Commissie voor de Regulering van de Elektriciteit en het Gas
Commission pour la Régulation de l'Electricité et du Gaz

# Will Flowbased market coupling lead to better usage of transmission capacity, increased welfare and security of supply?

ELECTRICITY MARKET INTEGRATION – A NORTH EUROPEAN PERSPECTIVE
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CREG

Will Flowbased market coupling lead to better usage of transmission capacity, increased welfare and security of supply?

**It's complicated…**

- Flow-Based basic principle:
  - Capacity calculation and allocation in the same optimization
  - ATC: capacity determined ahead

- Euphemia formula:
  - Max welfare (Objective function)
  - $\Sigma\ PTDF \cdot nex < RAM$ (Constraints)
    - PTDF: power transfer distribution factor
    - Nex: net export positions
    - RAM: remaining available margin

# Overview

- History and future outlook
- Welfare & other indicators
- Regulatory Issues – FBMC parameters
- Regulatory Issues – Flow Competition
- Stakeholder issues
- Conclusion

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# HISTORY AND FUTURE OUTLOOK

# History

- 7 June 2007: CWE Memorandum of Understanding
  - *[… ] implementation of a flow-based market coupling between the five countries […]*
- …
- March 2015: FBMC approval process in last stages
  - Documents on www.casc.eu

# Future outlook

- Between now and launch of FBMC
  - Market testing
  - Internal validation by the CWE FBMC Project
  - Flow competition - adequacy discussion
  - (market consultation +) Regulatory approval

- FBMC 2.0 after FBMC 1.0

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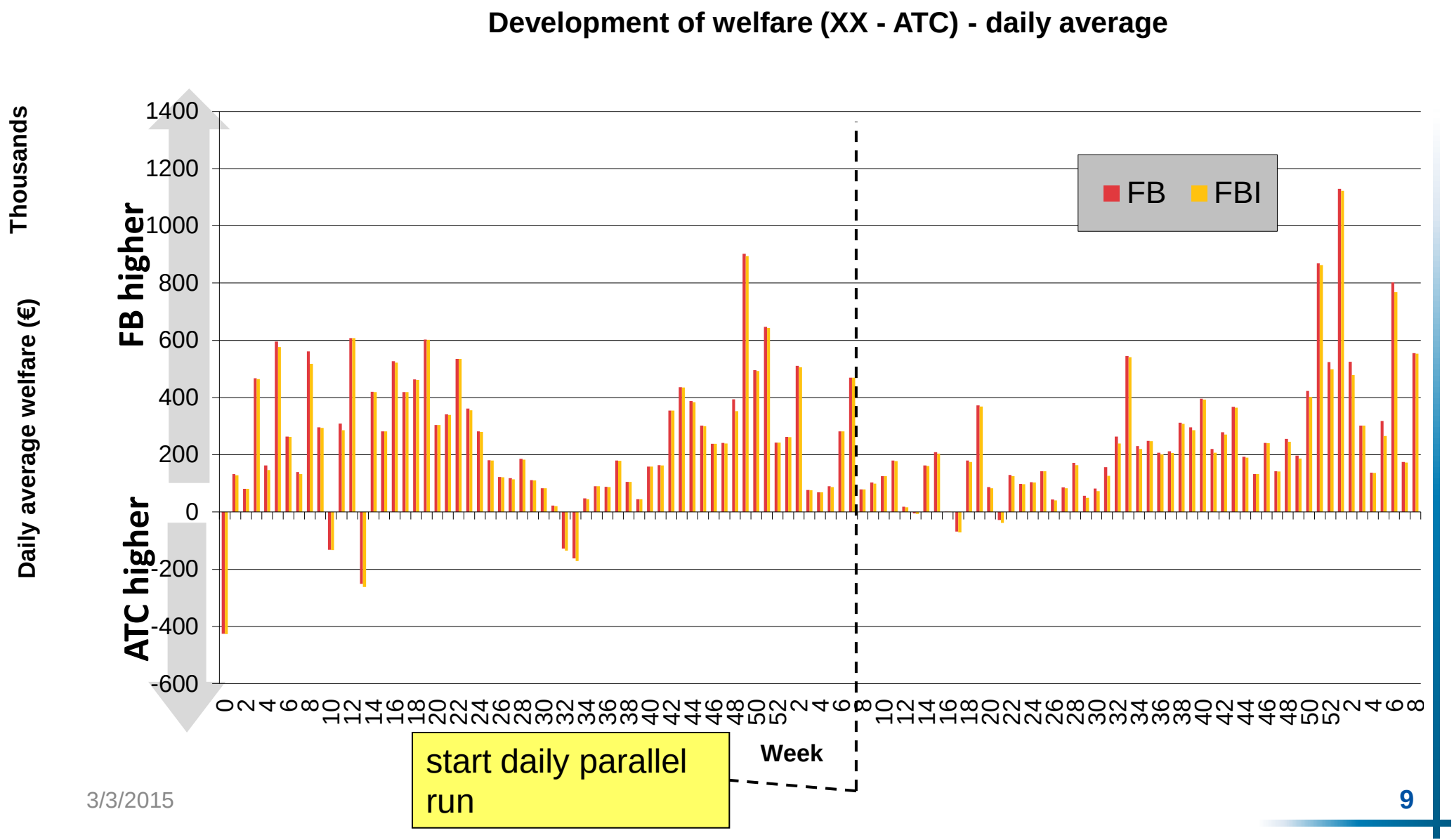
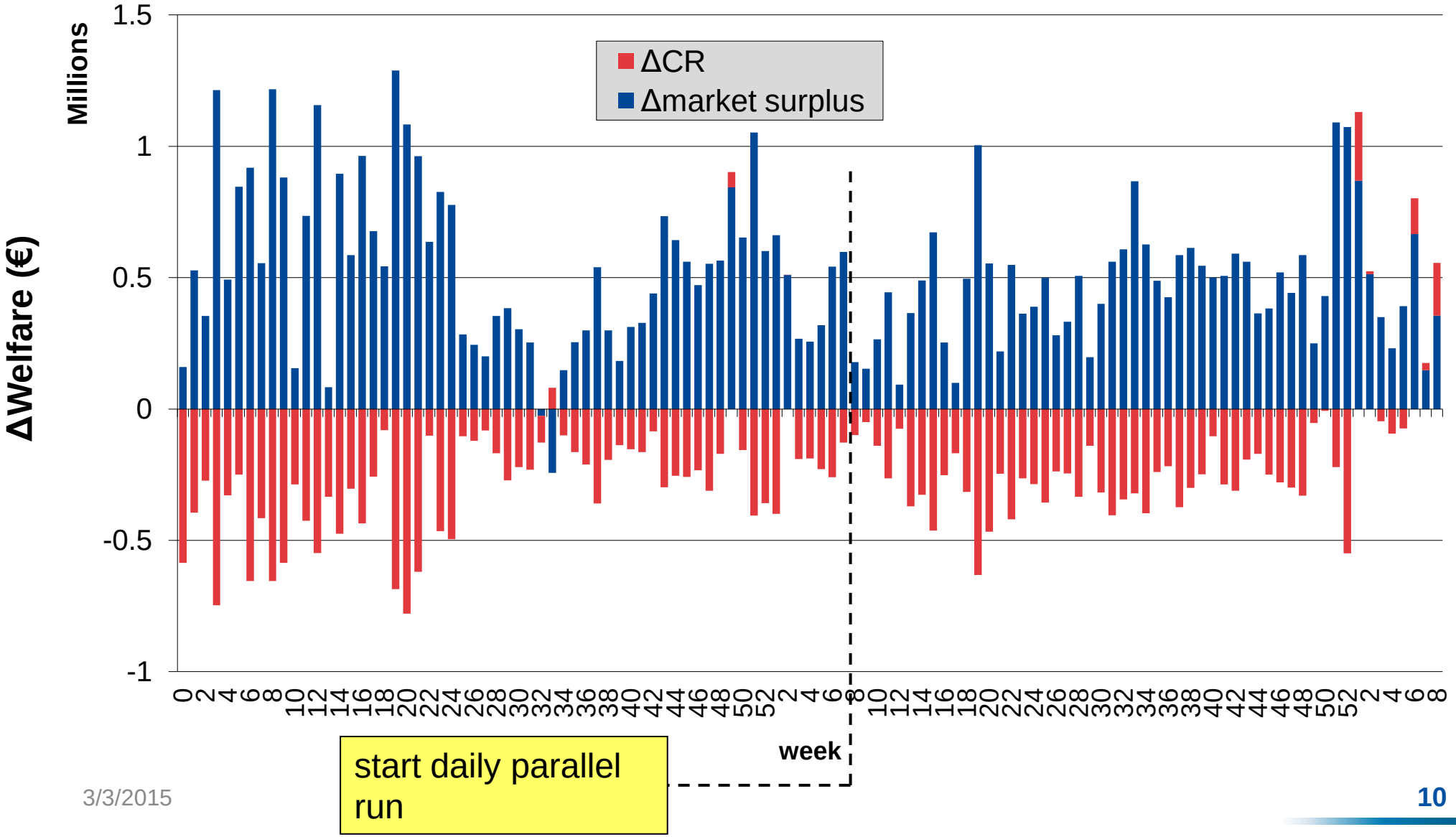
# WELFARE & OTHER INDICATORS

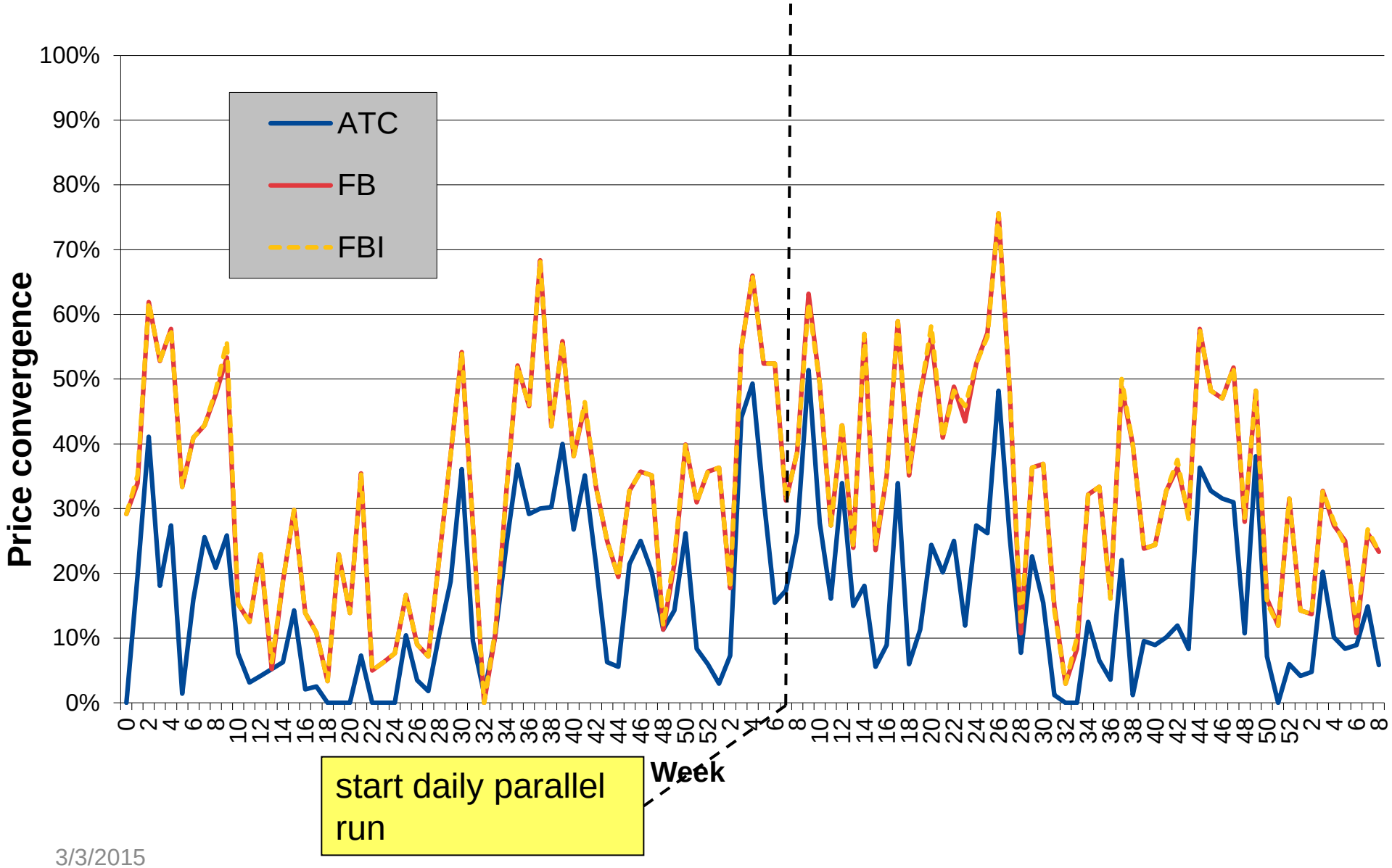
# Weekly day ahead welfare



# Change in average welfare



# Price convergence



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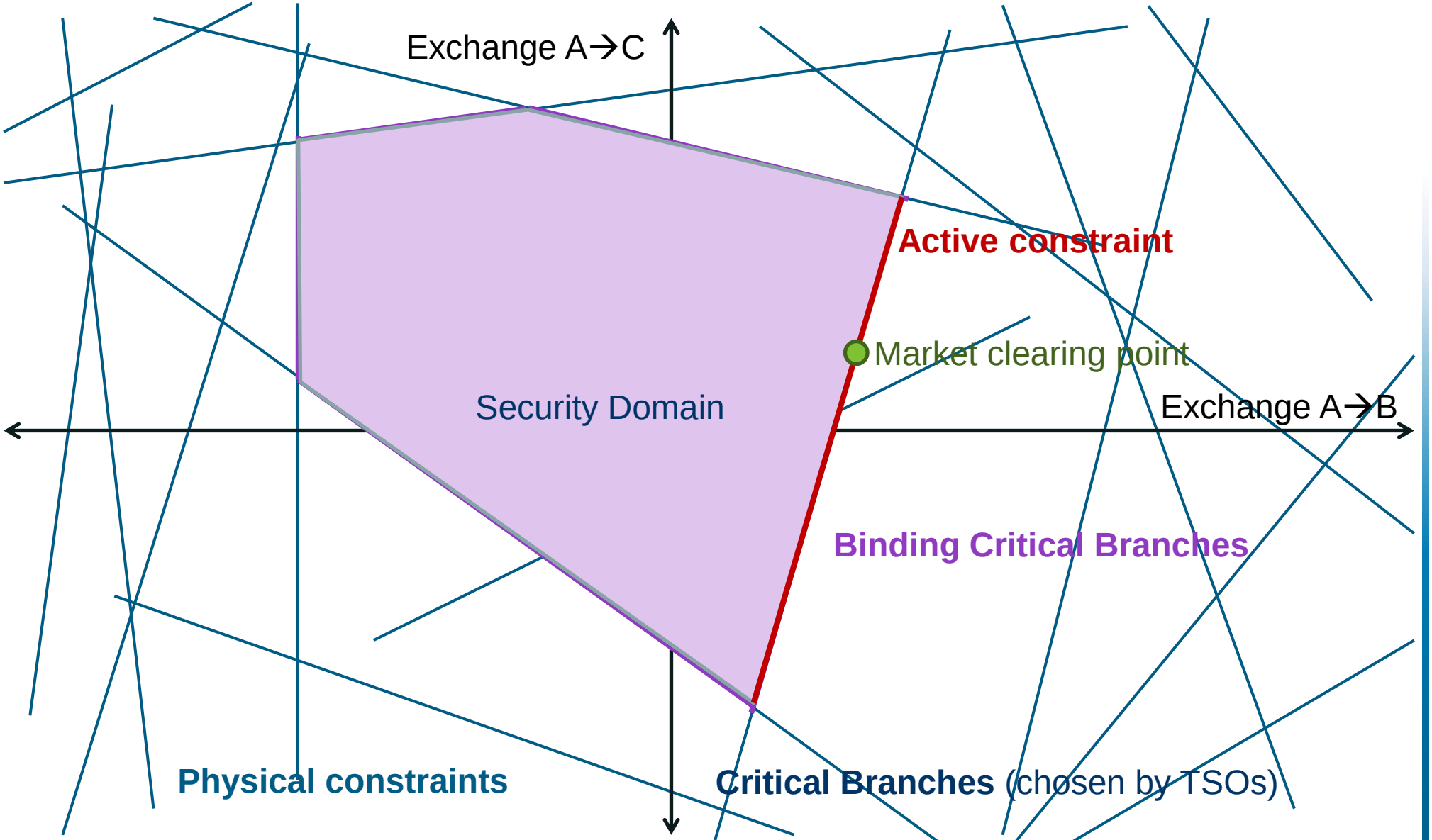
# REGULATORY ISSUES – FBMC PARAMETERS

# Critical Branches (CB)

- FB allocation = Optimisation under constraints corresponding to thermal line capacities of CB
- Capacity on the CB, given to the FBMC :
  - **$RAM = F_{max} - F_{ref} - FRM – FAV$**
    - ✓ RAM = remaining available margin (~ ATC value)
    - ✓ $F_{max}$ = maximum allowable flow
    - ✓ $F_{ref}$ = physical flow resulting from base case
      - ➢ needs to be adjusted for LT nominations
    - ✓ FRM = flow reliability margin
    - ✓ FAV = Final adjustment value

# Critical Branches (CB)



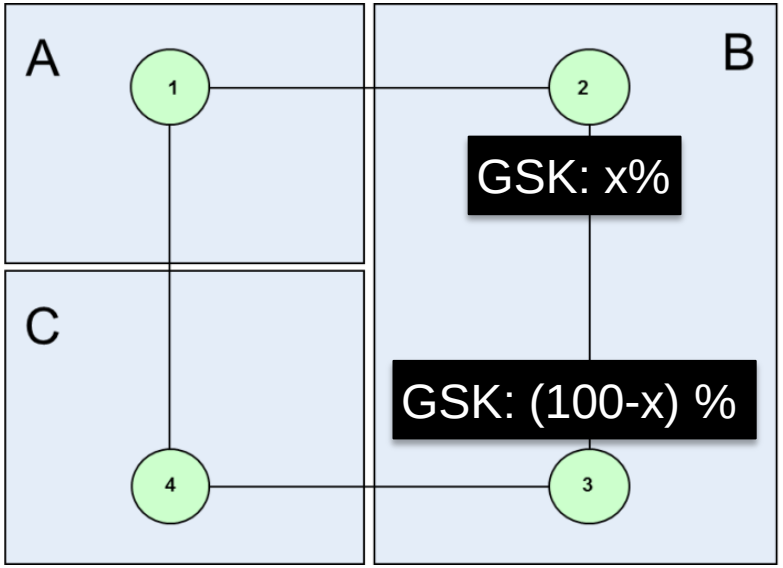
# Critical Branches (CB)

- CB = existing branches in the regional grid
- CB determines constraints in the Market Coupling algorithm
- Constraints impact welfare and prices

Choice of CB influences the prices

# Generation Shift Key (GSK)

- Trades between zones A, B and C depend on GSK assumptions
- GSK is factor for transforming node-to-line to zone-to-line PTDF



# Generation Shift Key (GSK)

- $PTDF_{\text{zone-to-line}}$ is GSK-dependent
- Electricity prices are $PTDF_{\text{zone-to-line}}$ -dependent

$$\frac{P(C)-P(B)}{PTDF_{B\rightarrow ConL34}}=\frac{P(C)-P(A)}{PTDF_{A\rightarrow ConL34}}=Shadow\ price$$

  - With a given P(C) and P(B), P(A) will depend on $PTDF_{B\rightarrow C \text{ on } L34}$

Electricity prices are GSK-dependent

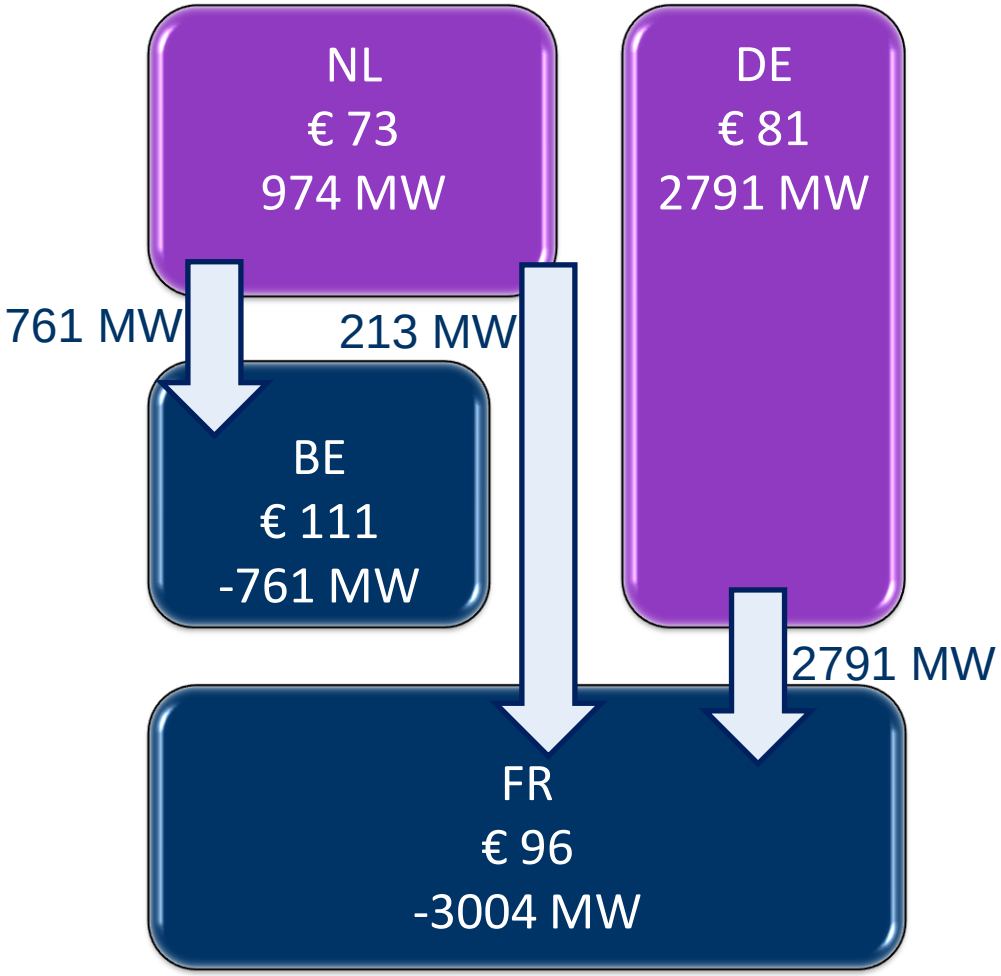
# Margins on the CB

- RAM = $F_{max}$ - $F_{ref}$ - FRM – FAV

- Margins:
  - Flow Reliability Margin (FRM)
  - Final Adjustment Value (FAV)
  - “Special” critical branches
    - Explicit additional constraints in the algorithm

- Reflect uncertainty

# Intuitiveness

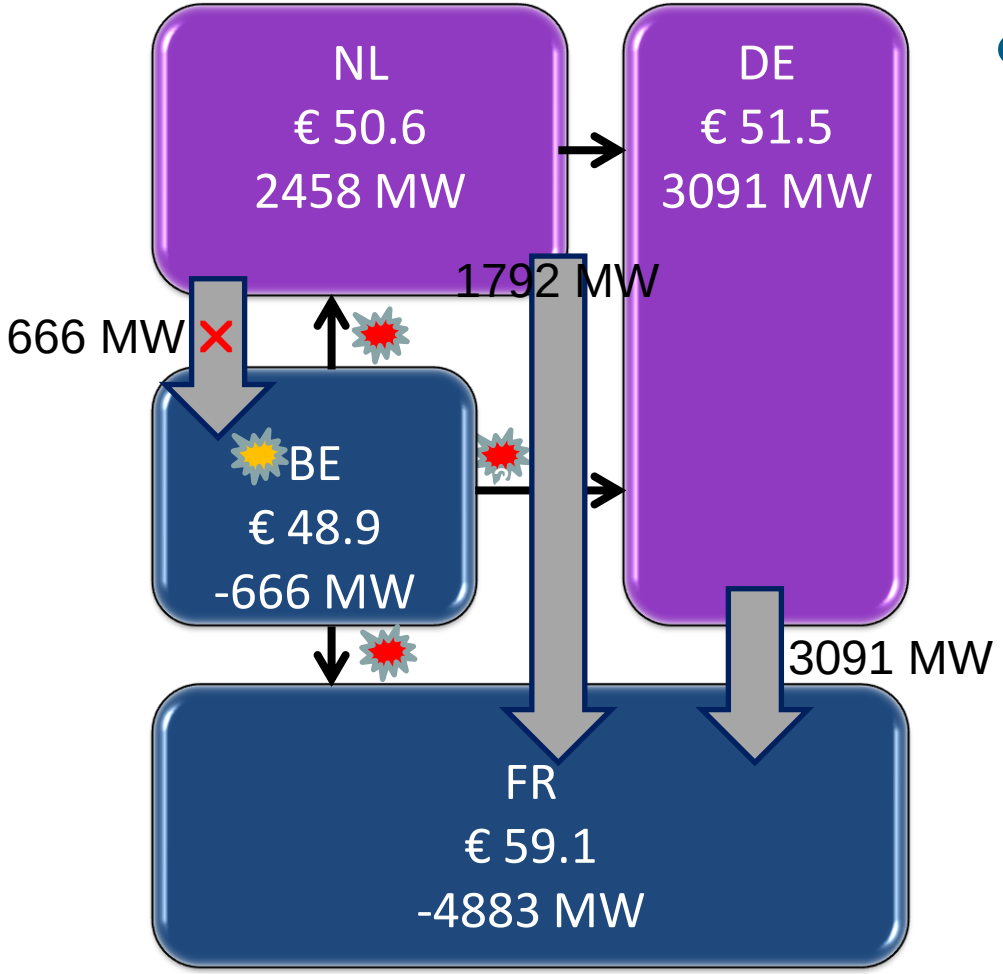



(Results of simulation of FBMC on December 2st, 2010 at 20:00)

- Intuitive example

* Source: CWE TSOs, Intuitiveness "pedagogical" presentation, 22 November 2011

# Intuitiveness




(Results of simulation of FBMC on December 1st, 2010 at 07:00)

- Non-intuitive example

* Source: CWE TSOs, Intuitiveness "pedagogical" presentation, 22 November 2011

# Intuitiveness

- FBMC is welfare optimising
  ≠ Price minimization

- Frequency and importance of non-intuitive results seems higher for smaller zones when there is a mix of large and small zones.

- CWE FBMC will start with “FB intuitive”
  – Following the results of the Market Consultation

# Monitoring

- Monitoring: completion of the template of periodic data for regulators
- Type & frequency of monitoring reports
- Important monitoring work of NRAs
  - TSOs have direct impact on prices / market operation
  - Data collection and analysis

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# REGULATORY ISSUES – FLOW COMPETITION

# Flow competition in FB

- FBMC improves market outcome when no congestion

- FBMC induces flow competition between large and small countries / zones in case of congestion
  - Competition issue under normal circumstances
  - Security of Supply / adequacy issue under scarcity circumstances

# Security of supply with FB

- In scarcity conditions:
  - if Belgium competes with France for imports from the Netherlands and Germany
  - risk that import volume in Belgium goes to zero even when bidding 3000€
- "All or nothing" behaviour above a given threshold observed in the current design

Current design lets countries that do not bid max price get all capacity → **mitigation measures**

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# STAKEHOLDER ISSUES

# Market forums and consultation

- Recognition of improvements with FBMC
  - welfare
- Market has intermediate understanding of FBMC
- Improvements before go-live or in FBMC 2.0
- Concerns of losing welfare gains from Day ahead FBMC in intraday afterwards
  - Impact on ID market is unclear

# Market forums and consultation

- Market in CWE wants
  - much transparency
    - To reap all benefits from FBMC
  - Robustness
  - FB intuitive
  - More studies before go-live to better understand

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# CONCLUSION

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Will Flowbased market coupling lead to better usage of transmission capacity, increased welfare and security of supply?

**Yes,**

**If all parameters are designed accordingly**