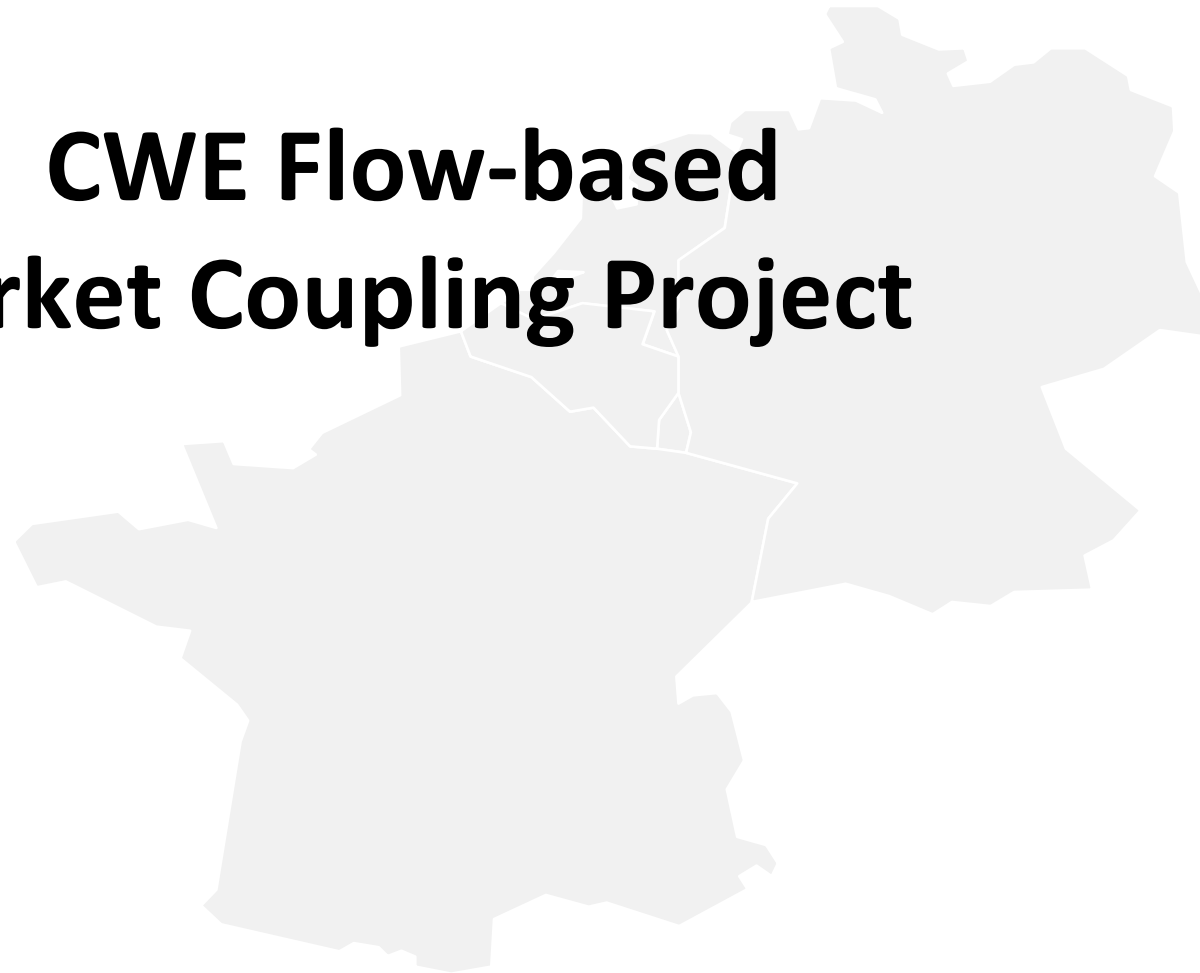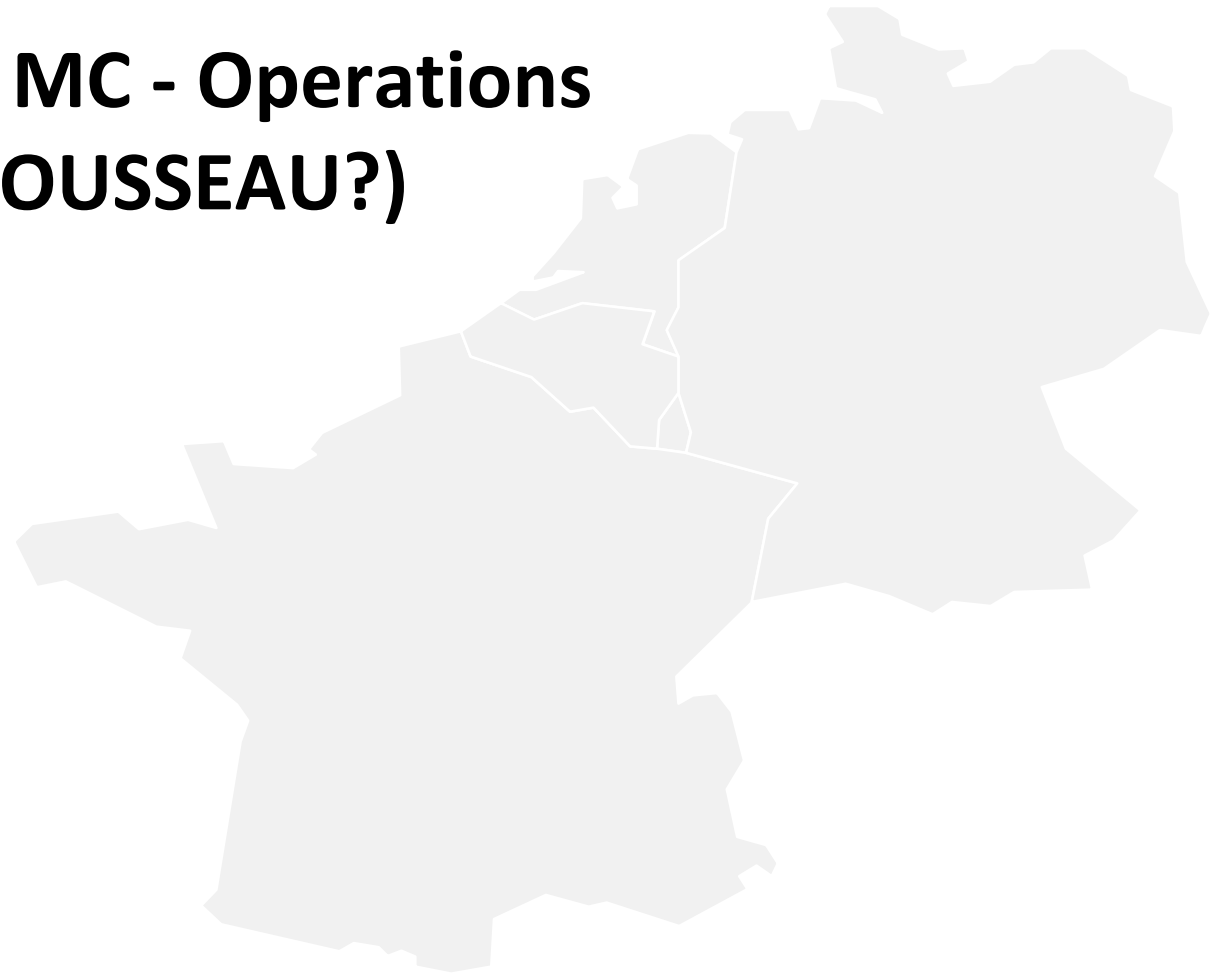# CWE Flow-based Market Coupling Project

ATC CWE MC - Operations
(R.ROUSSEAU?)

ATC CWE MC - Operations
New common CWE website

- CWE Project launched a new **common website** where actual flow data and prices as well as ATC data are available on a daily basis:
  - You can visit this website at the following address: https://www.europeanpricecoupling.eu/

ATC CWE MC - Operations
Long Clock Change (LCC)

▶ The functioning of Long Clock Change within the different systems has been changed:

2011	2012
• Due to different market rules and some technical constraints, ATC values for hours 3a and 3b had to be set to zero on hub borders (FR-DE, FR-BE, DE-NL) • For EPEX SPOT, participants had to submit the same order for the hours 3a and 3b • For APX and Belpex, participants had to submit orders for 25 hours instead of 24	• Today both exchanges have the same market rules regarding LCC • As a consequence, 25 hours ATC will be published and all participants will submit 25 hours order books • Please note that for Nordic countries (included in ITVC coupling) the rule does not change this year and only 24 hours bidding will be possible (hour 3A and 3B are doubled automatically). EMCC was updated to accommodate both rules

▶ **Satisfying tests** to simulate the dealing with 25 hours were organized:

- LCC day and the day after were tested

- Tests run smoothly

CWE FB MC - Project
(P. FONCK)
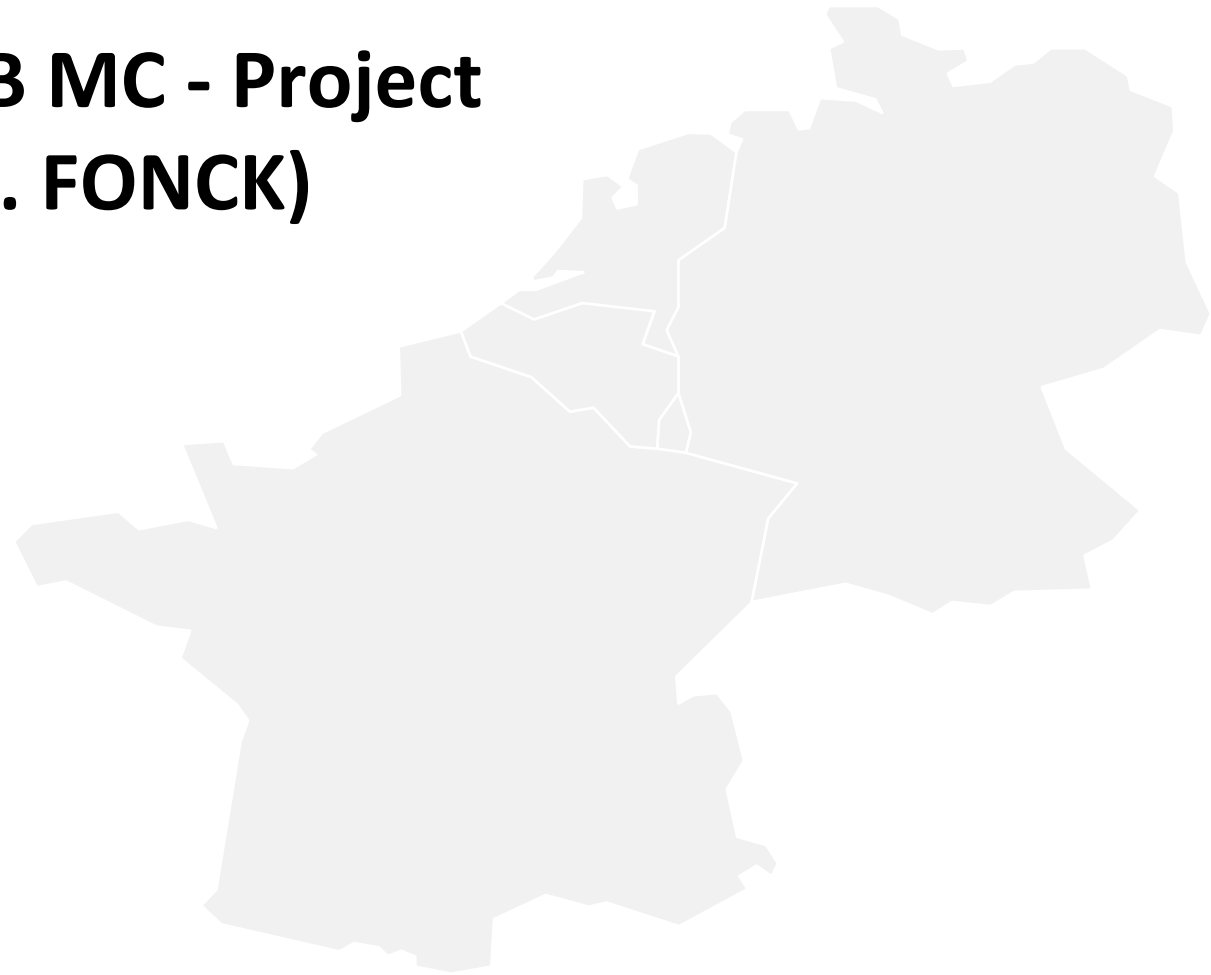
CWE FB MC - Project
Context

▶ **CWE-Region roadmap and objectives:**

- Harmonization and improvement of long-term explicit auction rules
- Implementation of a day-ahead Flow Based market coupling
- Implementation of harmonized continuous cross-border intraday trade
- Maximization of the amount and the utilization of cross-border capacities
- Increase of market Transparency
- Guarantee regarding Security of Supply (SoS)

| 2007 | 2010 | *FB parallel run* → | 2013 |

Signature of the Memorandum of Understanding by the Pentalateral Energy Forum

Launch of CWE ATC MC

Launch of CWE FB MC

Objective: analysis, design and implementation of a flow-based market coupling between 5 countries of the CWE region

Objective: first step towards an integrated day-ahead market while studying a FBMC in parallel

Objective: simulating the impact of FB MC

Objective: algorithm taking into account a more sophisticated grid modeling in order to optimize commercial flows on the electrical interconnections of meshed networks as in the CWE region

▶ **Objective:** A CWE FB MC providing more trading opportunities for the market and maximizing the CWE Day-Ahead market

CWE FB MC - Project
Project Planning

▶ **Dependencies**:

- Stabilization of FB computation before end of 2012
- Duration of external parallel run (one full year vs. 10 months including seasonality)
- Duration of simulations and testing with NWE
- Regulatory approval

Predictability of LT auctions:

As FB MC Go Live is foreseen for the end of 2013, the impact of this market design change on LT capacity auctions is minimized for 2013

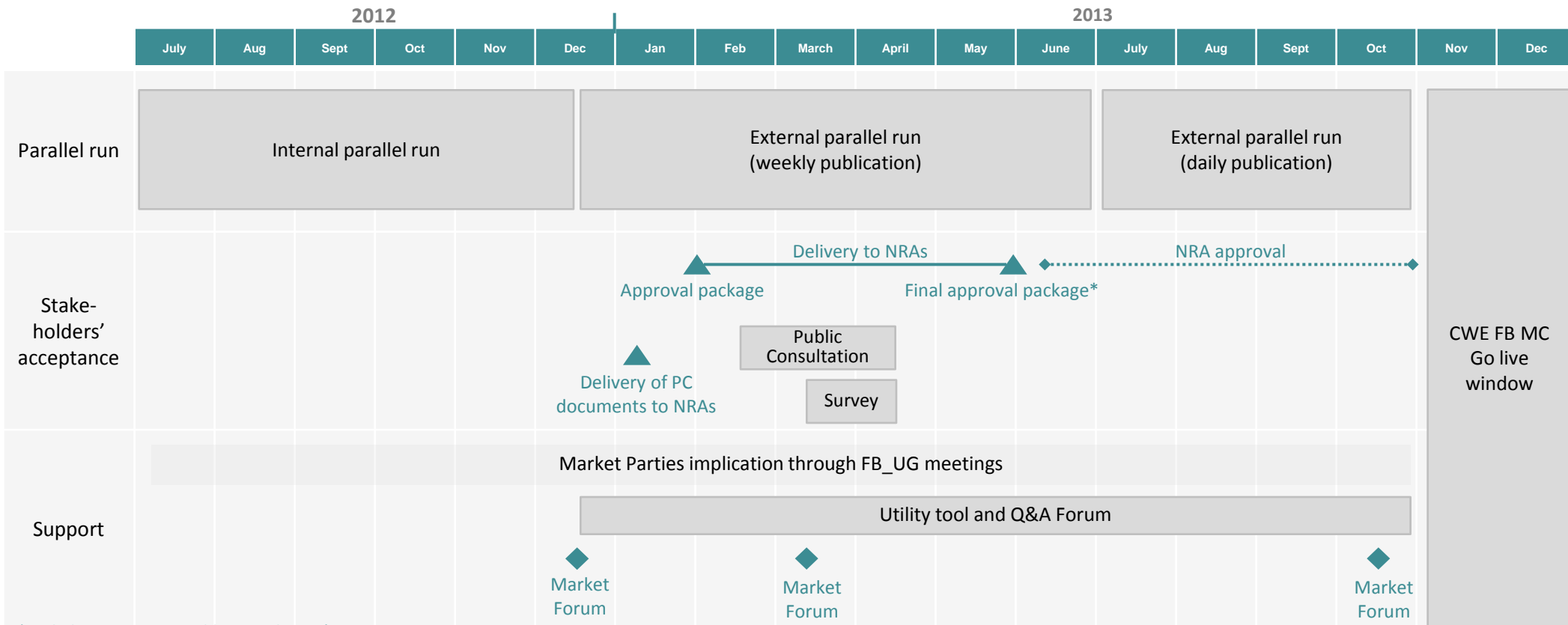|	2012						2013										
	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec

Parallel run
- Internal parallel run
- External parallel run (weekly publication)
- External parallel run (daily publication)

Stake-holders' acceptance
- Delivery to NRAs
- Approval package
- Final approval package*
- NRA approval
- Delivery of PC documents to NRAs
- Public Consultation
- Survey

Support
- Market Parties implication through FB_UG meetings
- Utility tool and Q&A Forum
- Market Forum
- Market Forum
- Market Forum

CWE FB MC Go live window

* Including answers to public consultation's outputs

Status of FB implementation
(P. NOURY)
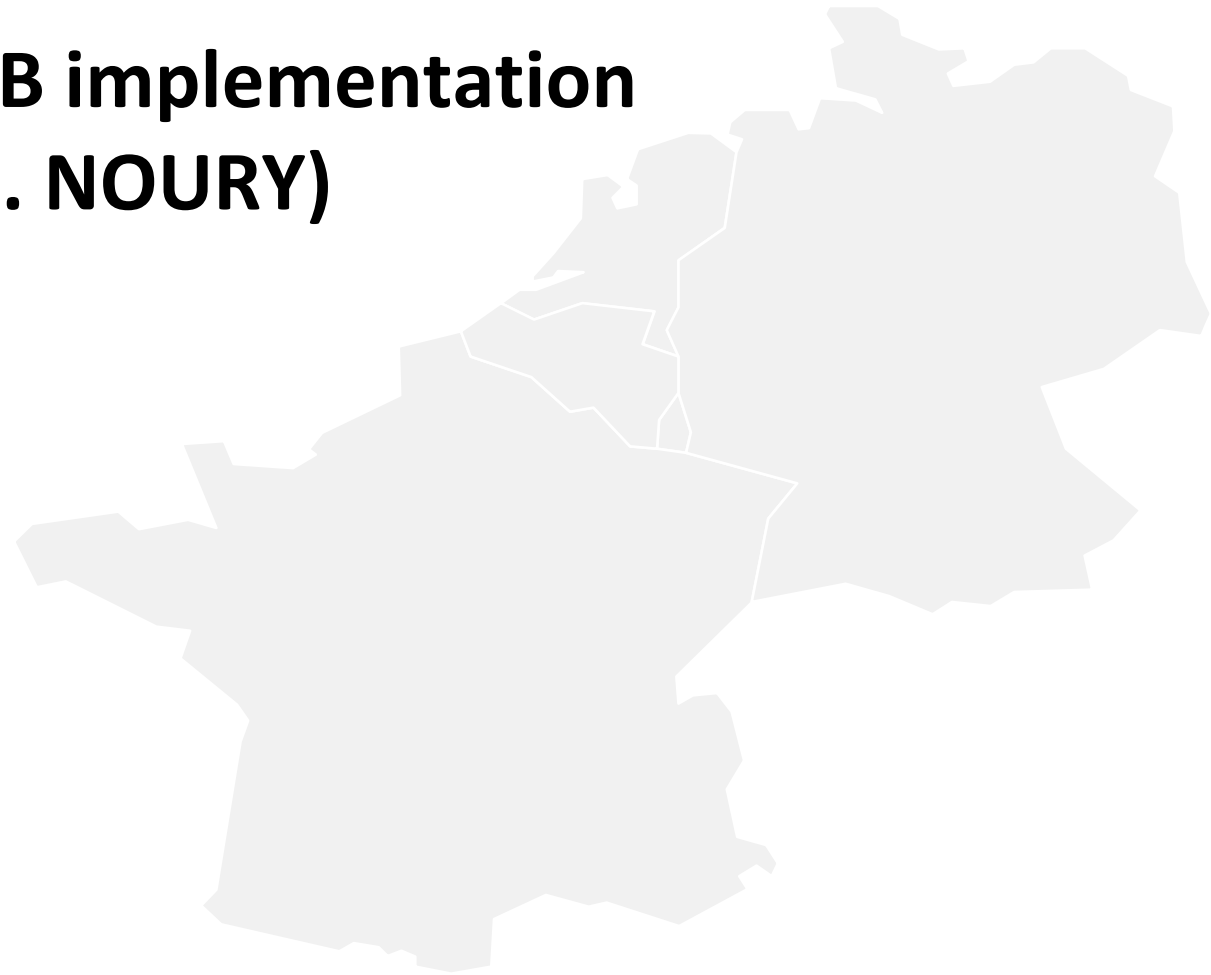
Status of FB implementation
Methodology stabilization

▶ All TSOs have been steadily working on a **detailed action plan** in order to stabilize the FB methodology in terms of:

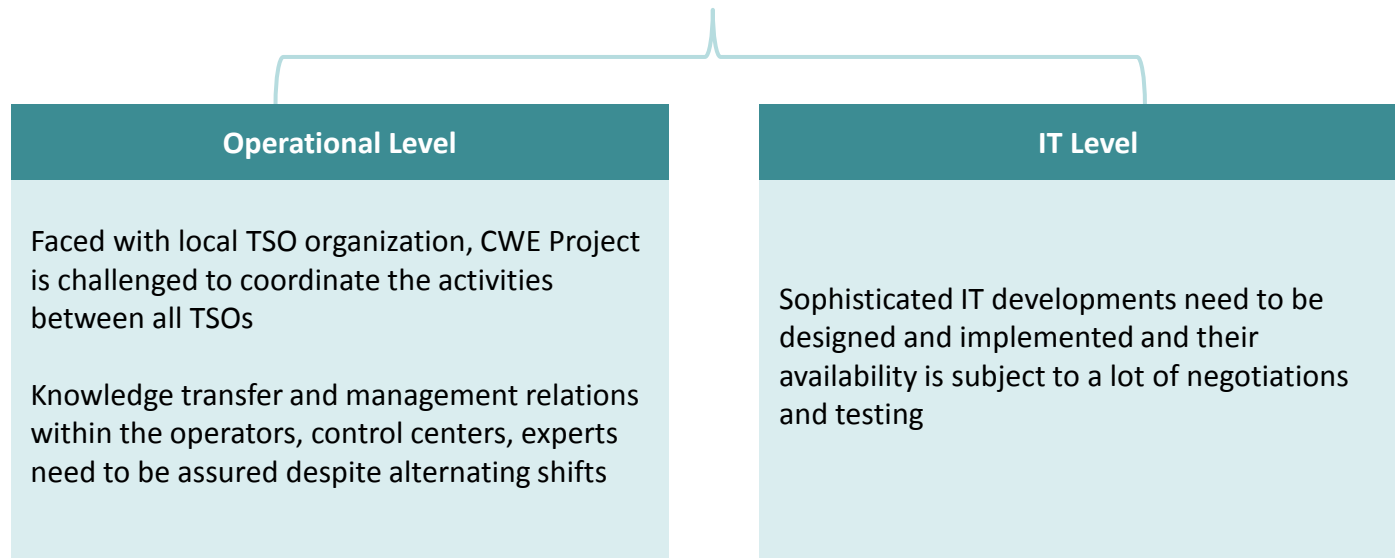| Generation Shift Keys (GSK)	Flow Reliability Margins (FRM)	Critical Branches (CB) selection	Remedial Actions (RA)
Experimentation of new methodologies in order to overcome the main limitations of the current approach	Finalization of operational FRM values thanks to the learning of the internal parallel run currently performed by TSOs	Implementation of objective selection process in order to foster the usage of an adequate "Critical Branches" set	Implementation of coordinated usage of RA under Flow based in order to optimize the capacity domain

▶ All TSOs are confident that the provided work on these actions will be reflected in the parallel run results

▶ The FB principles will be described in detail in the **"CWE consultation package"** and will be submitted to Regulatory approval in the course of 2013

Status of FB implementation
Operational deployment

- In implementing a complete new methodology, CWE Project had to recognize the **complexity of the process** at different levels:

Operational Level	IT Level
Faced with local TSO organization, CWE Project is challenged to coordinate the activities between all TSOs Knowledge transfer and management relations within the operators, control centers, experts need to be assured despite alternating shifts	Sophisticated IT developments need to be designed and implemented and their availability is subject to a lot of negotiations and testing

- All TSOs have been permanently **improving their operational and decision making process** and are confident that a stabilized and coordinated process will be implemented for the parallel run

Status of FB implementation
Experimentation results

▶ Current experimentation results show a gap between theoretical studies, detailed in the Feasibility Report, and practical results in terms of welfare gain, convergence rate, etc

▶ This "gap", which shows that the potential of FB is not yet reached at an operational level, is linked to the notions introduced in the 2 previous slides:

- **In terms of methodology:** TSOs are finalizing the adjustment of the model to operational reality
- **In terms of operational implementation:** transfer of expertise to operators and ad hoc tools development are also being finalized

▶ TSOs are putting all their **effort in the stabilization of an efficient and effective process** so as to reach the potential of FB when the parallel run is launched and to provide the most relevant results to Market Parties during the external parallel run
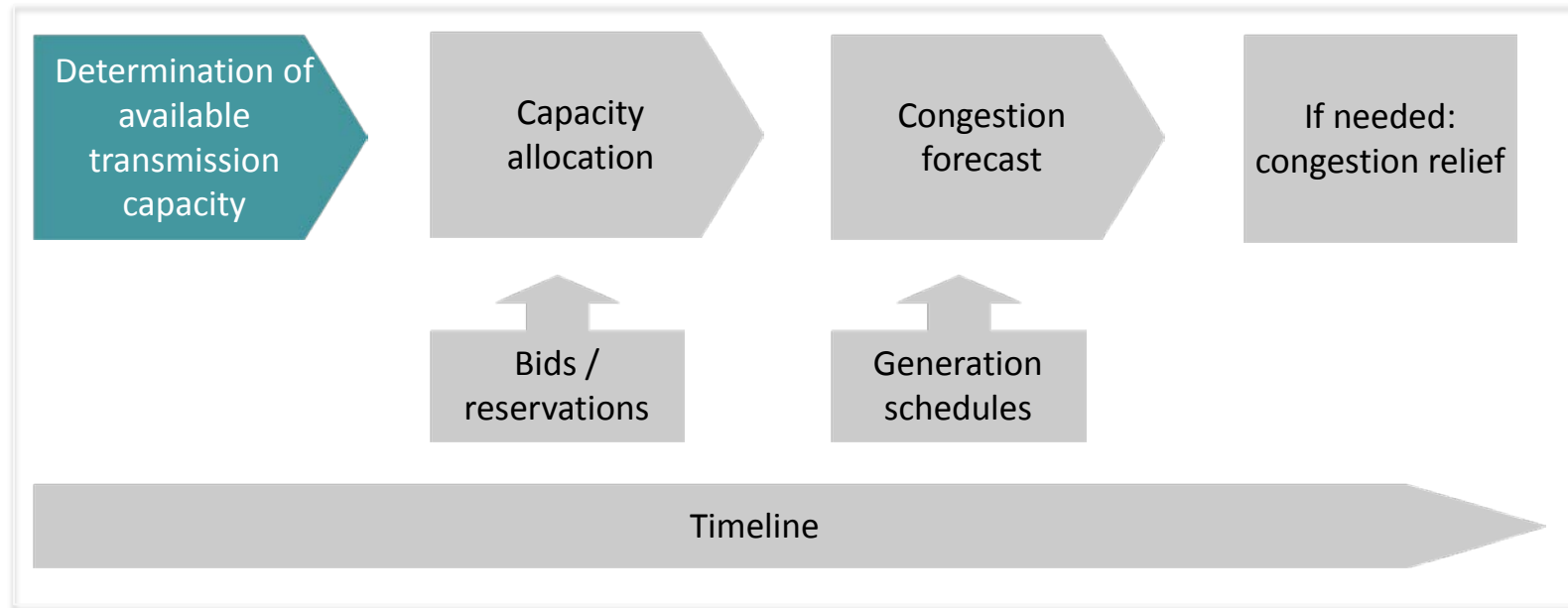
FB theoretical basics
(P. NOURY)
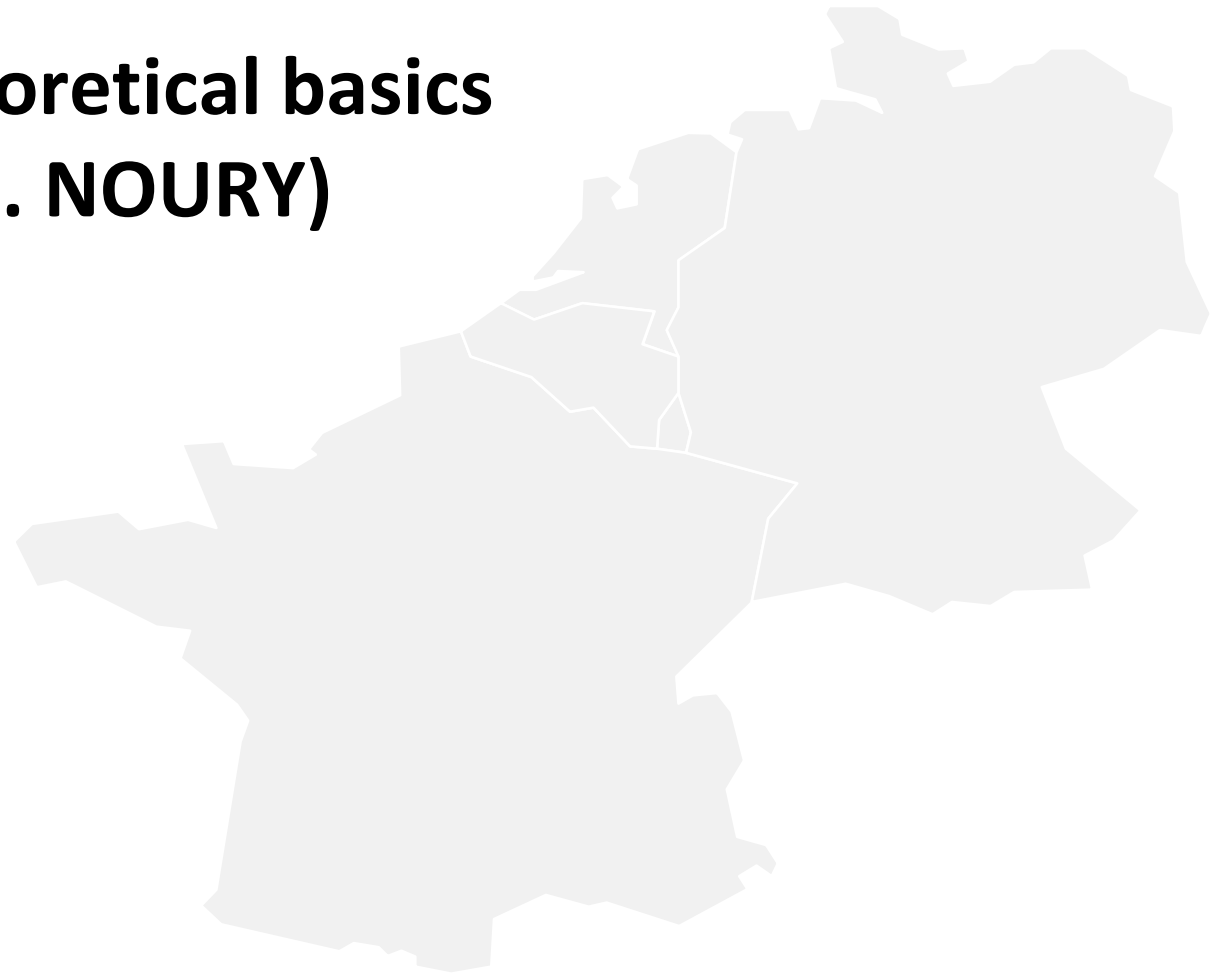
FB theoretical basics

▶ Main concepts of CWE FB

▶ FB plain and intuitive

▶ FB experimental results

▶ FB in CWE and ATCs outside the CWE region

Main concepts of CWE FB
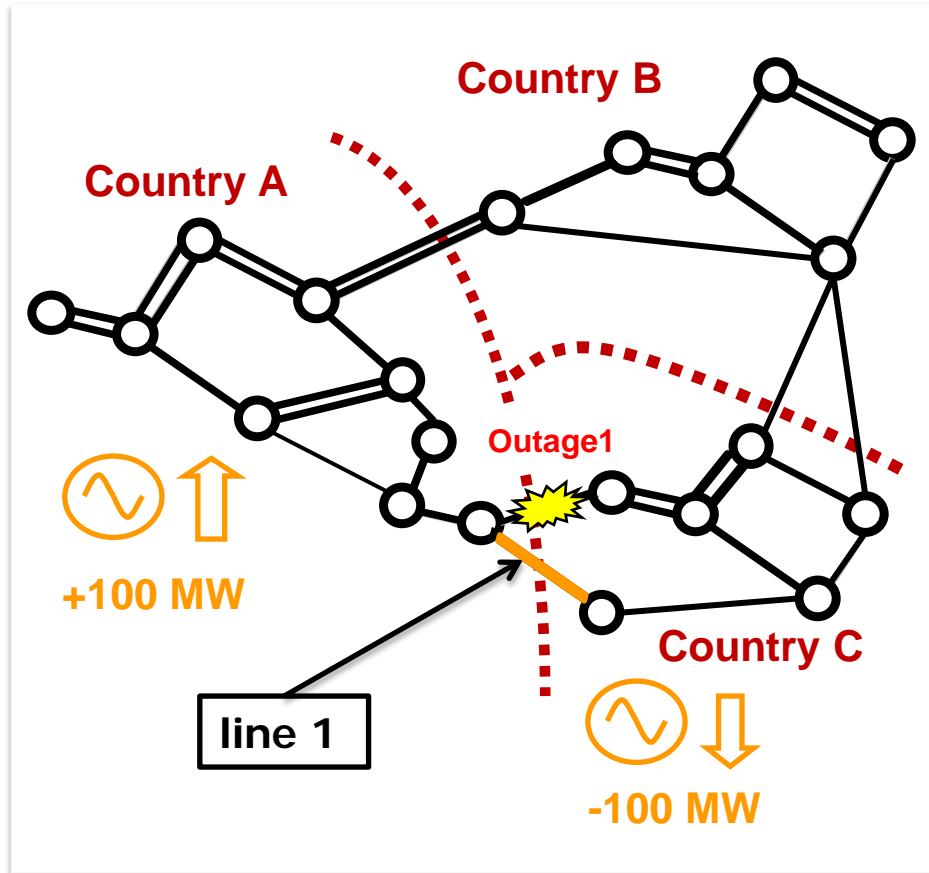## Congestion management in the broadest sense


```
[Determination of available transmission capacity] → [Capacity allocation] → [Congestion forecast] → [If needed: congestion relief]

                            ↑                              ↑
                    [Bids / reservations]         [Generation schedules]

[                          Timeline                                      →]
```

Main concepts of CWE FB
Approximation of the security of supply domain

▶ Example with 3 countries

Monitored lines	Outage scenario	Margin left (MW)	Influence of exchange on lines (PTDF)		
			A→B	A→C	B→C
Line 1	No outage	150		10%	
	Outage 1	120		20%	
	...				
Line 2	...				
	...				
Line 3	...				
	...				

Main concepts of CWE FB
The security of supply domain

Monitored Lines	Outage scenario	Margin left (MW)	Influence of exchange on lines (PTDF)		
			A→B	A→C	B→C
Line 1	No outage	150	1%	10%	3%
	Outage 1	120	5%	20%	1%
	Outage 2	100	6%	25%	1%
Line 2	No outage	150	-2%	0	5%
	Outage 3	100	-12%	0	10%
Line 3	No outage				
	Outage 4				

⚠ Numbers are for illustration only

- - - - - Constraints   🟨 Security of supply domain
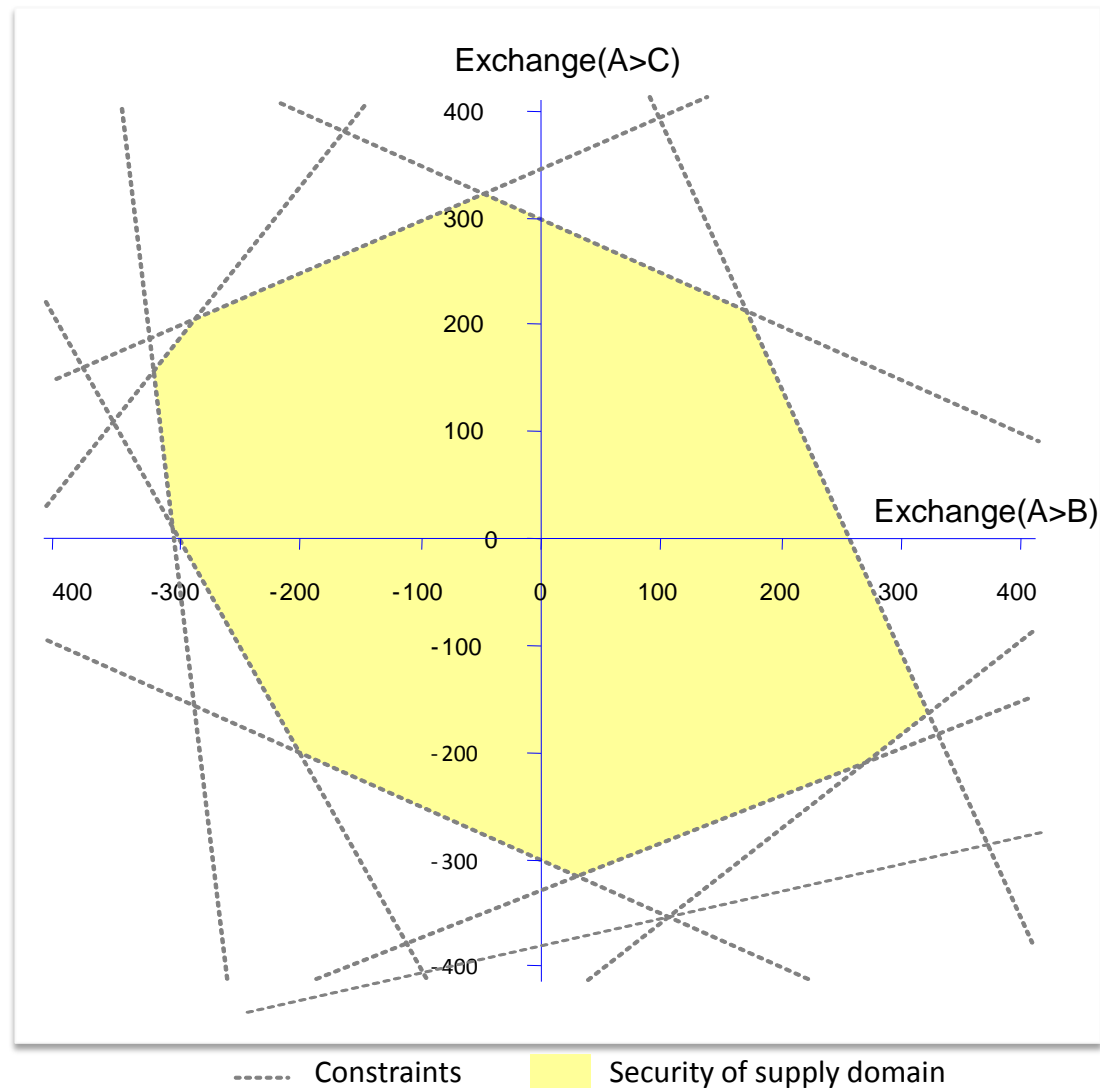
Main concepts of CWE FB
ATC & FB constraints – theory
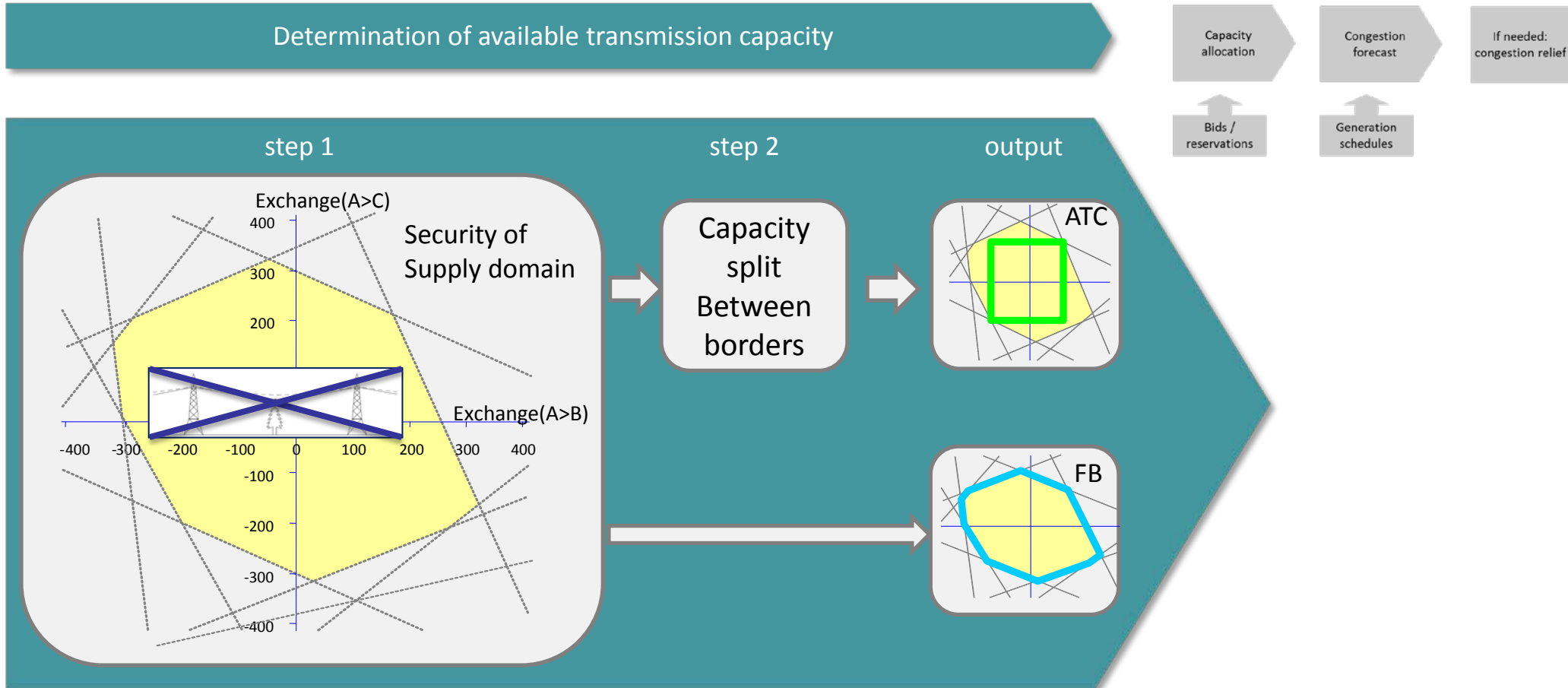
- Security domain is obtained by taking into account all the relevant physical constraints of the grid

- Given the security domain, NTC/ATC constraints and the corresponding NTC/ATC domain are a choice made by the TSO

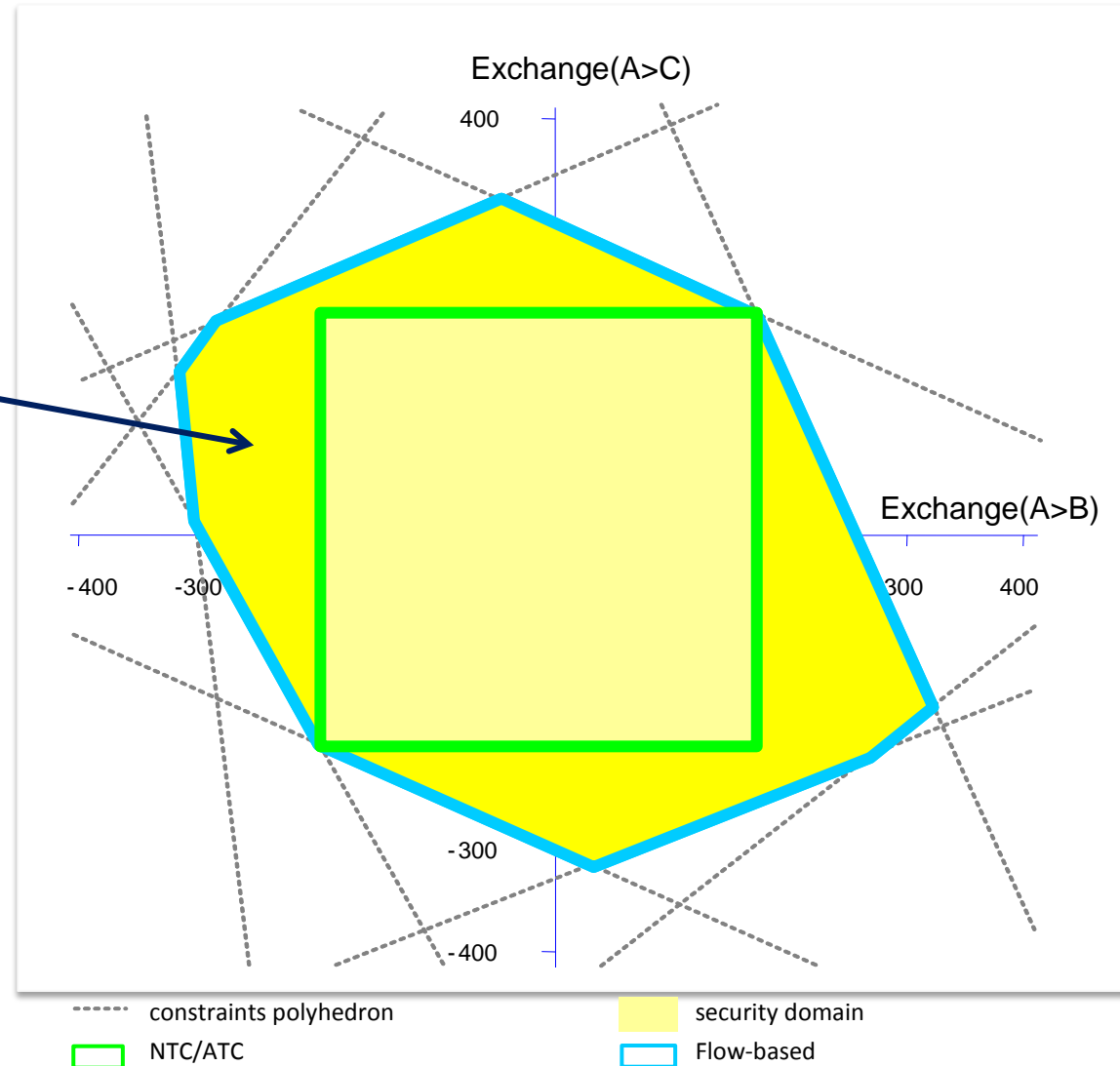- The FB domain is the security domain itself

- - - - - constraints polyhedron

NTC/ATC

security domain

Flow-based
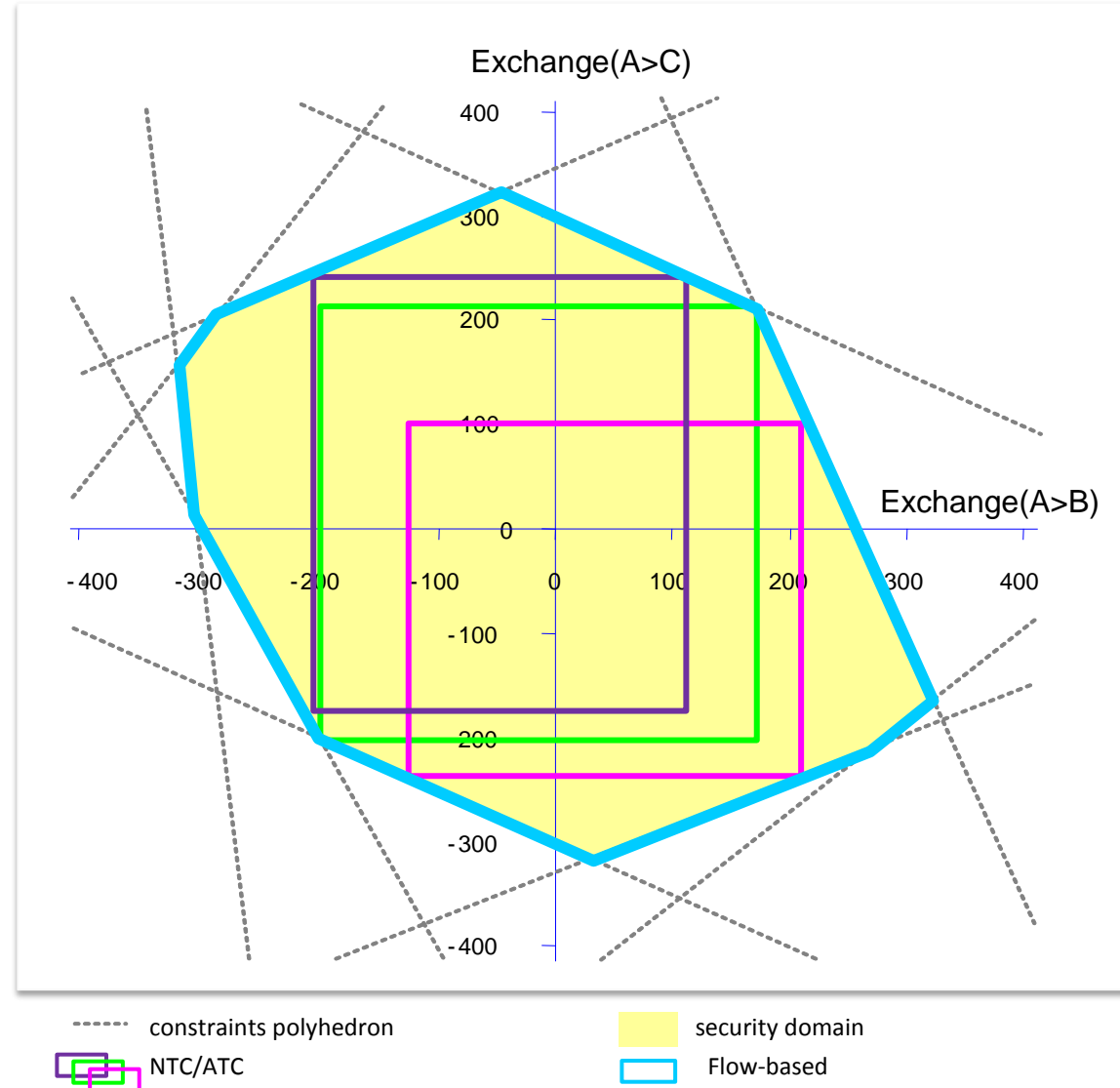
Main concepts of CWE FB
ATC and FB domain

ATC vs FB constraints – theory

- FB offers more trading opportunities with the same level of security of supply

- In FB capacity split is not a choice of the TSO, but is market driven (at the time of allocation)

FB plain and intuitive
Intuitiveness

- As a result of the optimization process within the allocation system, the outcome of market-coupling can on some occasions be qualified as **"counter-intuitive"** which may lead to situations with some bilateral exchanges "against the spread" where an area with the cheapest (most expensive) price is importing (exporting). These results were partly based on some normative assumptions to be further assessed during the parallel run
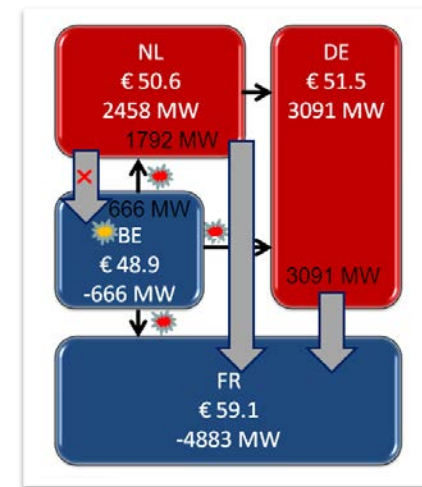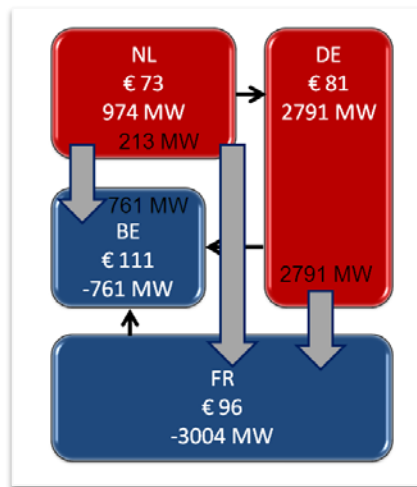

- This non-intuitive feature has a physical explanation: the counter-intuive exchange releaves a constraint somewhere in the grid, hence allowing other exchanges bringing more welfare.
- The market coupling system can cope with such situation through the applying of the "intuitive-patch". Counter-intuitive exchanges can then be forbidden, however this is at the cost of welfare since it is equivalent to adding additional constraints in the system
- Today, the **2 options are open : plain FB or intuitive FB**. This topic will be specifically addressed during the public consultation, and this will be supported by detailed documentation. Moreover, the external parallel run will provide simulations under the 2 models

FB domain

- ▶ CWE reported in Oct 2011 on their experimental findings with FBMC, based on 9 weeks of data ("CWE Enhanced Flow-Based MC feasibility report")
- ▶ FB offers more trading opportunities with the same level of SoS as the current coordinated ATC
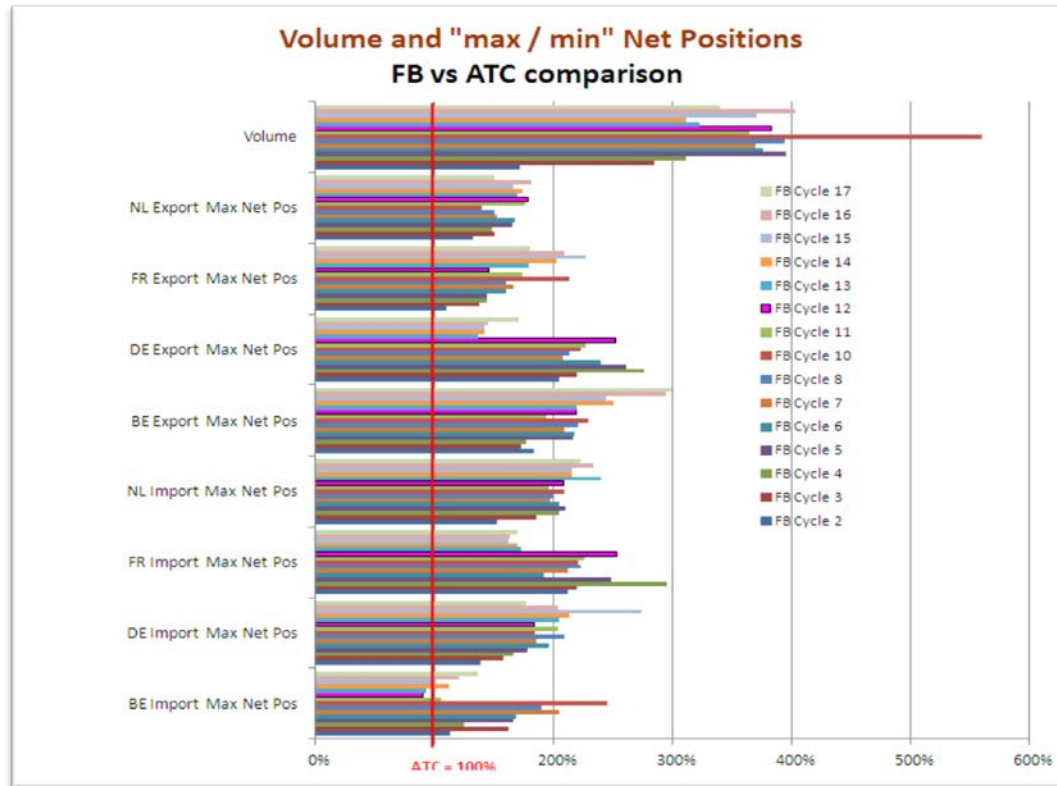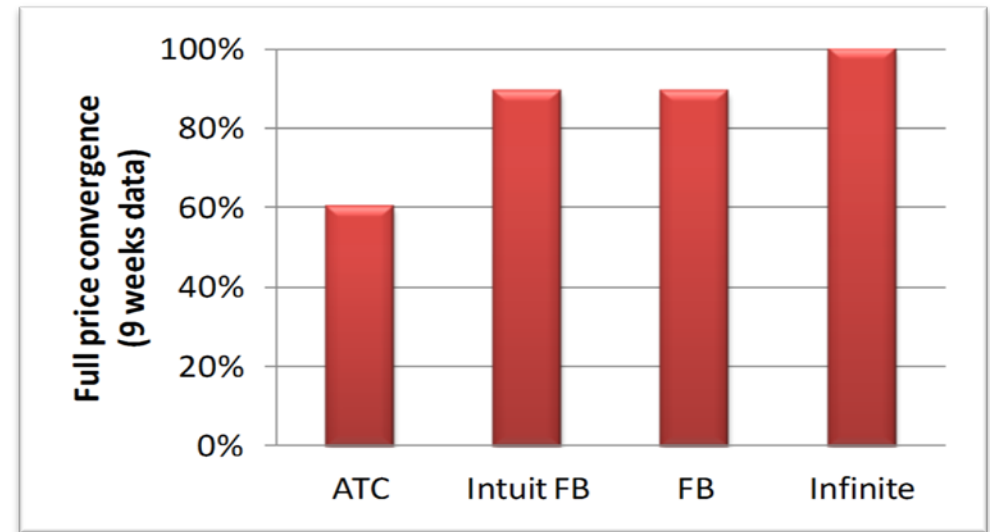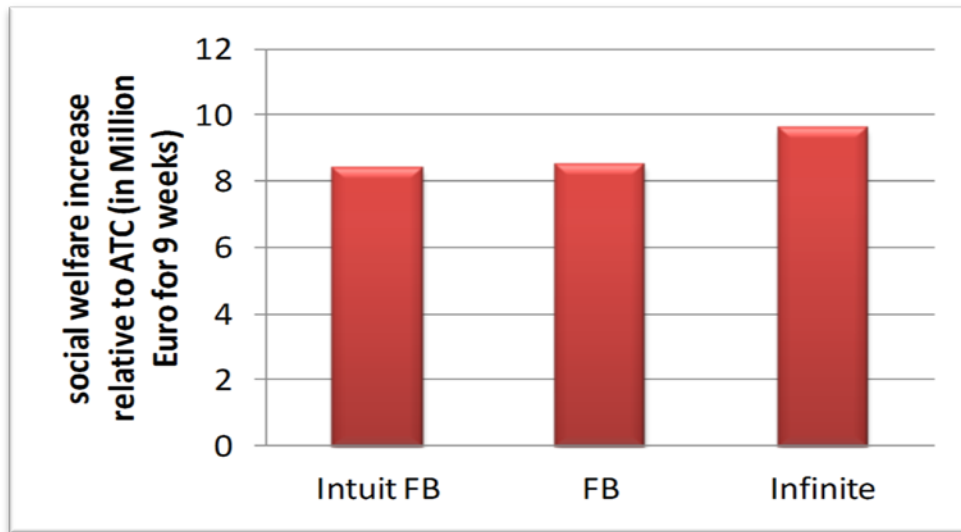
FB experimental results
FB market impact

▶ FB market coupling results in higher welfare and better price convergence compared to the current ATC MC ones
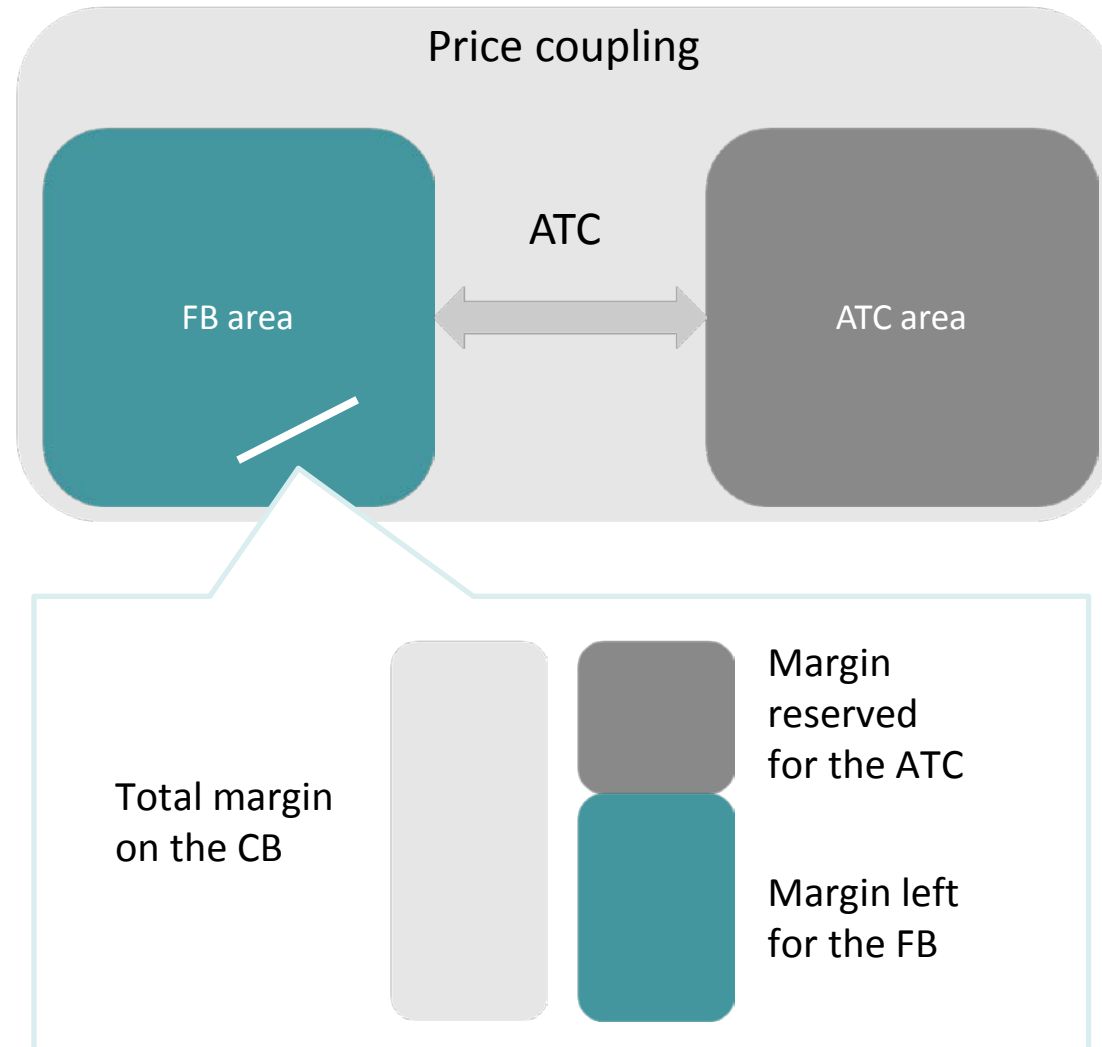
FB in CWE and ATCs outside the CWE region
"Hybrid Coupling" (1/2)

- For Hybrid coupling two variants exist:

1. **Standard**: realized ATC transactions are <u>not</u> taken into account in the margin of the CBs ➔ TSOs need to reserve margins (worst-case) on their CBs for the possible usage by the ATC area

- Just like today
- No competition for the use of the scarce capacity in the allocation mechanism due to the ex-ante split
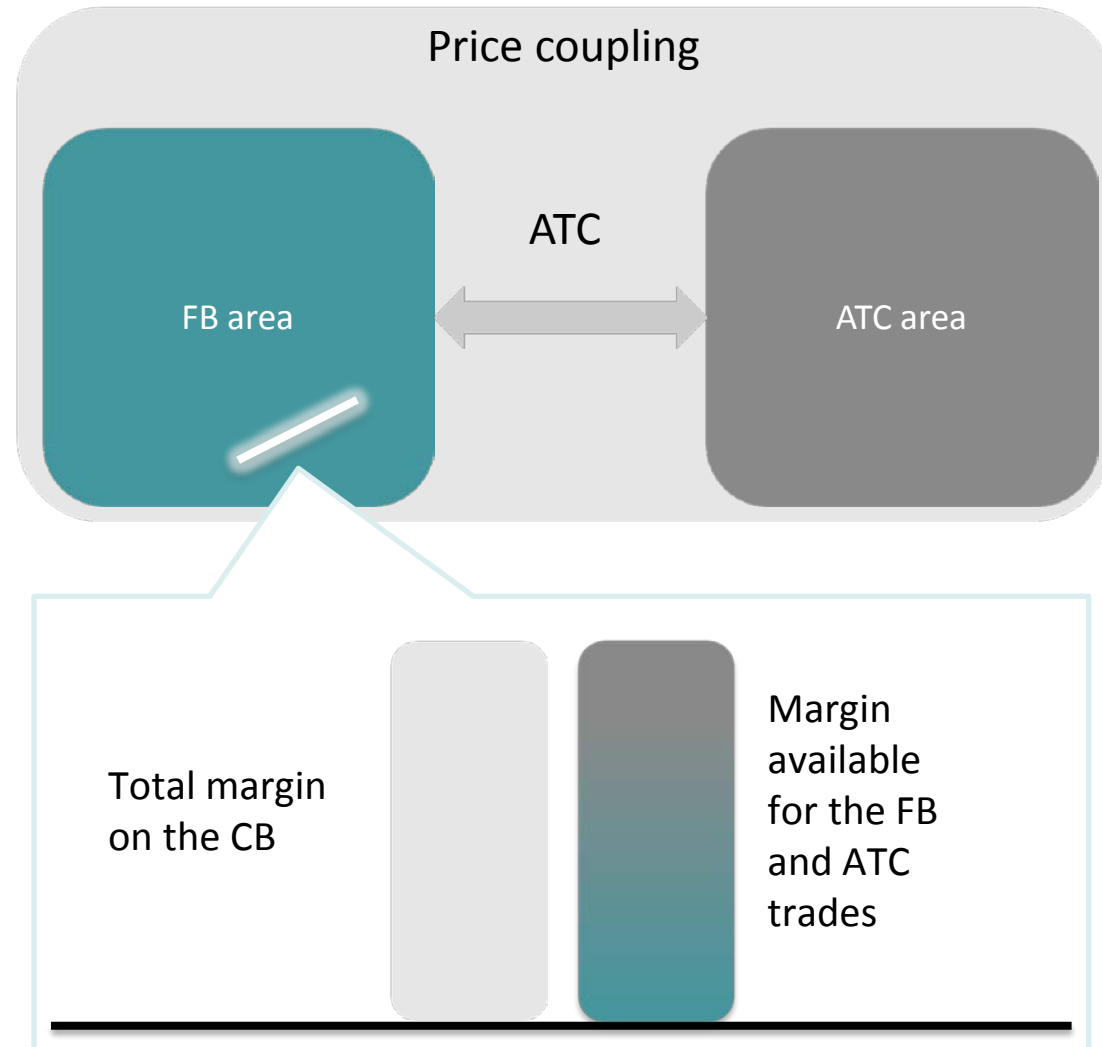- Not optimal: scarce capacity not always fully used

Price coupling

FB area — ATC — ATC area

Total margin on the CB

Margin reserved for the ATC

Margin left for the FB
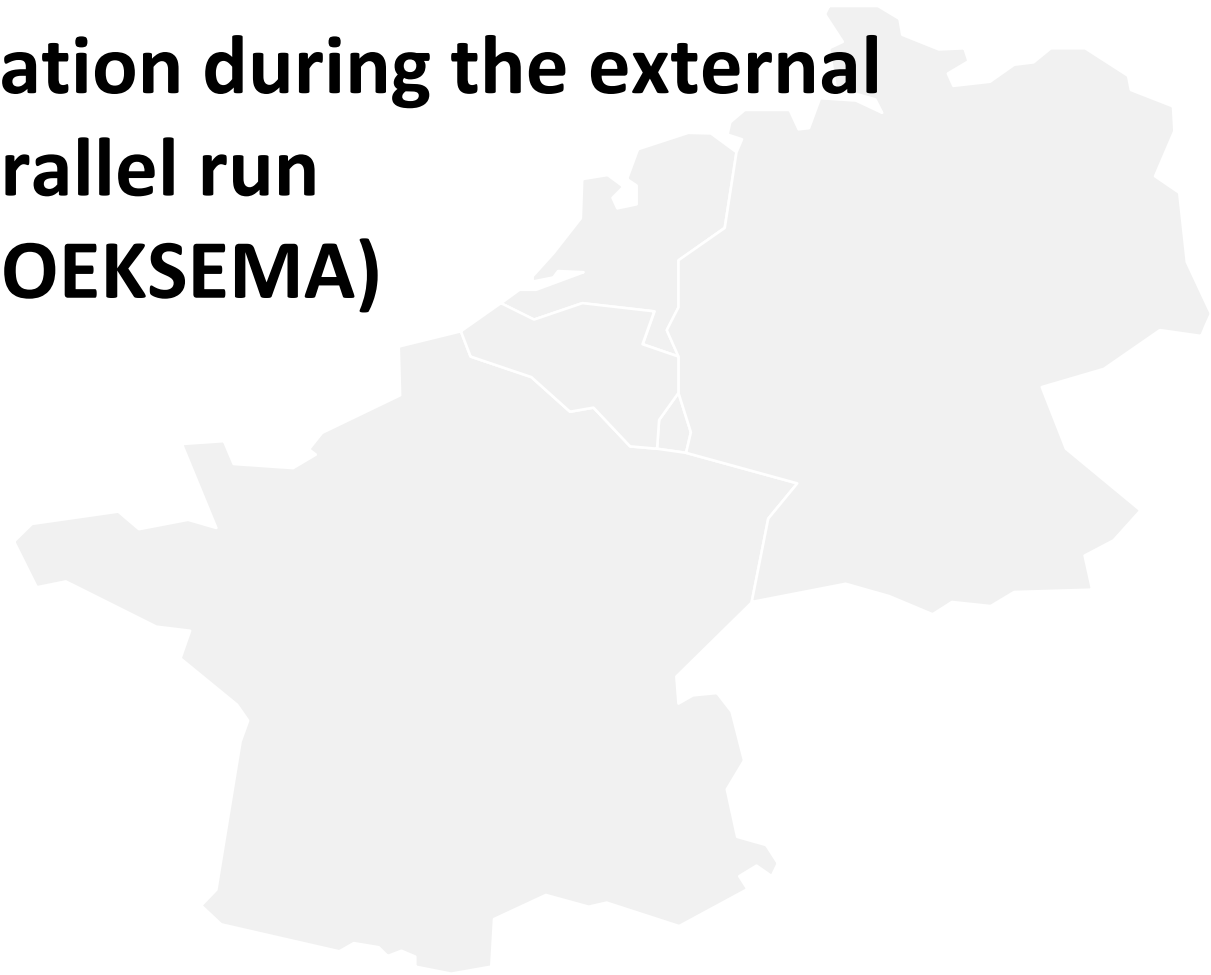
2. **Advanced**: realized ATC transactions are taken into account in the margin of the CBs ➜ TSOs do <u>not</u> need to reserve margins on their CBs ➜ use of margin is market driven

- ▸ Competition for the use of the scarce capacity in the allocation mechanism
- ▸ Optimal use of scarce capacity
- ▸ Maximum social welfare
- ▸ Interconnection is subject to FB price properties (typically: "counter-intuitive" exchanges on CWE – Non CWE borders, price spread on both ends of the line while its capacity is not fully used)

- ▸ CWE FB Market coupling will **go live with a standard hybrid coupling** while keeping open the possibility to evolve towards an **advanced hybrid coupling in a later stage**
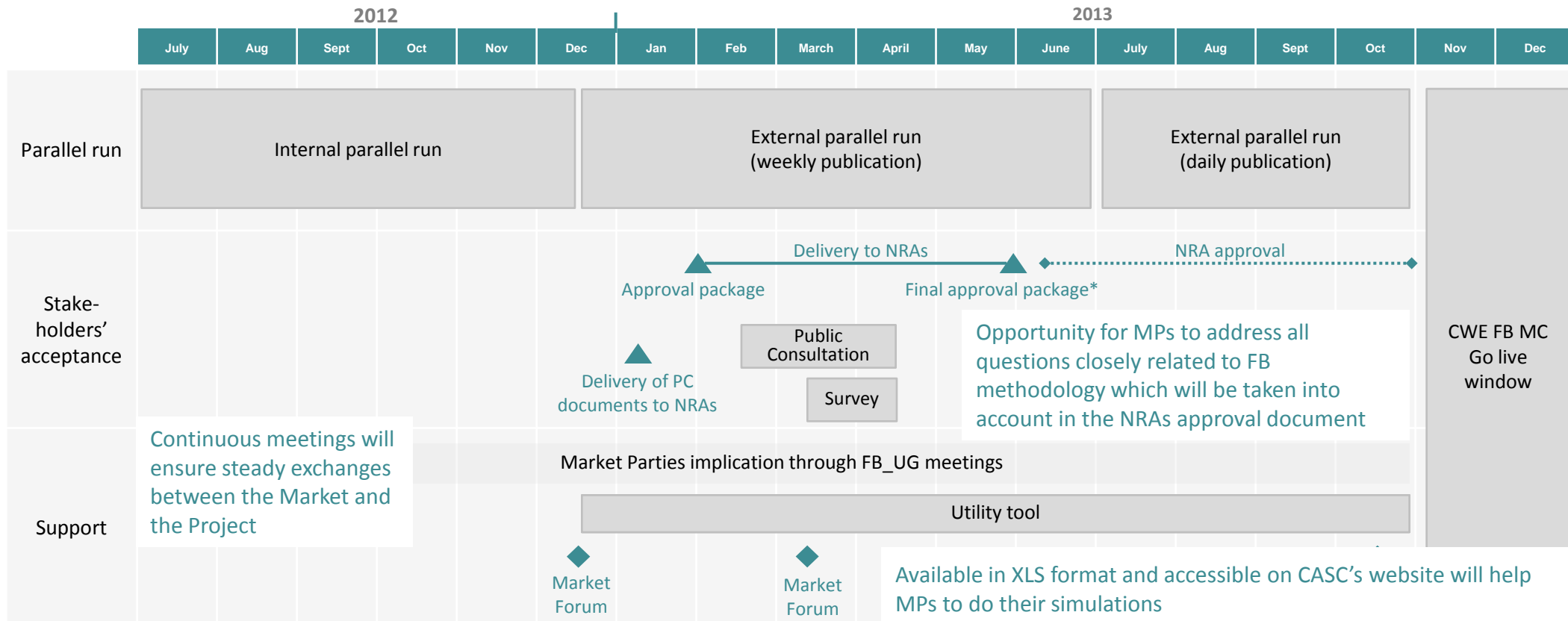
Price coupling

FB area

ATC

ATC area

Total margin on the CB

Margin available for the FB and ATC trades

Market communication during the external parallel run
(J. HOEKSEMA)

Market communication during the external parallel run
MP support

▶ CWE Project proposes different forums to ensure a **clear and transparent communication** between all Market Parties and the Project during the external parallel run:

2012   **2013**

| July | Aug | Sept | Oct | Nov | Dec | Jan | Feb | March | April | May | June | July | Aug | Sept | Oct | Nov | Dec |

Parallel run

Internal parallel run

External parallel run (weekly publication)

External parallel run (daily publication)

Stake-holders' acceptance

Delivery to NRAs

NRA approval

Approval package

Final approval package*

Public Consultation

Survey

Delivery of PC documents to NRAs

Opportunity for MPs to address all questions closely related to FB methodology which will be taken into account in the NRAs approval document

CWE FB MC Go live window

Support

Continuous meetings will ensure steady exchanges between the Market and the Project

Market Parties implication through FB_UG meetings

Utility tool

Market Forum

Market Forum

Available in XLS format and accessible on CASC's website will help MPs to do their simulations

A Kickoff Market Forum before the start of the external parallel run end of 2012 to explain the functioning of the parallel run and the functionalities of the utility tool

A second Market Forum during the public consultation process where MPs' questions will be answered

Market communication during the external parallel run
Focus on Utility tool (1/2)

▶ The following interface allows **simulations for trading volumes** of CWE MC Markets for each hour:

Maximum exchange from DE to BE assuming no other exchanges

(Non simultaneous values!)

Maximum DE export

(other areas are importing to ensure the balance)

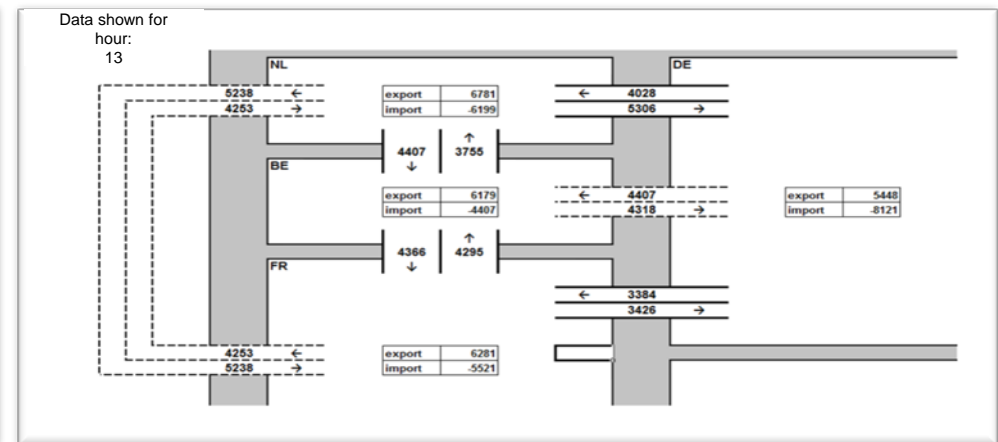# Market communication during the external parallel run
Focus on Utility tool (2/2)

▸ **Market graphs and a CWE map** facilitate the understanding of impacts of trade volumes for hub to hub exchanges:

Maximum bilateral exchanges
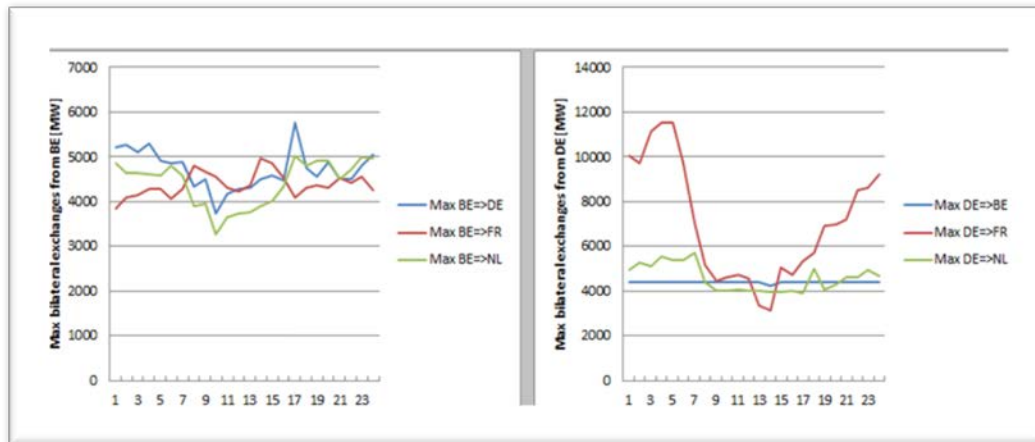
CWE max net positions and bilateral exchanges

▸ For a **live demonstration** of the utility tool simulation facilities:

Feuille Microsoft
Excel 97-2003