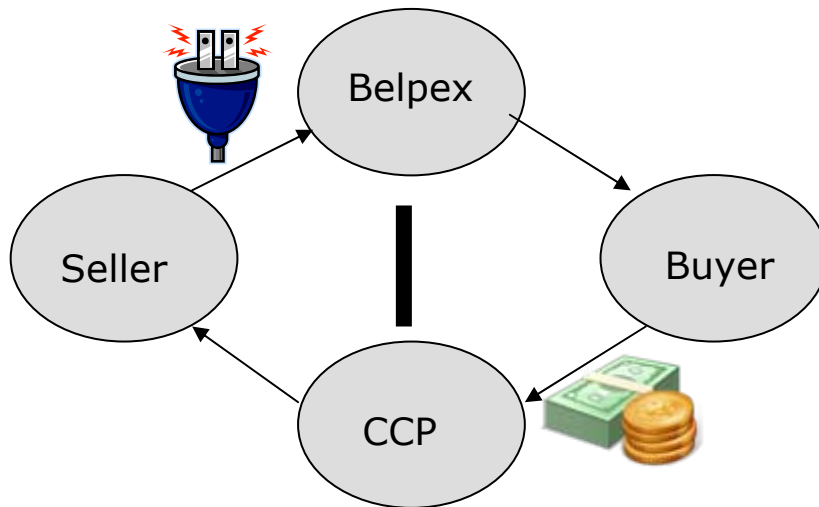
Today



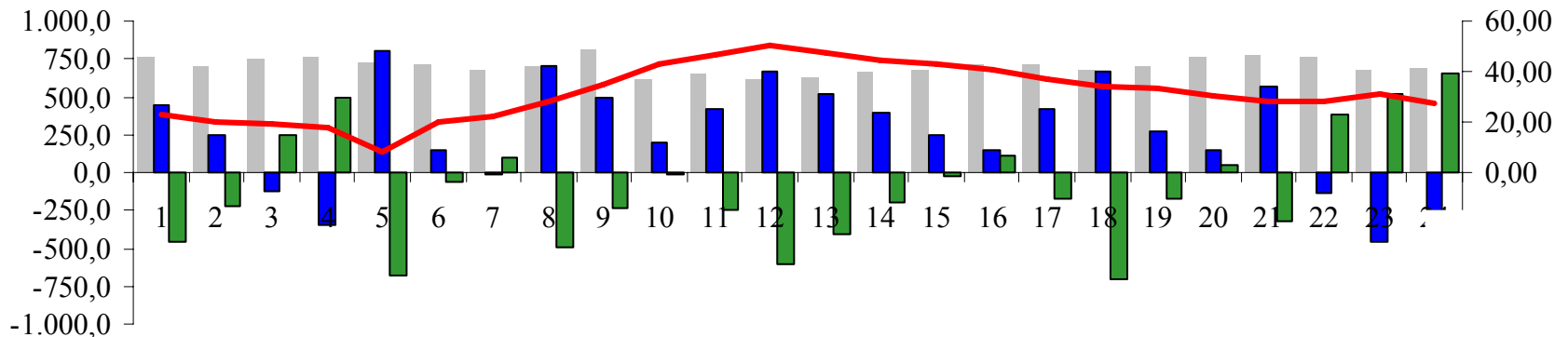
Tomorrow



The Belpex' market provides standardized, anonymous, cleared trading in Belgian day-ahead electricity at a transparent reference price.



- Predict power generation:
 - Temperature
 - Maintenance and incidents
 - Wind, sun, rain,...
- Effective production scheduling
 - Gas, oil, carbon prices
 - Produce extra when prices are high
 - Shut down when prices are low
 - Get it implicitly abroad



Intraday market

- Standard blocks of electricity:
 - 1H blocks
 - 4H blocks
 - 2 standard 6H blocks (8-14 and 14-20)
- Available for trading as from one day before delivery
- Tradable until close to real time
- 24*7 Market opening
- Clearing done via designated clearing house
- Delivery via ID HUB of Elia
- **SPE as Liquidity provider**
 - Divisible sales or purchase offer of 25 MW for 80% of the hours
 - Price boundaries
 - Sales order: Max (DAM+5% ; marginal cost+10%)
 - Purchase order: Min (DAM-5% ; marginal cost - 10%)
 - Transparent marginal cost formula based on publicly available indices

BELPEX • B&S volume available (30-07-2008 at 9:00)

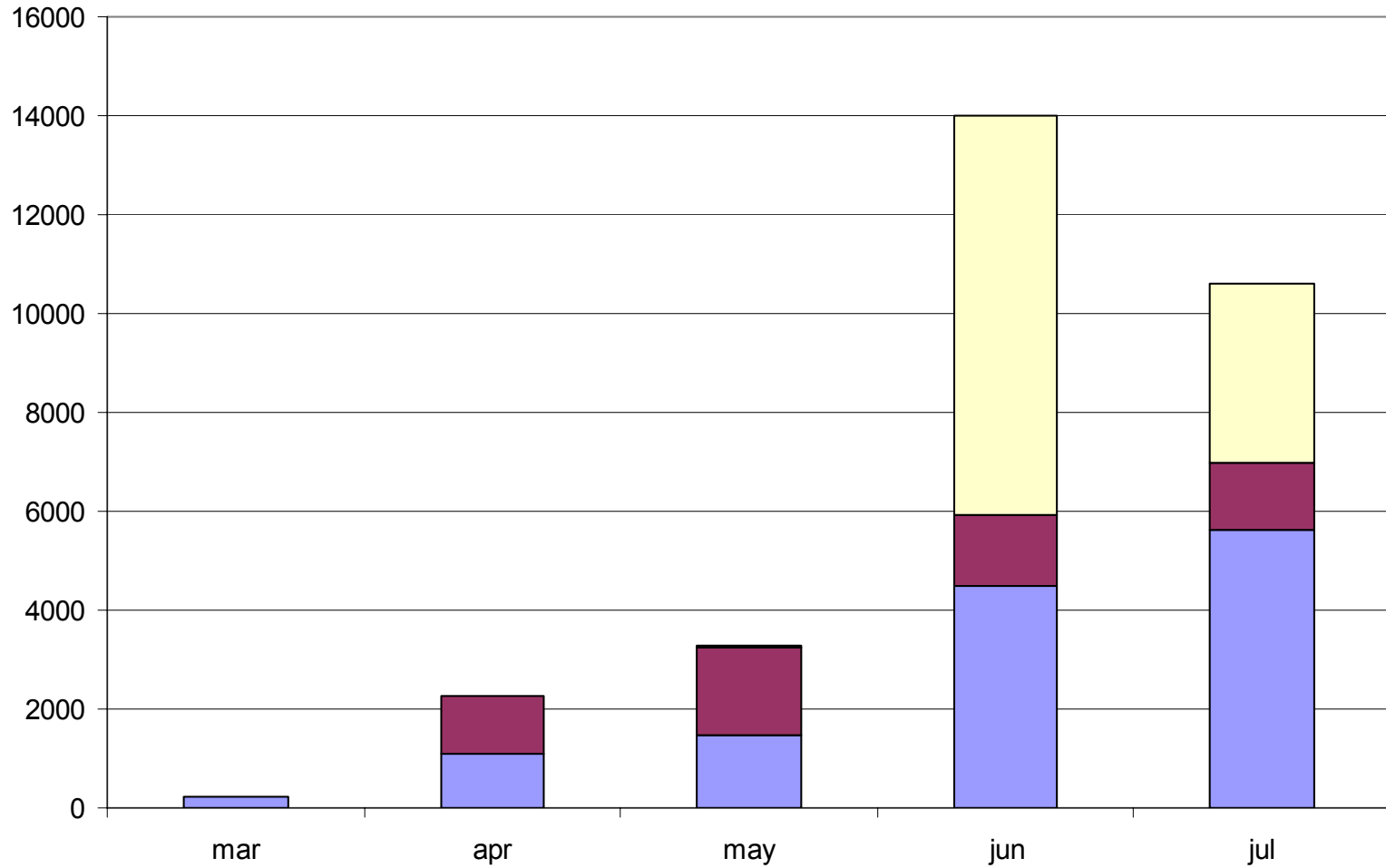
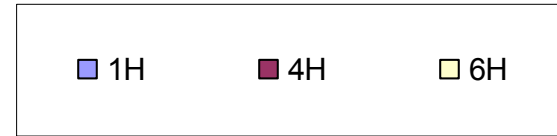
Market View - dj [Trader]															
File View Actions Format Settings Window Help															
Withdraw all Withdraw mine Hold all Hold mine															
Instrument	Sum	Bid Vol	Bid	Ask	Ask Vol	Sum	Last	Turnover	Last Trade Time	Open	High	Low	Close	P/L	
BE PEAK 08AUG01															
BE PEAK 08AUG02															
BE PEAK 08AUG03															
BE OFFPEAK 08JUL31															
BE OFFPEAK 08AUG01															
BE OFFPEAK 08AUG02															
BE OFFPEAK 08AUG03															
BE ID 08JUL30 - 1H-11	180,0	100,0	100,00	110,00	10,0	10,0									
BE ID 08JUL30 - 1H-12	235,0	100,0	100,00	110,00	10,0	60,0	100,0 @ 115,00	100,0	30/07/08 08:41	115,00	115,00	115,00		0,00	
BE ID 08JUL30 - 1H-13	240,0	100,0	100,00	110,00	10,0	60,0	100,0 @ 118,00	100,0	30/07/08 08:41	118,00	118,00	118,00		0,00	
BE ID 08JUL30 - 1H-14	153,0	50,0	85,00	125,00	50,0	50,0	50,0 @ 121,00	50,0	30/07/08 08:42	121,00	121,00	121,00		0,00	
BE ID 08JUL30 - 1H-15	149,0	50,0	80,00	121,00	50,0	50,0	50,0 @ 118,00	50,0	30/07/08 08:42	118,00	118,00	118,00		0,00	
BE ID 08JUL30 - 1H-16	147,0	50,0	67,00	110,00	50,0	50,0	50,0 @ 105,00	50,0	30/07/08 08:42	105,00	105,00	105,00		0,00	
BE ID 08JUL30 - 1H-17	136,0	50,0	67,00	110,00	50,0	50,0	50,0 @ 105,00	50,0	30/07/08 08:42	105,00	105,00	105,00		0,00	
BE ID 08JUL30 - 1H-18	93,0	68,0	44,00	105,00	50,0	50,0									
BE ID 08JUL30 - 1H-19	62,0	37,0	44,00	105,00	50,0	50,0									
BE ID 08JUL30 - 1H-20	49,0	24,0	44,00	105,00	50,0	50,0									
BE ID 08JUL30 - 1H-21	82,0	57,0	44,00	85,00	50,0	50,0									
BE ID 08JUL30 - 1H-22	100,0	100,0	68,00	85,00	100,0	100,0									
BE ID 08JUL30 - 1H-23	81,0	56,0	44,00												
BE ID 08JUL30 - 1H-24	25,0	25,0	43,64												
BE ID08JUL30- 4H -04	150,0	50,0	72,00	110,00	25,0*	75,0									
BE ID08JUL30- 4H -05	100,0	100,0*	68,00	110,00	22,0*	72,0									
BE ID08JUL30- 4H -06	50,0	50,0	68,00	110,00	22,0*	22,0									
BE ID 08JUL30 6H-02															

Instrument	Sum	Volume	Bid	Ask	Volume	Sum
BE ID 08JUL	100,0	100,0	100,00	110,00	10,0	10,0
	150,0	50,0	85,00	125,00	50,0	60,0

Belpex ID 1H - BE ID 08JUL30 - 1H-13
 30 Juli 2008 12:00:00
 Closes at 30-07-2008 11:55:00 CET
 Time to close: 0 day(s) 02:41:57

BEL170983C@212.72.50.216.4	09:13:04
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Intraday monthly volumes



- First: opening BE-NL ID border
 - Capacity and energy sold separately
 - Energy: Belpex (BE), Powernext (FR) and APX (NL)
 - Capacity: explicit allocation based on improved pro-rata mechanisms
- Second: coupling continuous ID markets
 - Capacity and energy sold simultaneously: IMPLICIT ALLOCATION (cf Day Ahead)

- Intraday trading is becoming increasingly important
 - Within CWE region several “local ID markets” exist or will be launched soon
 - TSOs of the CWE region are exploring different possibilities to allocate XB ID capacity
 - It is generally accepted that XB ID capacity should be allocated implicitly
 - PEX can make important contributions in the development and implementation of XB congestion management methods based on implicit allocations (f.i. successful TLC project)
 - PEX have markets that facilitate liquidity
 - PEX have knowledge of trader’s needs and incentive to meet those
- ⇒ APX, Belpex, EEX and Powernext have prepared a white paper on a possible model for Cross Border Intraday Trading

- Cost efficiency
 - Technical solution
 - Market entry and transaction
- Efficient Market
 - Centralisation of liquidity and competition of orders irrespective of origin
- Transparent and efficient access to available XB capacity
 - Access arrangements should minimize risk and cost
- “Straight through processing”
 - “one mouse click” principle to get ID liquidity, irrespective of origin
- High transaction speed
 - Avoid delay that could cause uncertainty regarding deal confirmation
- Extendibility
 - XB ID mechanisms should easily be extendible to areas not initially included

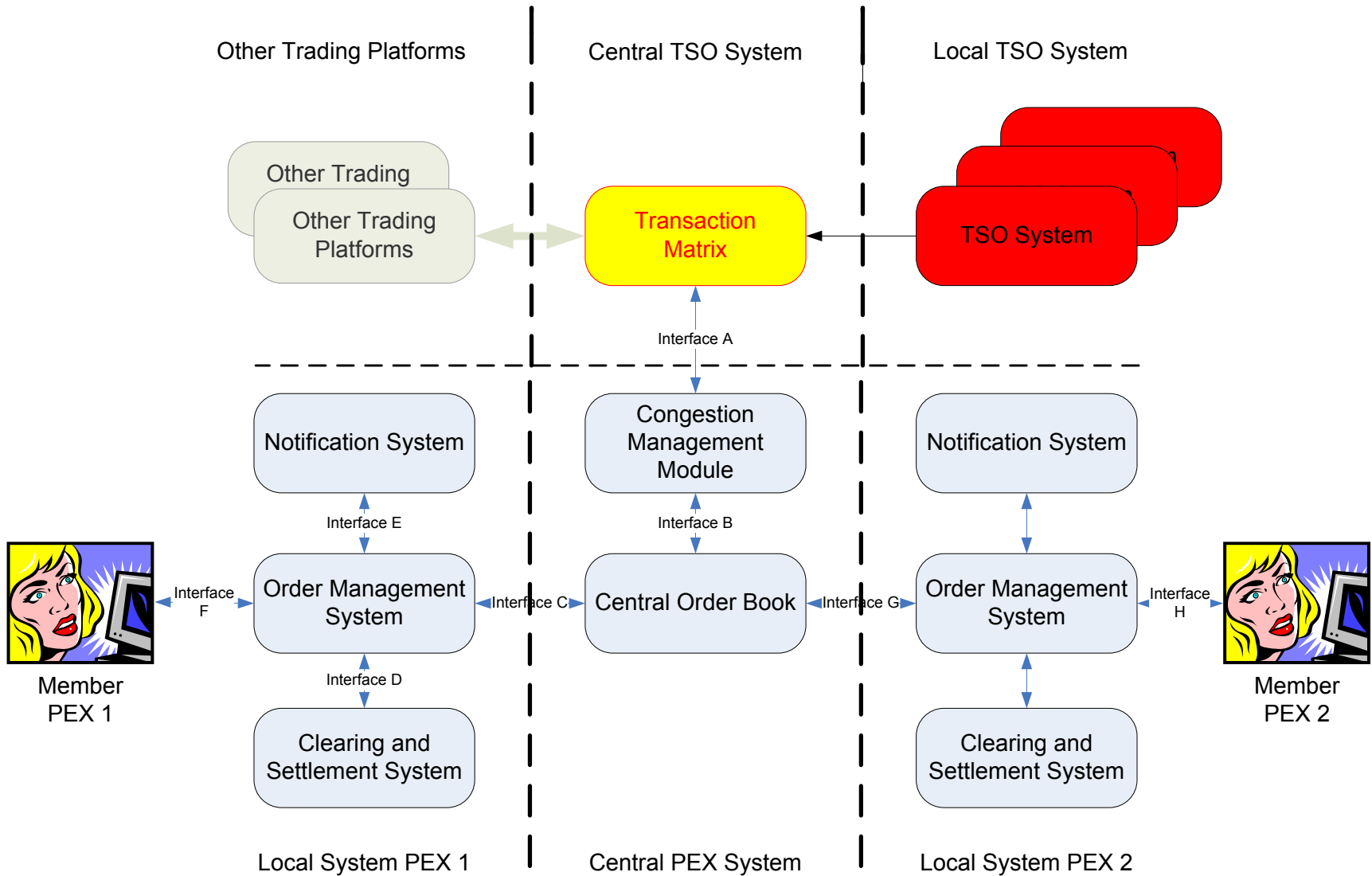
- For market parties
 - More efficient balance management => avoidance of imbalance charges
 - More opportunities to have efficient generation dispatched
 - For Transmission System Operator/Society
 - Yet more efficient capacity utilization
 - More efficient balancing system:
 - Lower grid imbalances
 - Possibility to buy cheaper balancing means on IDXB market
- => lower balancing cost ; lower balancing reserves

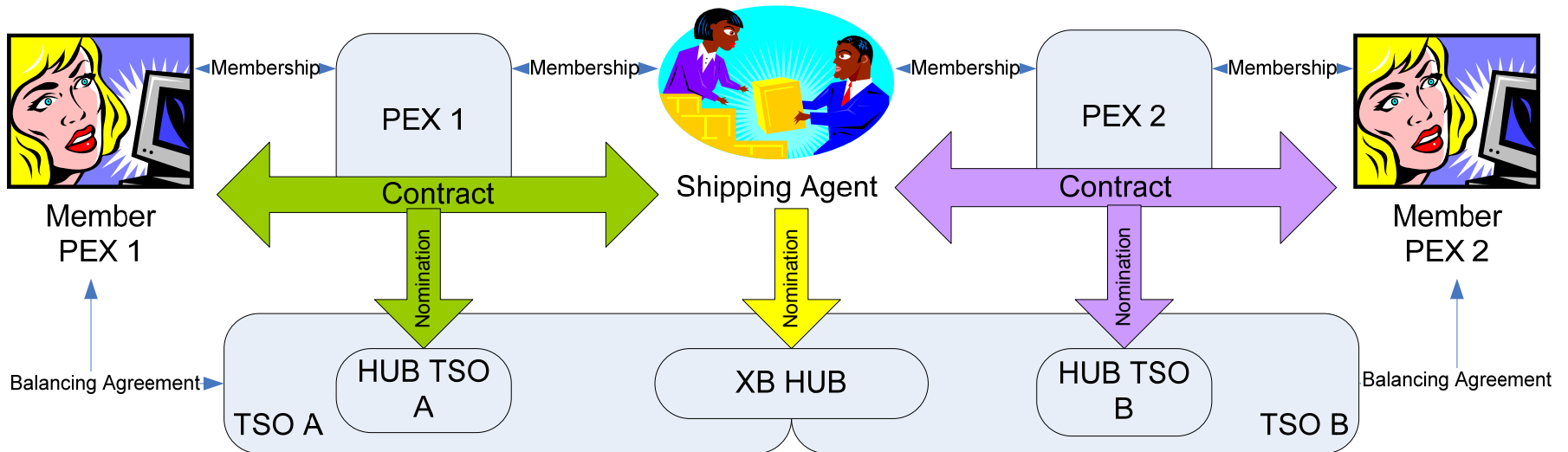
Possible market model that is proposed

Collaboration between exchanges to allow their respective ID liquidity to match between them, irrespective of the exchange it was submitted to, but taking into account the available XB ID capacity.

Characteristics

- Implicit allocation
- Central order book and matching engine
- Local arrangements for participants
 - Local membership and clearing agreement
 - Local balancing agreement
 - Only local notification
- “Shipping agent”:
 - carrying out XB notifications
 - Counterparty towards PEX for XB deals





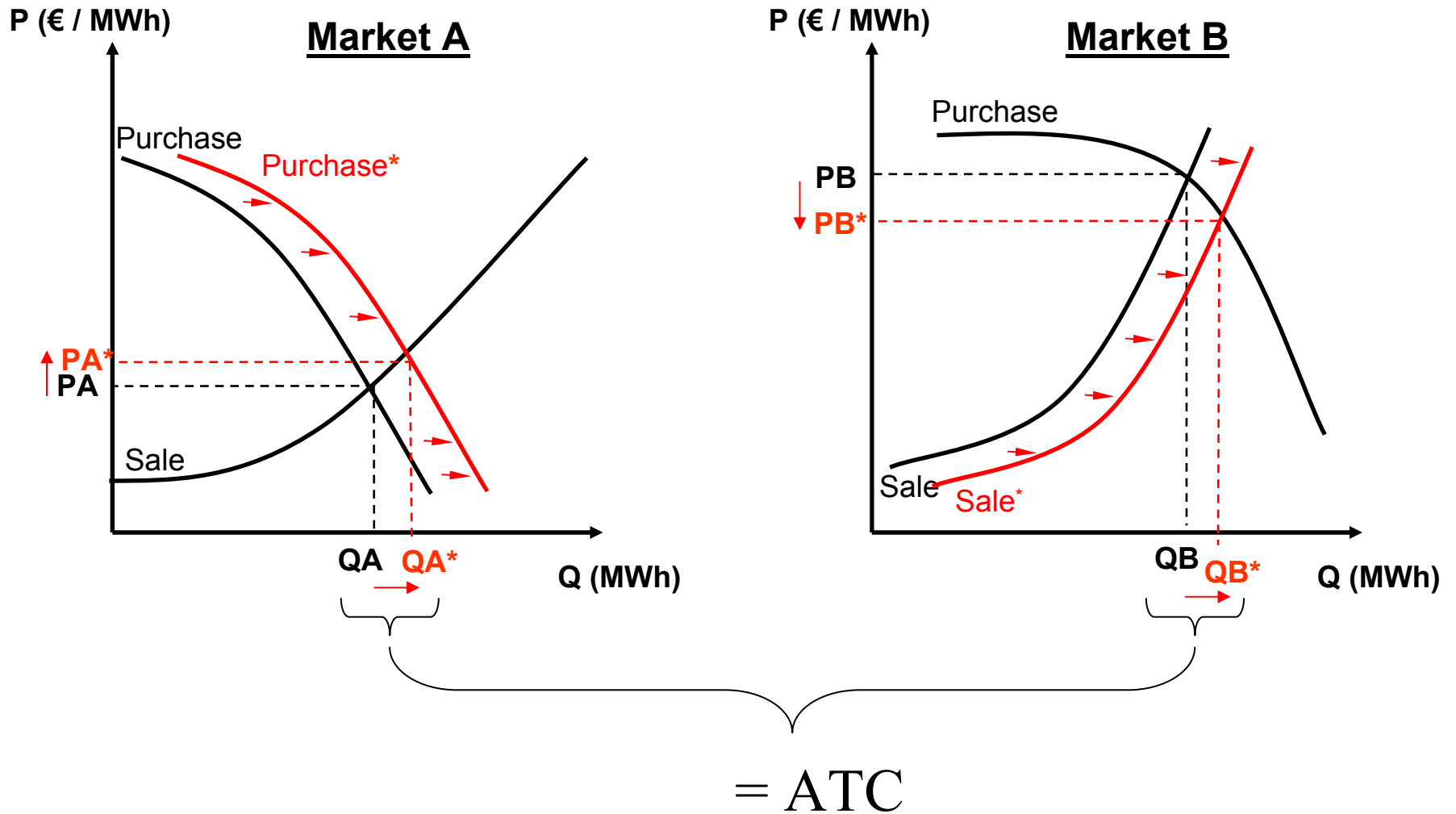
- Capacity Matrix
 - Contains available ID capacity
 - Updated as result of XB deal or changed grid conditions
 - Capacity needs to be firm and “obligatory use”
 - Can be “one-to-one” or “one-to-many” (several platforms connecting) provided:
 - Capacity taken is obligatory use
 - Technical solution does not alter deal confirmation time
 - Should be extendible to other area’s
- Congestion Management Module
 - Filter between different ID markets
 - Updates ATC DB as a result of XB deal
 - Updates Central Order Book as a result of movements in ATC DB
- Central Order Book
 - Centralizes orders
 - Contains matching engine
 - Should be extendible to other area’s
- Shipping Agent
 - Counterparty towards exchanges for all XB deals
 - XB energy shipments (nominations)
 - Who in charge? Several models exists today:
 - PEX only: Nordpool
 - PEX-TSO jointly (Market coupling Germany-Denmark)
 - TSO only: TLC


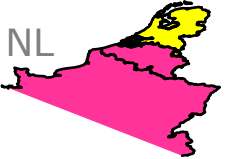


Regional market coupling

What is Market Coupling?

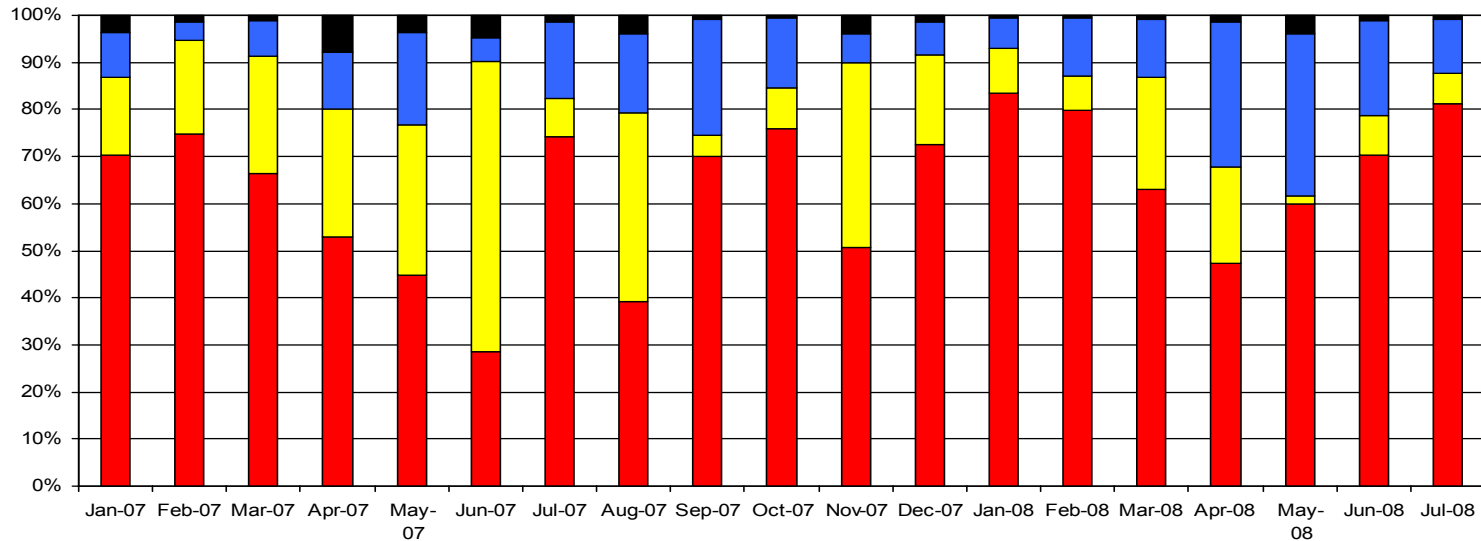
Handling of all orders jointly, according to their merit order

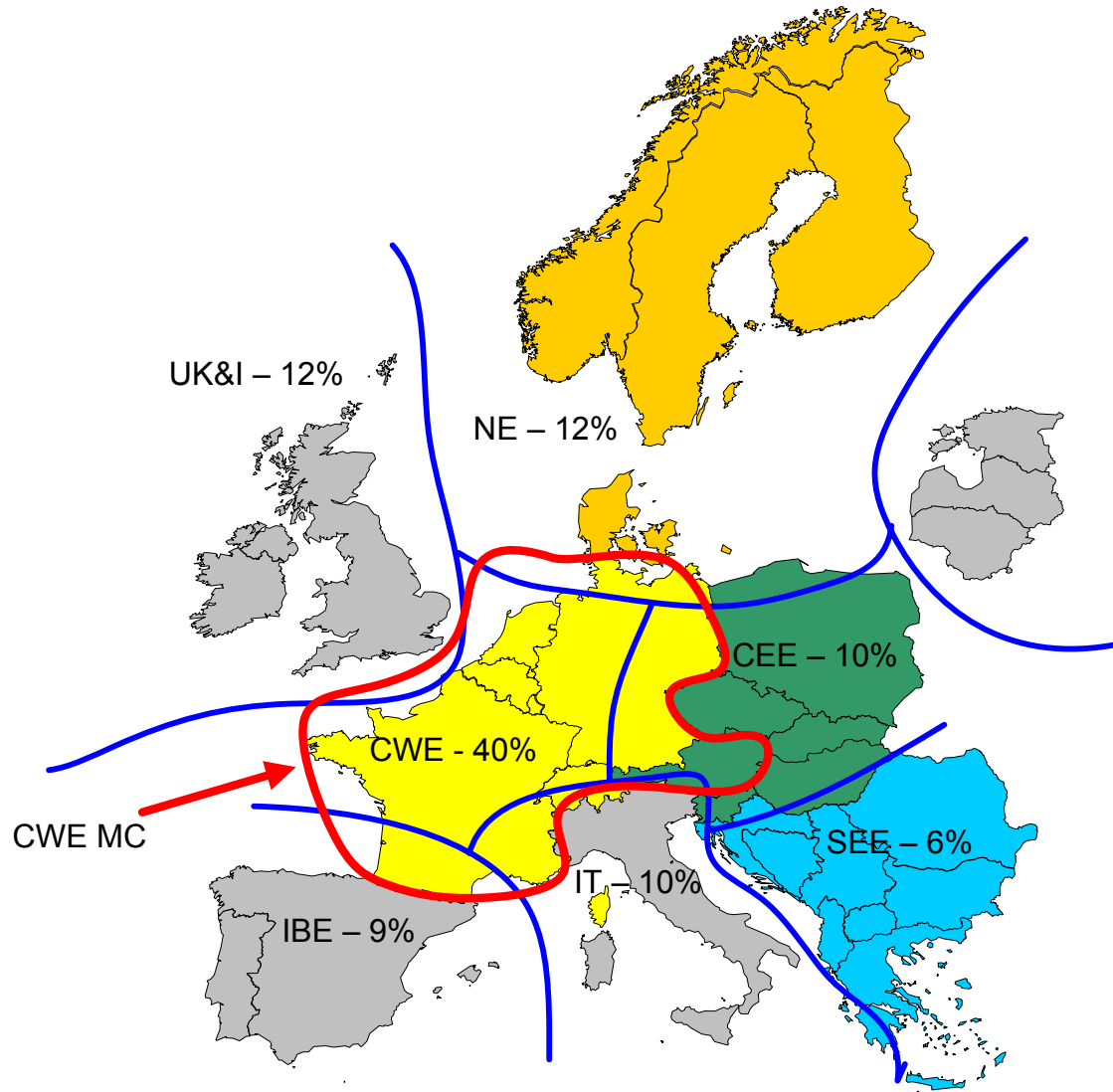
- Matching the highest purchase and lowest sales orders,
 - regardless of where they have been introduced,
 - but taking into account the available interconnection capacities allocated to MC.
- The counterparty of a transaction in NL (say) may be in F (say)
 - Without participants being bound to acquire the transmission capacity
 - Without even being aware that the transaction is being carried out cross border : no one knows the counterpart of a transaction is and whether the transaction is cross border or not.
- Overall aim of MC : maximise total surplus of all participants. (cheaper generation in one country can cover more valuable demand in another country)



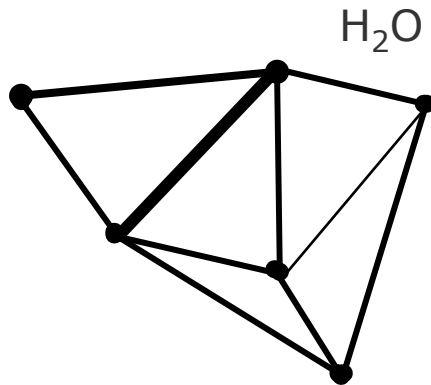
Borders		French-Belgian border	
		Congestion	Uncongested
Belgian-Dutch border	Congestion	$F \neq B \neq NL$ 1,3% 	$F = B \neq NL$ 21,7% 
	Uncongested	$F \neq B = NL$ 11,6% 	$F = B = NL$ 65,5% 

Evolution of convergence Baseload (Months)
Period: from 1/01/2007 to 31/07/2008



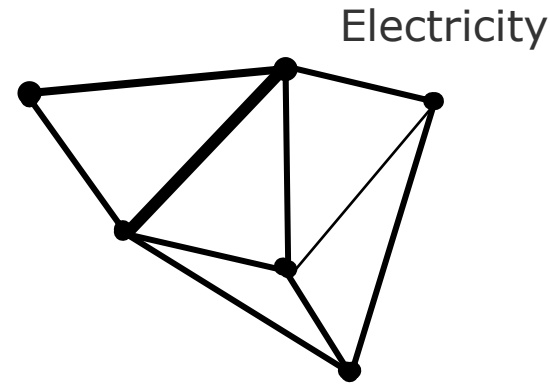


Electric networks are less flexible than other networks

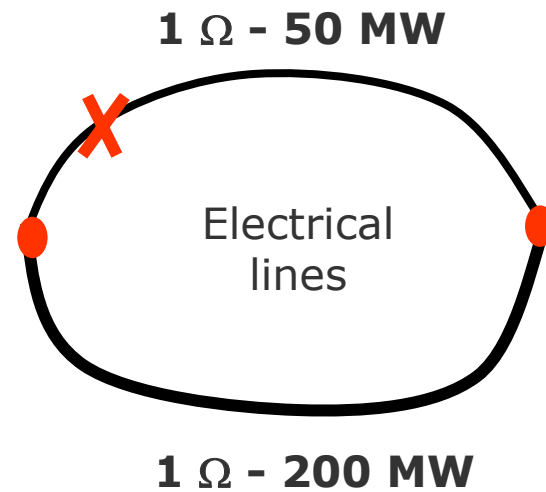
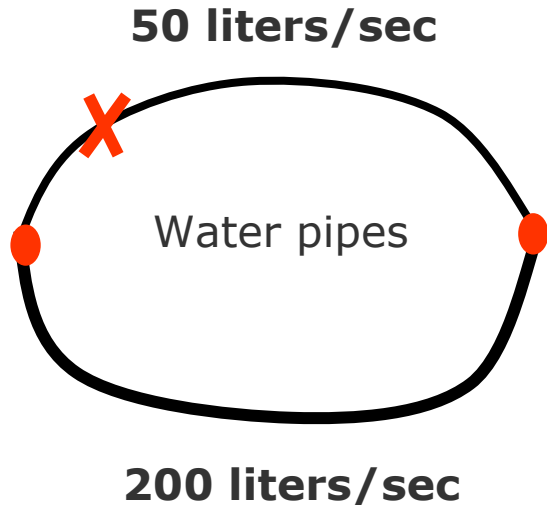


n nodes
m > n edges

- m degrees of freedom
- flows independent of each other
- transmission capacity related to "resistance" in the pipe



- n-1 degrees of freedom
- all flows determined by the "potential" at each node
- transmission capacity unrelated with "impedance" of the line



Total capacity from left to right

250 liters/sec

100 MW

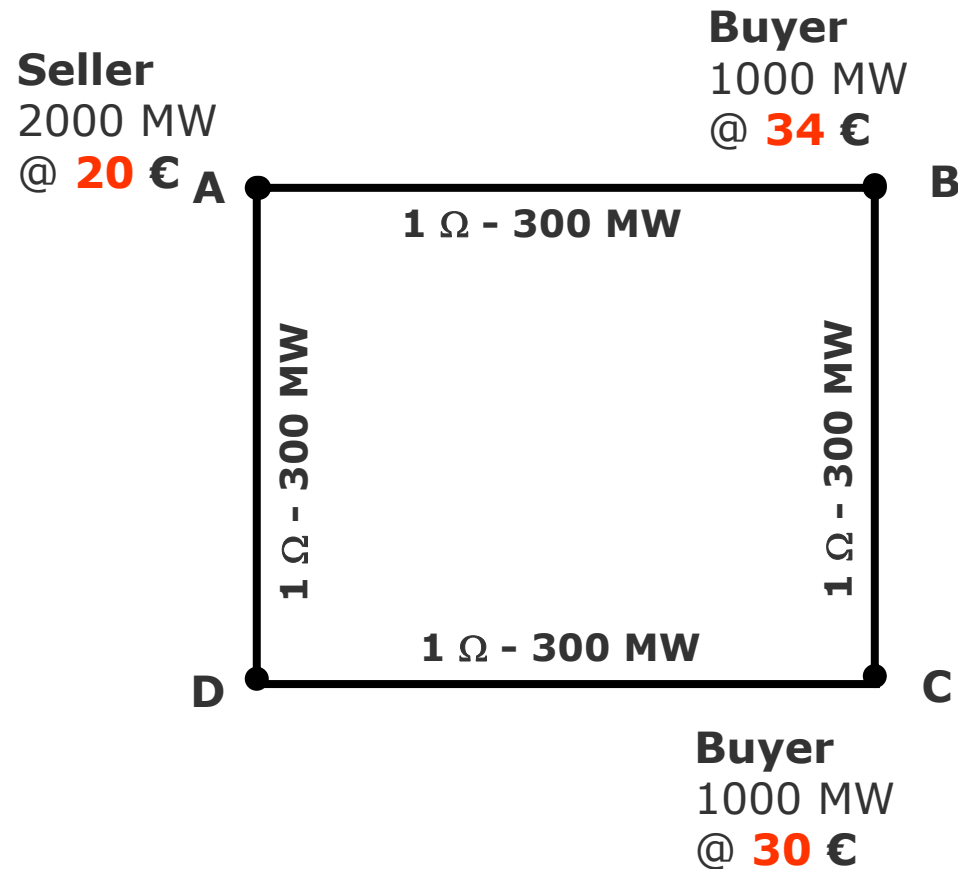
Total capacity with upper link blocked

decreases to 200 liters/sec

INCREASES(!) to 200 MW

BELPEX Counter intuitive example 2

Ratios between 2 paths



From A to B

A → B : **1**

A ↓ : **1/3**
B ↑ : **1/3**
D → C : **1/3**

⇒ Max **400 MW**

From A to C

A → B : **1**
↓ : **1**
C

A ↓ : **1**
D → C : **1**

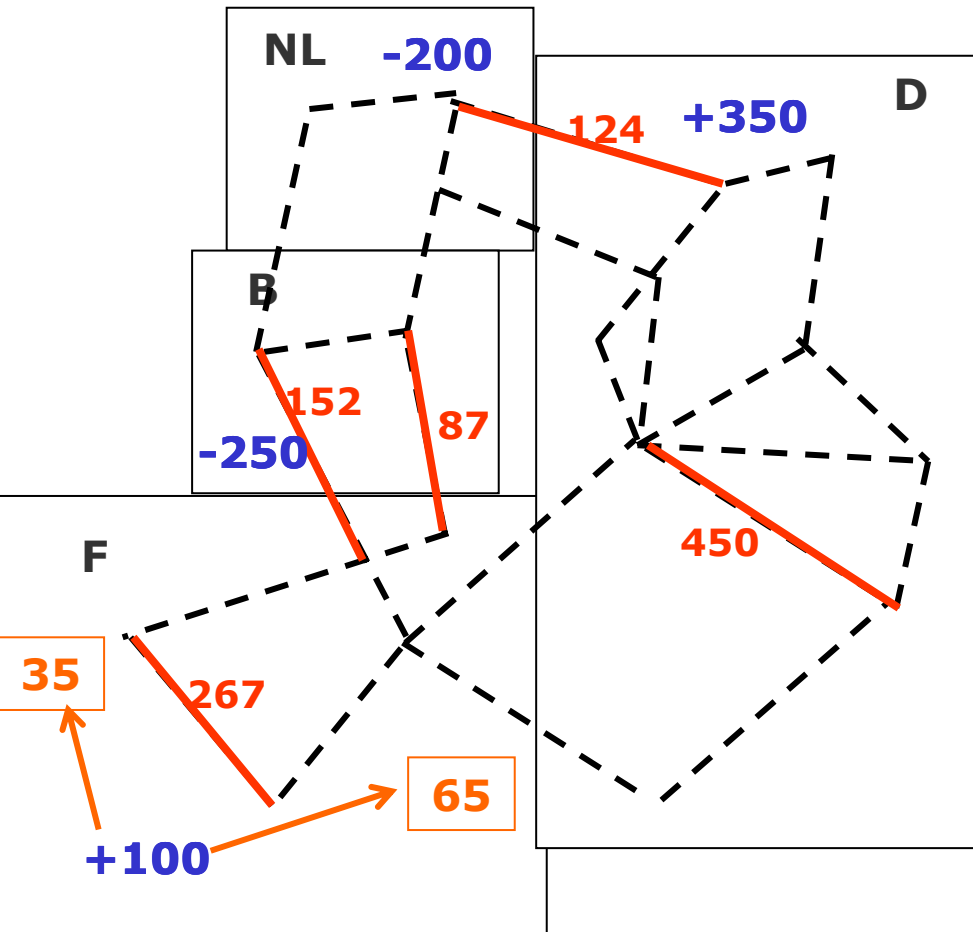
Max **600 MW**

Surplus

$$400 \times (34 - 20) = \mathbf{5600}$$

$$600 \times (30 - 20) = \mathbf{6000}$$

Conclusion : 600 MW to C, nothing to B !



$$\begin{pmatrix} 124 \\ 450 \\ 87 \\ 152 \\ 267 \end{pmatrix} = \text{PTDF} \times \begin{pmatrix} -200 \\ +350 \\ -250 \\ +100 \end{pmatrix}$$

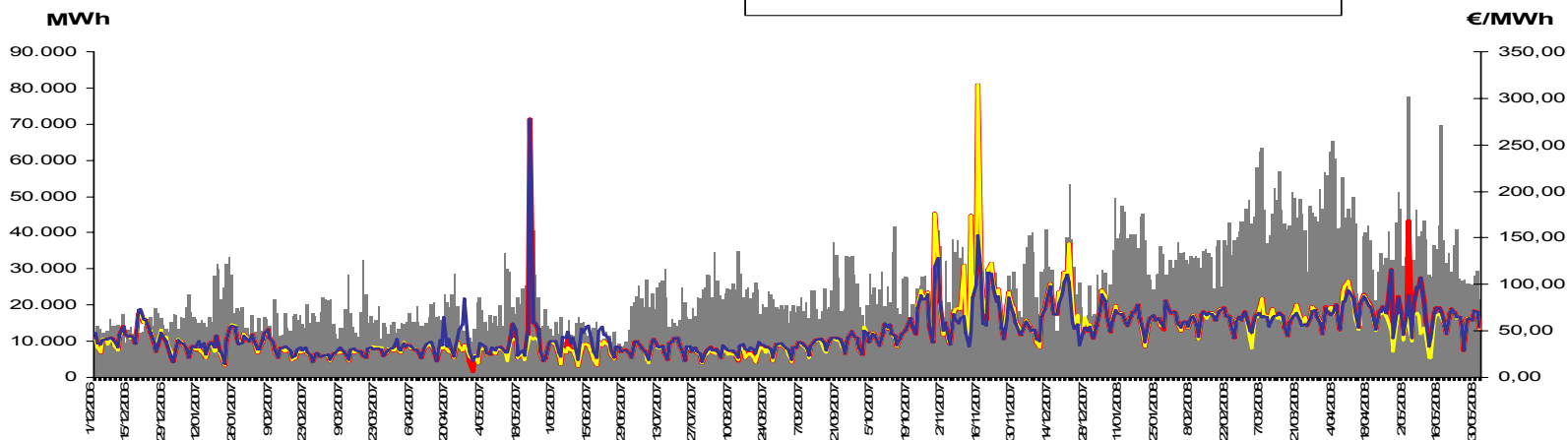
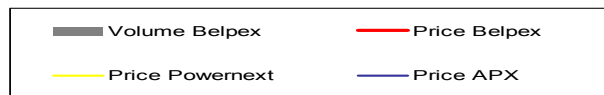
$$\begin{pmatrix} 124 \\ 450 \\ 87 \\ 152 \\ 267 \end{pmatrix} = \text{PTDF}' \times \underbrace{\text{GSK} \times \begin{pmatrix} -200 \\ +350 \\ -250 \\ +100 \end{pmatrix}}_{\begin{pmatrix} 35 \\ 65 \\ \dots \\ \dots \end{pmatrix}}$$

plus all N-1 situations

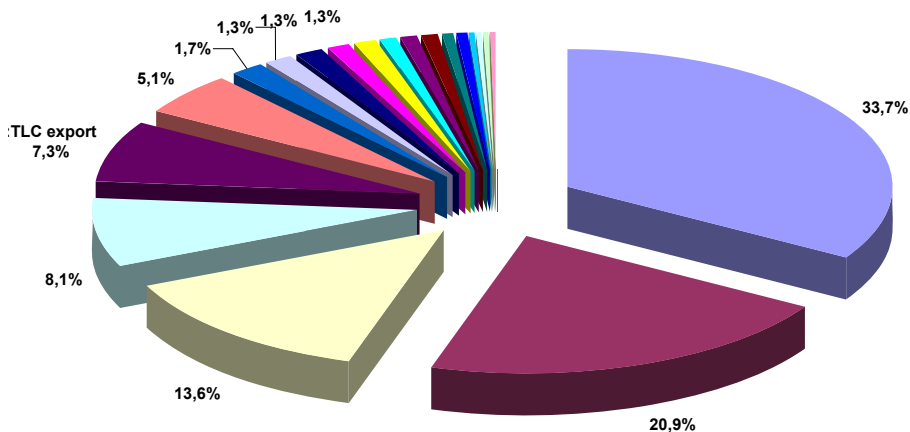
Liquidity

BELPEX Results: 01/12/06 till 31/05/08

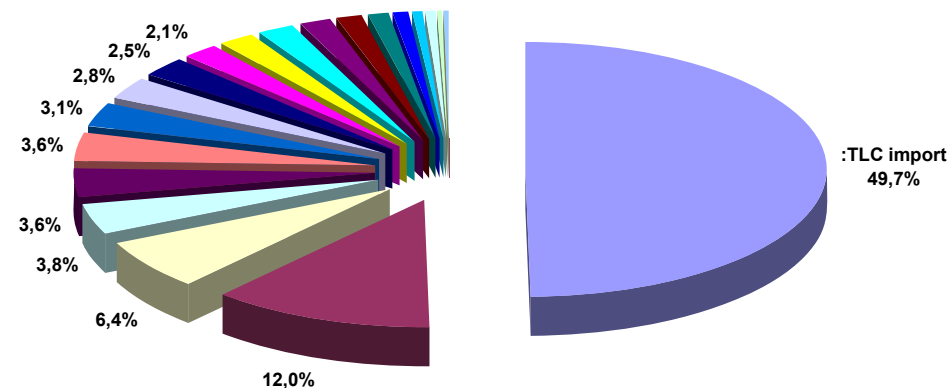
Volumes & Prices Baseload (Days)
 Period: from 1/12/2006 to 31/05/2008



Market shares, purchase side of the Belpex DAM

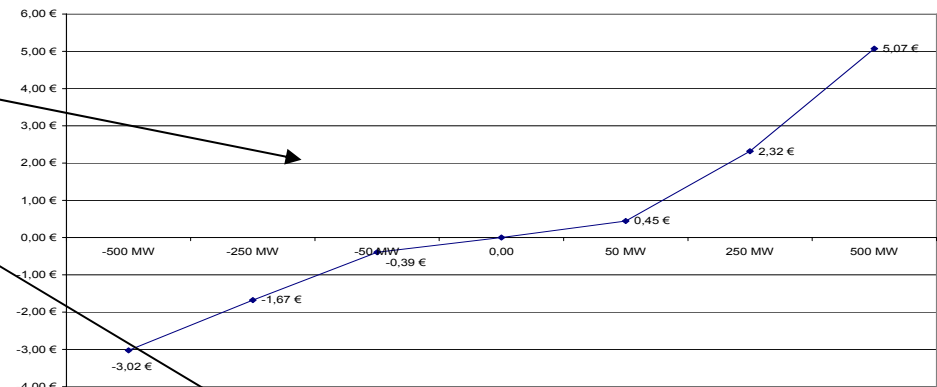


Market shares, sale side of the Belpex DAM

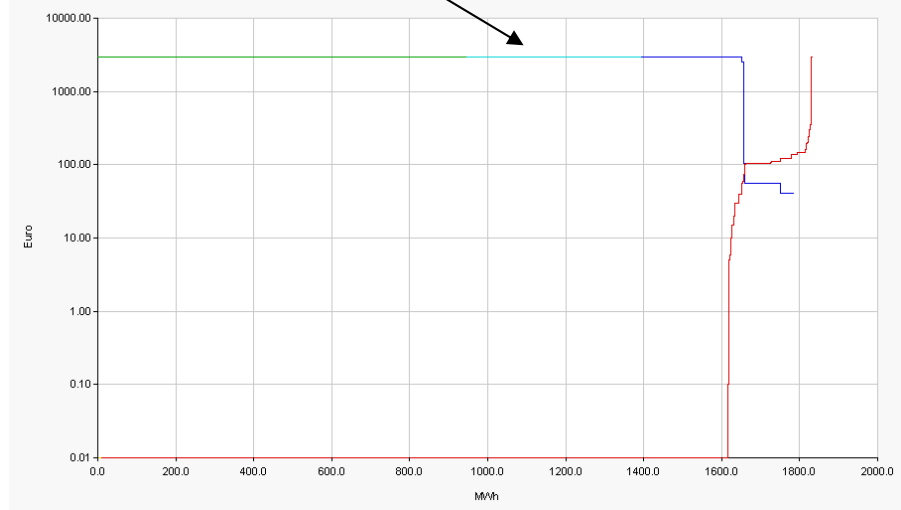


- Increased transparency
 - Resilience analysis
 - Block order info
- Product definition
 - Adapted block orders
 - Indirect participation
 - New collateral structure

Belpex baseload resilience



Applying date: 01-08-2008 Hour: 16 MCV: 1658.5 MWh MCP: 75.08 Euro



Acronyms

- PTR: Physical Transmission Rights
- FTR: Financial Transmission Rights
- CfD: Contract for Difference
- CR: Congestion Revenue
- MC: Market Coupling

Situation today:

- Explicit allocation of Y and M PTR's
 - Quantity: portion of Y (M) ahead ATC (consultation process)
 - Via single sided blind auction ; pay as cleared
 - What to do with it:
 - Resell to other market participant (up to couple days prior to actual expiry)
 - Return to TSO (up to couple days prior to actual expiry)
 - Nominate (8:00 am D-1)
 - Loose it (if none of the above)
- Implicit allocation of D capacity
 - Quantity:
 - reserved + UIOLI + Returned Y and M + incremental grid capacity or
 - D available ATC – nominated Y and M

Findings about actual mechanisms:

- Conflicting interests amongst market parties between:
 - Maximization LT PTR allocation for LT hedging and investment signals
 - Maximization ATC for MC for better convergence, lower price volatility, better capacity utilization

=> FTR scheme could solve dilemma

- Fixed-for-Floating financial hedging product sold by the TSO to manage XB price discrepancies (as a result of congestion); or
- “a financial instrument sold at a purchase date by TSO’s and entitling its holder to collect a revenue equal to the zone-to-zone price difference at a maturity date”; or
- A PTR with an “obligatory sale” characteristic
- Primary allocation of FTR: auction, pro-rata, only new entrants... but necessary to comply with EU regulation.
- FTR can be allocated in different time horizons, with different maturities
 - Multi Y, Y, M....
- Tradable in secondary markets (more easily than PTR’s)
- Not necessary to nominate FTR’s: financial settlement towards FTR holders could be done ex-post (avoidance of operational risk associated to PTR nominations, netting, calculation of D ATC....)

- Can be options or obligations:
 - Options: holder gets positive capacity value (if any)
 - Options exercise ? Not necessary, could be automatically settled
 - Obligations: holder gets positive capacity value and pays negative capacity value
 - Obligations allow netting
 - Obligations have lower intrinsic value than options (options and obligations tend to the same value if the congestion is always in same direction)
- Firmness: What to do in case of unexpected capacity curtailment?
- All physical capacity through MC: maximum market integration

- ↔ • Hedge vs system price
- System: virtual price system if infinite capacity
- TSO primary seller? (if No = CfD Nordpool)

- ↔ • Zone to zone hedge system
- Financial hedge between 2 price zones
- TSO primary seller? (if yes = FTR)

XB Hedging Zone B to Zone C:

Under Zone to zone hedge

- Product 1 and 2 or
- Product 3 and 4

Under System price hedge

- Product a and b

