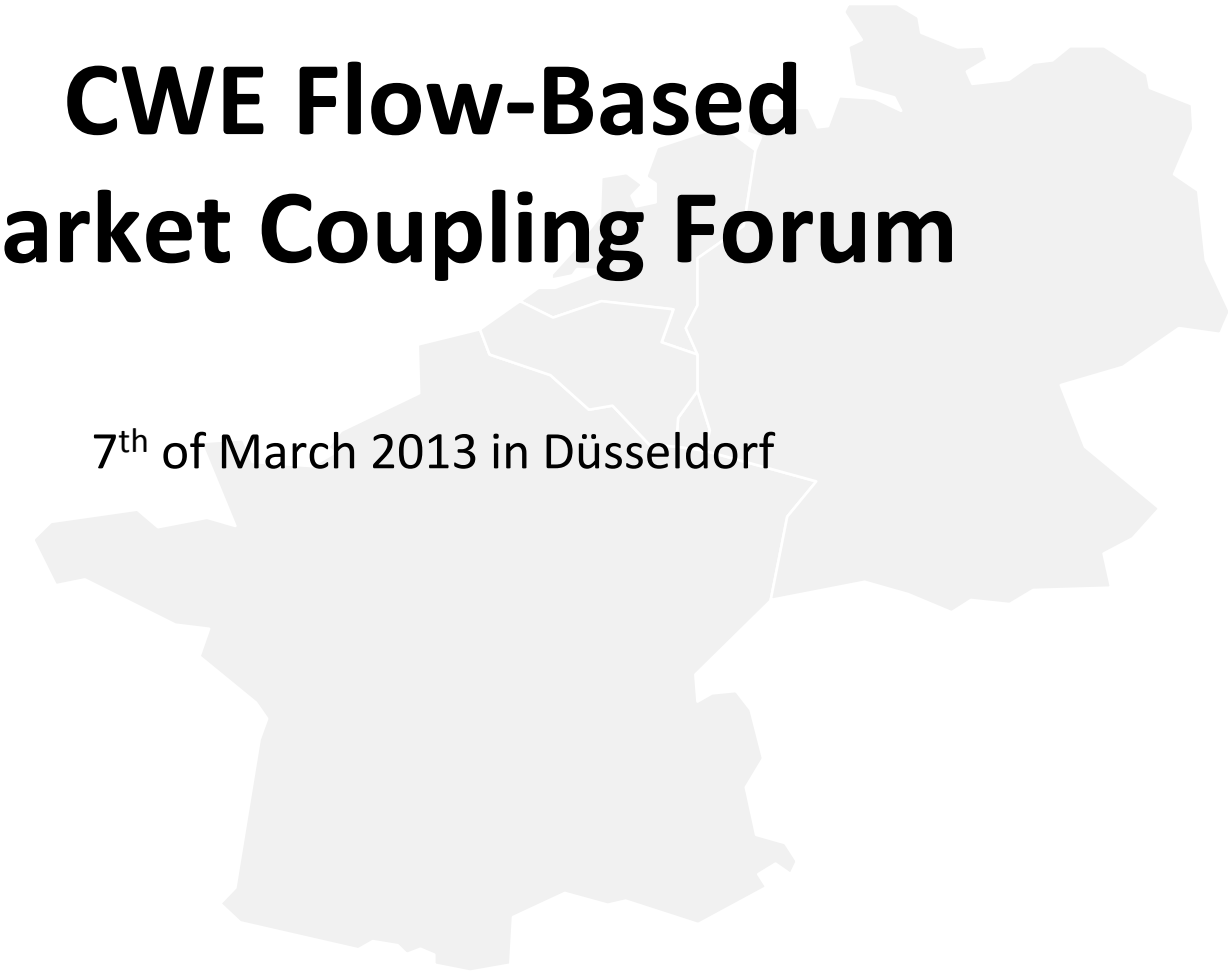
CWE Flow-Based Market Coupling Forum

7th of March 2013 in Düsseldorf



Agenda

Morning session

Timing	Topic	Speaker
10.00	*REGISTRATION AND COFFEE*	
10.30 – 10.45	Welcome speech : Status of CWE FB MC project implementation and coordination with other coupling projects	Jean VERSEILE (RTE) Bert DEN OUDEN (APX)
10.45 – 11.15	Presentation of the first external parallel run results	Pascale FONCK (Elia)
11.15 – 11.30	Information on project's implementation approach and planned support to MPs	Andrew CLAXTON (APX)
11.30 – 11.50	Q&A session	
11.50 – 12.10	Flow Based perception and expectations of Market Parties	Ruud OTTER (MPP)
12.15 – 13.30	*LUNCH*	

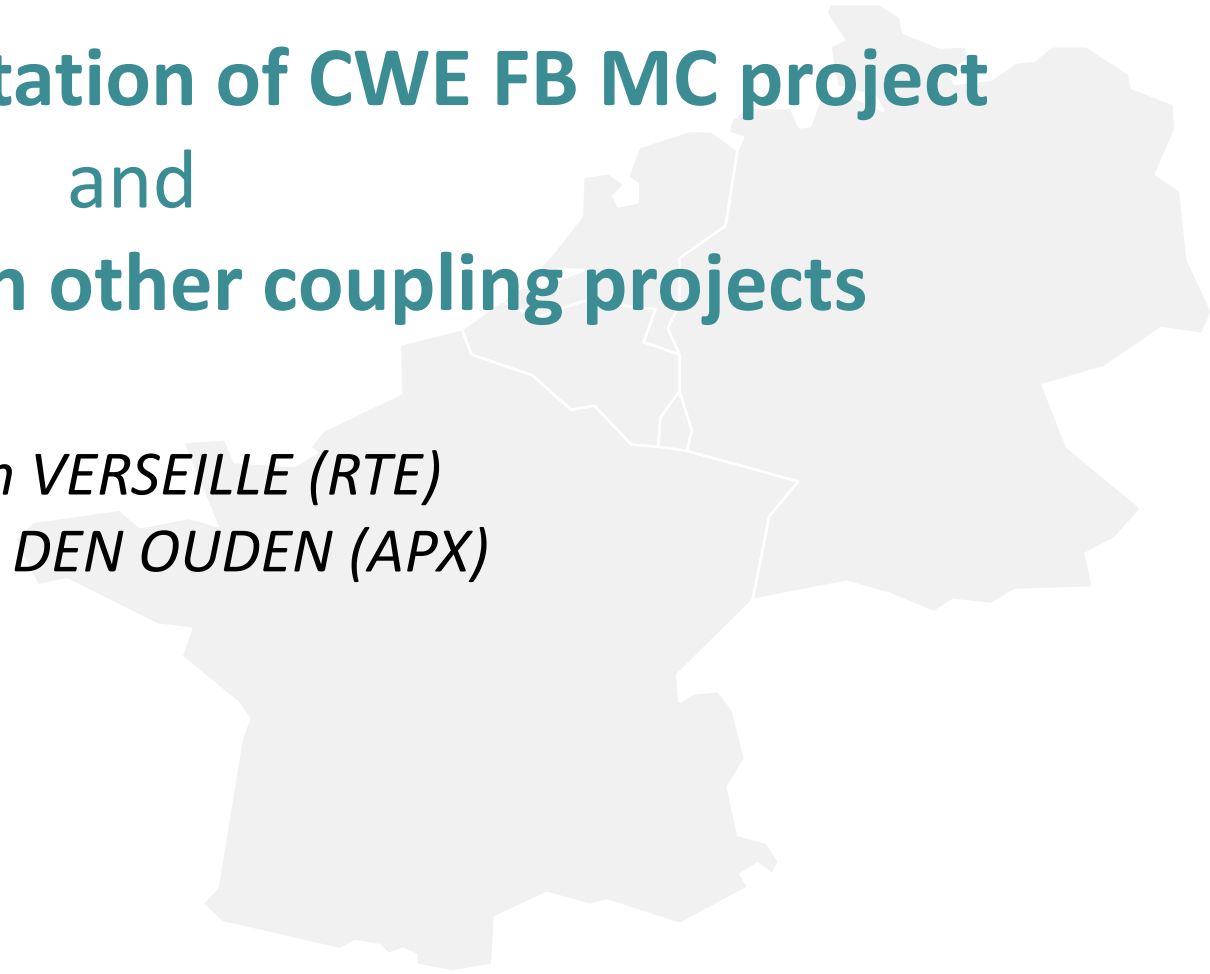
Agenda

Afternoon session

Timing	Group 1	Group 2
13.30 – 15.00	**Workshop Session 1** *by Joel HOEKSEMA (APX)* Theoretical understanding of flow-based method, intuitiveness, hybrid-coupling	**Workshop Session 2** *by Philippe NOURY (RTE)* Parallel run functioning, In-depth analysis of daily results, presentation of utility tool
15.00 – 15.30	*COFFEE BREAK*	
15.30 – 17.00	**Workshop Session 2** *by Philippe NOURY (RTE)* Parallel run functioning, In-depth analysis of daily results, presentation of utility tool	**Workshop Session 1** *by Joel HOEKSEMA (APX)* Theoretical understanding of flow-based method, intuitiveness, hybrid-coupling

Status on implementation of CWE FB MC project
and
coordination with other coupling projects

by Jean VERSEILLE (RTE)
and Bert DEN OUDEN (APX)



Implementation of CWE FB MC project

Where are we today?

- The Project has achieved a **major milestone** in the beginning of this year with the **launch of the external parallel run**
- All project partners have been putting their efforts in the realization of this important step which marks the beginning of concrete exchanges with the market about Flow Based simulation results
- In the name of all project partners, the Chairmen would like to welcome all stakeholders to today's Market Forum which will give the opportunity for constructive discussions based on methodological and very concrete inputs

Implementation of CWE FB MC project

Achievements and further objectives

2012	2013
Methodology • Agreement on CB* selection principles • Finalization of FRM* values • New GSK* implementations by some TSOs	**Methodology** • Formal approval by regulators • Adjustment of the CB* sets and reporting to regulators • Methodology refinement
Process • Organization of knowledge transfer • Coordination of common activities	**Process** • Continuous improvement of coordination activities
Tooling • Supporting the methodology by IT tools	**Tooling** • Implementation of an industrialized IT tool

- The project is proud about **progress made in 2012** and would like to share some insights regarding two crucial achievements: the **Critical Branches selection principle** and the **new Flow Reliability Margins values**

* CB: Critical Branch; FRM: Flow Reliability Margin; GSK: Generation Shift Key

Implementation of CWE FB MC project

Achievements: Focus on CBs and FRMs

Critical Branches (CB) selection principles

- Assessment of CBs: based on impact of CWE cross-border trade on the network elements and on operational experience
- Threshold of significance for a CB: its maximum CWE zone-to-zone Power Transfer Distribution Factor (PTDF) is larger than 5%
- Exceptions for a CB below the threshold are allowed but must be justified

Update of Flow Reliability Margins (FRM) values

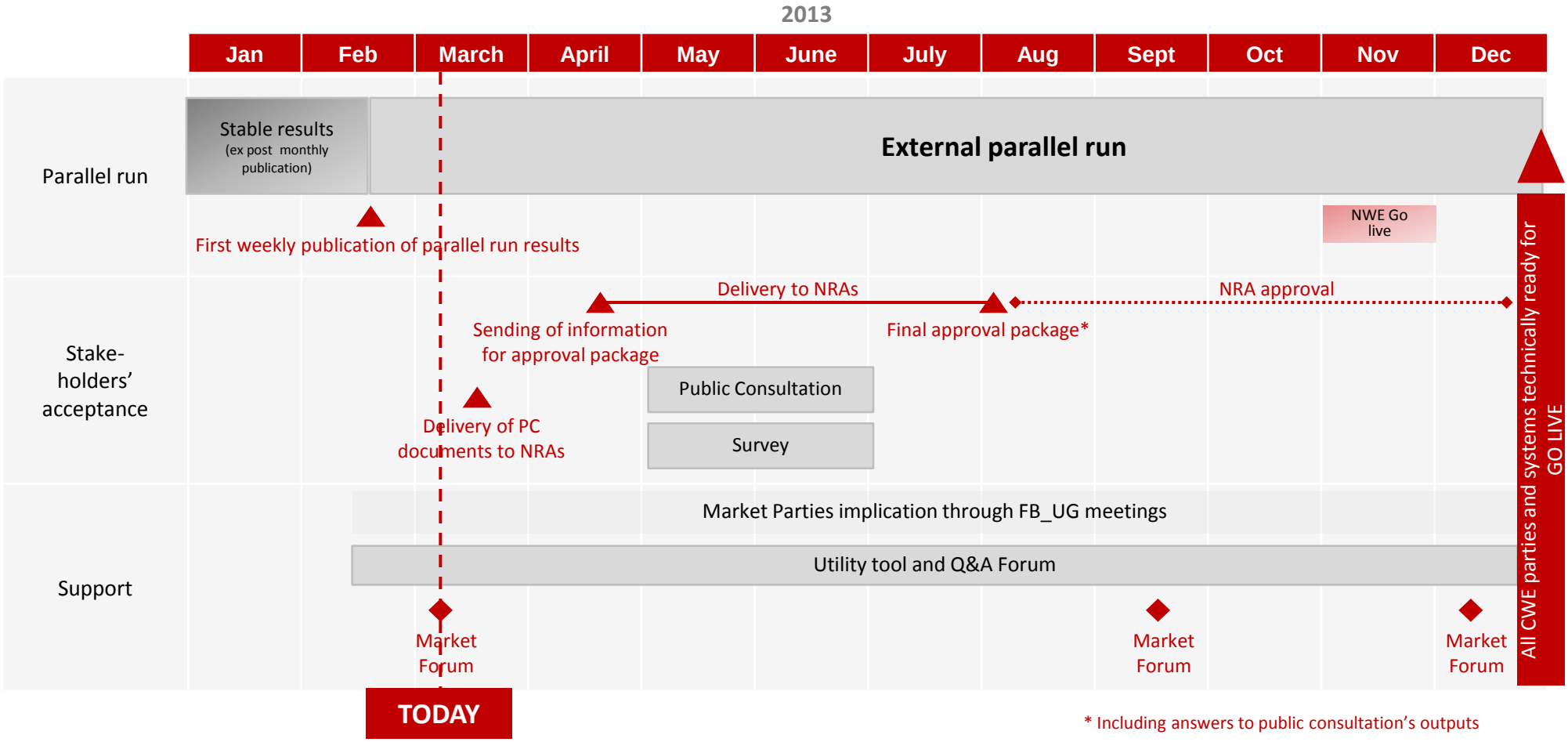
- TSOs have performed a thorough statistical analysis in order to set operational FRMs
- Each CB has its own FRM which is a fixed input for the FB computation
- FRM computation is part of a consistent risk management policy followed by TSOs: despite new values being in average larger than the 10% forfeit used during the FB experimentation in 2011, and thanks to process improvements, the FB domain keeps the same size

- **CB selection principles and FRM methodology will be described in the consultation package and are subject to formal regulatory approval but not the values themselves**
- **Any impacting change in the method will follow a change control procedure within the project, will be communicated to MPs**

Implementation of CWE FB MC project

Achievements translating into the following project planning

- Thanks to these achievements, the external parallel run has been launched and the next resulting milestones will follow shortly



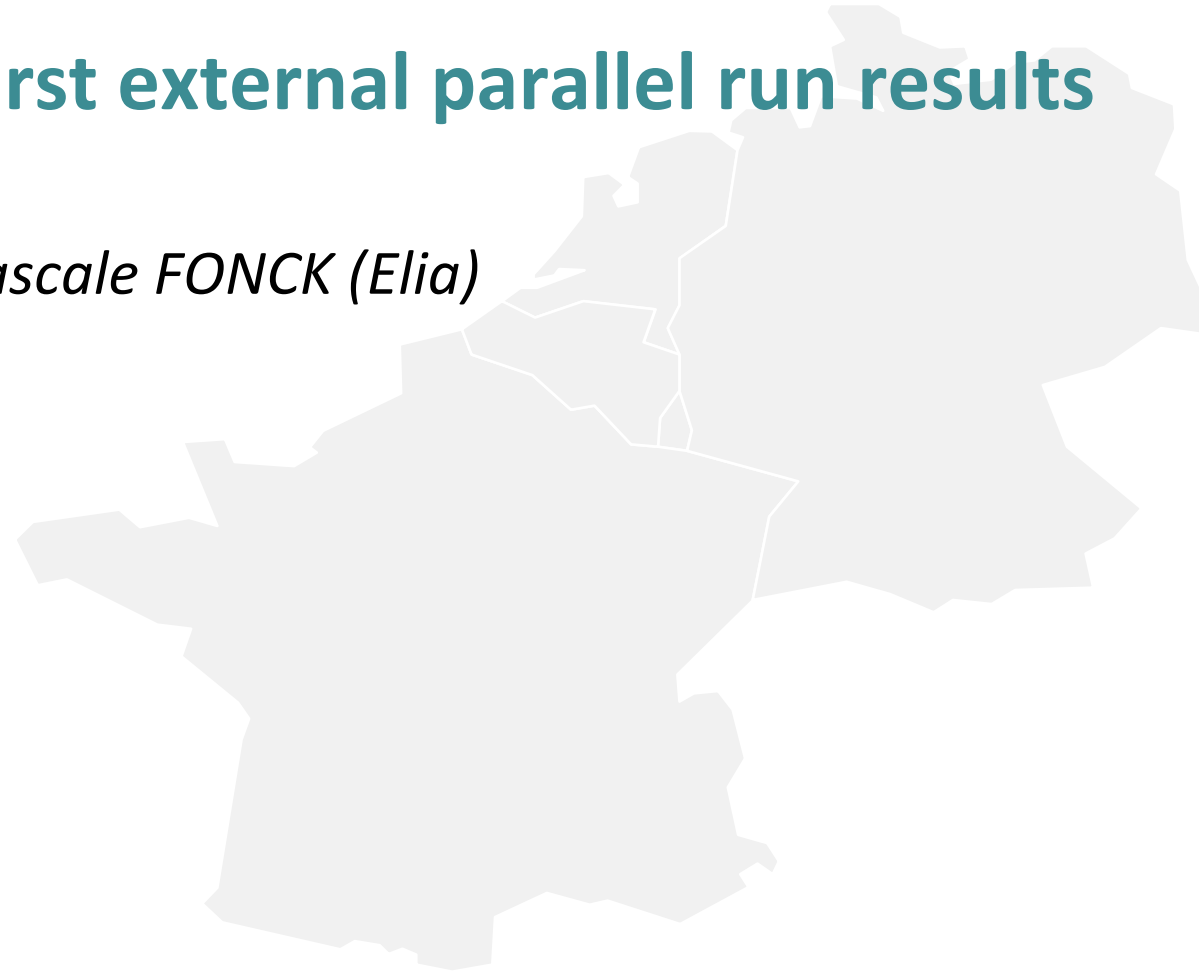
Coordination with other coupling projects

CWE – important step towards a Single European Price Coupling

- NWE and CWE FB are both essential for the Single European Price Coupling
  - NWE (based on PCR method) to create the nucleus to which other regions can easily connect
  - CWE flow based to (re-)improve the price convergence and economic surplus in that nucleus
- The CWE project is embedded in **ACER's Cross-regional roadmap for Capacity Calculation** and is strongly coordinated with the NWE (North Western European) Day-Ahead Market Coupling Project
- Due to technical reasons, and necessity to have parallel run including NWE market coupling the CWE FB MC will only go live after the successful Go Live of NWE
- In the meantime, other initiatives are ongoing and aim at achieving the target model for Market Integration in 2014 (a.o. European Price Coupling): SWE, CEE, CSE….
- Within this roadmap, the **CWE FB methodology is compatible (e.g. by the "hybrid" facility) with all other day-ahead coupling projects** currently being prepared and with Intraday projects so that the coordination and sequential implementation will be facilitated between initiatives

Presentation of the first external parallel run results

by Pascale FONCK (Elia)



Presentation of the first external parallel run results

- CWE FB MC project has started data publication since the **21st of February 2013** and **publication will continue all along 2013**
- These results are the outcome of the parallel run process which consists in the following activities:
  - **TSOs** generate on a daily basis Flow Based parameters based on operational data
  - **PXs** simulate market results on a weekly basis with a simulation facility based on ATCs order books
  - The process is performed with experimental tools, pending industrialization of the systems
- **First external parallel results of 2013 look quite promising** in comparison to ATC, though there is still a margin for improvement in the course of the external parallel run

Ex-post results from the 1st of January 2013

- During the external parallel run, some daily results might be missing as the process is not yet fully industrialized

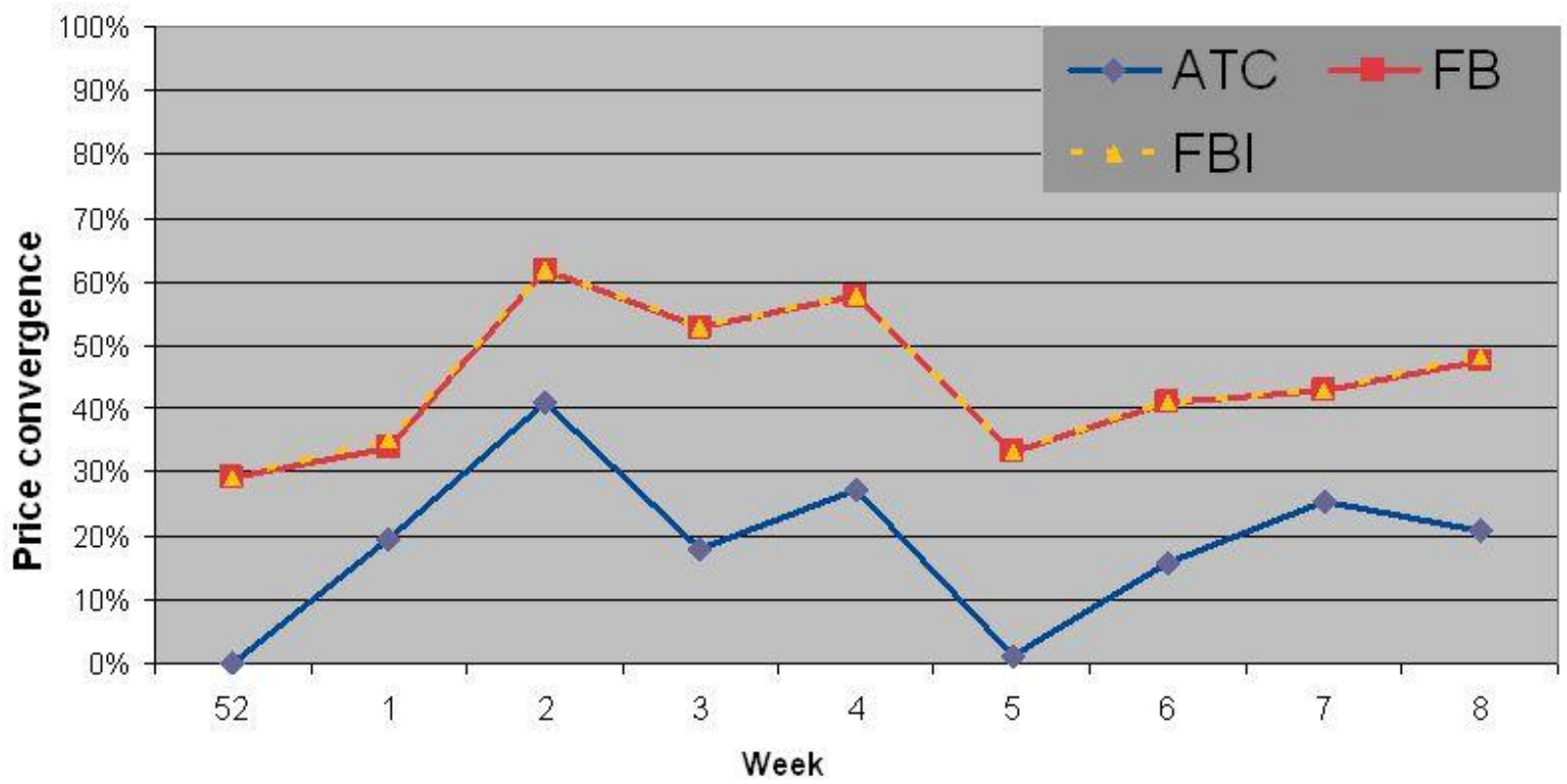
Year	week	Wed	Thu	Fri	Sat	Sun	Mon	Tue
2012	52							2013-01-01
2013	1	2013-01-02	2013-01-03	2013-01-04	2013-01-05	2013-01-06	2013-01-07	2013-01-08
	2	2013-01-09	2013-01-10	2013-01-11	2013-01-12	2013-01-13	2013-01-14	2013-01-15
	3	2013-01-16	2013-01-17	2013-01-18	2013-01-19	2013-01-20	2013-01-21	2013-01-22
	4	2013-01-23	2013-01-24	2013-01-25	2013-01-26	2013-01-27	2013-01-28	2013-01-29
	5	2013-01-30	2013-01-31	2013-02-01	2013-02-02	2013-02-03	2013-02-04	2013-02-05
	6	2013-02-06	2013-02-07	2013-02-08	2013-02-09	2013-02-10	2013-02-11	2013-02-12
	7	2013-02-13	2013-02-14	2013-02-15	2013-02-16	2013-02-17	2013-02-18	2013-02-19
	8	2013-02-20	2013-02-21	2013-02-22	2013-02-23	2013-02-24	2013-02-25	2013-02-26

48 of 57 days successful

- ***Note**: As external parallel run data has been published since the 1st of January, week 52 contains only one day*
- ***Note**: Our weeks run from Wednesday to Tuesday and carry the calendar week of the first day of the week. Consequently 1st of January is in week 52*

Price convergence since the beginning of 2013

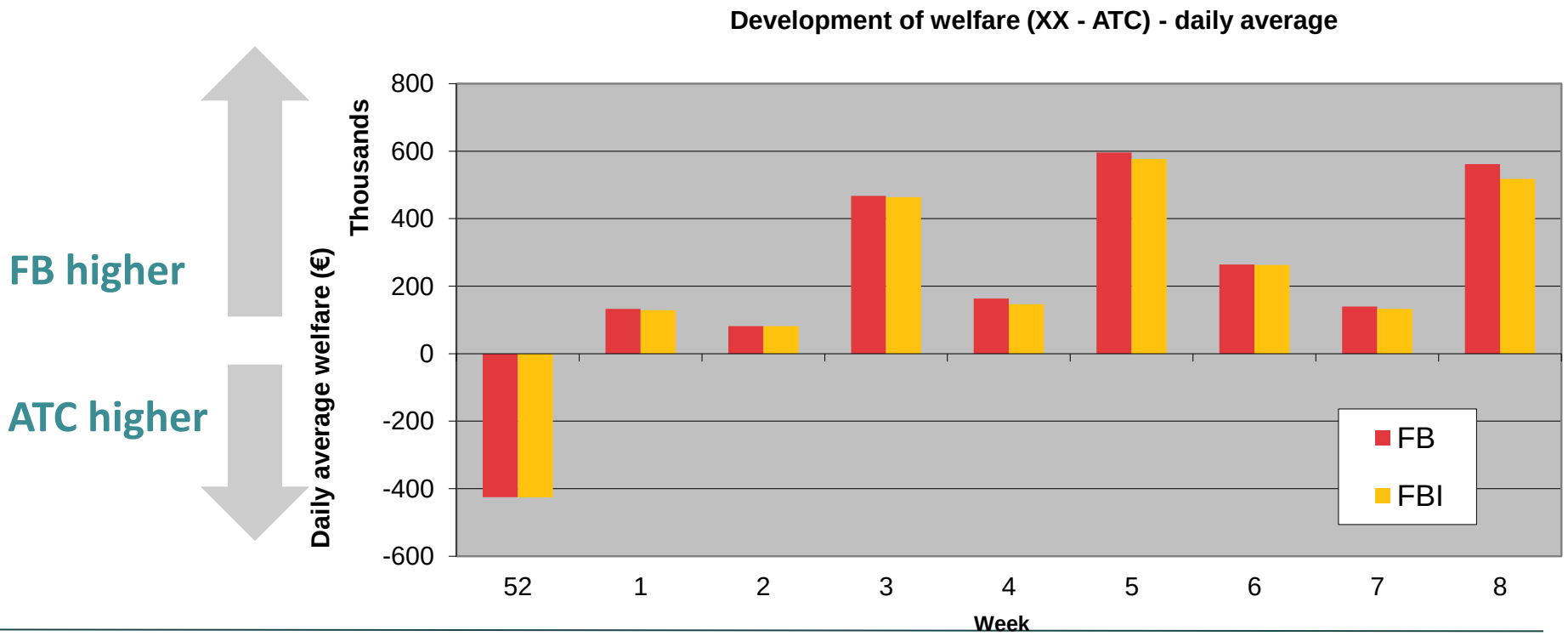
- The price convergence overview shows a continuous, **at least 10%, higher price convergence** under FB than under ATC



Weekly overview of the Day ahead market welfare

In comparison to ATC

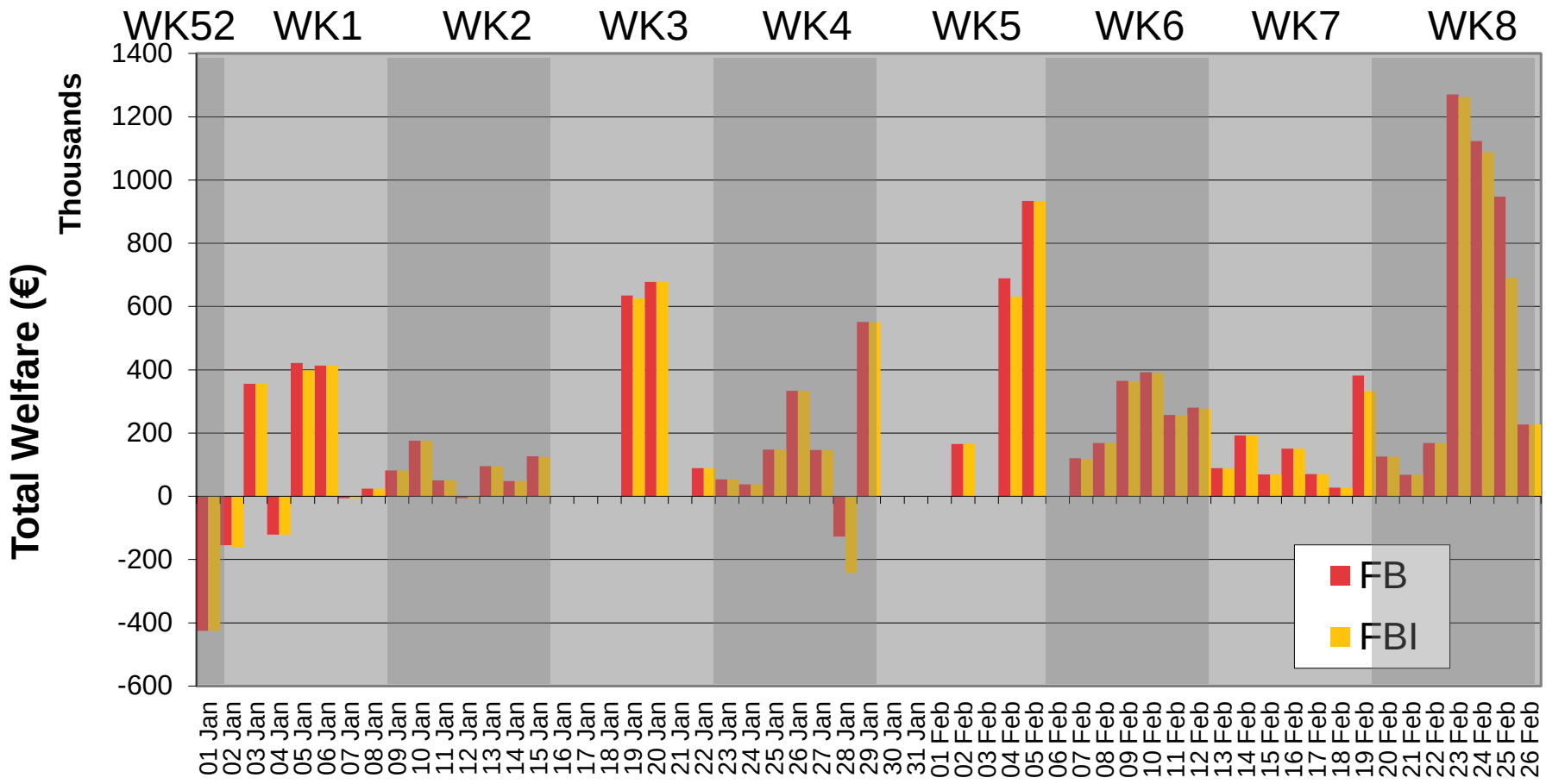
- This overview shows the **gain in weekly DA market welfare** since the beginning of 2013
- Observation:
  - Total welfare under FB is higher than under ATC
  - No significant difference so far between FB and FBI



Daily overview of the Day ahead market welfare

In comparison to ATC

- The detailed **daily overview** shows a significant increase in DA market welfare under FB for almost all days

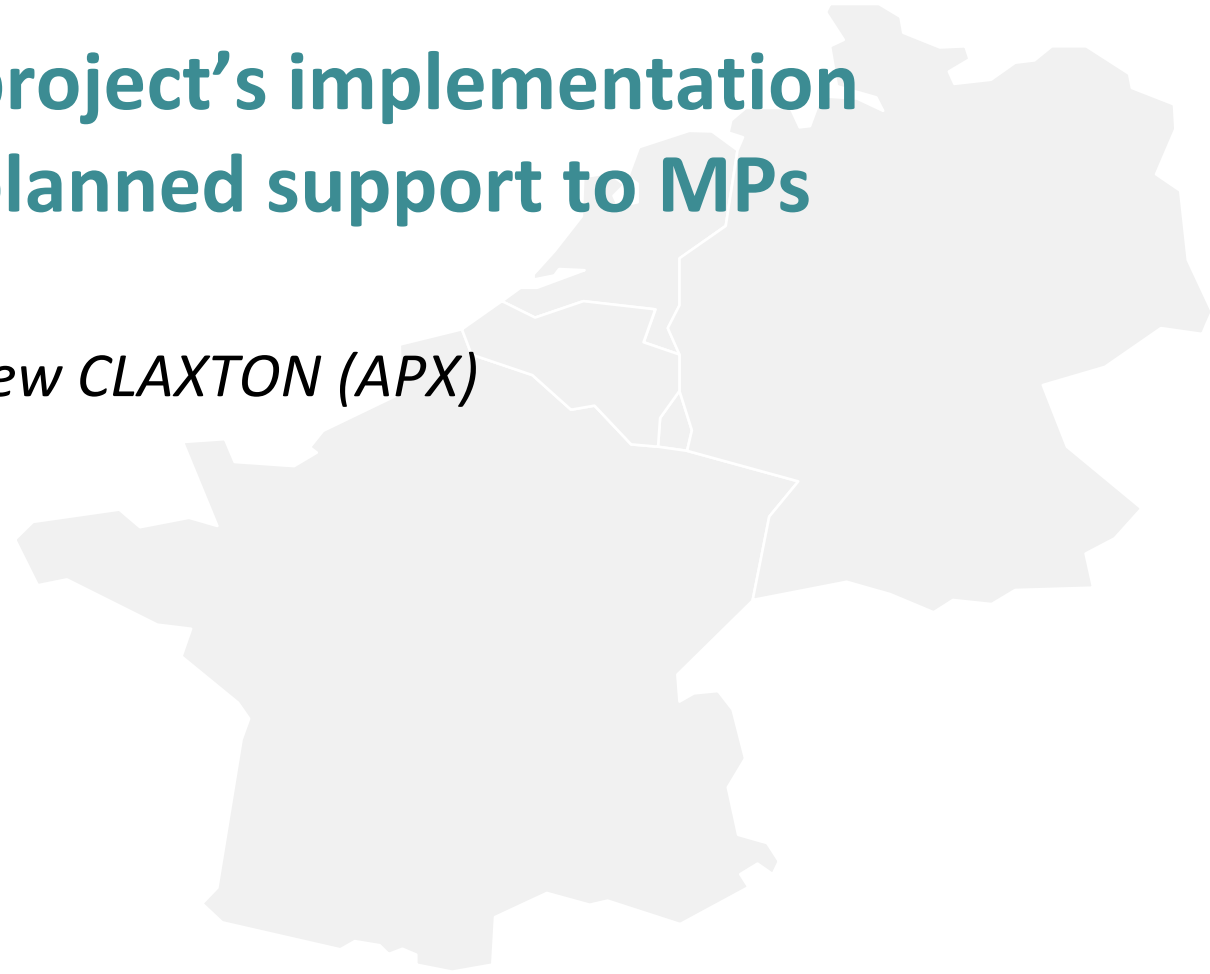


REMINDER: the parallel run, one year of learning period

- The external run which will last one year is a **learning period for project partners and market participants**
- Therefore, the data has to be taken cautiously, keeping in mind important facts:
  - The external parallel run is performed with ATC Order books from production environment
  - As an industrialized tool is not available yet, an ex-post recalculation of the process can not be guaranteed. CWE Project Partners can therefore not ensure the 100% availability of results
  - The external parallel run remains a project phase in which some changes might for example be applied to the FB method or the process after having been submitted to a change procedure
- Of course, the **market will be informed** in due time about any impacting change that will occur during the external parallel run

Information on project's implementation approach and planned support to MPs

by Andrew CLAXTON (APX)



Information on project's implementation approach and planned support to MPs

2012

Internal parallel run

- ✓ Internal process improvements
- ✓ External parallel run preparations and design of market support
- ✓ Regulatory approval preparations
- ✓ Preparation of IT systems
- ✓ Exchanges with MPs via the Flow Based User group

2013

External parallel run

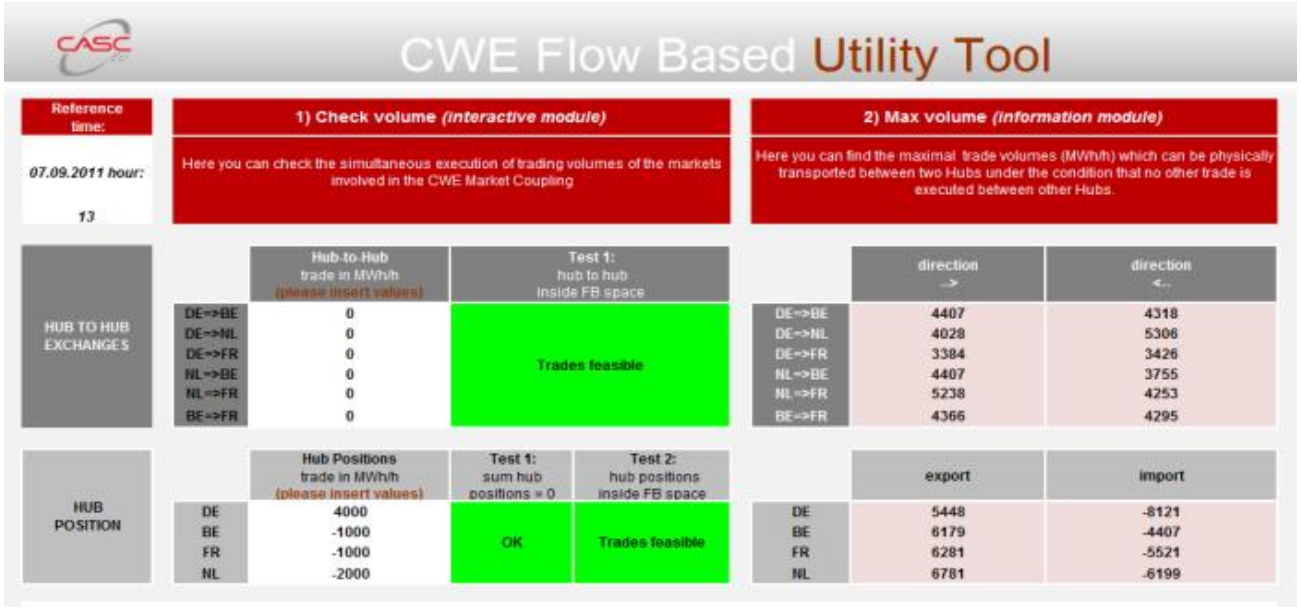
- ✓ Availability of one year of simulations results to evaluate the FB methodology
- ✓ Ongoing, constructive dialogue with the market via the Flow Based User Group
- ✓ Process improvements accompanied by necessary simulation tools

- Project Partners have taken the last year to prepare **helpful supporting tools for market participants** in order to support them in the handling of the new methodology and to facilitate the switch from ATC to FB
- This year will be fully dedicated to **communication with all market participants**, and the project partners are looking forward to their feedback

Market support

Facilitating simulations thanks to the Utility Tool

- Project Partners wish to facilitate the transition to FB for market participants
- Therefore, FB experts have developed a **simulation tool** where the relevant FB parameters will be displayed and market participants can do their own simulations



CWE Flow Based Utility Tool

Reference time: 07.09.2011 hour: 13

1) Check volume *(interactive module)*

Here you can check the simultaneous execution of trading volumes of the markets involved in the CWE Market Coupling

2) Max volume *(information module)*

Here you can find the maximal trade volumes (MWh/h) which can be physically transported between two Hubs under the condition that no other trade is executed between other Hubs.

HUB TO HUB EXCHANGES

	Hub-to-Hub trade in MWh/h (please insert values)	Test 1: hub to hub inside FB space
DE=>BE	0	Trades feasible
DE=>NL	0	
DE=>FR	0	
NL=>BE	0	
NL=>FR	0	
BE=>FR	0	

	direction ->	direction <-
DE=>BE	4407	4318
DE=>NL	4028	5306
DE=>FR	3384	3426
NL=>BE	4407	3755
NL=>FR	5238	4253
BE=>FR	4366	4295

HUB POSITION

	Hub Positions trade in MWh/h (please insert values)	Test 1: sum hub positions = 0	Test 2: hub positions inside FB space
DE	4000	OK	Trades feasible
BE	-1000		
FR	-1000		
NL	-2000		

	export	import
DE	5448	-8121
BE	6179	-4407
FR	6281	-5521
NL	6781	-6199

! For more information, demonstration and explanation on the functionalities of the Utility Tool, please attend this afternoon's practical workshop !

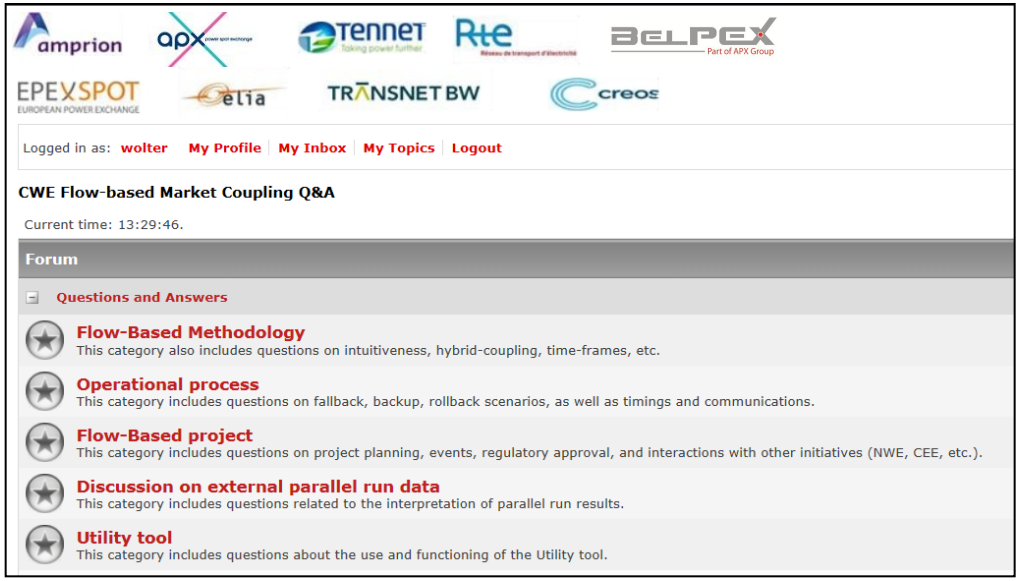
Market support

An open Q&A Forum for all your questions

- During the whole duration of the external parallel run, a **Q&A Forum** is available online enabling market parties to ask their questions: http://www.casc.eu/en/Resource-center/CWE-Flow-Based-MC/Q---A-Forum
  - Questions will be published after their reception and project partners will do their best to post the corresponding answers as quickly as possible. You will be notified via email when the answer is online

Practical advice:

- Please facilitate the process by:
  - Asking short and concise questions
  - Asking questions ONLY related to FB
  - Checking whether you question has already been posted on the forum
  - Uploading only short files or graphs when really necessary
  - Posting your question in the most relevant category



Market support

Public Consultation and Survey for your formal remarks

- Market participants will have access to official project documentation via CASC's website which will include the following information:
  - CWE Market Coupling Solution
  - Fallback arrangement
  - Roll back
  - Coordinated Flow Based capacity domain determination
  - Economic Assessment
  - Publication of data

- In parallel, you will be invited to comment on specific questions and provide comments regarding these documents via an online survey
- Public consultation and survey: **1st May 2013 – 30th June 2013**

  - Official invitation including all access information will be sent in due time
  - All formal remarks or concerns regarding the methodology should be given during the public consultation process as its outcome will be taken into account for the drafting of the final approval package submitted to NRAs

Q&A Session

Flow Based perception and expectations of Market Parties

by Ruud OTTER (MPP)

MARKET PARTIES PLATFORM

Linking Energy Markets

MARKET PARTIES PLATFORM
Linking Energy Markets

Flow based project from a market perspective

CWE Flow Based Market Forum

7 March 2013

Some Background on the MPP

- The MPP is a cooperation of the 6 electricity associations in the CWE + Austria region (Pentalateral region)
- Has been involved in the market coupling process as co-signer of the MoU on the Pentalateral market coupling in 2007
- During this process information became available on the flow based concept and the concept looked promising
- We now face the implementation challenge with many questions and uncertainties

MARKET PARTIES PLATFORM
Linking Energy Markets

The process

- First NWE price coupling, then CWE flow based coupling :
  - Market participants need to be able to understand and differentiate impacts arising from NWE coupling and from Flow Based coupling
  - Flow Based should not be “rushed”. An extended parallel run that would cover NWE coupling would be beneficial for all
  - Reliability of the flow-based algorithm is of utmost importance and should be ensured in a NWE-coupled environment (9 days without convergence so far)
- Consultation :
  - Beyond the May-June consultation: how can market parties be associated to the go-live decision?
- What is the expected implementation time for market parties? Is it in the planning?

What is in the black box?

- With flow based it is even more important to know the exact rules and methods of the capacity calculation
- It is important that every market player can make thorough analysis
- This will also increase reliability of market estimations

MARKET PARTIES PLATFORM
Linking Energy Markets

Open the black box

- All technical grid information should be public
- A detailed “explanatory guide” to the XML technical files provided on the CASC website should be written
- More information on the technical data in the XML file should be made public (critical branches…)
- The parallel runs should also show different scenarios
- How are remedial actions taken into account?
- How is the algorithm and operational process tuned?
- What are the optimisation criteria exactly?

MARKET PARTIES PLATFORM
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The market would like to be in *dialogue*

- Q&A are not enough: many answers trigger new questions
- User group should be used to create that dialogue
- A CWE stakeholder group (with representative organisations) meeting would also help the consultation
- Dialogue should not stop after the May-June consultation. September & December forums should be taken into consideration for go-live

MARKET PARTIES PLATFORM
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Thank you for your attention

Questions?

MARKET PARTIES PLATFORM
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Agenda

Afternoon session

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Please check the workshop participants' list at the entry of the workshop rooms

Lunch

Workshop Session 1:

Theoretical understanding of flow-based method, intuitiveness, hybrid-coupling

by Joel HOEKSEMA (APX), Adrien ATAYI (RTE) and Pieter SCHAVEMAKER (e-Bridge)

Workshop 1

Agenda

I. **Flow-based Method**
   I. Capacity Calculation principles
   II. Capacity Allocation principles

II. **Intuitiveness**
   I. Interaction with LT nominations and ID

III. **Hybrid Coupling**

Practical advise:

- This workshop is meant to be **interactive** and to give room for discussions
- Please feel free to **ask your questions** or to **comment** after each section
- Questions that go beyond the scope of this workshop will be collected and answered via the Q&A Forum afterwards

FB Capacity Calculation principle

- TSOs impose constraints to the market coupling algorithm in order to safeguard the grid
- FB constraints have two components:
  - **Remaining Available Margin (RAM):** number of MWs that can be used by the trades
  - **Power Transfer Distribution Factor (PTDF):** indicates how much MWs are used by the net positions resulting from the trades
- **The FB search space is the concatenation of the above mentioned constraints**

FB MATRIX

=

As many lines as there are **constraining critical branches** defined by TSOs

+

As many columns as there are **hubs (for each PTDF)**

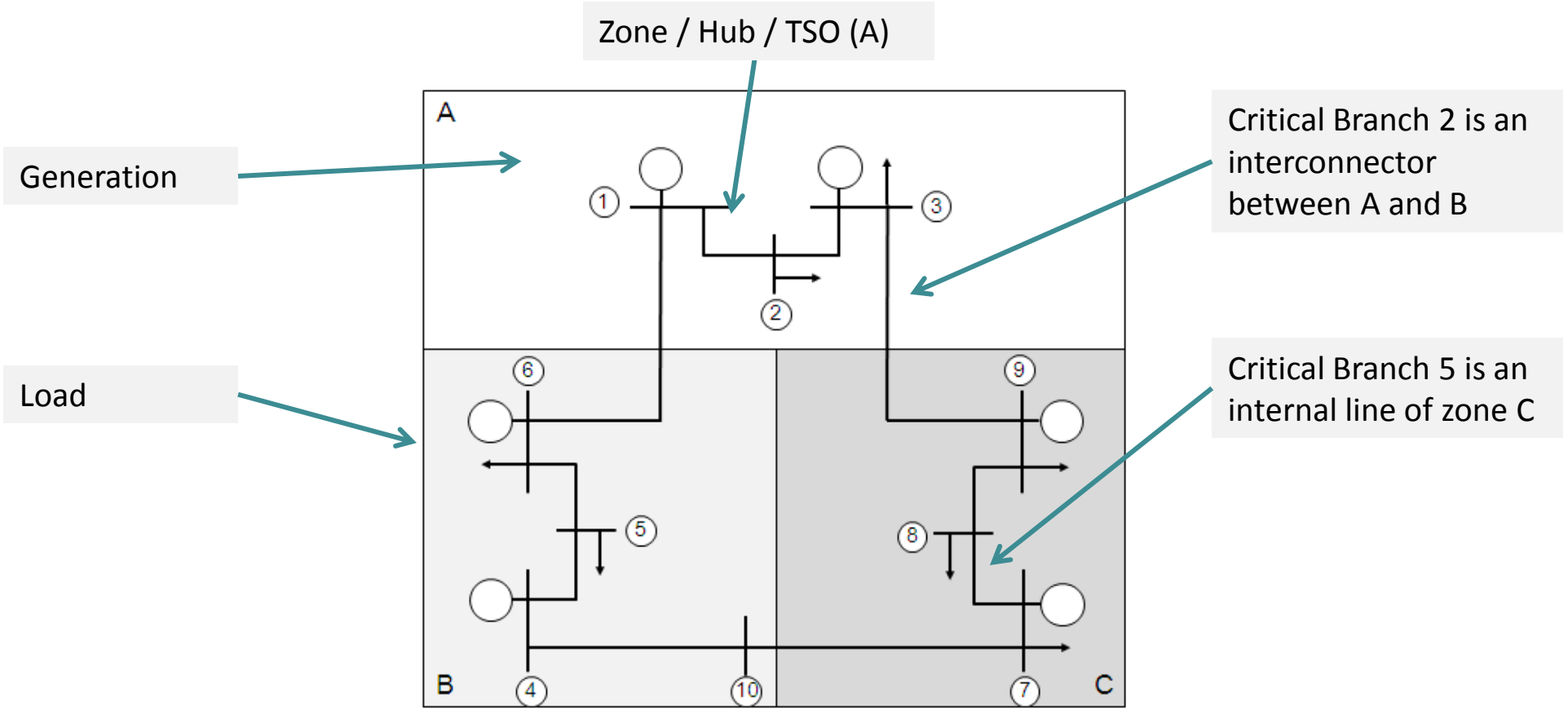
+

One column for the **RAM** (the **limiting value** in the inequation)

- In CWE, there are 4 hubs, but the overall DA balance imposes the sum of CWE Net Exchanges (Nex) to equal 0 (linear bound between the four hubs). Consequently, the CWE search-space is **3 dimensional**, each constraint being modeled by a plane in this space

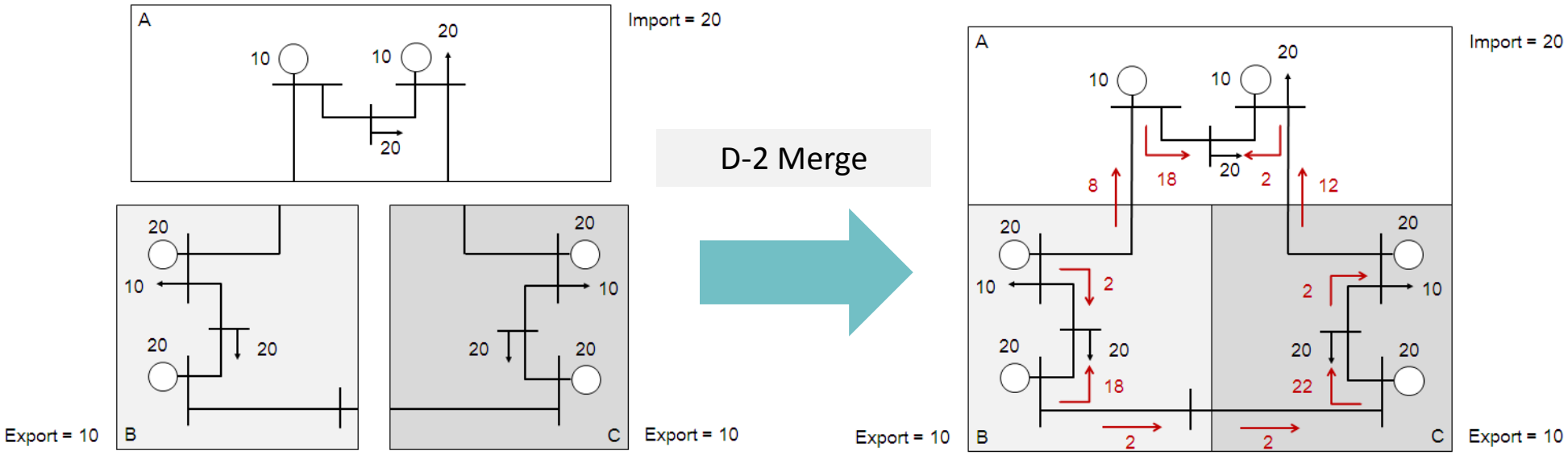
FB Parameters computation: An introduction

- For illustrating the principles of PTDF and RAM computation (how to compute the coordinates of each plane), we are going to use a **simplified network made of 10 nodes**, connected by 10 lines. Our example is constituted of **3 hubs/TSOs**



FB Parameters computation: the "basecase"

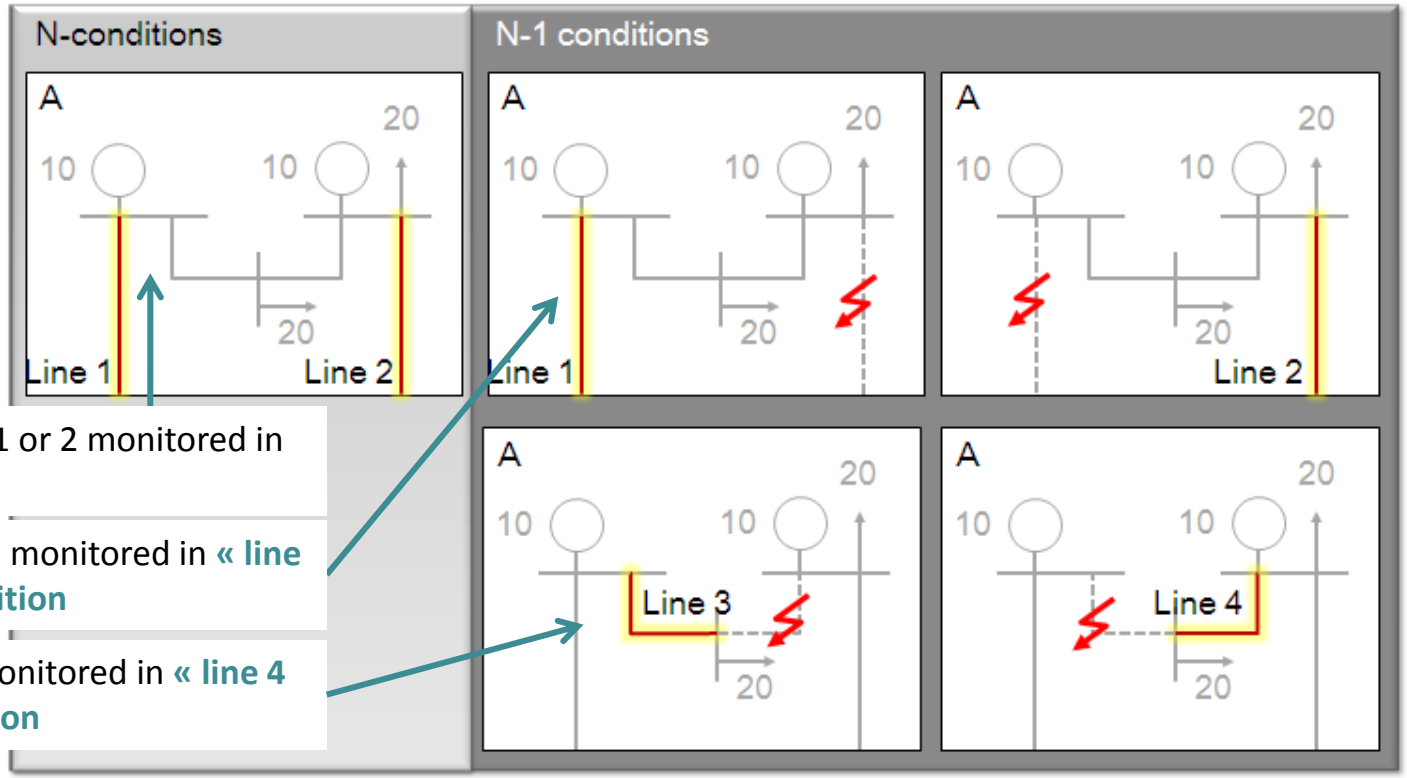
- **Two Day Ahead Congestion Forecast (D2CF)** process at each TSO
  - Provides the best estimation of the grid
  - Constitutes the working point for a predefined hour of day D
- **Centralized merging activity** to put together the D2CF building blocks of the Common Grid Model (CGM)
  - Representative load flow model of the grid for a predefined hour of day D
  - Basis for the coordinated capacity calculation process



FB Parameters computation: the "CBs"

- TSOs define the elements of the grid that they would like to monitor and that are significantly impacted by cross-border trades (CBs)
  - CBs can be **interconnectors** (lines 1 or 2) and **internal lines** (3 or 4)
  - CBs can be monitored in **"N situation"**, but also under outage scenarios, so called **"N-1 cases"**

Branches monitored by TSO A (Line 1 / 2 / 3 / 4, marked in yellow):



Interconnector 1 or 2 monitored in **« N » situation**

Interconnector 1 monitored in **« line 2 outage » condition**

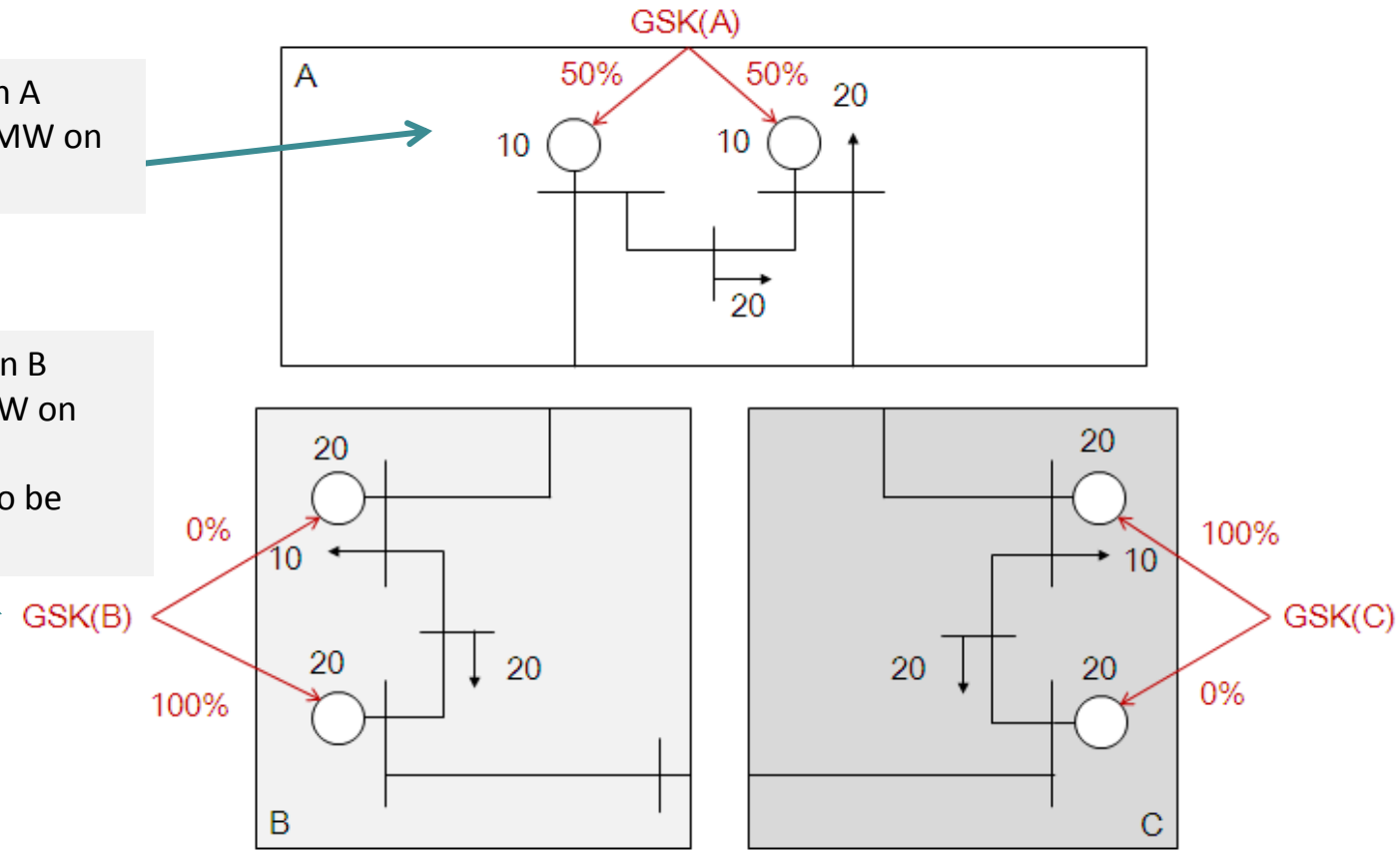
Internal line 3 monitored in **« line 4 outage » condition**

FB Parameters computation: the "GSK"

- The **Generation Shift Key (GSK)** indicates on which generation units a net position change of the hub will take place
- The GSK is a **linear relationship between Nex variation and generation pattern of each hub**

A variation of « N MW » of net position A will be derived into a variation of N/2 MW on each of the 2 units inside this hub

A variation of « N MW » of net position B will be derived into a variation of N MW on one unit
The other unit which is assumed not to be influenced by DA trades will not move

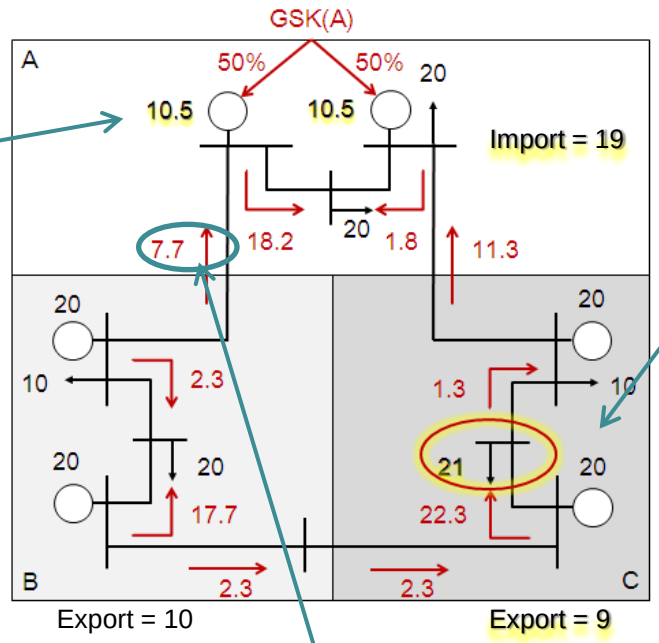


FB Parameters computation: the "PTDF"

1

We assume an **increase of 1 MW of Hub A net position**

According to GSK(A), this 1 MW is split in 0.5 MW in the 2 units of hub A



2

Overall balance is ensured by compensating this 1 MW by increasing the load of a **"reference node"**

3

The resulting flows on each CB are computed with a **DC load flow** and compared to flows from the basecase

- **The difference between resulting and initial flows is the basis for PTDF determination**
- For instance, flow on line 1 changed from 8 MW to 7.7 MW, after increasing A export of 1 MW
  Therefore, PTDF_line1 (Hub A) = - 30%

FB Parameters computation: the "PTDF" (2)

- The process described in the previous slide is repeated for each CB, for each Hub
- PTDFs are also computed in "N-1" conditions when deemed relevant by TSOs
  - The same "reference node" is used. Choice of this node has no impact
- Indeed, the **market coupling algorithm will optimize exchanges between hubs**
- An exchange of 1 MW from zone A to zone B (for instance) is equivalent to:

An exchange of 1 MW **from hub A to the reference node** − An exchange of 1 MW **from hub B to the reference node**

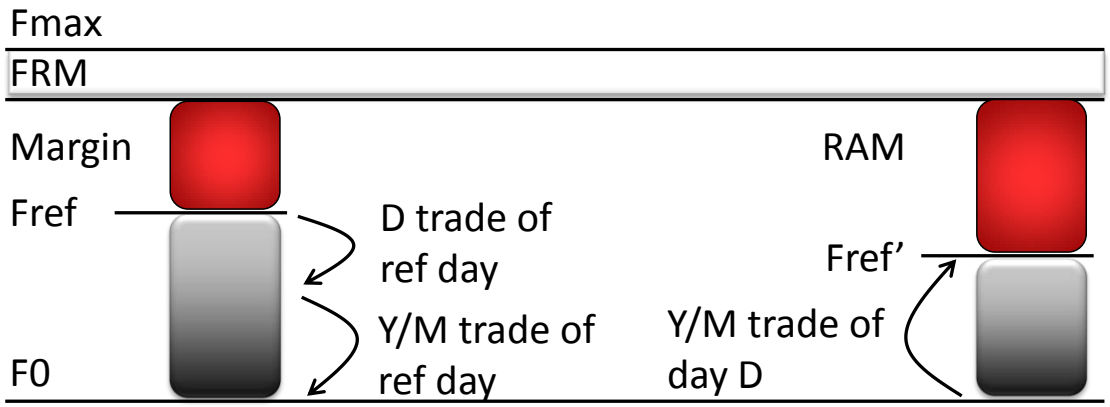
This property holds due to the linearity of the PTDF computation (DC load flow)

  - "hub-to-hub" PTDFs are therefore easily derived by substracting the "hub-to-reference" PTDFs computed before

- **Advantage of this approach**: A "concentration" of FB parameters in a small number of values (hub-to-reference PTDF). Computing and providing separately all combinations of hub-to-hub PTDF would be impractical, especially if the number of hubs increases

FB Parameters computation: RAM (1)

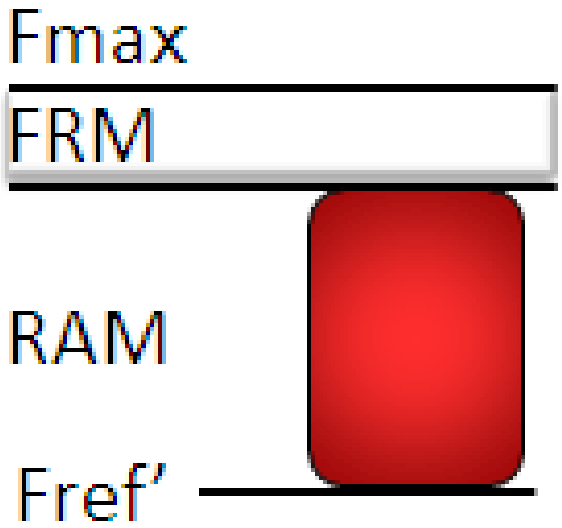
- After the illustration of PTDF computation, we will now address the **computation of RAM**
- In the flows observed in the D2CF basecase (the Fref) the impact of cross-border trade (of the reference day) is reflected. The flows are adjusted in accordance to the graph below, by using the PTDF computed before



- **Ex. For line 1:**
  - Fref = 8 (as computed on slide 32)
  - Net positions in the D2CF basecase: NP(A) = -20, NP(B) = 10, NP(C) = 10
  - F0 = Fref – (NP(A)*PTDF(A) + NP(B)*PTDF(B) + NP(C)*PTDF(C)) = 8 – (-20*-0.3 + 10*0.3 + 10*-0.1) = 8 – 8 = 0
  - Assume that the net positions due to the long-term nominations equal: NP(A) = -10, NP(B) = 5, NP(C) = 5
  - Fref' = F0 + (NP(A)*PTDF(A) + NP(B)*PTDF(B) + NP(C)*PTDF(C)) = 0 + (-10*-0.3 + 5*0.3 + 5*-0.1) = 0 + 4 = 4

FB Parameters computation: RAM (2)

- The maximum allowed flow on line 1 equals: **Fmax = 25**
- The Flow Reliability Margin (FRM) on line 1, the margin that the TSO needs to reserve in order to hedge against uncertainties has been assessed to be equal to: **FRM = 3**
- We computed the Fref' on line 1, the flow that is expected to flow on line 1 prior to the allocation of the Day-Ahead capacity to be: **Fref' = 4**
- The Remaining Available Margin (RAM) on line 1, the margin available for the market to be used under the FBMC amounts: **RAM = Fmax – FRM – Fref' = 25 – 3 – 4 = 18**



FB Parameters computation: summary

- Eventually, for each hour, the FB computation performed by TSOs leads to the **completed FB parameter matrix**, as in our example below for line 1:

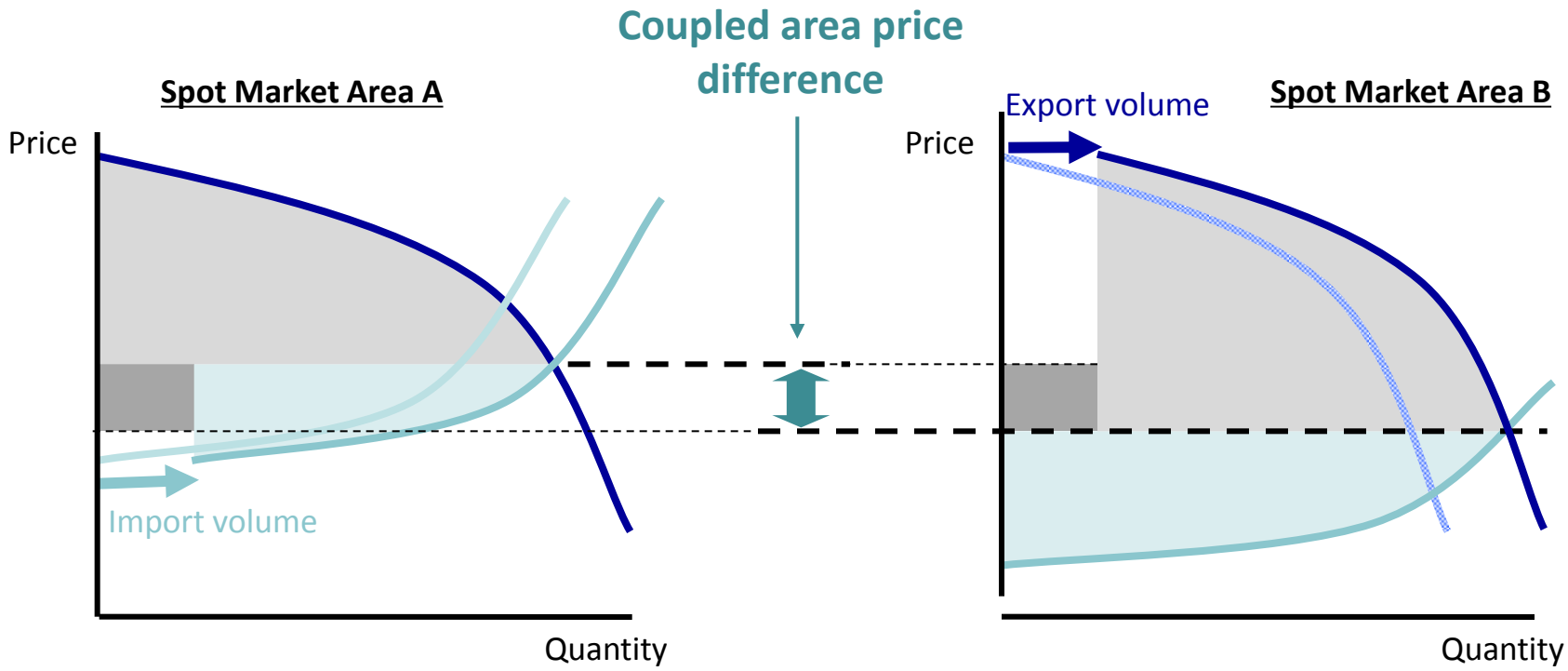
Monitored branch	Outage scenario	Zone A PTDF	Zone B PTDF	Zone C PTDF	RAM
Line 1	-	-0.3	0.3	-0.1	18

- **The concatenation of these constraints is the FB domain**
  - Each constraint is a hyperplane in a n-1-dimension search space, where n is the number of hubs
  - With 4 hubs in CWE, the FB search space is a kind of potato, made up of an average of 15 – 20 planes (corresponding to the most constraining CB)

- **This matrix is provided at 10:30 am in DA**, as in ATC today, as a set of constraints for the welfare optimization algorithm of the market coupling system

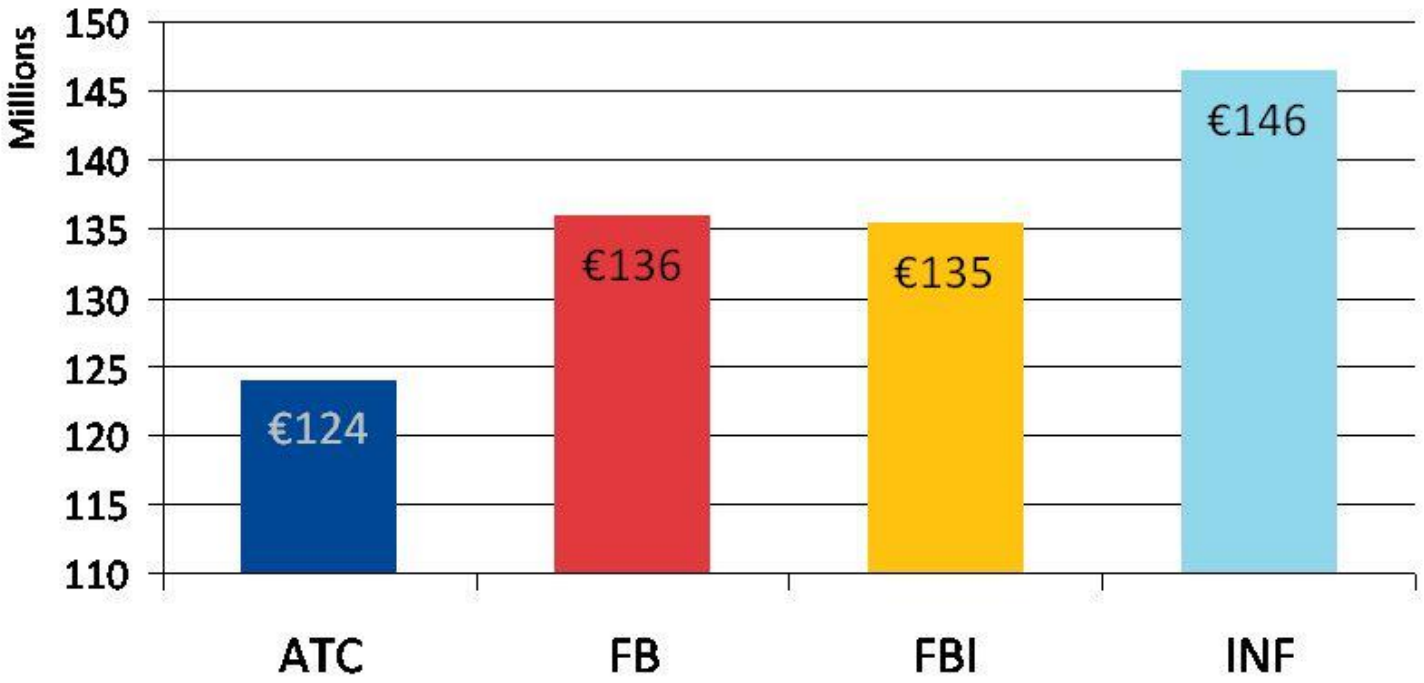
Capacity allocation: basic principle

WELFARE = *Seller surplus* + *Buyer Surplus* + *Congestion rent*



Outcome of FB Parameters computation: increased welfare

- Theory has been proved by parallel run results (welfare increase compared to uncoupled markets): **more capacity under FB leads to a higher welfare under FB** than under ATC



- ***Note***: Data from 1st of January to 28th of February 2013

Example (1/2)

Monitored branch	Zone A PTDF	Zone B PTDF	Zone C PTDF	RAM
Line 1	-0.3	0.3	-0.1	18

OBKs:

A: buy 1000MWh@50
B: sell 1000MWh@20
C: sell 1000MWh@30

Best price

1MW B->A exchange uses:
(0.3 – (-0.3)) = 0.6 MW
→ 18/0.6 = 30MWh can be exchanged

1MW C->A exchange uses:
(-0.1-(-0.3)) = 0.2 MW
→ 18/0.2 = 90MWh can be exchanged

Two choices:

1. A buys 30@20 from B
2. A buys 90@30 from C

Most welfare

Example (2/2)

Monitored branch	Zone A PTDF	Zone B PTDF	Zone C PTDF	RAM
Line 1	-0.3	0.3	-0.1	18

OBKs:

A: buy 1000MWh@50
B: sell 1000MWh@20
C: sell 1000MWh@30

Silly idea:
1MW C->B exchange uses:
-0.1-(0.3) = -0.4MW

notice sign

This exchange actually relieves the line by 0.4MW

Recall that 1MW C->A used 0.2MW on the line. I.e. each 1MW C->B exchange allows us to schedule 2MW C->A

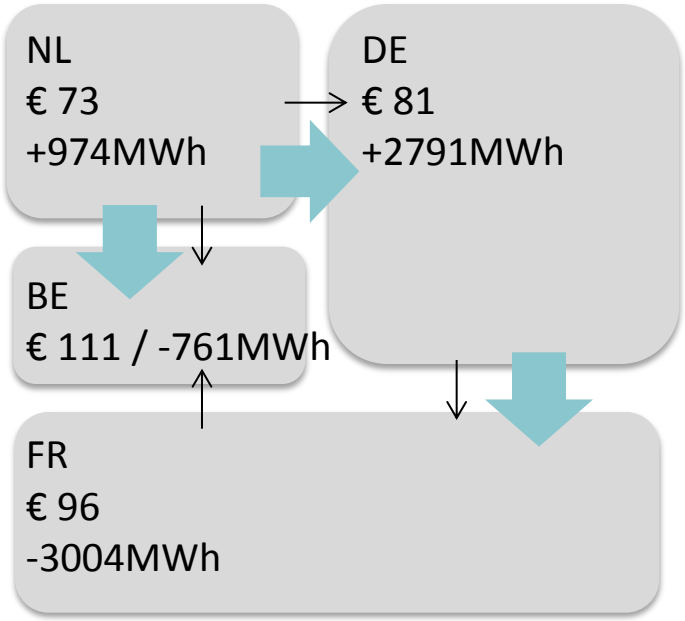
Since C->A exchanges generate welfare, we might even accept C->B exchanges that lose welfare (but less than what is gained on C->A). This would be an non-intuitive situation

Intuitive energy flows: introduction

Intuitive energy flows are exchanges from low price areas to high price areas

An intuitive situation

(December 2nd, 2010, hour 20, FB "standard" MC simulation)

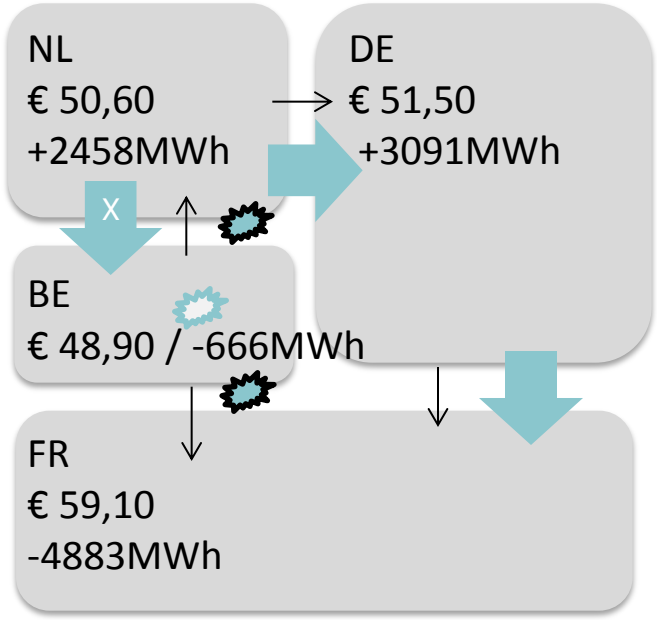


Bilateral commercial exchange

Possible intuitive exchange

A non-intuitive situation*

(December 1st , 2010, hour 07, FB "standard" MC simulation)



Area importing with the lowest price

Area unable to import intuitively

No decomposition exists such that all energy flows from low price to high price markets

However,

enforcing intuitiveness is an additional constraint at the cost of DA market welfare

**A second case can occur where an expensive market is forced to export, becoming even more expensive*

Intuitiveness within the CWE region

- Those non-intuitive flows from high price to low price areas were identified in FB MC simulations in 2008
- An algorithm was developed that can prevent such situations, which is called “intuitive patch”
- **Plain FB as well as FB intuitive will be simulated during the external parallel run** in order to facilitate the decision in favour of FB plain or FB intuitive in the CWE region

Intuitiveness within the CWE region

- So far, the choice of plain vs. intuitive FB is subject to the adapted point of view:
  - **From "within" the standard MC model**: FB "intuitive" MC only decreases the day-ahead market welfare while it does not bring any good property to the model → ***Choose FB "plain"***
  - **From "outside" the standard MC model**: Preference for ATC like properties which exist more often in "intuitive" FB. Areas involved in non-intuitive exchanges should not have to import (resp. export) with the lowest (resp. highest) price to "help" others. Smaller areas are more often involved in non-intuitive situations → ***Choose FB "intuitive"***
  - **With a "commodity market" point of view**: A product should not be sold in another country at a lower price than the price charged in its home market. The disappearance of partial convergence under FB "plain" prevents local reasoning that allowed forecasting easily the price range → ***Choose FB "intuitive"***

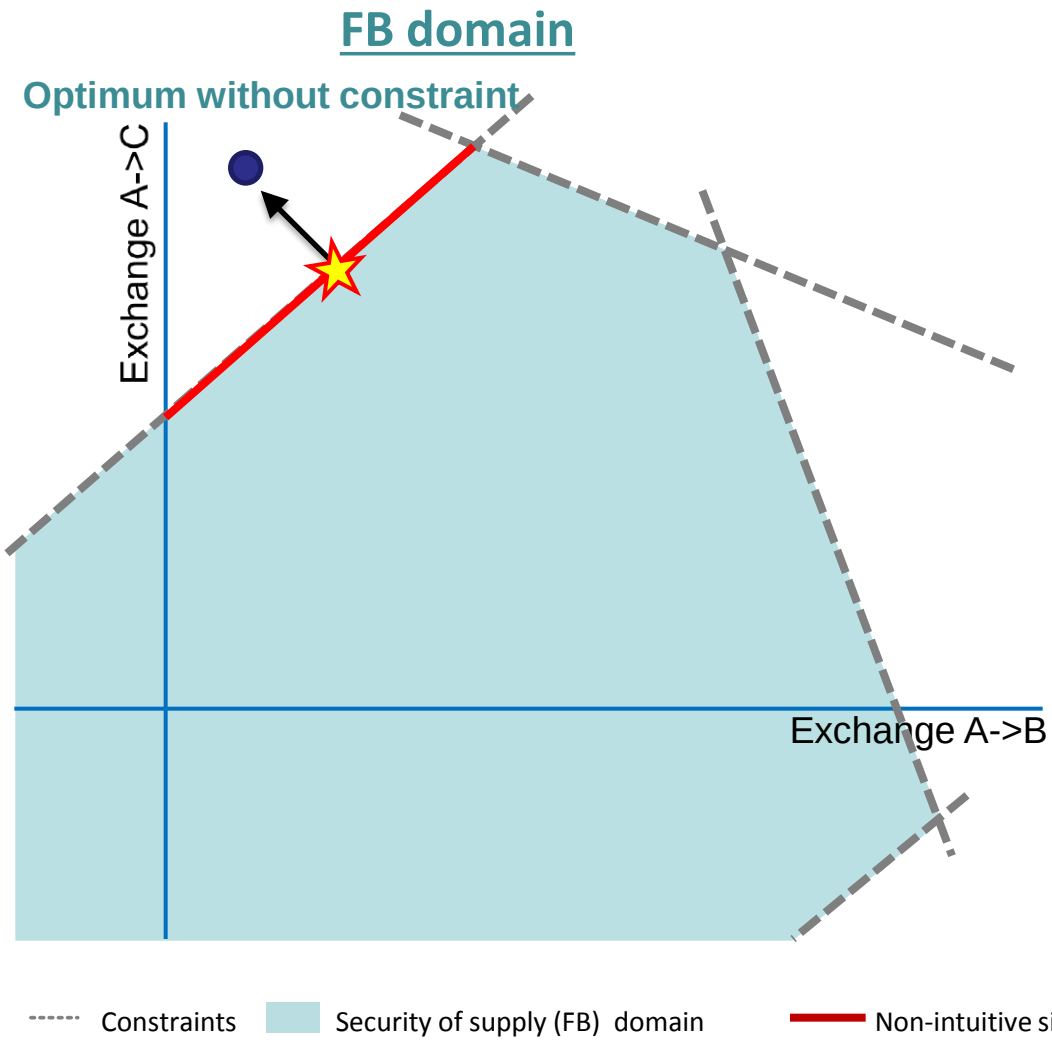
- *Please refer to the Intuitiveness Report, 2012.*

And in practice?

Observation of non-intuitivity

- During the external parallel run, **87 non-intuitive cases** have been found, out of the 1152 hours ➔ i.e. non-intuitive cases in less than 7.6% of the time
- 58 of those cases appeared on just five days
- Smaller countries are more impacted: predominantly Belgium and Netherlands were involved in the non-intuitive exchanges (e.g. the cheapest country and importing or most expensive and exporting)
- Less than 5% of the gain from the switch from ATC MC to FB “plain” MC is lost if FB “intuitive” MC is chosen
- 65% of the losses were on two days: January 28th (20%, 114k€) and February 25th (45%, 258 k€).

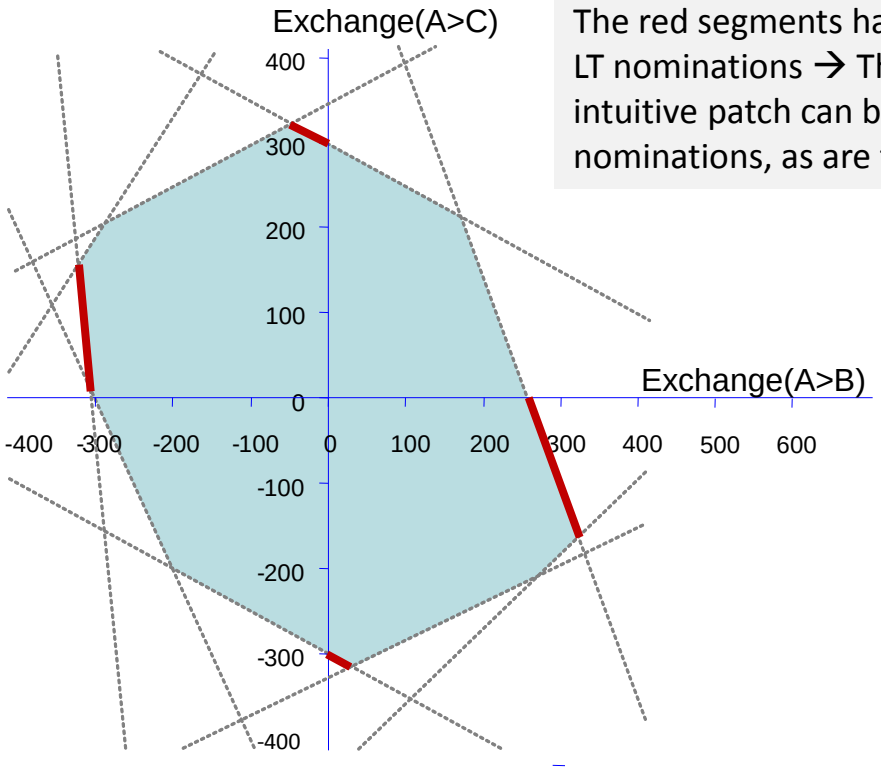
Graph: FB domain + non-intuitive situations



- Why would a market outcome on the red line correspond to a non-intuitive situation? Because:
- Increasing **A→B** frees capacity for **A→C** exchanges
- Consider the market outcome illustrated by the star
  - Here mcp(B) < mcp(A) < mcp(C)
  - More welfare can be obtained in the direction of the black arrow
  - No welfare gains can be expected in the feasible region: if one existed, that would have been the market outcome
  - I.e. apparently it is not favorable to exchange more on **A→B** : this flow therefore must be adverse

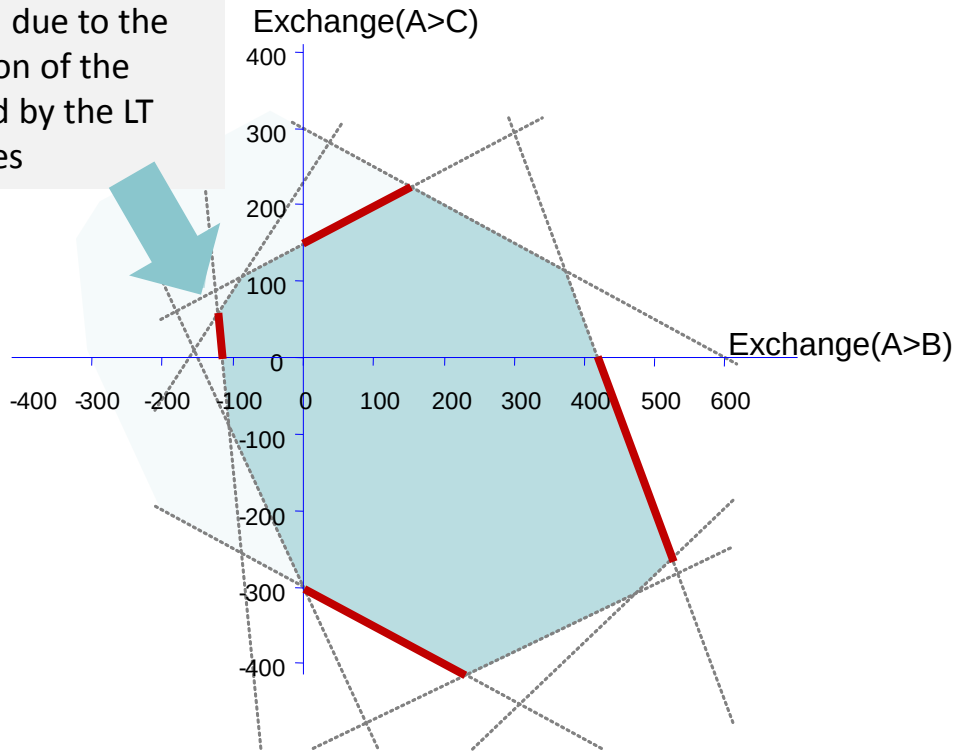
FB intuitive in interaction with LT and ID

FB domain before LT nominations



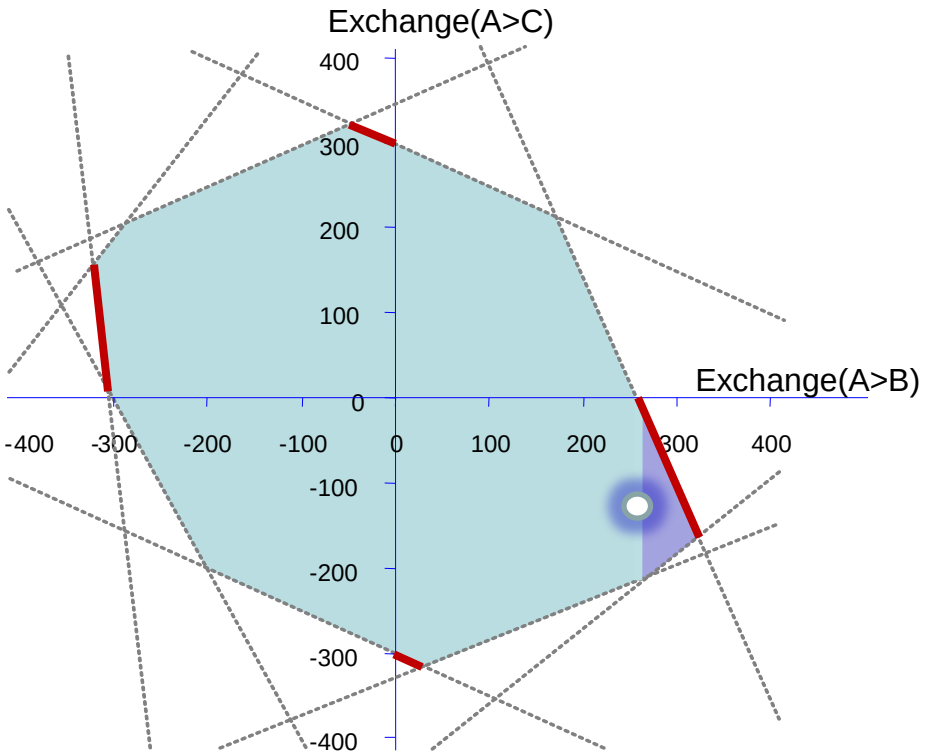
The red segments have changed due to the LT nominations → The application of the intuitive patch can be influenced by the LT nominations, as are the DA prices

FB domain after LT nominations



Constraints | Security of supply domain | Non-intuitive situations

Application of the intuitive patch and interaction with ID



- When enforcing intuitive market results, the FB domain is restricted and capacity is blocked
- The "blocked capacity" which is not used in the DA market could be fed into the ID market

→ **new (artificial) source of ID capacity increase**

Constraints
Non-intuitive situations
"blocked" capacity
Security of supply domain
Market clearing point

Hybrid Coupling: introduction

- CWE Project is not a standalone project and needs to **be fully integrated in the European market**
- Compatibility with neighboring regions using the ATC method has been ensured:

  CWE FB MC Go Live will start with a standard hybrid solution while keeping the opportunity to move to an advanced hybrid solution

- These two solutions are described in the following slides

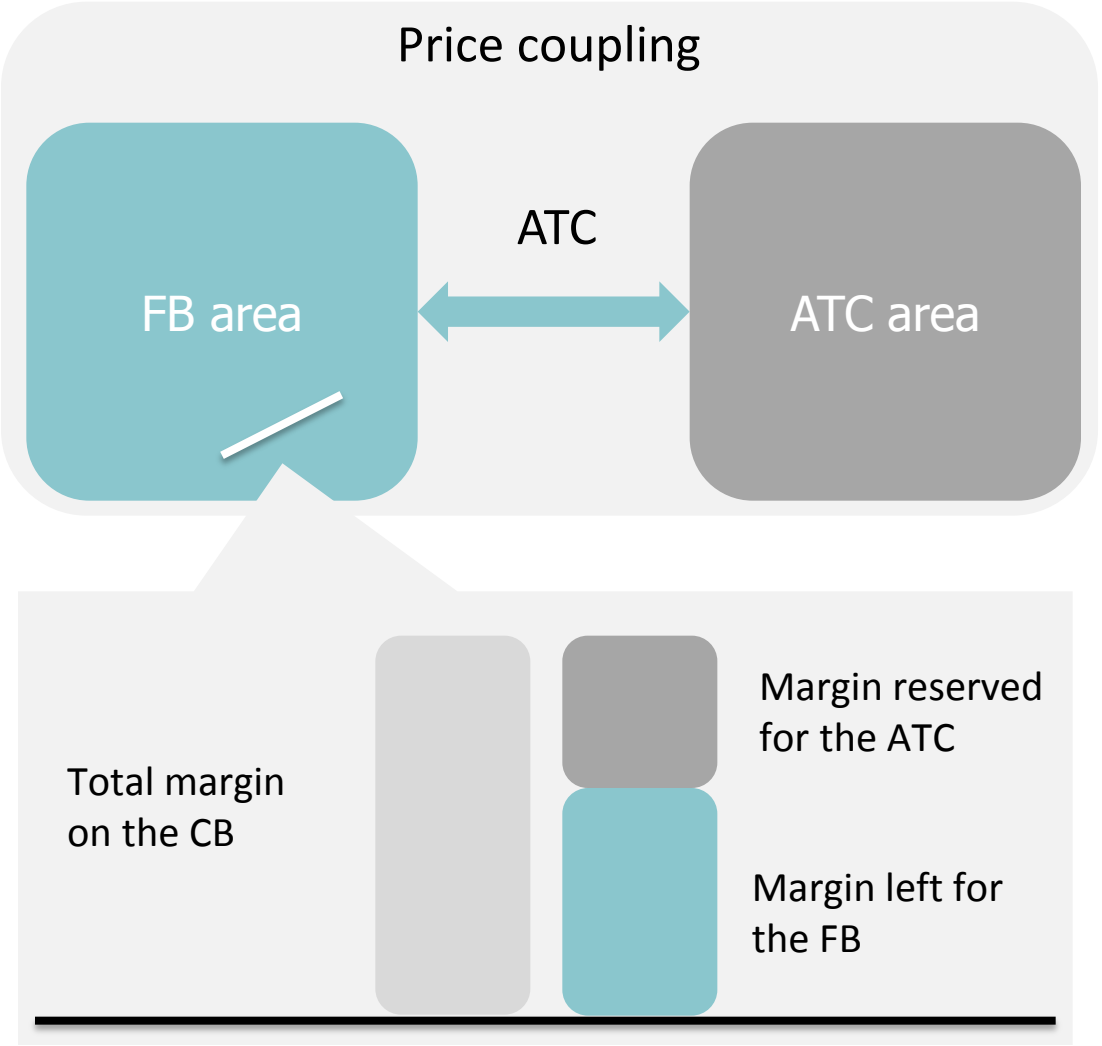
Hybrid Coupling

How deal with FB in CWE region and ATCs outside this area?

Hybrid coupling, two variants

1st variant: Standard

- Realized ATC transactions are not 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



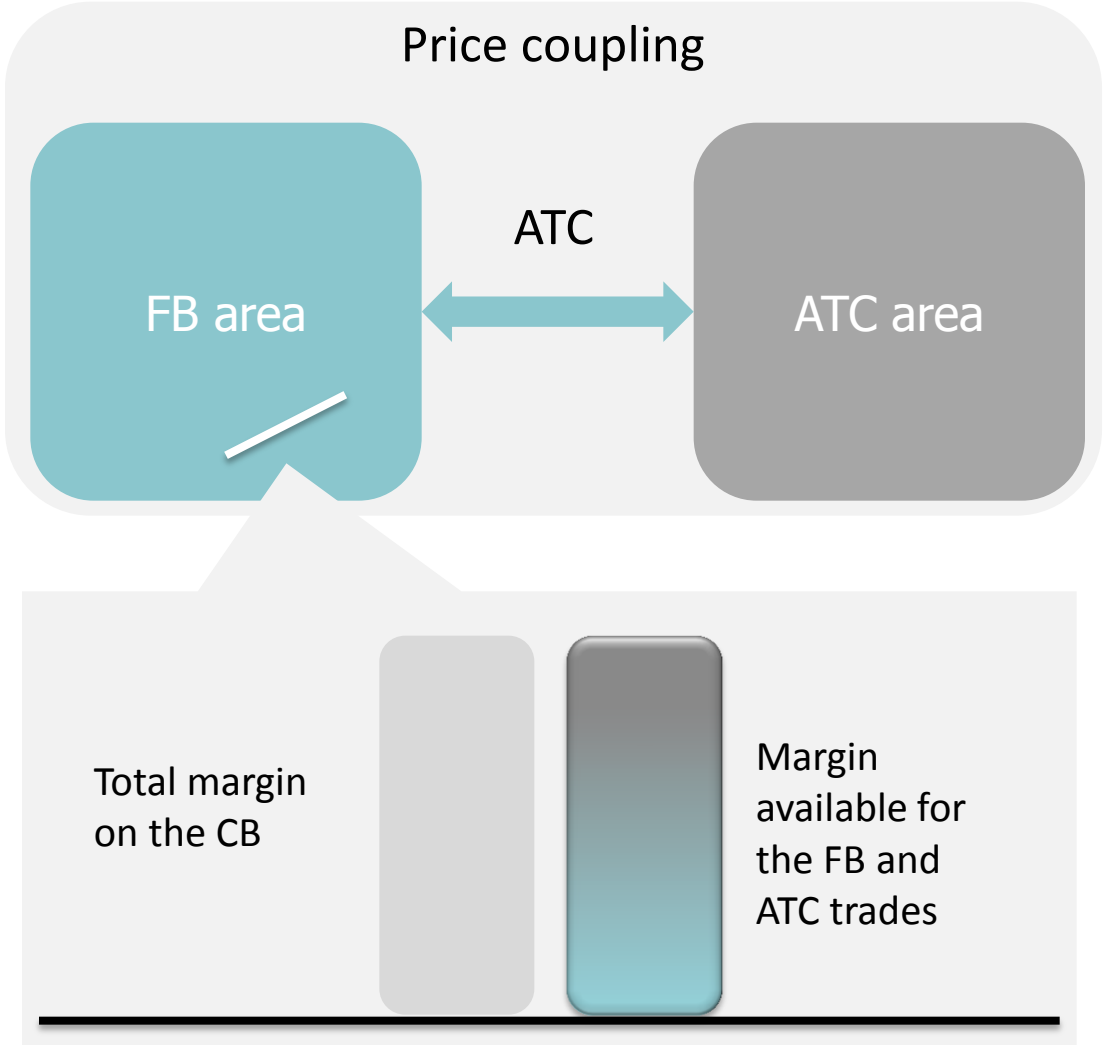
Hybrid Coupling

How deal with FB in CWE region and ATCs outside this area?

Hybrid coupling, two variants

2nd variant: Advanced

- Realized ATC transactions are taken into account in the margin of the CBs ➔ TSOs do not 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
  - The connection to the ATC area is subject to FB price properties



Q&A Session

Workshop Session 2:

Parallel run functioning, In-depth analysis of daily results, discussion on interpretation of parallel run results, presentation of utility tool

by Philippe NOURY (RTE), Raphaël BOURGEOIS (Elia), Jürgen Wölpert (Transnet BW) and Yves LANGER (APX-Belpex)

Workshop 2

Agenda

I. **Introduction: the parallel run in practice**

II. **Publication during the parallel run: quick demonstration of Utility Tool & market coupling report**

III. **Explanation of parallel run results: practical cases**

1. "Normal" day and non-intuitive situation
2. Less Welfare in FB than in ATC
3. Negative prices (Christmas and Boxing days)
4. Block orders effect

Practical advise:

- This workshop is meant to be **interactive** and to give room for discussions
- Please feel free to **ask your questions** or to **comment** after each section
- Questions that go beyond the scope of this workshop will be collected and answered via the Q&A Forum afterwards

Introduction

- During the weekly/daily publication process, the published data concerns the previous week/day
- All data will be published in a report including the following information resulting from current ATC based operation and from Flow Based simulation: hourly prices and volumes for all CWE market areas, net positions, graphs on price convergence/divergence and welfare calculations
- Traders will also have at their disposal an **Utility tool** displaying the relevant Flow-Based parameters which will be helpful for their simulations

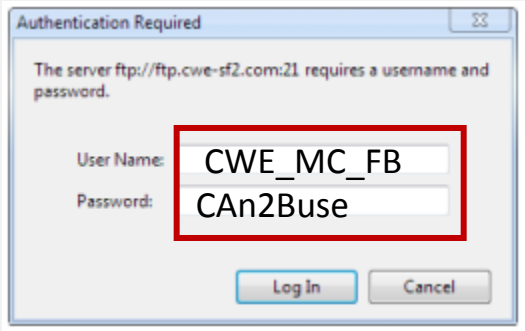
Principles of the parallel run

- During the parallel run, TSOs follow a **true operational daily process** in computing FB parameters
- The process is performed in **real time**, by operators in shift. The process is neither performed nor corrected ex-post by FB experts
- This process encompasses the following main steps :
  - Data gathering : local inputs (CB, GSK) & D2CF merge
  - 1st FB computation, as described in workshop 1
  - Local assessment and coordination between TSOs, possibly leading to an update of some CBs
  - 2nd FB computation with updated CB and adjustment to LT nominations
- At the end of each week, FB experts perform an **assessment of the FB parameters on the basis of quality criteria and detailed operational reports**, and validate the days relevant for transfer to PXs for market coupling simulations based on ATC OBKs. The objective of this assessment is to ensure that the published data is fully representative
- If for any reason (either in the common process or in one of the local TSO process), there is a doubt on data representativeness, then the corresponding day will not be transferred to PXs, and therefore will not be published
- Despite the weekly publication, as TSOs follow an operational daily process, the ex-post computation of FB parameters is not possible, as one cannot reproduce truly an operational process

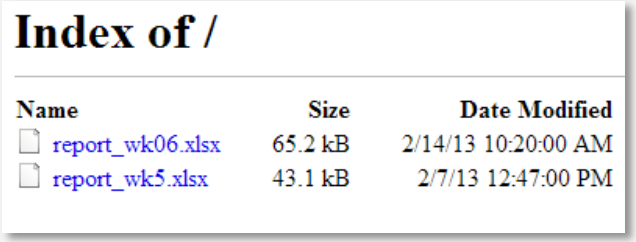
Market coupling reports: access

- Results provided by the Simulation Facility, which couples the Flow Based Parameters with the ATC order books

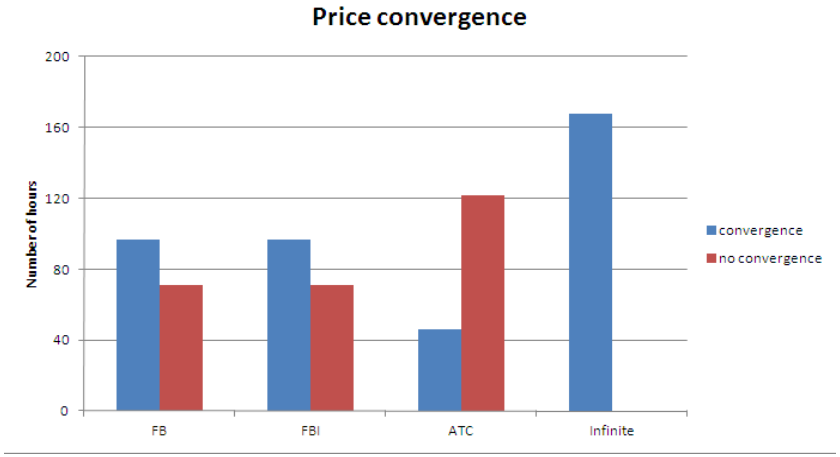
Access FTP for Market Coupling results

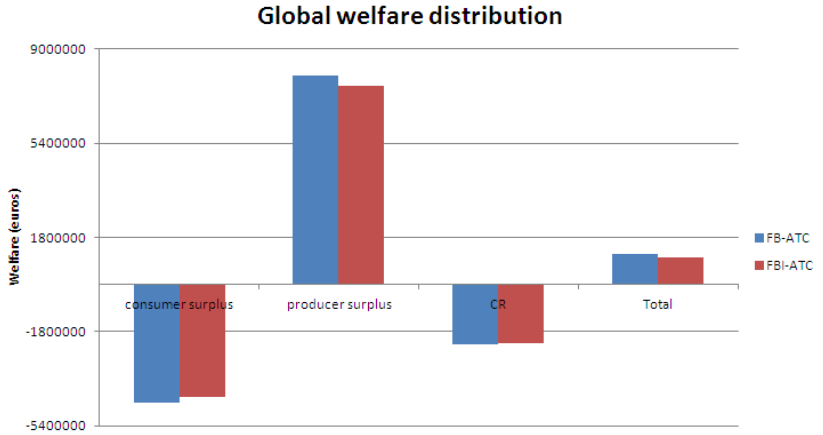


Market Coupling Results



- Typical displays:



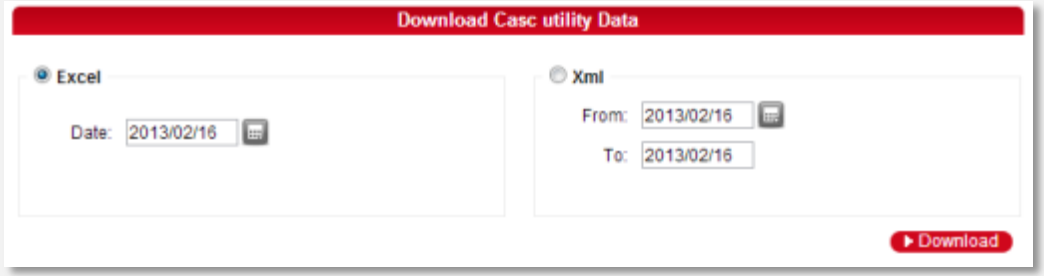


http://www.casc.eu/en/Resource-center/CWE-Flow-Based-MC/Parallel-Run-Results

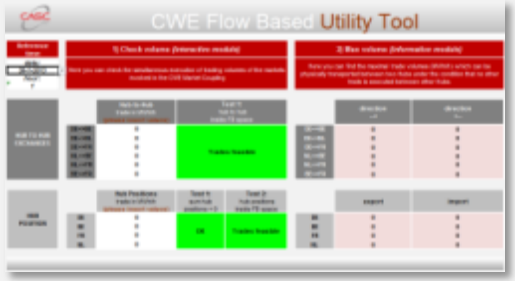
Utility tool: access

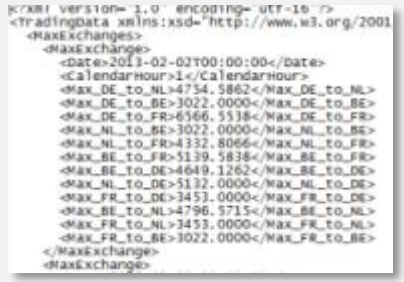
- The Utility Tool provides energy traders the possibility to determine the feasibility of different trades of transmission capacity within the CWE region under Flow Based

Utility tool access



Utility tool (excel based tool)XML files





http://www.casc.eu/en/Resource-center/CWE-Flow-Based-MC/Utility-Tool

Utility tool: front page

- This interface allows to check different simultaneous execution of trading volumes

CWE Flow Based Utility Tool

Reference time:	
date:	2013-02-19
hour:	1

1) Check volume *(interactive module)*

Here you can check the simultaneous execution of trading volumes of the markets involved in the CWE Market Coupling

HUB TO HUB EXCHANGES

	Hub-to-Hub trade in MWh/h (please insert values)	Test 1: hub to hub inside FB space
DE=>BE	0	Trades feasible
DE=>NL	0	
DE=>FR	0	
NL=>BE	0	
NL=>FR	0	
BE=>FR	0	

HUB POSITION

	Hub Positions trade in MWh/h (please insert values)	Test 1: sum hub positions = 0	Test 2: hub positions inside FB space
DE	-2000	OK	Constrained Transmission System
BE	5000		
FR	-3000		
NL	0		

2) Max volume *(information module)*

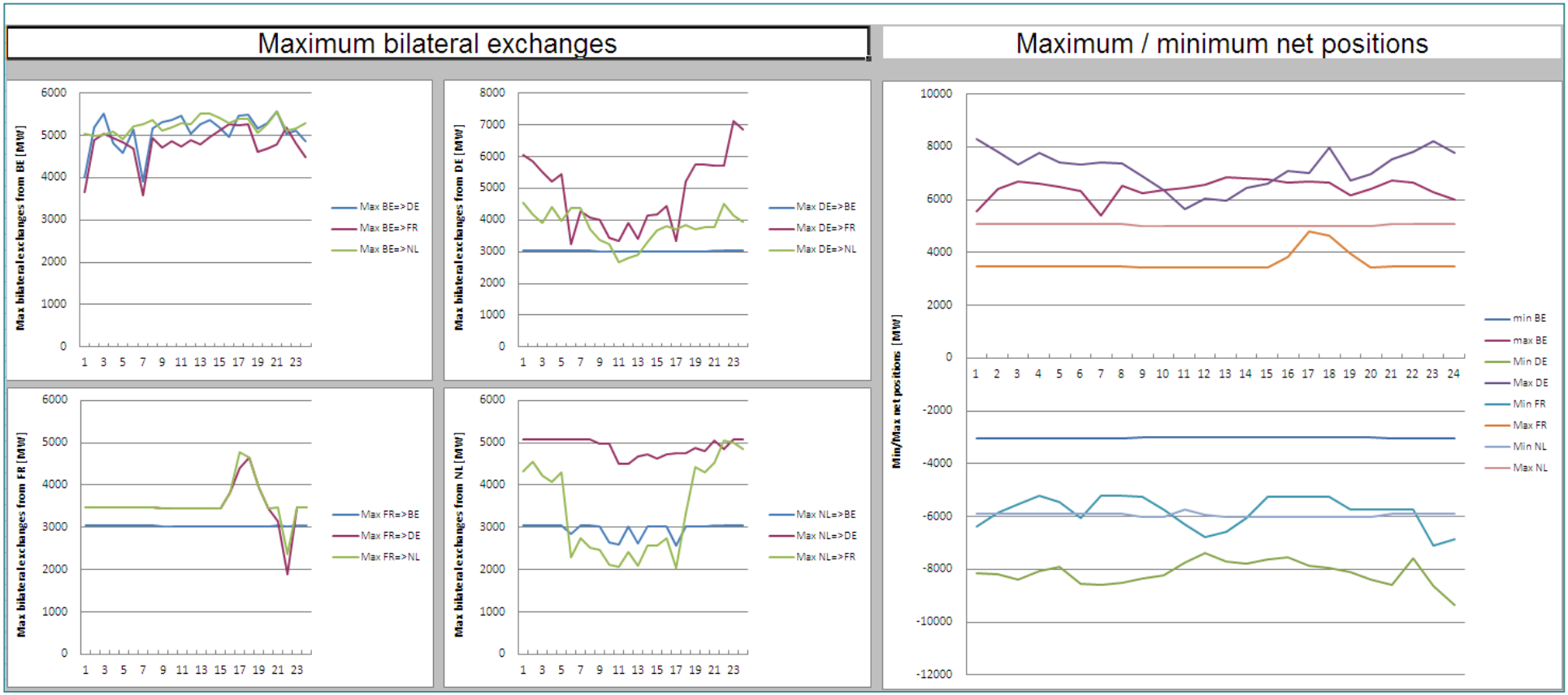
Here you can find the maximal trade volumes (MWh/h) which can be physically transported between two Hubs under the condition that no other trade is executed between other Hubs.

	direction -->	direction <--
DE=>BE	3047	4017
DE=>NL	4531	5085
DE=>FR	6057	3473
NL=>BE	3047	5039
NL=>FR	4313	3473
BE=>FR	3666	3047

	export	import
DE	8296	-8157
BE	5547	-3047
FR	3473	-6391
NL	5085	-5915

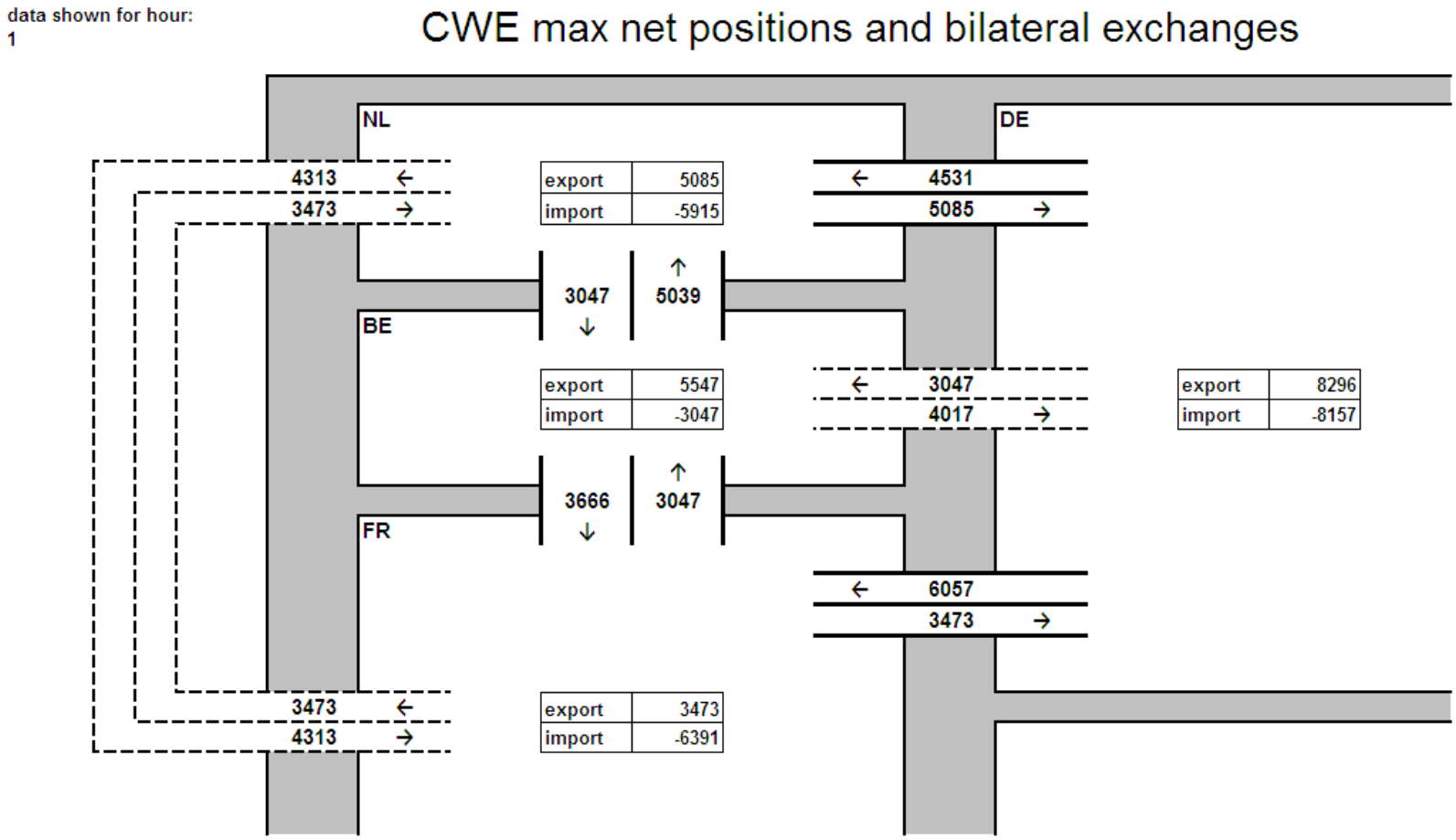
Utility tool: capacity indicators (1)

- The graphs indicate the maximum bilateral exchanges and net positions



Utility tool: capacity indicators (2)

- The graphs indicate the maximum bilateral exchanges and net positions with a geographical representation



Utility tool: FB parameters matrix

- Access to detailed PTDF matrix allowing the identification of limiting constraints

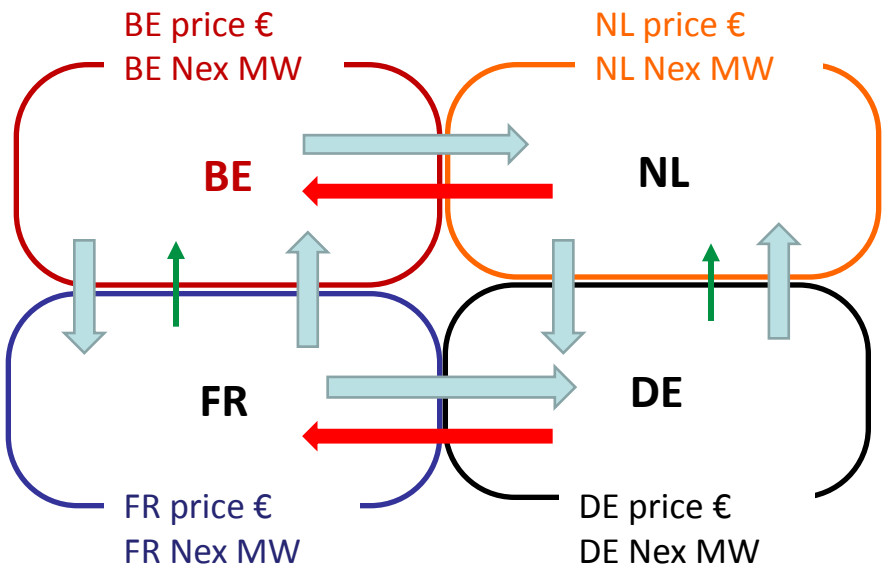
		BE-hub (MW)	DE-hub (MW)	FR-hub (MW)	NL-hub (MW)	Sum			
	Test Hub to Hub	0	0	0	0	0			
	Test Hub Positions	5000	-2000	-3000	0	0			
							Test Hub to Hub	# of constraints violated	Test Hub positions
	ID	BE-hub	DE-hub	FR-hub	NL-hub	RAM (MW)	0		8
hour 1	CB1	0,0964	0,2878	0,1676	0,4691	1554,5103	0		0
	CB2	-0,0384	0,1549	0,0605	0,2335	1045,0837	0		0
hour 1	CB3	-0,0539	0,1443	0,0544	0,1853	915,7149	0		0
hour 1	CB4	0,0400	-0,0470	-0,0467	-0,0303	386,8818	0		1
hour 1	CB5	-0,0964	-0,2878	-0,1676	-0,4691	1877,6497	0		0
hour 1	CB6	0,0447	-0,0491	-0,0580	-0,0216	376,6219	0		1
hour 1	CB7	-0,0040	-0,0408	-0,0181	0,0768	656,2237	0		0
hour 1	CB8	0,0219	0,1373	0,0717	-0,0166	697,1234	0		0
hour 1	CB9	-0,0037	0,0314	-0,0169	0,0509	292,2549	0		0
hour 1	CB10	0,0264	-0,1397	0,0558	-0,0912	844,4923	0		0
hour 1	CB11	0,0000	0,0000	1,0000	0,0000	3473,0000	0		0
hour 1	CB12	0,0000	0,0000	-1,0000	0,0000	6391,0000	0		0
hour 1	CB13	-1,0000	0,0000	0,0000	0,0000	3047,0000	0		0
hour 1	CB14	0,0000	0,0000	0,0000	-1,0000	5915,0000	0		0
hour 1	CB15	0,0000	0,0000	0,0000	1,0000	5085,0000	0		0

Focus on parallel run results

Introduction

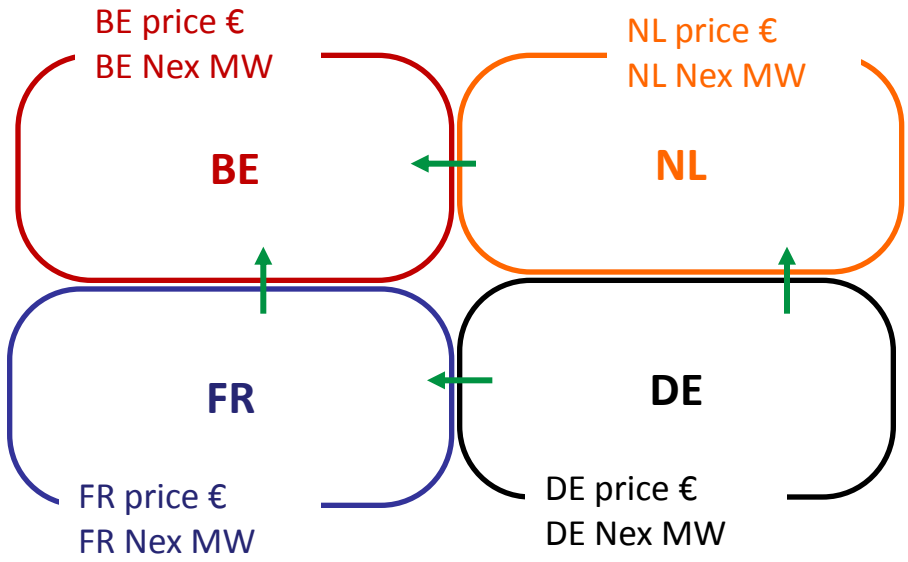
- For our study of practical outcomes of the parallel run, we take the following conventions:

ATC market coupling



FB market coupling

(Congested situation will be indicated by **red exchanges** and different prices)



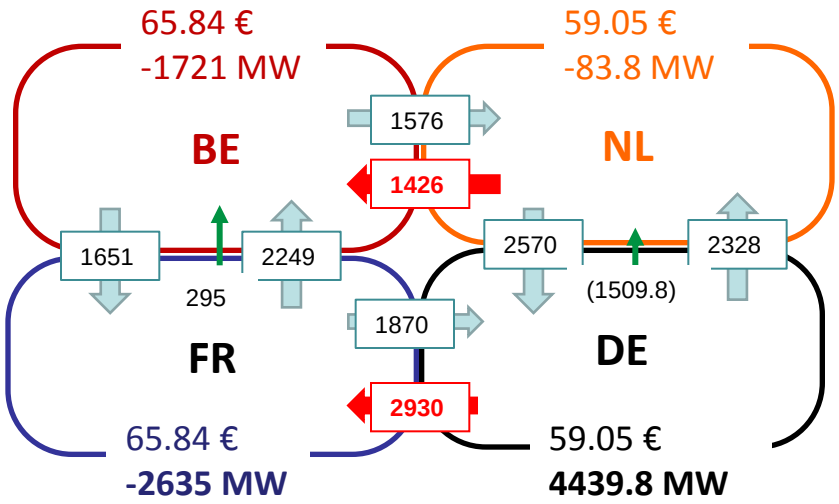
- ***Legend***: .

Focus on parallel run results

Focus Case n°1 : "normal" day (1)

Situation: 25th of January, at 6 – 7 pm

ATC market coupling

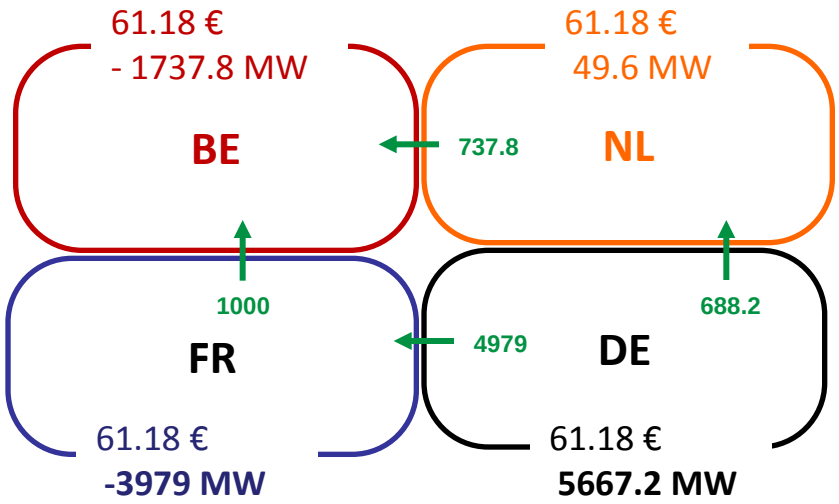


- Congested situation in ATC
- Limiting ATC from Germany to France, and from the Netherlands to Belgium
- Welfare

Producer	Consumer	Congestion Rent
78 583 092.64	88 374 116.77	29577.24

FB market coupling

Note : the decomposition of FB Nex into bilateral exchanges is completely arbitrary



- Unconstrained situation in FB or FBI
- Germany is more able to export, France is more able to import. Prices converge in CWE
- Welfare increase relative to ATC: **€ 4630.10:**

Producer	Consumer	Congestion Rent
78 609 497.83	88 381 918.94	0

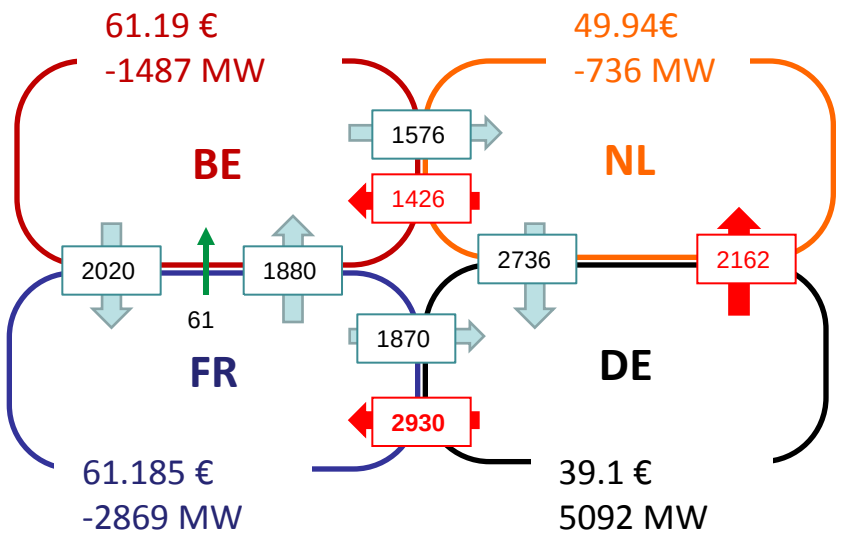
- **Welfare gain from ATC to FB may seem relatively low, but in fact is more a redistribution from TSOs to market parties**

Focus on parallel run results

Focus Case n°1 : "normal" day (2)

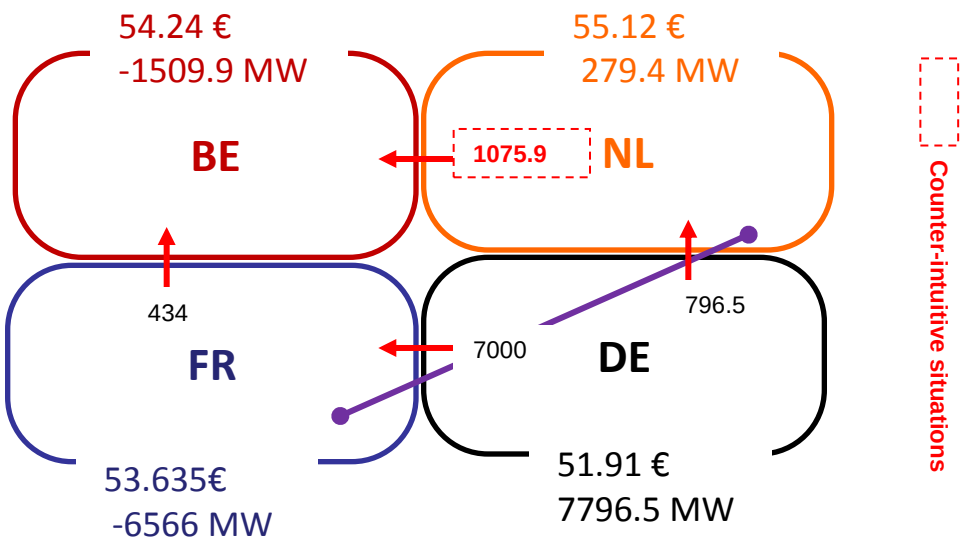
Situation: 25th of January, at 22 – 23

ATC market coupling



- Congested situation in ATC
- Limiting ATC from Germany to France and the Netherlands, from Netherlands to Belgium

FB market coupling



- Constrained situation in FB
- Somewhere in CWE an **"active CB" is limiting the market** (in purple, arbitrarily located)
- However there are **more exchanges and more convergence** (especially from DE to FR), the FB outcome generates more welfare for market parties, less congestion rent
- The situation is **non-intuitive**. NL is exporting while the most expensive, FR and BE are importing while cheaper than NL

Focus on parallel run results

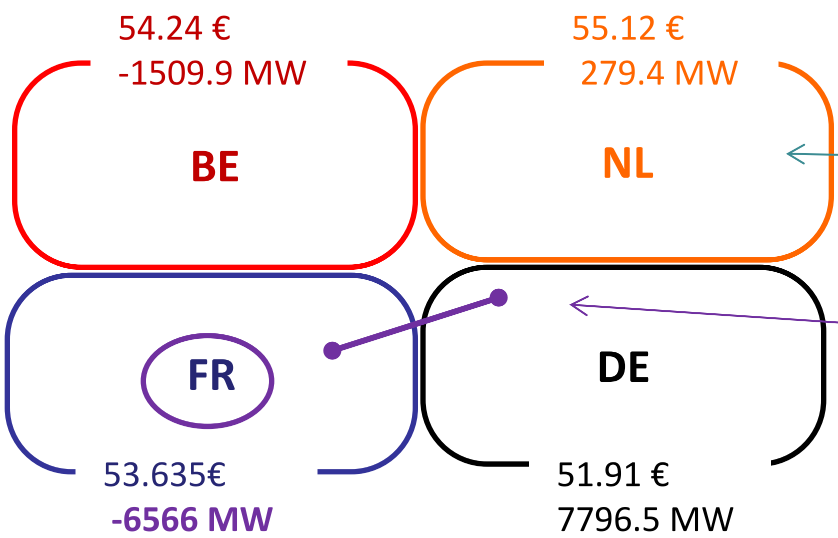
Focus Case n°1 : "normal" day (2)

Situation: 25th of January, at 22 – 23

- Identification of the active CB in Utility Tool

HUB POSITION		Hub Positions trade in MWh/h (please insert values)	Test 1: sum hub positions = 0	Test 2: hub positions inside FB space		export	import
	DE	7796,6	OK	Constrained Transmission System	DE	7867	-7936
	BE	-1509,9			BE	4806	-2905
	FR	-6566,1			FR	3751	-6566
	NL	279,4			NL	5212	-5788

This screenshot from the utility tool actually displays the constrained situation under FB, when slightly higher (0.1 MW) Nex than the ones resulting from the market coupling are put in



This screenshot from the utility tool actually displays the constraining CBS within CWE grid: CBS 14 (location on the sketch is **arbitrary**) & 17

		BE-hub (MW)	DE-hub (MW)	FR-hub (MW)	NL-hub (MW)	Sum			
	Test Hub to Hub	0	0	0	0	0			
	Test Hub Positions	-1510	7797	-6566	279	0			
							Test Hub to Hub	# of constraints violated	Test Hub positions
	ID	BE-hub	DE-hub	FR-hub	NL-hub	RAM (MW)	0		22
hour 23	CB1	0,1186	0,2637	0,1649	0,4005	1271,2055	0		0
hour 23	CB2	-0,0328	-0,1917	-0,3262	-0,1154	1470,7568	0		0
hour 23	CB3	0,1319	0,3379	0,2111	0,4825	1527,0102	0		0
hour 23	CB4	0,02137539	0,20702682	0,12182745	[illegible]	898,9133	0		0
hour 23	CB5	0,0422795	-0,04742679	-0,04672917	[illegible]	332,7545	0		0
hour 23	CB6	0,14277594	0,00896701	-0,07050466	[illegible]	992,1739	0		0
hour 23	CB7	-0,12648636	-0,15727979	-0,25451902	[illegible]	965,8733	0		0
hour 23	CB8	0,04812244	-0,04885248	-0,05769536	[illegible]	371,7152	0		0
hour 23	CB9	0,02809332	-0,15070142	0,06144959	[illegible]	937,3234	0		0
hour 23	CB10	0,01485024	0,23570469	0,14790371	[illegible]	1052,471	0		0
hour 23	CB11	0,05789386	-0,15438622	-0,05990004	[illegible]	1311,0017	0		0
hour 23	CB12	0,0223322	0,12716031	0,06516544	[illegible]	1399,668	0		0
hour 23	CB13	[illegible]	[illegible]	[illegible]	[illegible]	1630,3319	0		0
hour 23	CB14	0,02085058	0,12897177	0,06468859	-0,0202761	543,605	0		1
hour 23	CB15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0		0
hour 23	CB16	0	0	1	0	3751	0		0
hour 23	CB17	0	0	-1	0	6566	0		1
hour 23	CB18	1	0	0	0	2905	0		0
hour 23	CB19	0	0	0	-1	5788	0		0
hour 23	CB20	0	0	0	1	5212	0		0

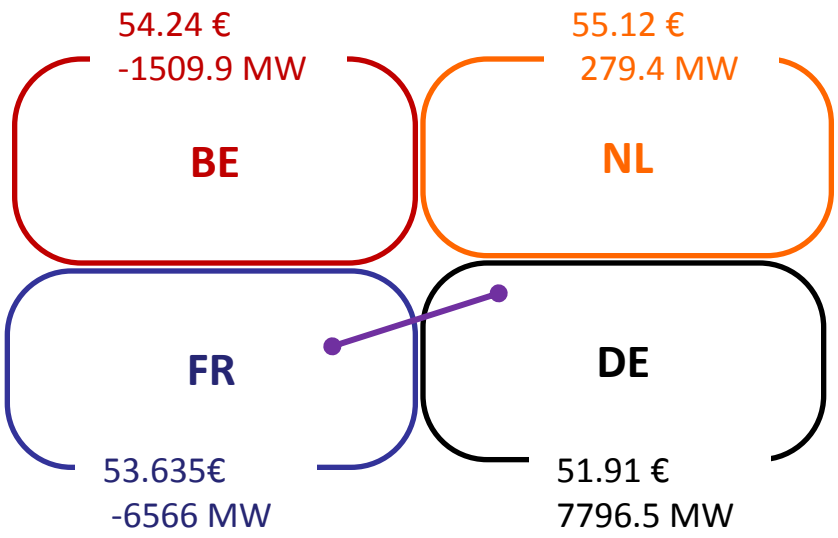
- Constrained situation in FB
- Somewhere in CWE an **"active CB" is limiting the market**
- However there are more exchanges
- One can also note that the situation is **non-intuitive**

Focus on parallel run results

Focus Case n°1 : "normal" day (2)

Situation: 25th of January, at 22 – 23

- Price formation in FB



*One should use the unrounded prices to get this result:

- BE = 54.23602702747
- DE=51.91229355337
- FR=53.63523903896
- NL=55.12

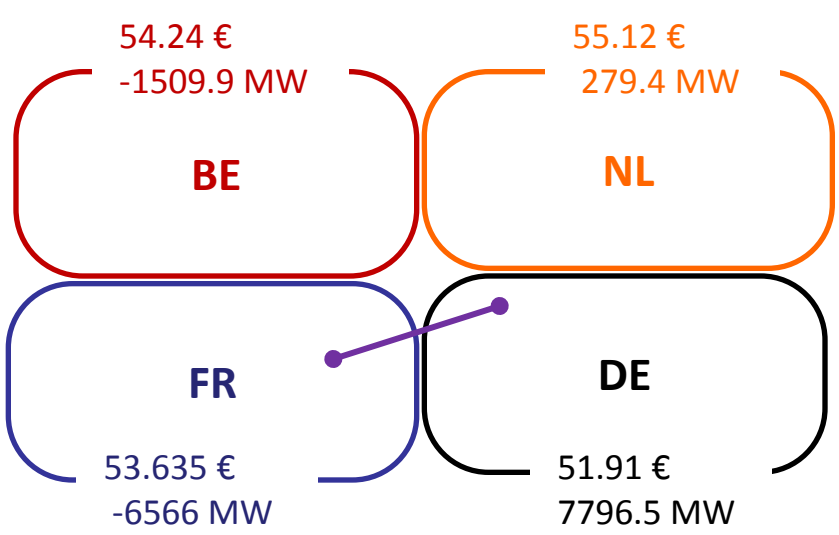
- **Two constraints are active:**
  - Constraint 1: FR import is restricted to -6566MW
  - Constraint 2 has the following parameters :
    - RAM (exhausted) = 543.605 MW
    - PTDF (BE) = 0.02085
    - PTDF (DE) = 0.12897
    - PTDF (FR) = 0.06469
    - PTDF (NL) = -0.02028
- The load on the constraint therefore is:
- (-1509.9) * 0.02085 + 7796.5 * 0.12897 + (-6566) * 0.06469 + 279.4 * 0.02028 = 543.61 (i.e. RAM exhausted)
- **Note that NL is most expensive, yet it is exporting. Why?**
- DE is the cheapest market and wants to export. Imagine the prices are static and we increase RAM by 1MW. Where will DE export its power to? NL or BE?
- DE→BE: 1 / (.12897 - .02085) = 9.249MW, valued (€54.24 – €51.91) * 9.249 = € 21.49*
- DE→NL: 1 / (.12897 – (-.02028)) = 6.700MW, valued (€55.12-€51.91) * 6.700 = € 21.49*
- I.e. there is an equilibrium which only is met at this price level
- NL exports, since it relieves some congestion and allows for this equilibrium to be found

Focus on parallel run results

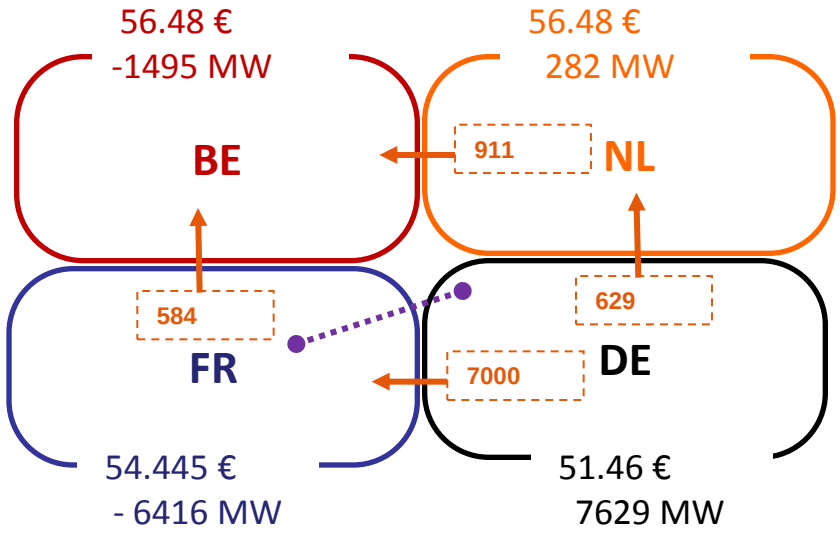
Focus Case n°1 : "normal" day (2'), effect of the intuitive patch

Situation: 25th of January, at 22 – 23

FB market coupling



FBI market coupling

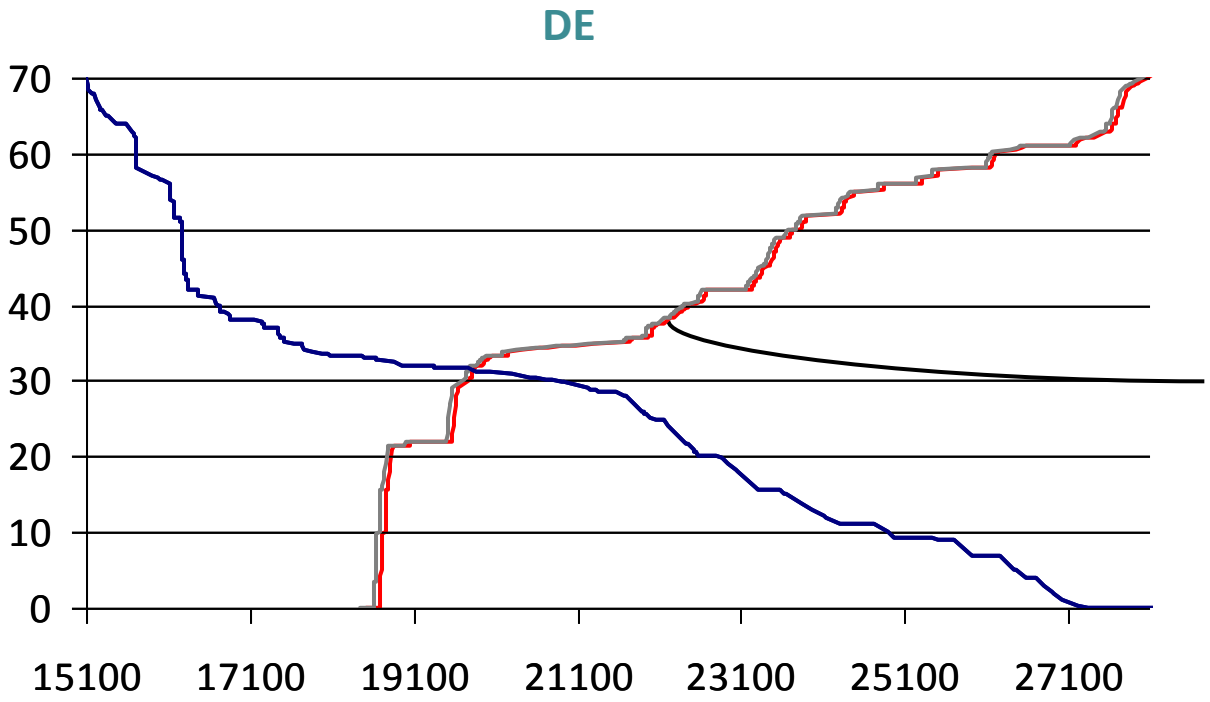


- The situation is **non-intuitive**
- NL is exporting while the most expensive, FR and BE are importing while cheaper than NL

- A situation of **partial convergence** between NL and BE has been created by reducing the import into BE
- A decomposition into bilateral exchanges (arbitrary on the sketch above) from low price to high price is now possible on all borders
- The active CB is "overcome" by an additional intuitiveness limitation

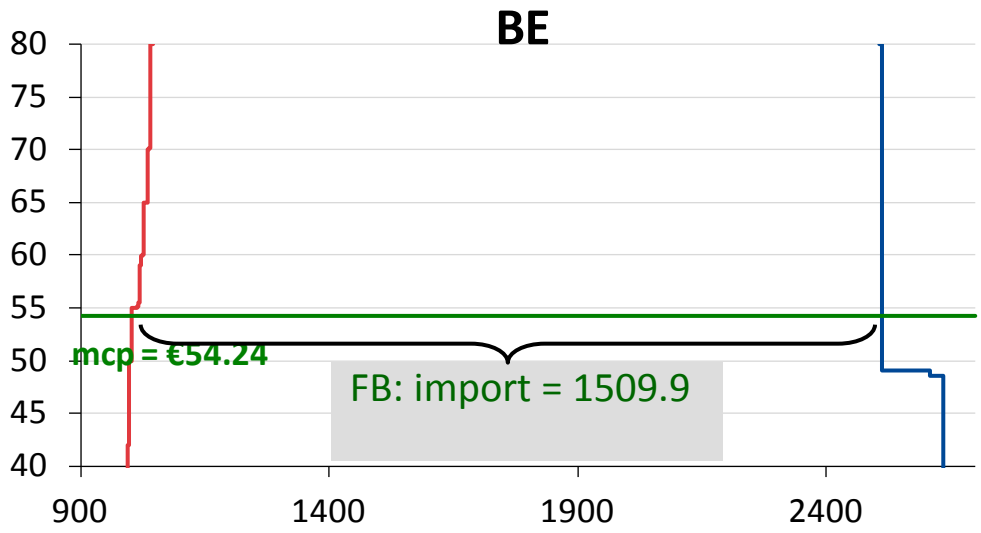
Focus on parallel run results

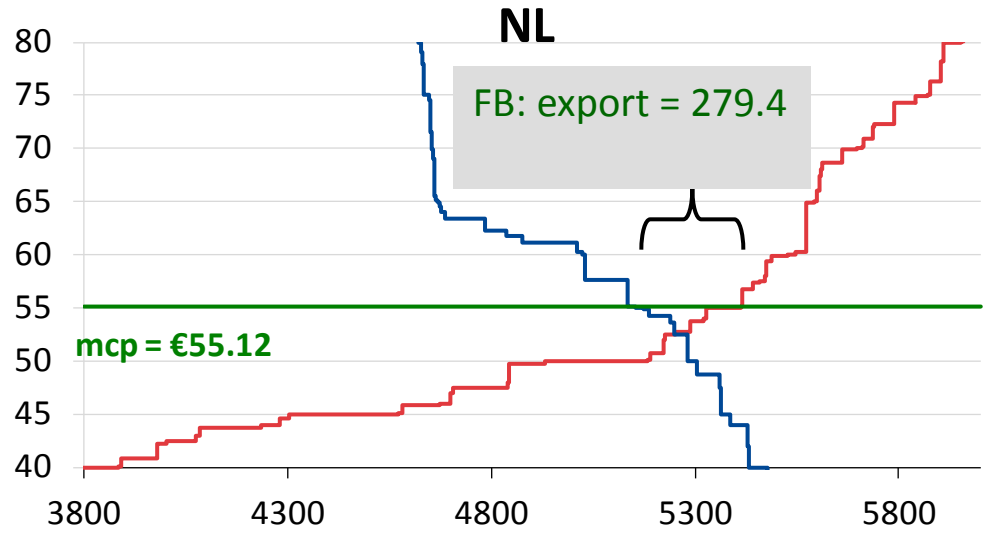
Focus Case n°1 : "normal" day (2'), effect of the intuitive patch

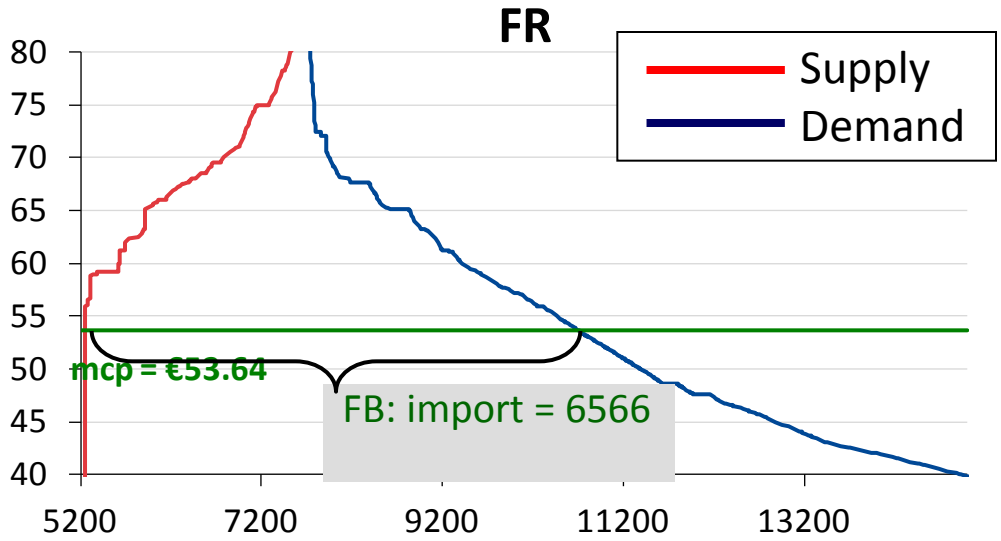


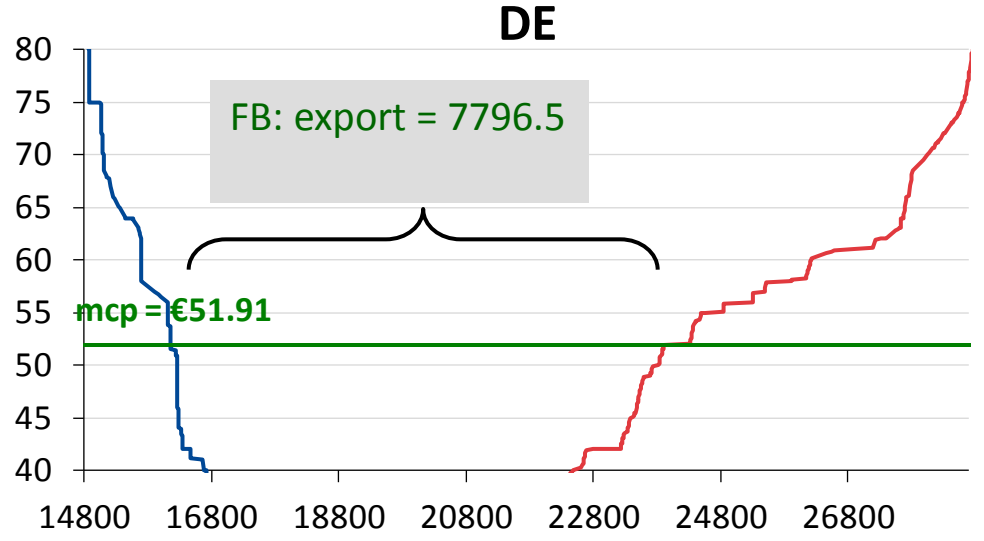
- **Note**: In intuitive FB 70MWh less sell block volume was accepted for DE market. Hence the curve is shifted to the left by 70MWh (i.e. the grey curve)
- Since the effect on prices is very small, in the following slides we will ignore this effect
- For other markets the block volume was identical between the FB and FBI runs

Focus on parallel run results

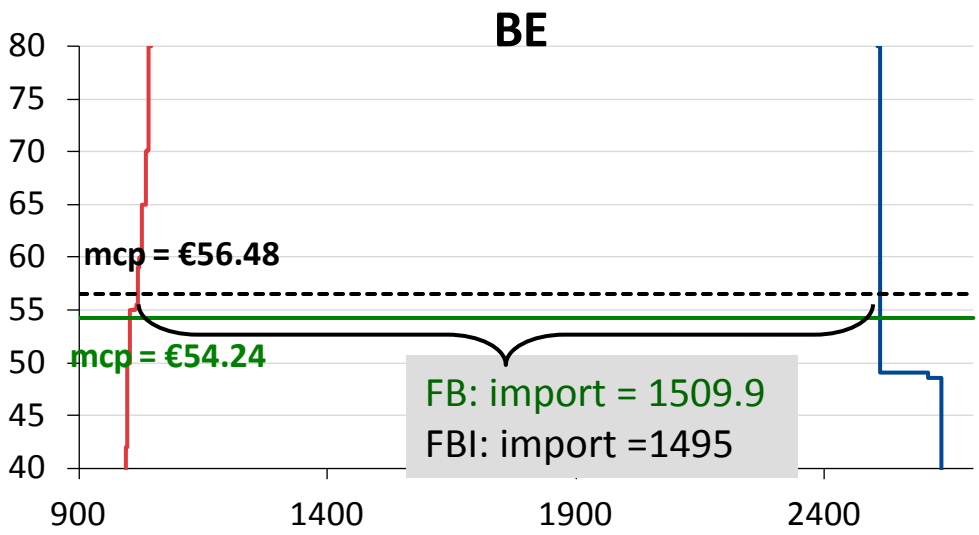


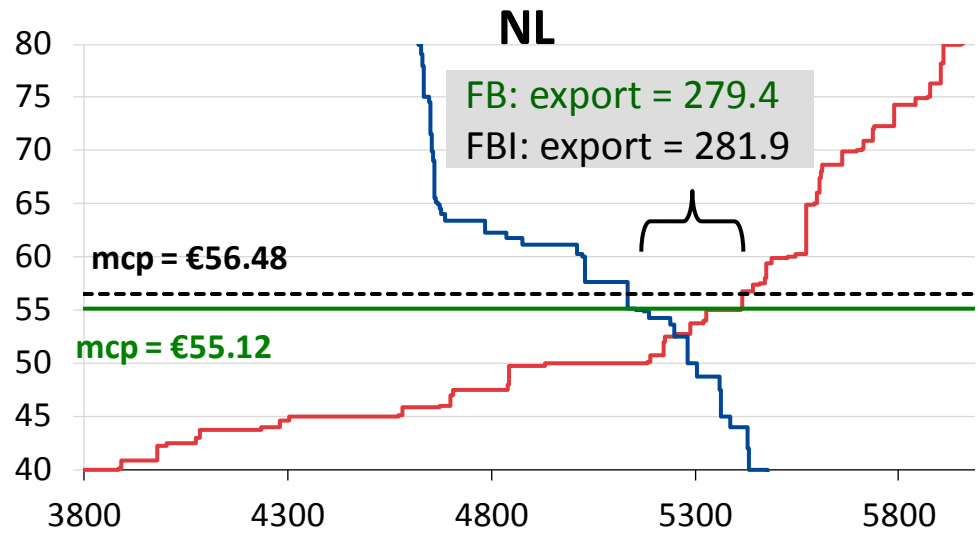


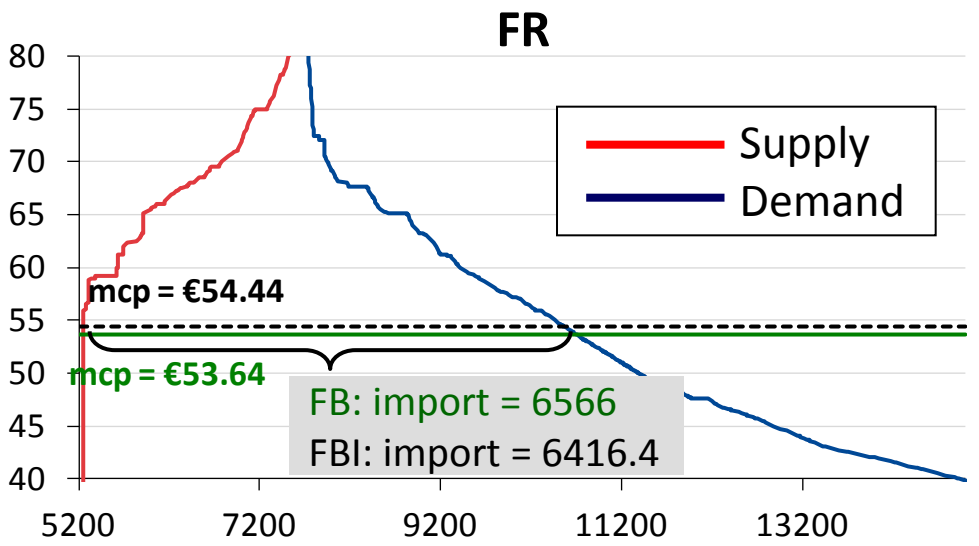


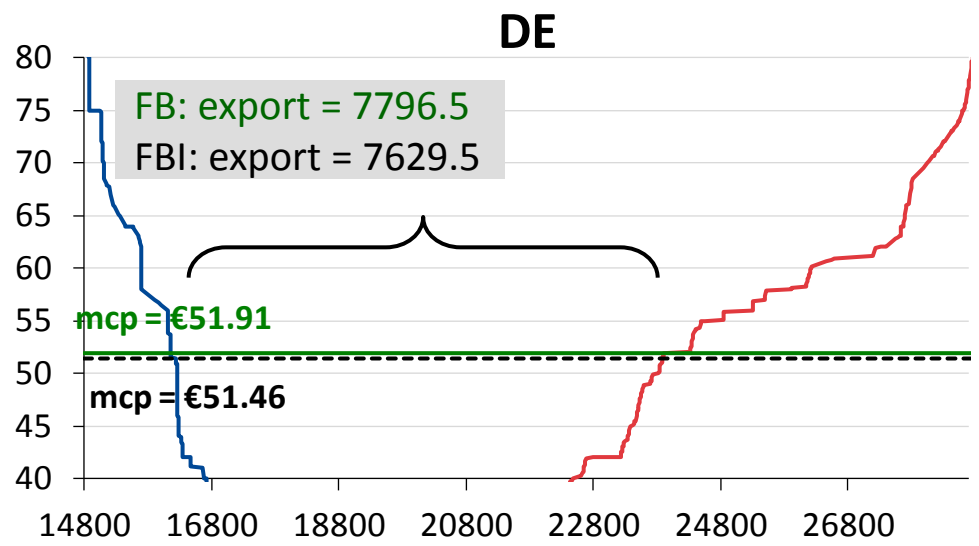


Focus on parallel run results







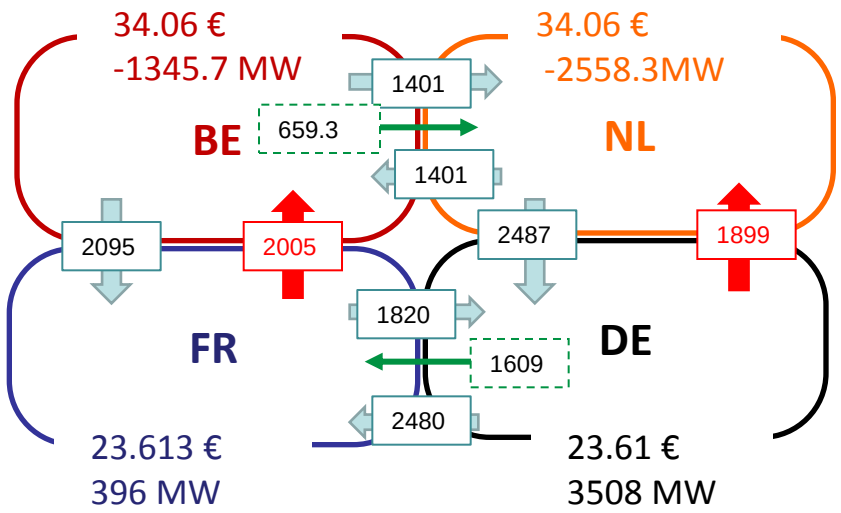


Focus on parallel run results

Focus Case n°2 : "less FB welfare" day

Situation: 2nd of January, at 0 – 1 am

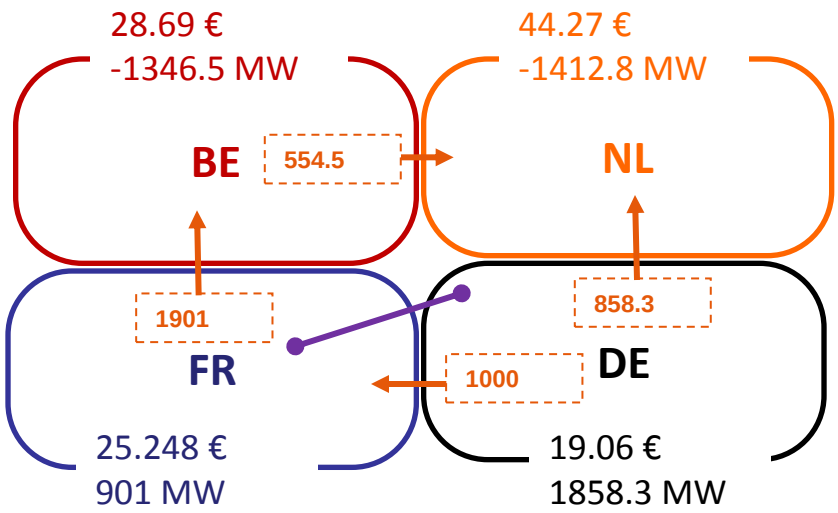
ATC market coupling



- Congested situation in ATC
- Limiting ATC from Germany to Netherlands, and from France to Belgium
- Welfare breakdown :

Producer	Consumer	Congestion Rent
76553006.53 €	74878461.23 €	29084.8 €

FB market coupling



Decomposition of Nex in bilat exchanges is arbitrary on this sketch

- **More Constrained situation in FB or FBI**, less exchanges are happening, prices diverge even more than in ATC (no partial convergence FR-DE and BE-NL)
- Welfare breakdown :

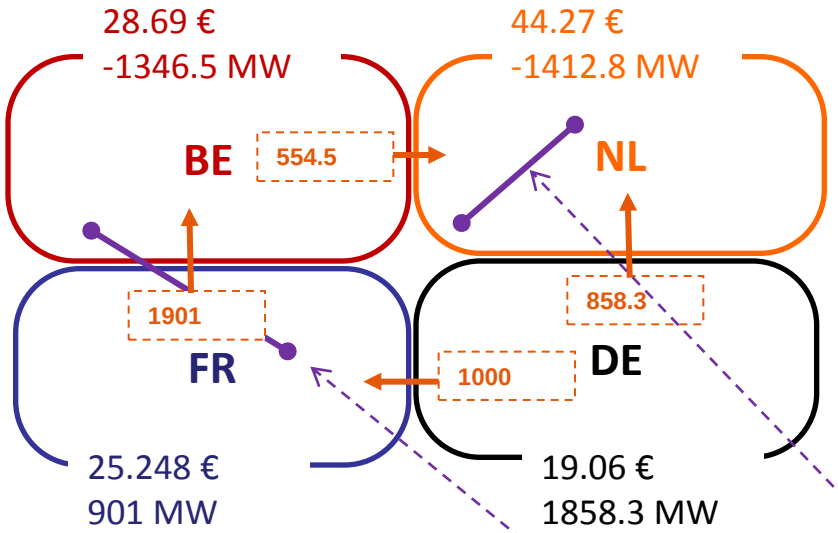
Producer	Consumer	Congestion Rent
76468692.72€	74936173.4 €	42 979.05€

Focus on parallel run results

Focus Case n°2 : "less FB welfare" day (2)

Situation: 2nd of January, at 0 – 1 am

- Identification of the active CB(s) in Utility Tool



When implementing the outcome of **ATC** market coupling, one can see that FB constraints are violated

Reference time:	date: 2013-01-02 hour: 1		
		involved in the CWE Market Coupling	
HUB TO HUB EXCHANGES		Hub-to-Hub trade in MWh/h (please insert values)	Test 1: hub to hub inside FB space
	DE=>BE	0	Constrained Transmission System
	DE=>NL	1899	
	DE=>FR	1609	
	NL=>BE	-659,3	
	NL=>FR	0	
	BE=>FR	-2005	
HUB POSITION		Hub Positions trade in MWh/h (please insert values)	Test 1: sum hub positions = 0 / Test 2: hub positions inside FB space
	DE	3508	OK / Constrained Transmission System
	BE	-1345,7	
	FR	396	
	NL	-2558,3	

		BE-hub (MW)	DE-hub (MW)	FR-hub (MW)	NL-hub (MW)	Sum
	Test Hub to Hub	-1346	3508	396	-2558	0
	Test Hub Positions	-1346	3508	396	-2558	0

	ID	BE-hub	DE-hub	FR-hub	NL-hub	RAM (MW)	Test Hub to Hub 15	# of constraints violated	Test Hub positions 15
hour 1	CB1	-0,0302	-0,1883	-0,3232	-0,1153	1487,1362	0		0
	CB2	0,1002	-0,1253	-0,0728	-0,1344	1178,6491	0		0
hour 1	CB3	-0,0528	0,1589	0,0630	0,2080	1197,5819	0		0
hour 1	CB4	0,0441	-0,0463	-0,0469	-0,0307	478,3745	0		0
hour 1	CB5	-0,0388	0,0467	0,0574	0,0229	326,9354	0		0
hour 1	CB6	0,0193	-0,1037	-0,0707	-0,0805	904,9530	0		0
hour 1	CB7	0,0077	0,0796	0,0338	-0,1178	334,3580	1		1
hour 1	CB8	-0,0117	-0,2304	-0,1482	-0,0125	1577,4757	0		0
hour 1	CB9	0,0656	-0,1575	-0,0613	-0,1882	1275,1738	0		0
hour 1	CB10	-0,0041	0,0699	-0,0144	0,0258	488,4168	0		0
hour 1	CB11	-0,0040	-0,0217	-0,0132	-0,0798	341,8468	0		0
hour 1	CB12	0,0039	0,0585	0,0213	-0,0437	184,3026	1		1
hour 1	CB13	0,0000	0,0000	1,0000	0,0000	4571,0000	0		0
hour 1	CB14	0,0000							
hour 1	CB15	-1,0000							

These constraints can be identified thanks to the "PTDF" sheet of the utility tool.

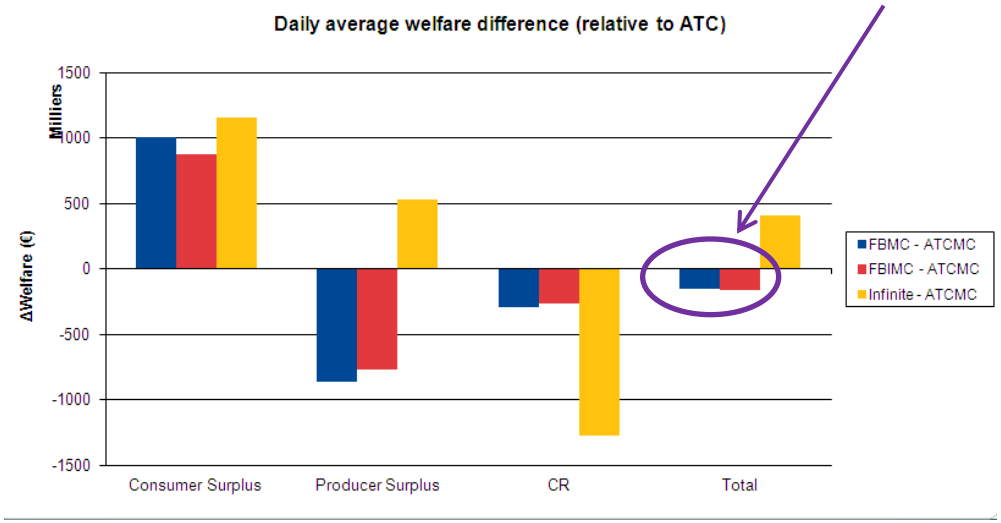
- Constrained situation in FB
- Somewhere in CWE, at least one "active CB" is limiting the market
- The CBs on the sketch above are located **for illustration only**

Focus on parallel run results

Focus Case n°2 : "less FB welfare" day (2)

Situation: 2nd of January

- This situation has been reproduced several times during the day
- As a consequence, **the daily total welfare is lower in FB than in ATC : - 155 k€**



- Social welfare in FB is supposed to be higher, isn't it ?... **What happened ?**
- Either in ATC or FB, TSOs apply the same risk policy when optimizing their capacities...on the basis of the information they have. And the FB methods is much closer to the physics of the grid. This enhanced knowledge can in some occasions (like the one described above) lead TSOs to decrease the capacity, in some market directions, below the levels granted in ATC
- On the other hand, this knowledge facilitates the optimization as TSO have a finer understanding about how to reach the maximum capacity of the grid. We will see in the next example how a better modeling of the grid's constraints eventually leads to a much higher level of provided capacity

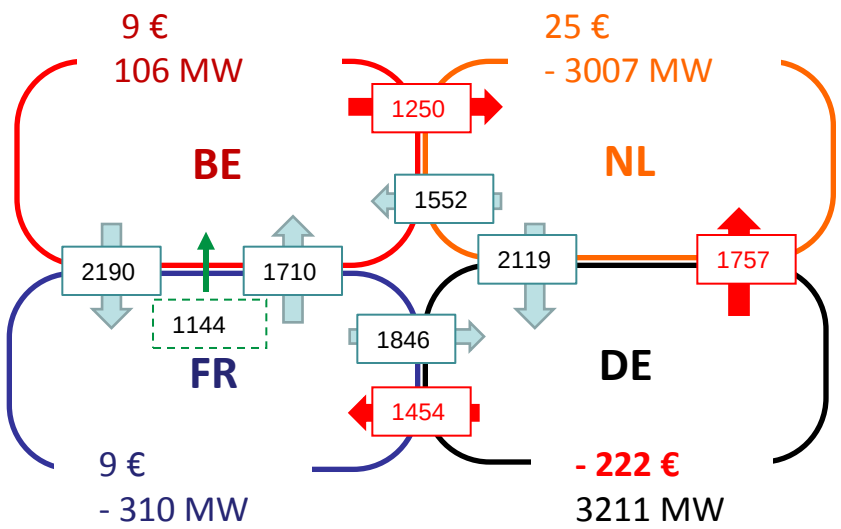
Focus on parallel run results

Focus Case n°3 : "Christmas & Boxing" days

Situation: Christmas day, at 2 – 3 am

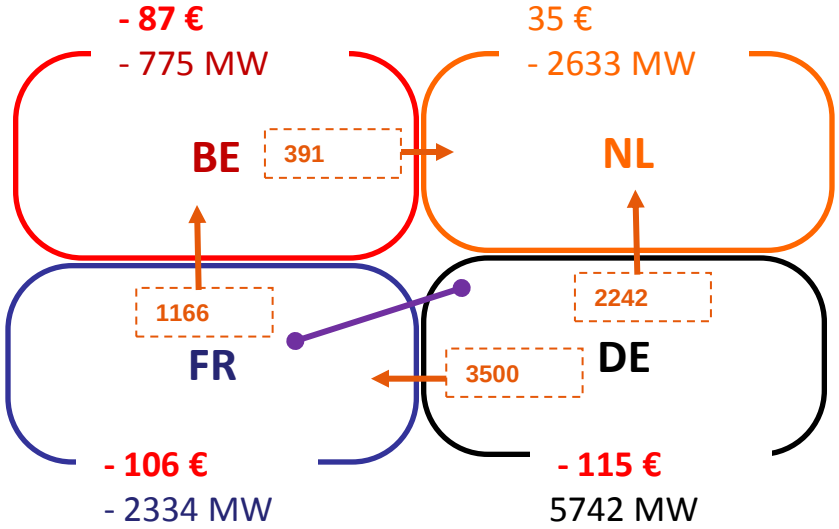
- The situation was remarkable with strongly negative prices in Germany, linked to high wind infeed

ATC market coupling



- Congested situation in ATC
- Limiting ATC from Germany to Netherlands and France, and from Belgium to Netherlands
- Negative prices in Germany only as export capability is limited

FB market coupling



- Constrained situation in FB
- Somewhere in CWE, at least an "active CB" is limiting the market (in purple, arbitrarily located)
- However there are more exchanges (especially from DE), and more convergence, the FB outcome generates more welfare for market parties, less congestion rent. Prices are less divergent, and become negative in FR and BE as well

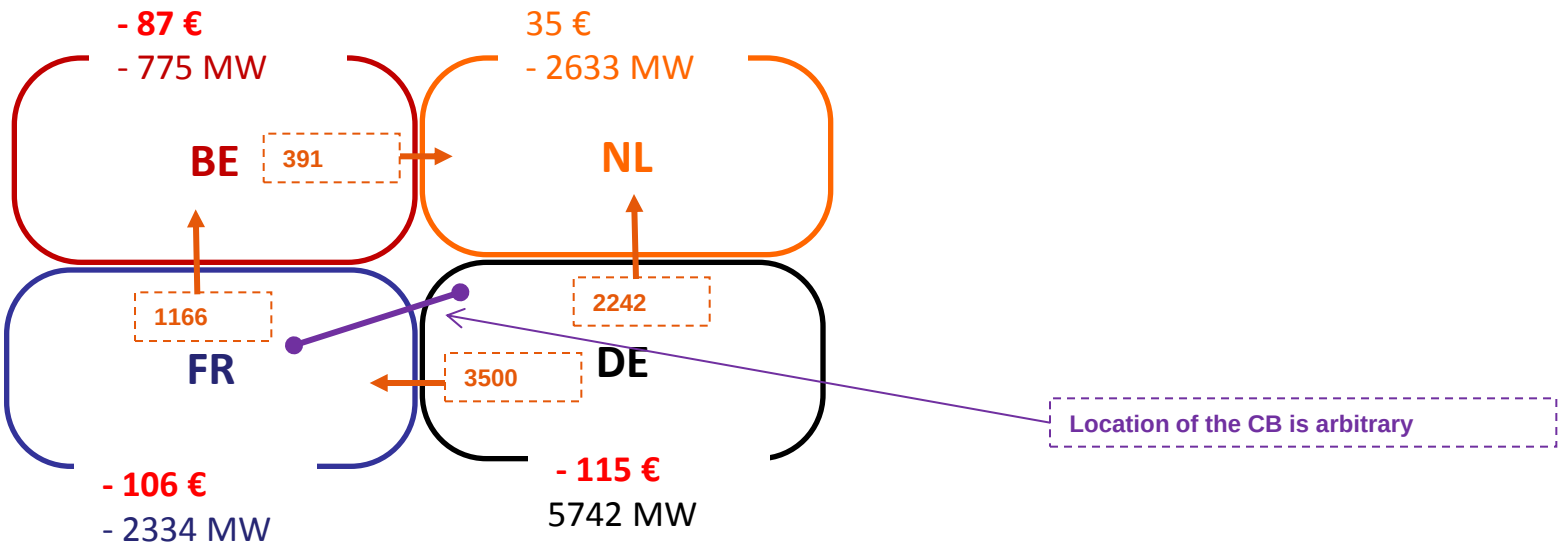
- ***Note**: the external // run had not started at this stage, however CWE partners were finalizing the preparation to be ready for the 1st of January. Consequently, the PTDFs computed this day are representative*

Focus on parallel run results

Focus Case n°3 : "Christmas & Boxing" days

Situation: Christmas day, at 2 – 3 am

- Utility tool is not available on Xmas day, however an active CB in FB has been identified by TSOs



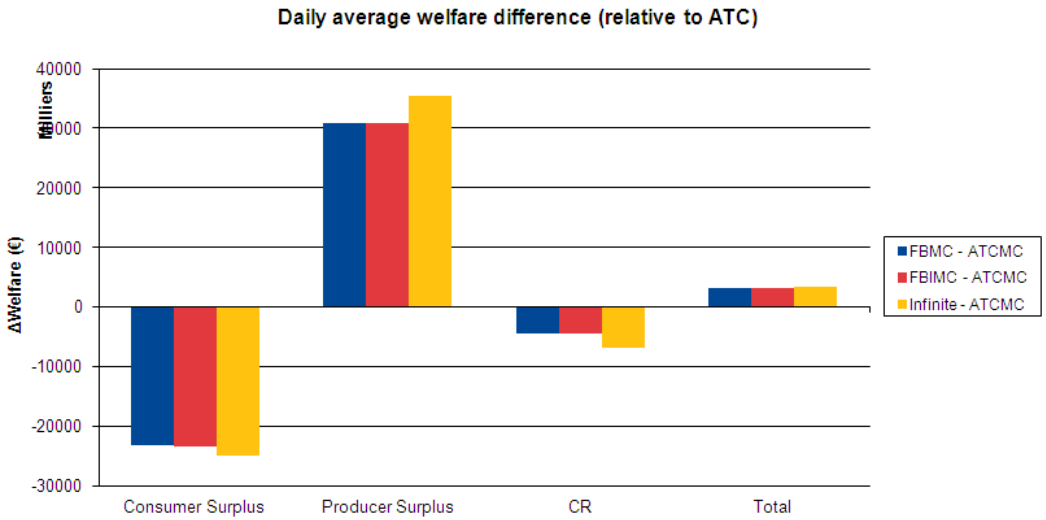
day	TS	BE-hub	DE-hub	FR-hub	NL-hub	RAM
25/12/2012	3	0,0059	0,0762	0,0346	-0,1172	660,5587

Focus on parallel run results

Focus Case n°3 : "Christmas & Boxing" days

Situation: Christmas day

- **The gain of welfare is remarkable : about 3 M€** over the day, essentially benefiting to German producers in this case, an increase due to the enhanced export capability of Germany.
- A comparable situation was observed on the morrow (boxing day)



- This is a direct illustration of the notion introduced in the previous case, but working the other way around. Thanks to a better description of the grid, TSOs have been able to maximize the offered capacity closer to the physical limit, increasing significantly trading opportunities and generating much welfare along the way. This phenomenon is all the more apparent that the operational situation is constrained for TSOs

Focus on parallel run results

Focus Case n°4 : effect of block orders

report_wk04.xlsx

ftp.cwe-sf2.com

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1			FB				FBI				ATC			
2	date	period	BE	DE	FR	NL	BE	DE	FR	NL	BE	DE	FR	NL
123	2013-01-28	1	-1356.1	3722.9	-1743	-623.8	-1356.1	3722.9	-1743	-623.8	-1362	4338	-1557	-1418.6
124	2013-01-28	2	-1341	4022.8	-1745	-936.7	-1341	4022.8	-1745	-936.7	-1344.6	4338	-1419	-1574.6
125	2013-01-28	3	-754.2	3821.3	-1058	-2009.1	-754.2	3821.3	-1058	-2009.1	-754.2	4338	-1198	-2385.6
126	2013-01-28	4	-1668.5	3094.7	857	-2283	-1668.5	3094.7	857	-2283	-1578.5	3011.9	721	-2154.5
127	2013-01-28	5	-1748.5	2905	890	-2046.7	-1749	2904.6	891	-2046.7	-1657.6	3007.9	725	-2075.4

hourlyPrices | mcv_hourly | **nex** | convergence | welfare

1	tolerance	0.01	FB				FBI				ATC			
2	date	period	BE	DE	FR	NL	BE	DE	FR	NL	BE	DE	FR	NL
123	2013-01-28	1	41.56	29.7	36.56	44.9	41.56	29.7	36.56	44.9	37.27	30.63	37.271	37.27
124	2013-01-28	2	39.3	30.92	35.773	41.66	39.3	30.92	35.773	41.66	37.46	31.05	37.465	37.46
125	2013-01-28	3	34.3	30.38	32.65	35.41	34.3	30.38	32.65	35.41	32	30.96	32	32
126	2013-01-28	4	31.25	31.25	31.25	31.25	31.25	31.25	31.25	31.25	33.52	30.74	30.738	33.52
127	2013-01-28	5	29.99	29.35	29.721	30.17	29.99	29.35	29.721	30.17	31.88	29.09	29.09	31.88

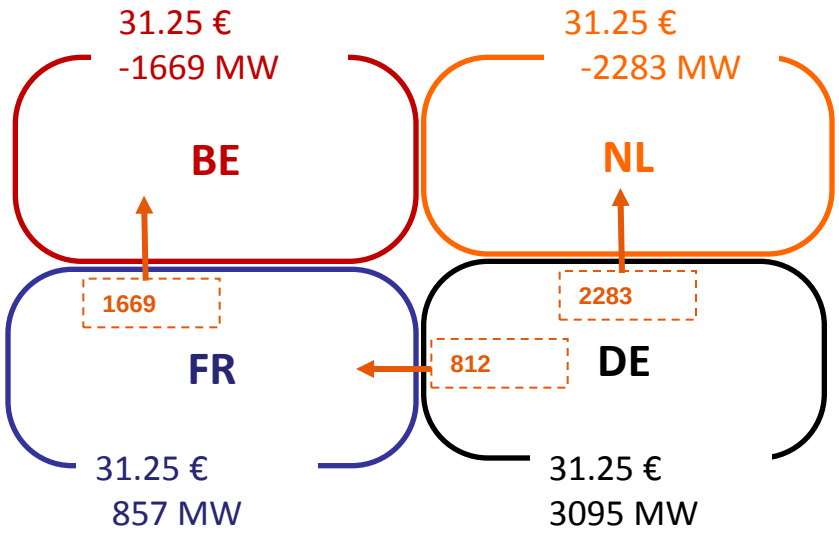
hourlyPrices | mcv_hourly | nex | convergence | welfare

Focus on parallel run results

Focus Case n°4 : effect of block orders

Situation: 28th of January, at 4 – 5 am

- **Example FB result – full convergence**



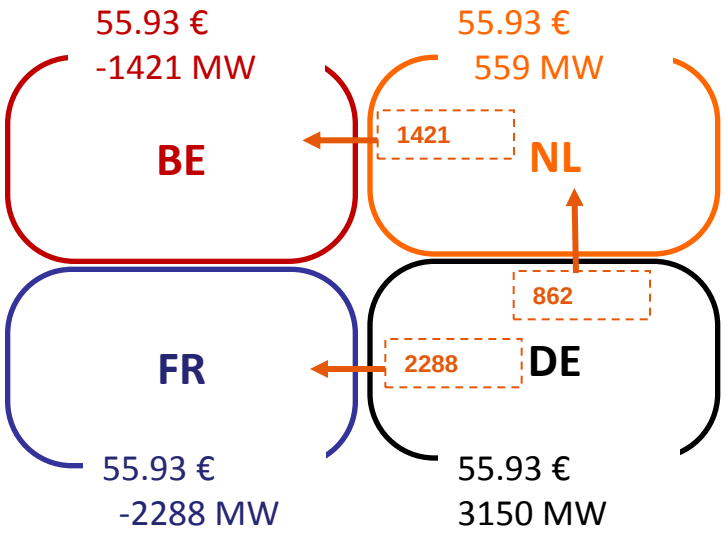
- FBI result is identical to FB result
- MCP = € 31.25
- **As expected**: if FB domain is sufficiently large, CWE behaves as single area. No issue with intuitiveness, so we expect both FB and FBI to provide identical solutions

Focus on parallel run results

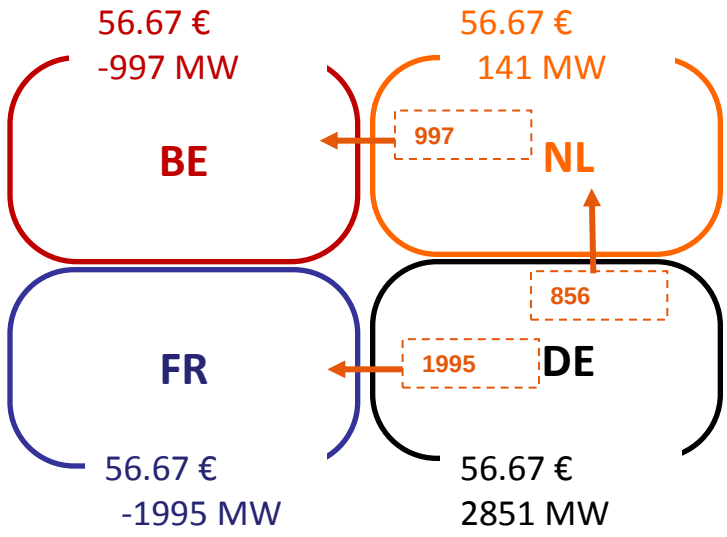
Focus Case n°4 : effect of block orders

Situation: 28th of January, at 10 – 11 am

FB results



FBI results



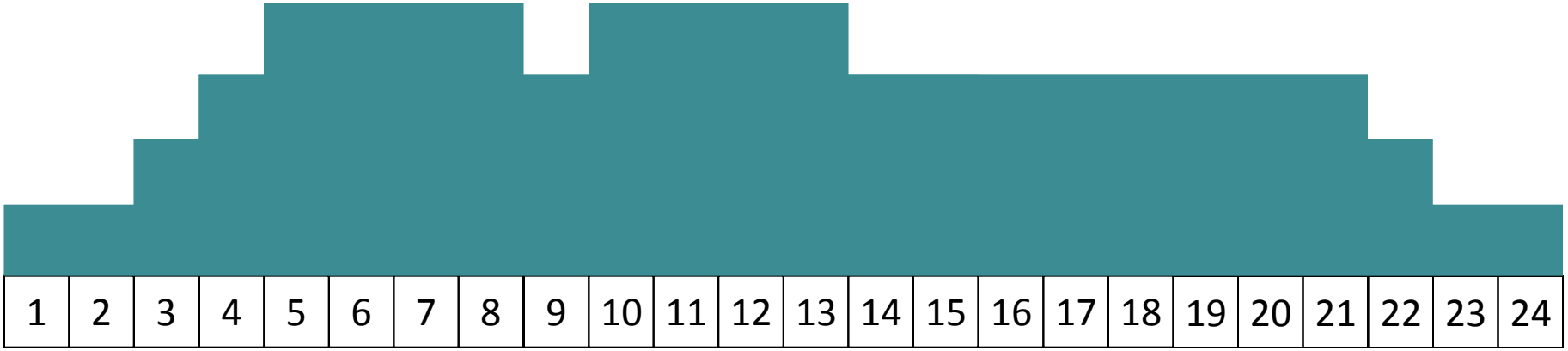
- Neither result congested, i.e. again single CWE price
- MCPs are:
  - FB: € 55.93
  - FBI: € 56.67
- This effect is not a FB effect, but rather a block effect

- Contrary to the intuition of the previous slide there now is a difference. Somehow results from adjacent hours affect the result for this hour: **block orders**

Focus on parallel run results

Focus Case n°4 : effect of block orders

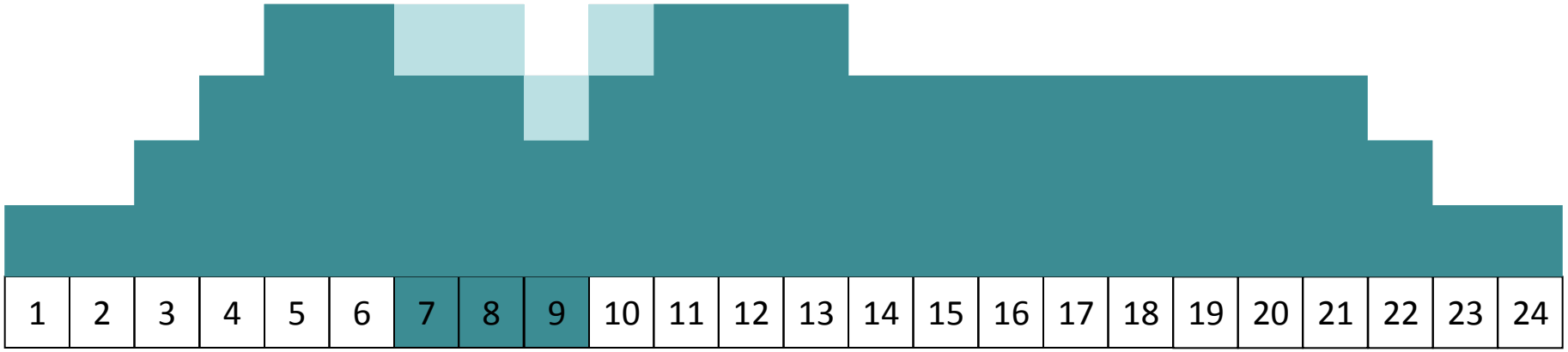
- Imagine the following set of blocks is accepted (across the different areas)
- The following profile results:



Focus on parallel run results

Focus Case n°4 : effect of block orders

- Imagine the prices for hours 7, 8 and 9 change dramatically between FB and FBI
- Under the new prices, block A no longer meets its execution condition
- Consequently the block profile changes:



- This new profile also implies a change for hour 10. Consequently the price of hour changes via the blocks, even though no network constraints were limiting for hour 10 in either FB or FBI

Q&A Session

CWE Project Partners would like to thank you for your attention and participation!