CACM: an industry view on challenges and benefits

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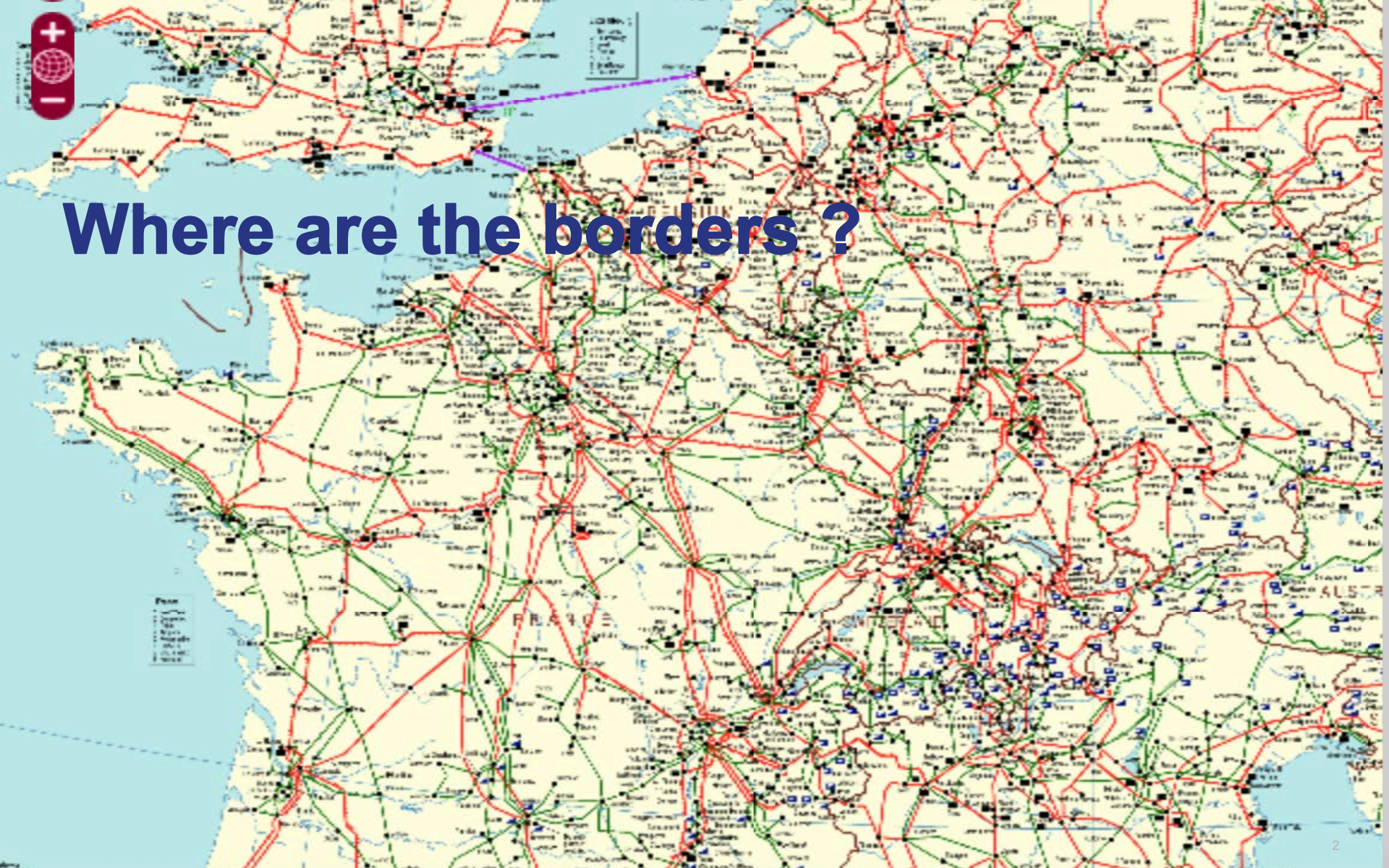

Where are the borders ?

Overview

1. The target model: which consequences ?
2. How to allocate capacity to the market ?
3. How to calculate capacity for the market ?
4. Intraday: new black or black sheep ?

Target Model: marriage of economy and physics

Fundamentally, energy supply is an engineering challenge. Good market design should give **economic incentives** to **align economics to physics in the short term and physics to economics in the long term**

Target model: a pan-European electricity market

Physically, we are interconnected and interdependent
But almost everything else has yet to follow this physical reality

Which benefit for the global welfare ?

Increase efficiency
Increase robustness and liquidity
Integrate new technologies and facilitate the energy transition

Why do we want it as market participant ?

Managing cross-border portfolios
New buying and selling opportunities
Facilitate the integration of new technologies

What is the consequence of zonal market design choice ?

Europe chose a zonal market for the benefit of liquidity and competition of supply and demand

- Bidding Zone (BZ) = geographical zone in which transmission capacity is not taken into account for domestic trades. Between 2 zones, traders have to take into account the availability of cross-border transmission rights :
  - explicitly by procuring physical or financial transmission rights (PTR or FTR)
  - implicitly via market coupling (Day-Ahead auction) or via implicit matching of orders (XBID, …)

- Physics can of course not be ignored (electricity flows cannot be restricted by commercial agreements !)
  - within a bidding zone, internal trades generate congestions
  - TSOs intervene to manage these congestions
  - the cost of these interventions is socialized via the grid-charges

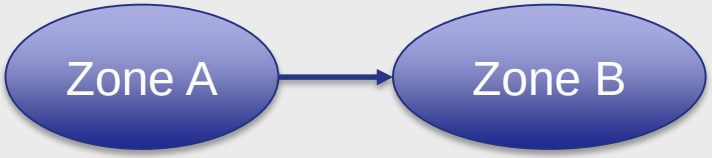
The determination by TSOs of how much physical cross-zonal capacity is allocated to the market = **capacity calculation**

How to allocate the cross-zonal capacity ?

Explicit allocation

- Process **separates capacity from energy**

1. Trader bids for capacity between two zones (ie: explicitly requires to purchase transmission capacity at a given price) in a capacity auction (via JAO) is organized The capacity offered will be given to the n highest bids received
   - The trader acquires transmission rights MW can flow from A to B
2. The energy is then traded:
   - Trader can then use a long position in A to fulfill a short position in B
   - These long/short positions can be created from OTC trades or through the DA power exchange
3. Schedules of the flows to both TSOs are submitted

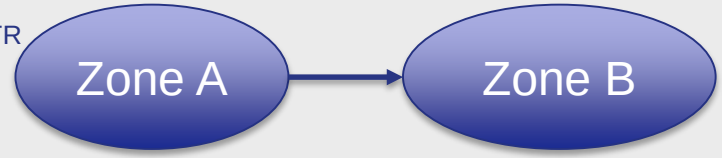


- The capacity product can be sold in forward (Long Term Allocation – LTA) or in Day-Ahead where no market coupling exist
  - EU Network codes guidelines foresees that a “Use It or Sell It” principle applies
  - Forward product can be physical (PTR) or financial (FTR)

How to allocate the cross-zonal capacity ?

Explicit allocation : PTR versus FTR

- In Forward, TSO are allocating capacity, with an expiry in day-ahead (“Use It Or Sell It” Principle) (eg from A to B)
- This gives the owner the option to
  - Physically flow electricity from zone A to zone B -> Physical Transmission Right - PTR
  - Hedge against the price spread between B and A -> Financial Transmission Right – FTR
    - The market participant must then go in the Power Exchange to clear his physical position



- Illustrative example:

PTR

- Bought 10 MW PTR from A to B in December 2017, for delivery in 2018
- At 08:00 am, B trades at a higher price (35 €/MWh) than A (30 €/MWh):
  - Sell 10 MW OTC in B at 35 €/MWh
  - Buy 10 MW OTC in A at 30 €/MWh
- Nominate the « use » of the PTR from A to B
- Benefit of the operation = 5€/MWh
- When computing the available capacity for the DA market coupling in A and B, TSOs will take into account the LT nominations

FTR

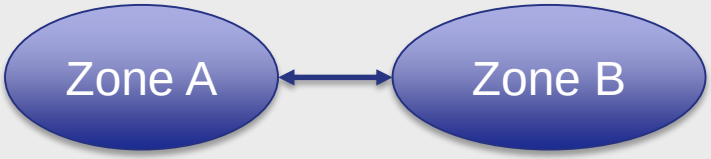
- Bought 10 MW FTR from A to B in December 2017, for delivery in 2018
- At 08:00 am, B trades at a higher price (35 €/MWh) than A (30 €/MWh):
  - Sell 10 MW OTC in B at 35 €/MWh
  - Buy 10 MW OTC in A at 30 €/MWh
- Put orders at « any price » in the DA market coupling:
  - Buy 10 MW in B at any price
  - Sell 10 MW in A at any price
- DA market results: A = 25 €/MWh ; B = 40 €/MWh ➔ my FTR gives me 15 €/MWh
- Benefit of the operations = 5 €/MWh

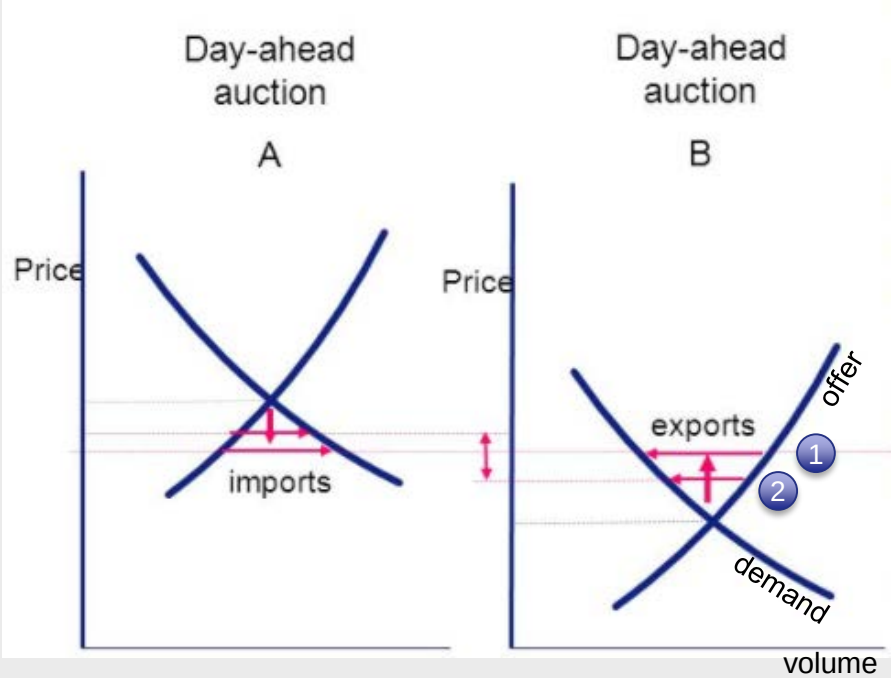
How to allocate the cross-zonal capacity ?

Implicit allocation

- Process **merges capacity and energy**

1. Trader bids for energy (bids and offers) in each zone to the Power Exchange
2. TSOs provide the available capacity between each zone
3. The energy bids and offers in the different zones is then matched, depending on the availability of capacity
   - If no congestion (ie: enough capacity): no price difference between A and B (1)
   - If congestion (ie: not enough capacity allocated to the market), a price difference between A and B appears (2)





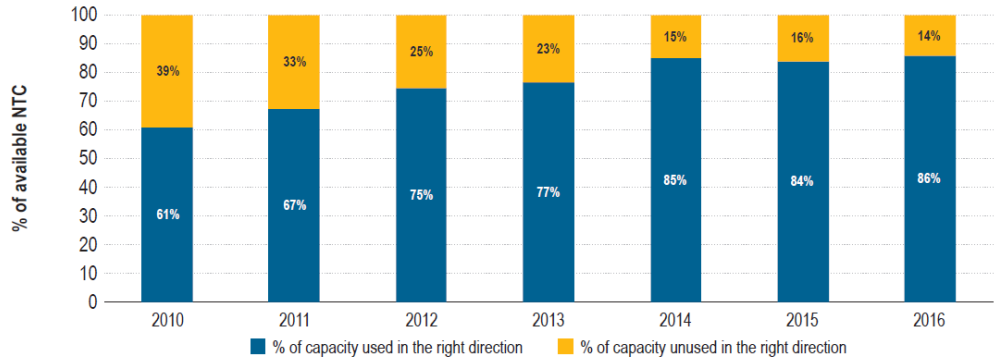
How to allocate the cross-zonal capacity ?

Implicit allocation: which benefits ?

- Capacity is optimally used, particularly for periods when the positive price direction is uncertain at the time of nomination of capacity (increasing the risk that the nomination is made in the 'wrong' direction).
- The market value of the transmission connection is exactly identical to the price difference between the areas. This ensures that congestion income only arises when real constraints exist.
- When there are no transmission constraints, the markets will converge entirely and the Power Exchange prices will be identical. Market coupling thus represents a major step towards a more integrated European market
- Greater social welfare

Quoting EFET

Figure 18: Percentage of available capacity (NTC) used in the 'right direction' in the presence of a significant (>1 euro) price differential on 37 European electricity interconnectors – 2010 (Q4) – 2016 (%)

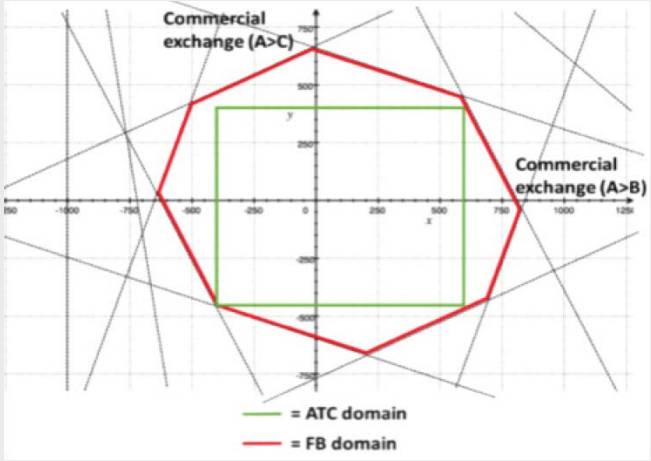


Source: ACER Market Monitoring Report 2016

How to calculate the cross-zonal capacity ?

- NTC:
  - Bilateral agreements between neighbouring TSOs
  - Based on historical data for each reference day, taking into account potential loop flows, seasonal impacts, security margin…
  - ATC = NTC – long term nominations

- Flow Based:
  - Instead of supplying fixed commercial capacities per direction, FB formulates constraints reflecting physical limitation of the grids
  - Flow Based methodology takes into account the impact of net export from each zone on the flows generated on a defined set of critical grid elements
  - This potentially allows to accommodate transactions that would have been impossible with ATC methodology



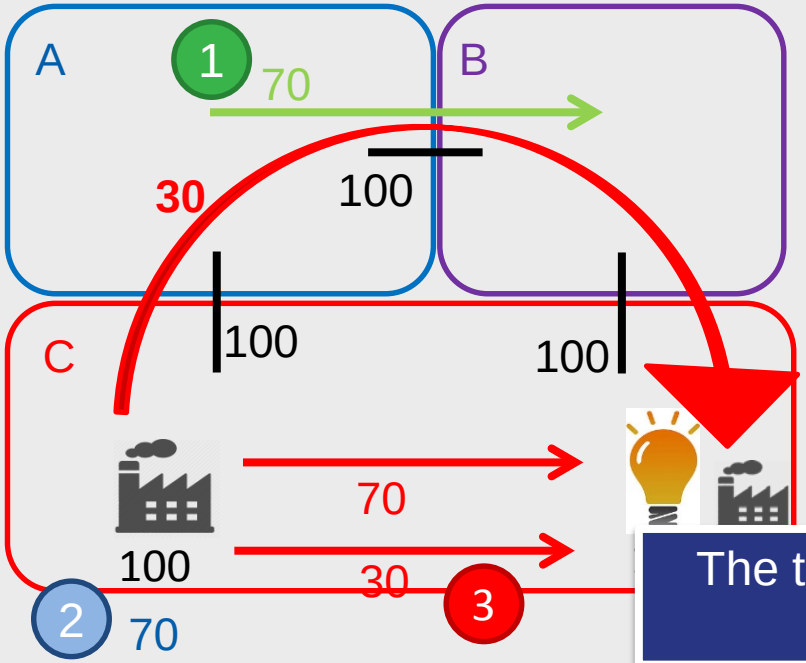
Source: El Fact sheet: cross-border electricity trading: towards flow-based market coupling – KU Leuven Energy Institute

How to calculate the cross-zonal capacity ?

How to take physics into account ?

A simplified example – assumptions :

- 100 MW of production at Western part of C
- 100 MW of consumption at Eastern part of C
- Internal C network can only accomodate 70 MW



How to address the situation ? Several options:

1. Restrict cross-border capacity: limit the commercial exchanges to 70 MW) →indirect cost by reducing the welfare

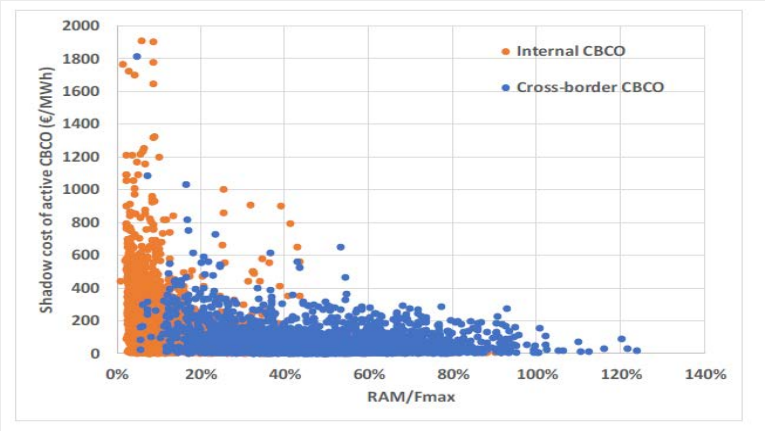
2. Perform remedial actions: eg reduce the production at the West side of C and increase the production at the East side of C → leads to costs

3. Invest in the network : reinforce the lines from West to East → leads to costs

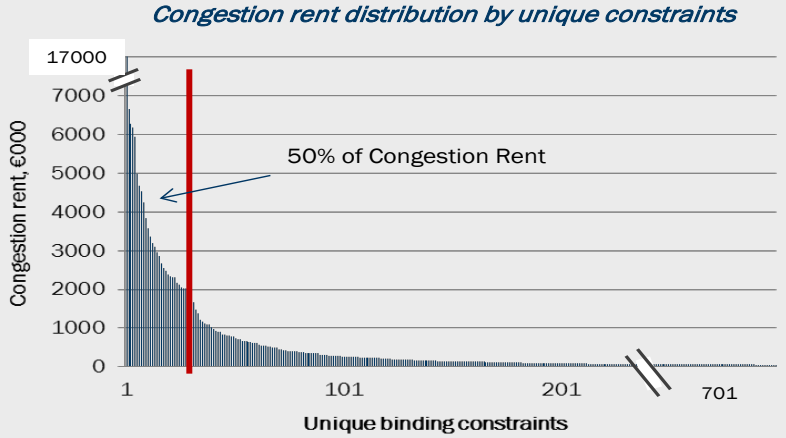
The target should be to find the economic optimum between all solutions

How to calculate the cross-zonal capacity ?

CWE Flow Based: return of experience (1/2)



Source: CREG Study « Functioning and design of the Central West Eureopean day-ahead flow based market coupling for electricity: Impact of TSOs Discretionary Actions



Source: FTI CL - Flow-based Market Coupling monitoring in CWE

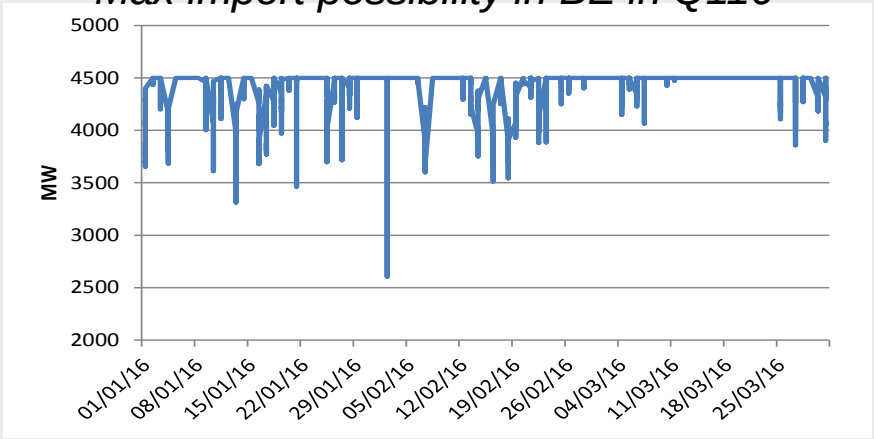
A limited number of constraints are generating 50% of the congestion rent ➔ are we at the economic optimum ?

How to calculate the cross-zonal capacity ?

CWE Flow Based: return of experience (2/2)

- With ATC, capacity calculation separated from market coupling and done per border. Combined with publication by TSOs of line availability => predicatbility possible for the market
- With FBMC, calculation and allocation together. Limitation on one border can be due to other borders or due to congestions inside a zone.
- To achieve similar transparency, market must be informed of all critical network elements limiting the transmission capacity and of the availability of these elements.

Max import possibility in BE in Q116

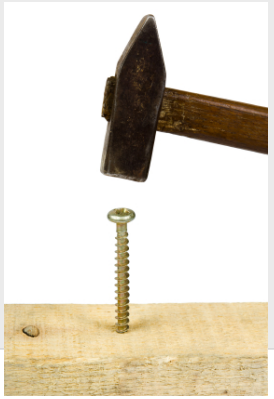


— Since June 2017 (~2 years after go live!), publication of CBCO is done. Improvements are still required on the consistency, format and frequency of updates. No history of publication is provided, although several additional CBCO were added after go live.

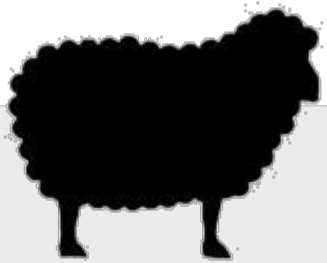
How to calculate the cross-zonal capacity ?

CACM CCM: has the objective been achieved ?

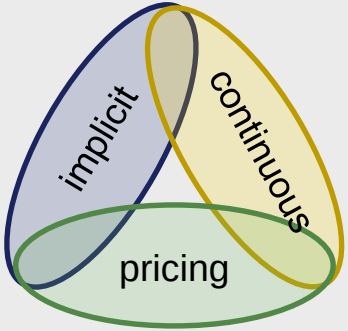
- Capacity Calculation Methodology have been submitted by TSOs to NRAs for approval
- Proposal submitted fails objectives of CACM, mainly due to the lack of clear and binding information on elements used in the methodologies:
  - Lack of clear and transparent rule for selection of CBCOs
- A real paradigm shift is necessary in order to maximize the overall welfare:
  - Consider costly remedial actions on an equal footing with limitations of cross-zonal capacity, and this on a regional/EU basis
  - Give TSOs the access to the “tools” needed for the security of the grid (including for managing congestions close to real time such as countertrading)
  - Grant full transparency on capacity calculation, including on how remedial actions are used



Intraday: new black or black sheep ?



1. The impossible « trilemma » should be solved !



2. Recalculation of cross-zonal capacity is a priority
   - Return on experience from CWE is not promising
   - Even « small » amount of additional cross-zonal capacity can lead to significan welfare increase
3. Balancing processes should not come at the cost of self-balancing opportunities
   - Co-otimization processes between balancing and day-ahead should not forget intraday
   - Gate Closure Time for balancing products should not overlap with cross-zonal intraday one
   - Pro-active balancing systems should not interfere with the development of intraday markets