



Status CWE Flow-Based Project

European Market Design Working Group
May 31st 2013



Agenda

Status of FB Project

FB Project Planning

External Parallel Run - Results

Next Steps

Status of FB Project

Launch of the external parallel run

Major milestone in Q1 2013: launch of the external parallel run and the start of the weekly data publication since the 21st of February 2013

Additionally, ex-post results from the 1st of January on have been made available

Each Thursday, project partners publish on CASC's website (<http://www.casc.eu/en/Resource-center/CWE-Flow-Based-MC/Parallel-Run-Results>) the simulation results of the previous week as well as the Utility tool displaying the relevant FB parameters



The screenshot shows the 'CWE Flow Based Utility Tool' interface. It features a red header with the title and two main sections: '1) Load (MW) (forecast)' and '2) Flow (MW) (forecast)'. Below these are several tables and a large green area.

Area	Load (MW)	Flow (MW)
Area 1	1000	500
Area 2	1500	750
Area 3	2000	1000
Area 4	2500	1250
Area 5	3000	1500
Area 6	3500	1750
Area 7	4000	2000
Area 8	4500	2250
Area 9	5000	2500
Area 10	5500	2750
Area 11	6000	3000
Area 12	6500	3250
Area 13	7000	3500
Area 14	7500	3750
Area 15	8000	4000
Area 16	8500	4250
Area 17	9000	4500
Area 18	9500	4750
Area 19	10000	5000

Status of FB Project

Learning curve @ all levels

As the process is not yet fully industrialized, some days are still considered not representative by TSOs. As a consequence, the market results of these days are not simulated in FB/FBI and can not be published.

To answer MP's concerns regarding these days, the project indicates for each of these days, the reason leading to non-publication:

Error type	Explanation
1	The Operators who actually perform the common Flow-Based activities are working in rotating shifts which means that a same company will apply the FB process only once every 6 weeks in average. However, extra training is being provided by TSO's as well as continuous update of operational procedures to avoid these kinds of errors.
2	The FB parallel run is being performed without an industrialized system and relies on local tools (usually Excel macros) which are not always optimal. All local tools will be integrated in a new industrialized system to be delivered in autumn 2013.
3	The prototype has been continuously improved during the internal parallel run. The latest bugs have been corrected and a new version delivered in April 2013. However it remains a prototype which does not have the same robustness, technical support and backup as the foreseen industrialized solution will.
4	The FB process is a more complex system than ATC. Local TSO operators need to adapt and fully integrate the procedures. This is being addressed by reinforced continuous local training .
5	This kind of issue is linked to the fact that FB is a new system which therefore may present some unforeseeable errors in application of the methodology (on a local or more global level). However this type of error is part of the learning curve of the FB methodology.
6	Exceptional: for example clock-changes, inundations ...

Status of FB Project

MP support - Q&A Forum

In addition to the weekly publication, a Q&A Forum has been made available for MPs in order to ask practical questions regarding:

[Flow-Based Methodology](#)

[Operational process](#)

[Flow-Based project](#)

[Discussion on external parallel run data](#)

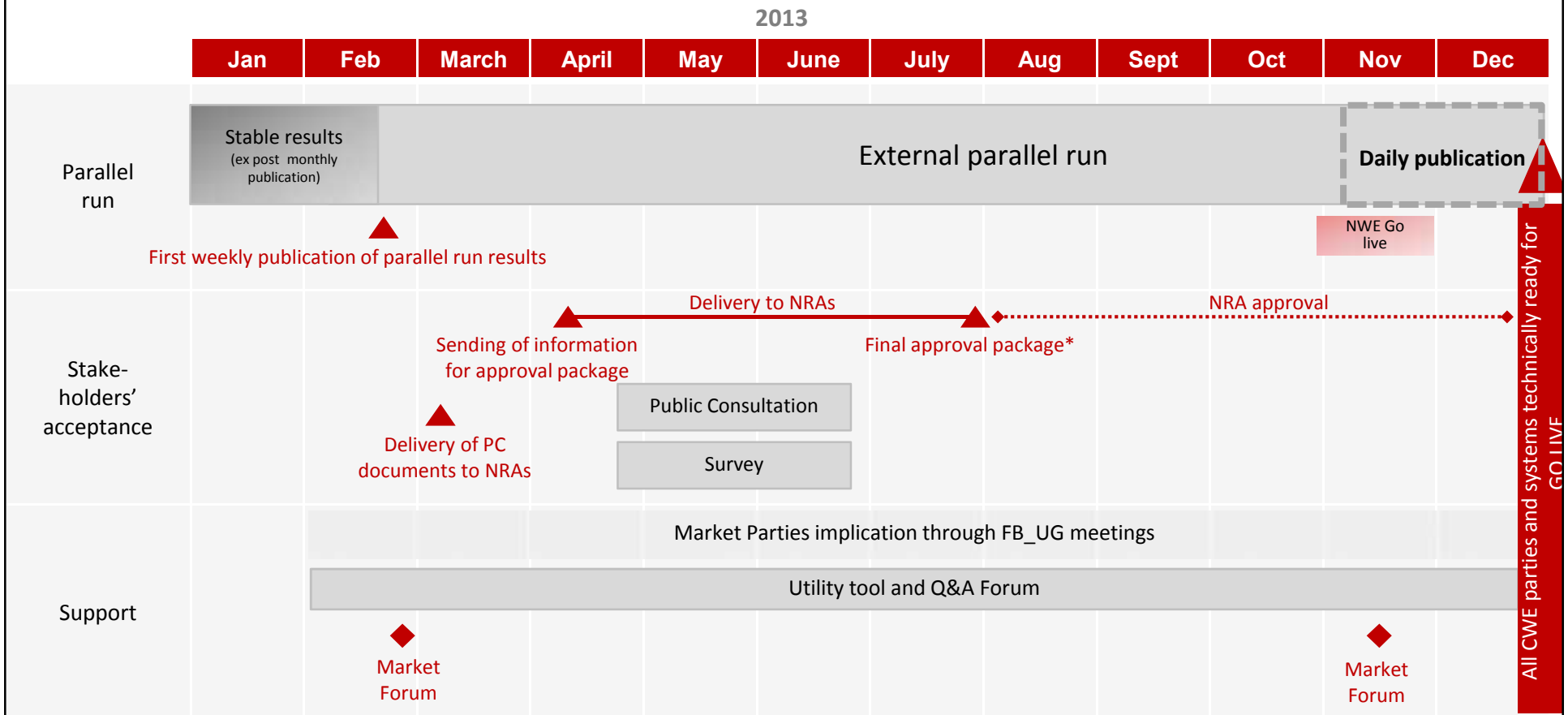
[Utility tool](#)

This platform allows MPs to express their concerns and project partners to better understand MPs' needs

Project Partners ask for your understanding that some tricky or sensitive questions may need a longer reply delay

FB Project Plannig

After the end of the public consultation and survey, the final approval package including your feedback will be submitted to the regulators



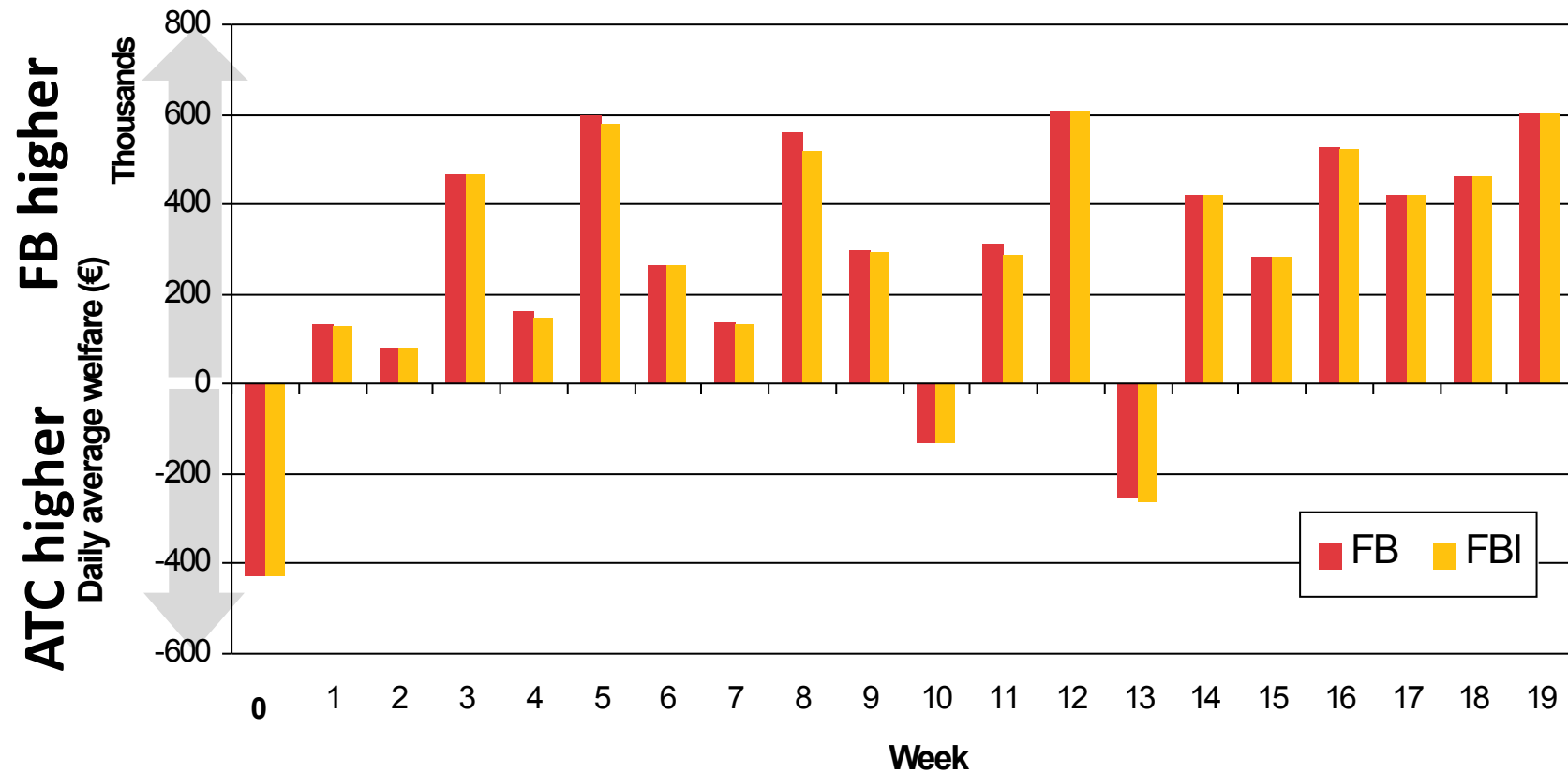
* Including answers to public consultation's outputs

//RUN AGGREGATED RESULTS

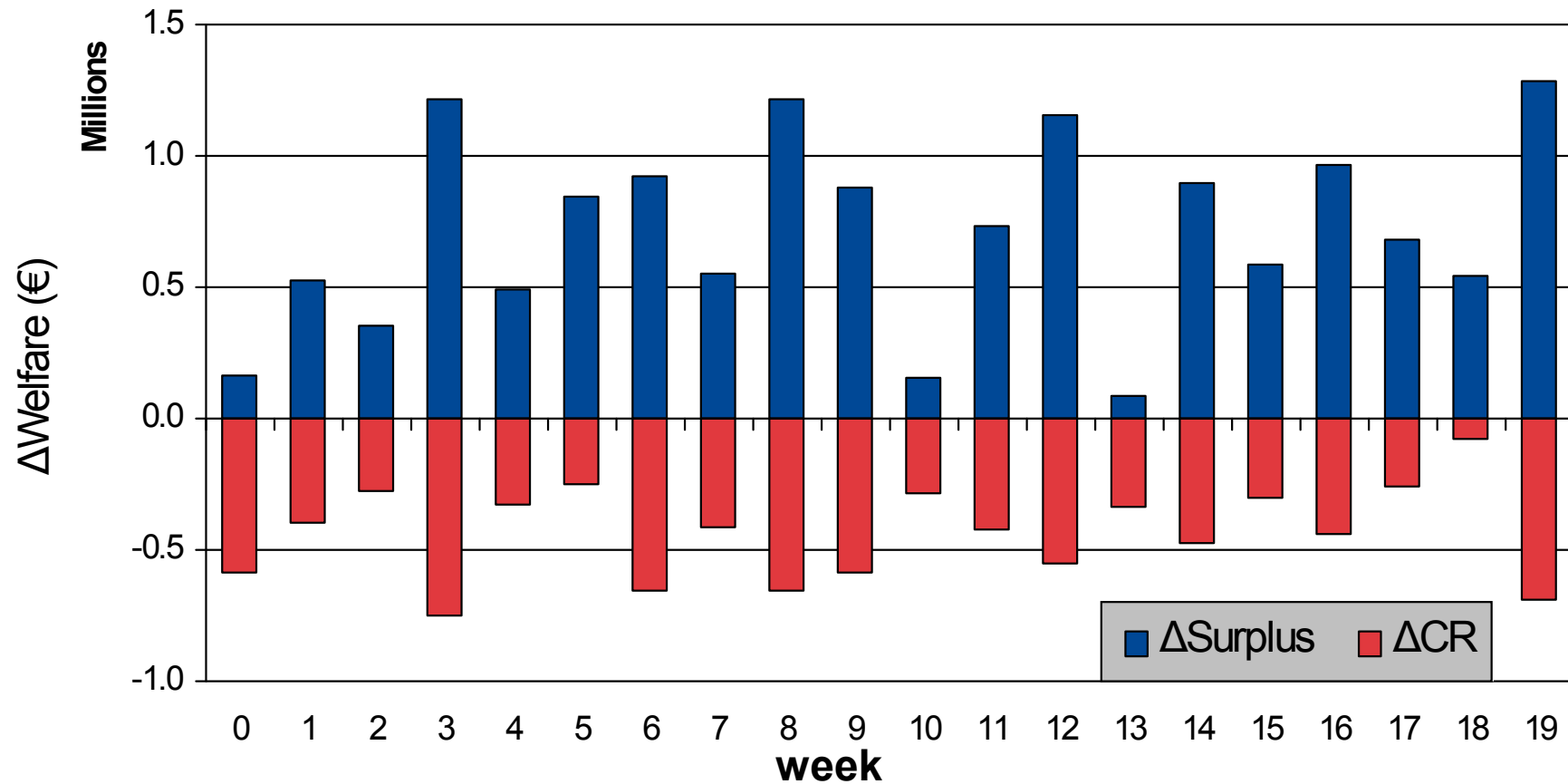
Based on 19 weeks

DAY-AHEAD WELFARE - WEEKLY

Development of welfare (XX - ATC) - daily average



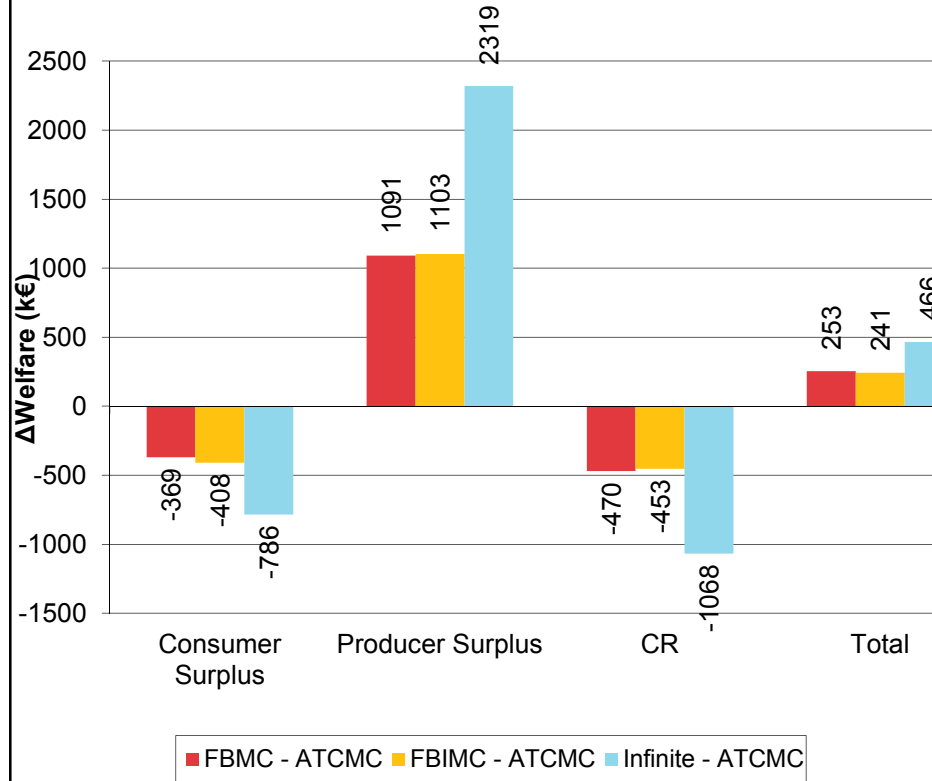
DAY-AHEAD WELFARE - WEEKLY FB - ATC



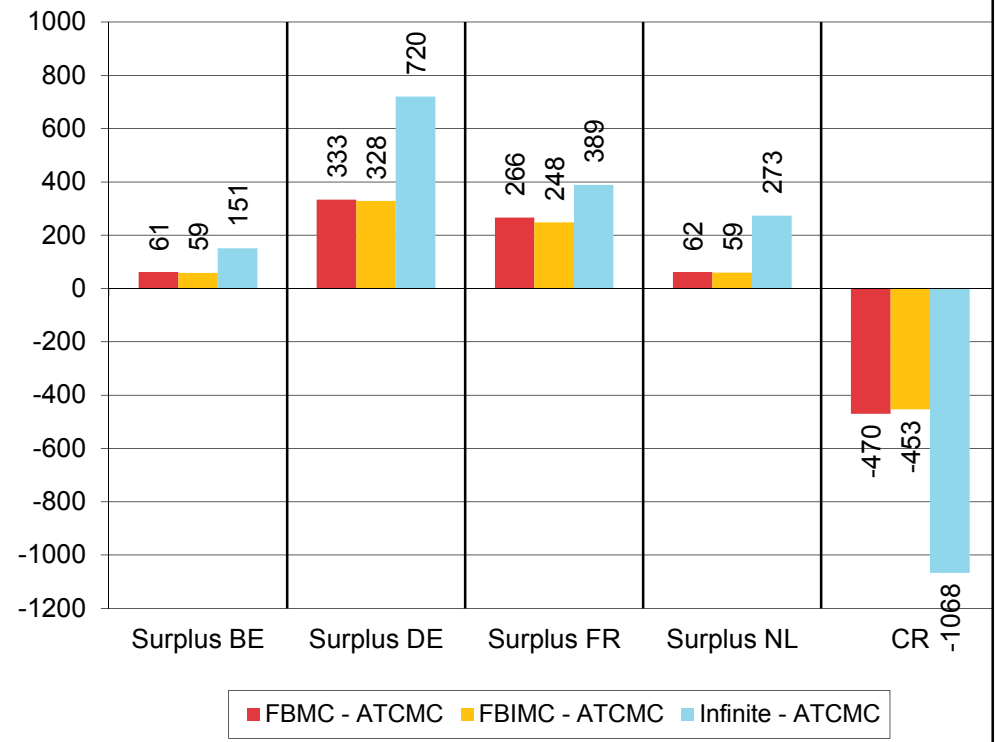
Weeks 0, 10 and 13 that led to decrease of welfare, still led to increase of surplus

AVERAGE DAY-AHEAD MARKET WELFARE

Daily average welfare difference (relative to ATC)

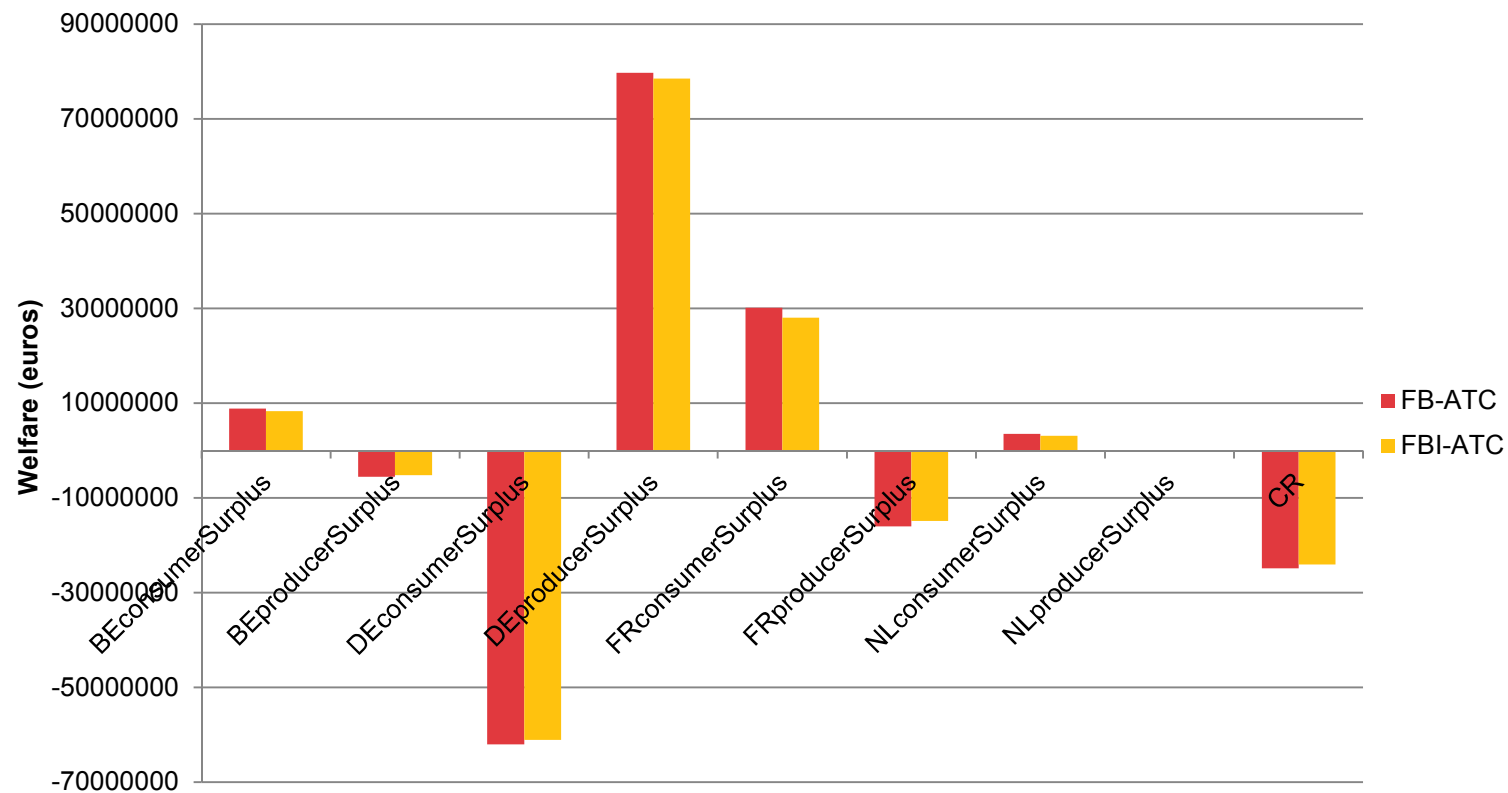


Daily average welfare difference (relative to ATC)

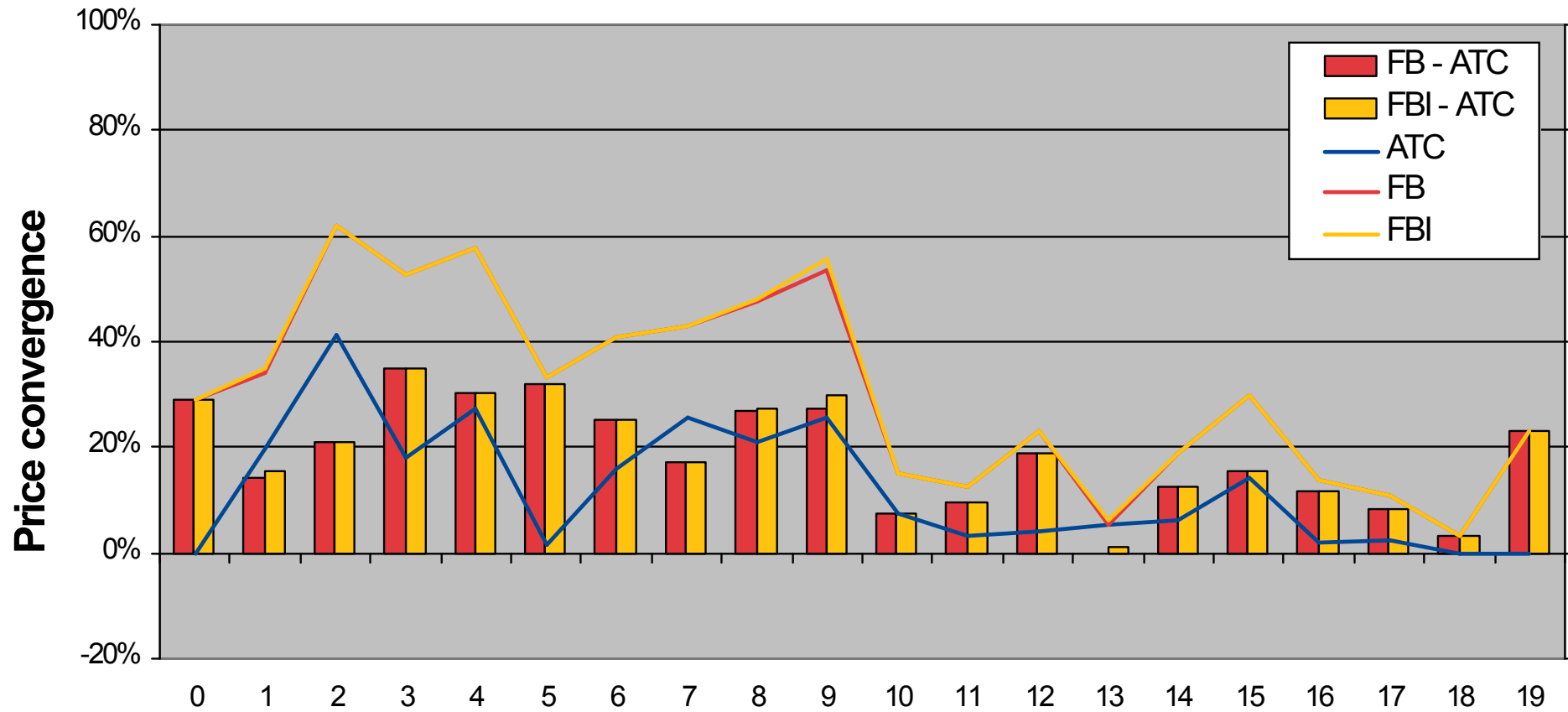


GLOBAL DAY-AHEAD MARKET WELFARE

Welfare distribution breakdown



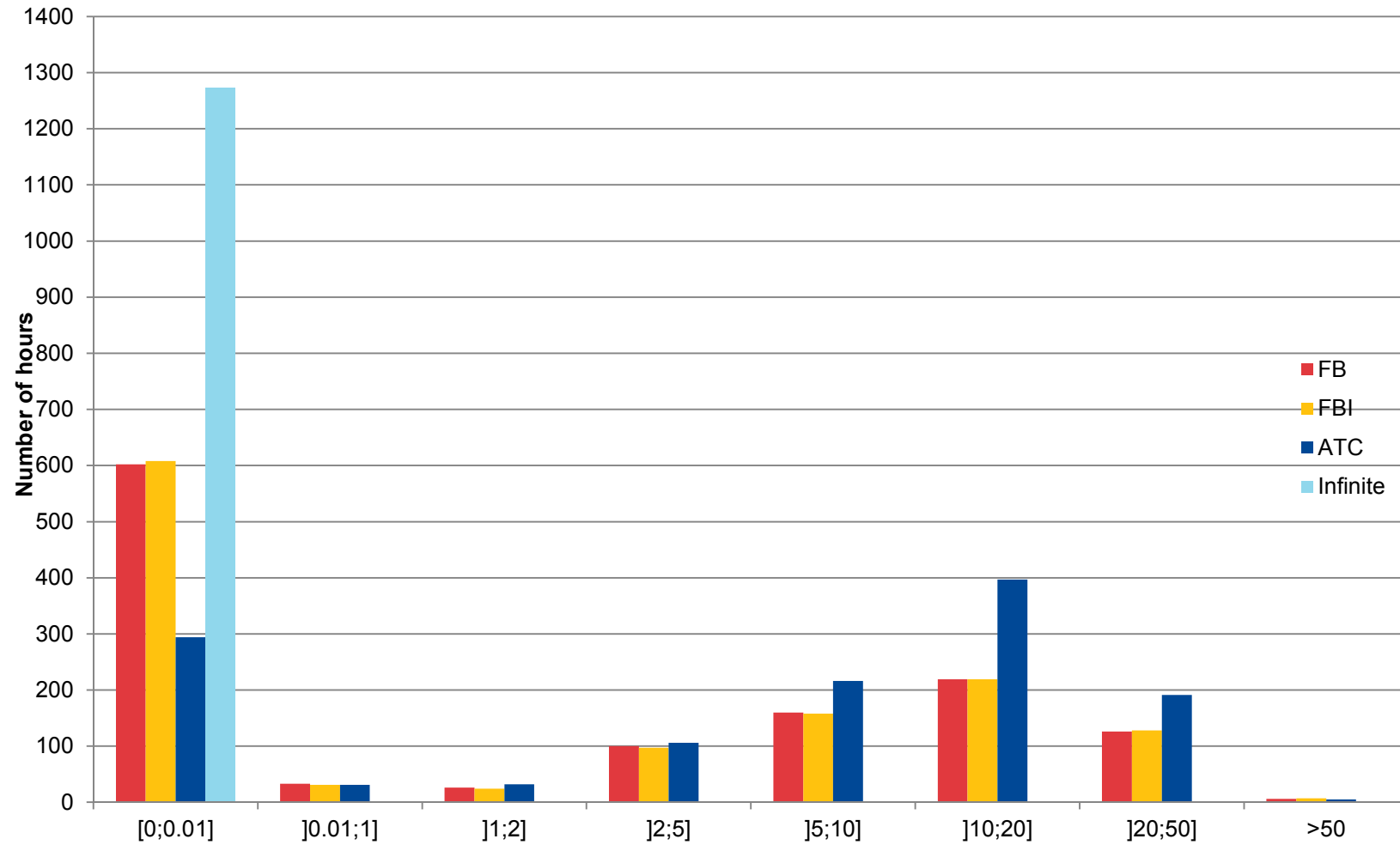
FULL PRICE CONVERGENCE



→ Full convergence better under FB than under ATC

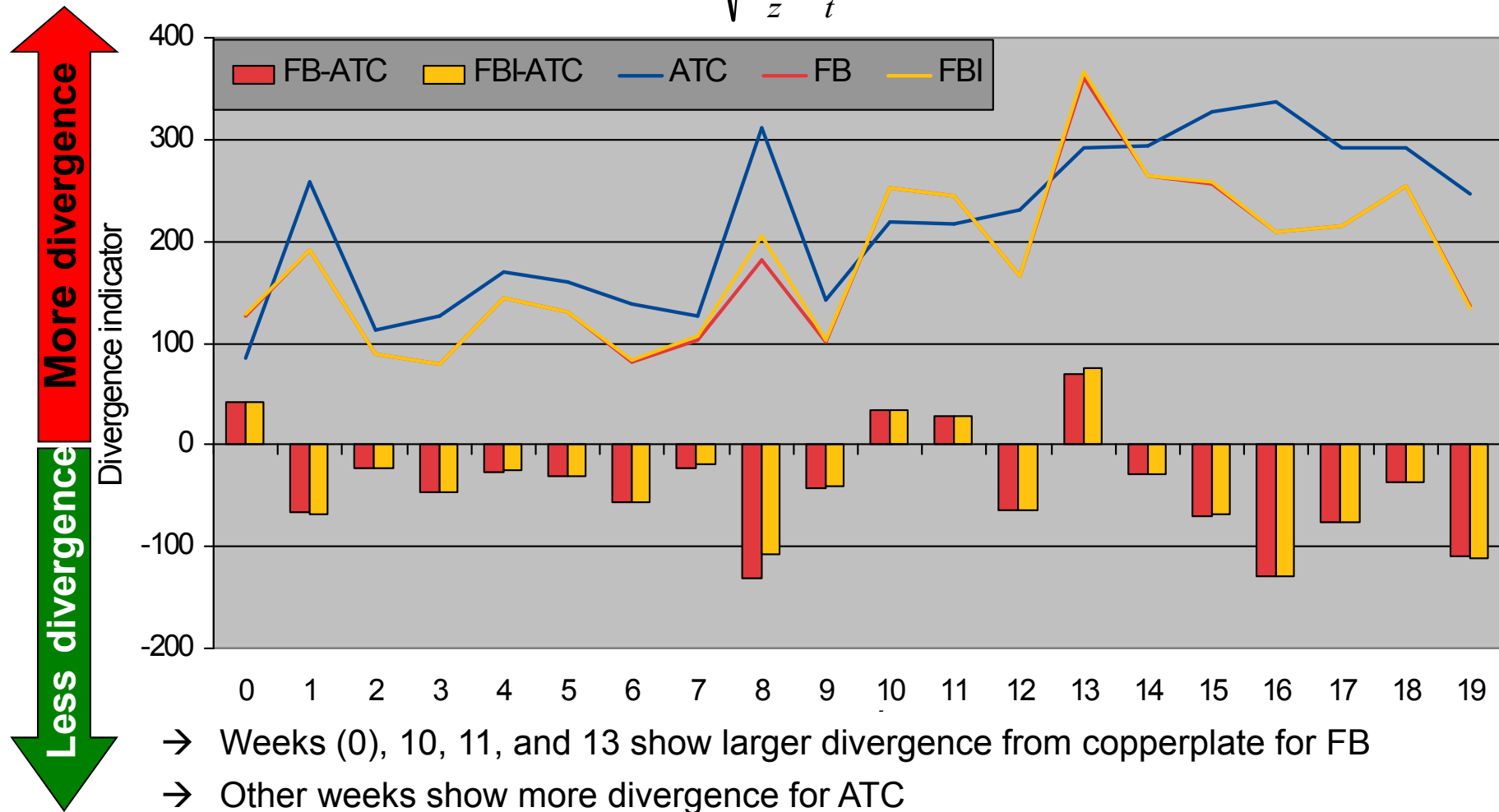
→ Week 13 apart from less welfare also similar full price convergence as ATC

PRICE CONVERGENCE



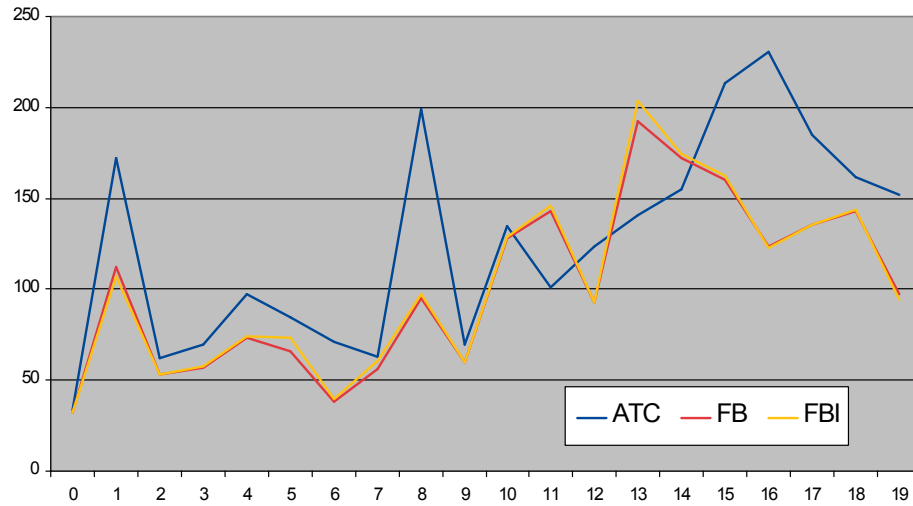
DISTANCE TO COPPER PLATE

$$\Delta(XX, INF) = \sqrt{\sum_z \sum_t (mcp_{z,t}^{XX} - mcp_t^{INF})^2}$$

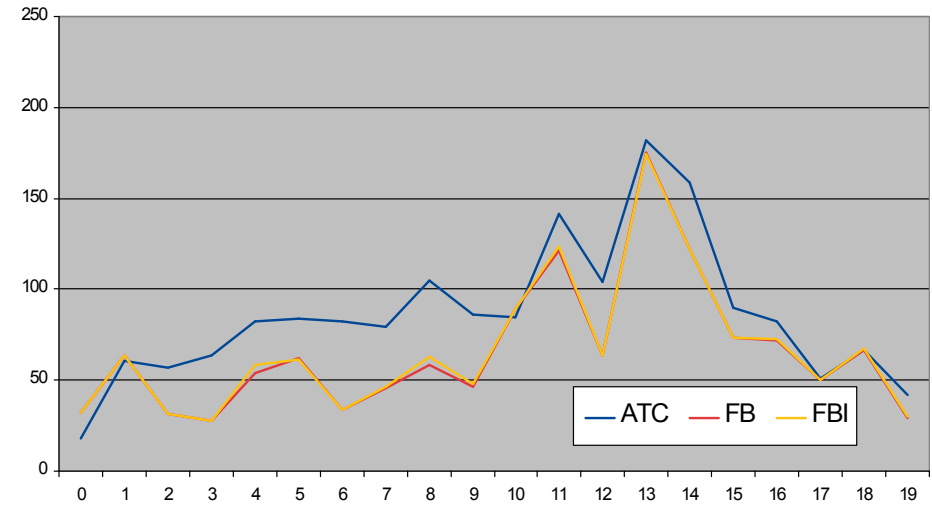


DISTANCE TO COPPER PLATE

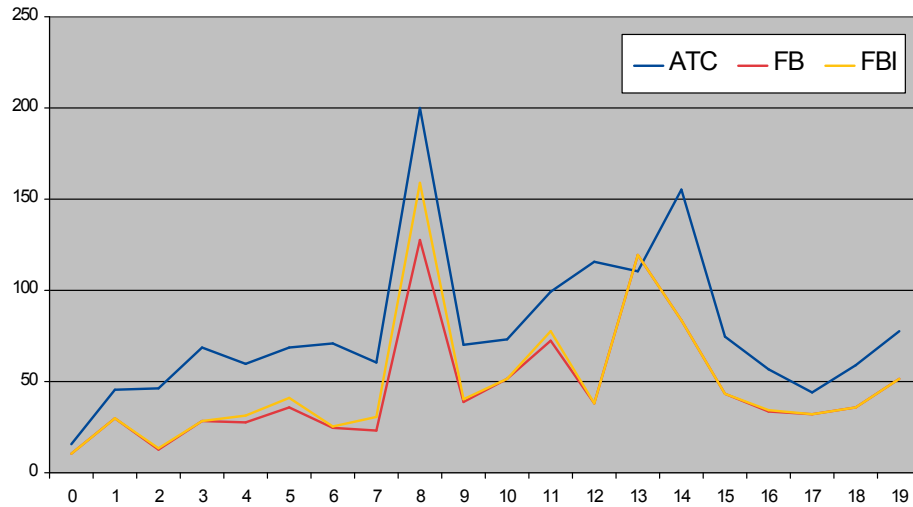
BE



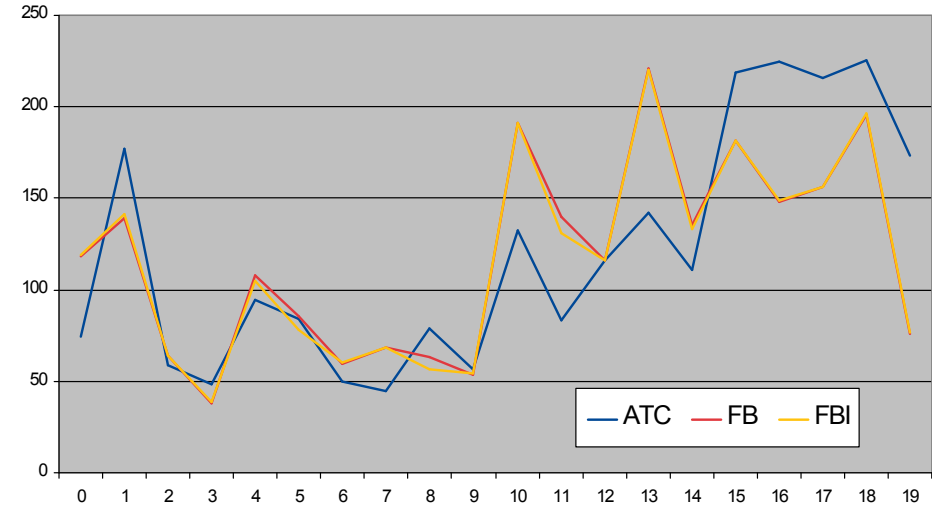
DE



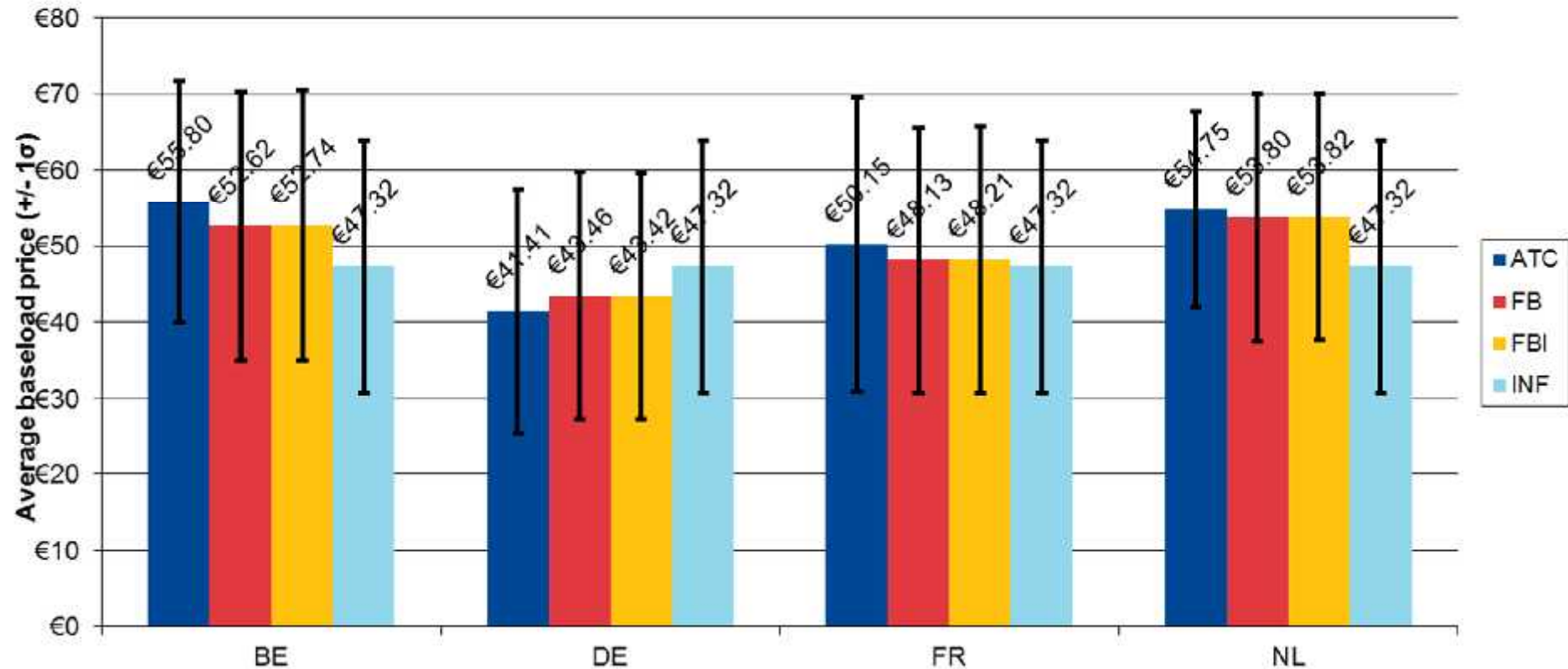
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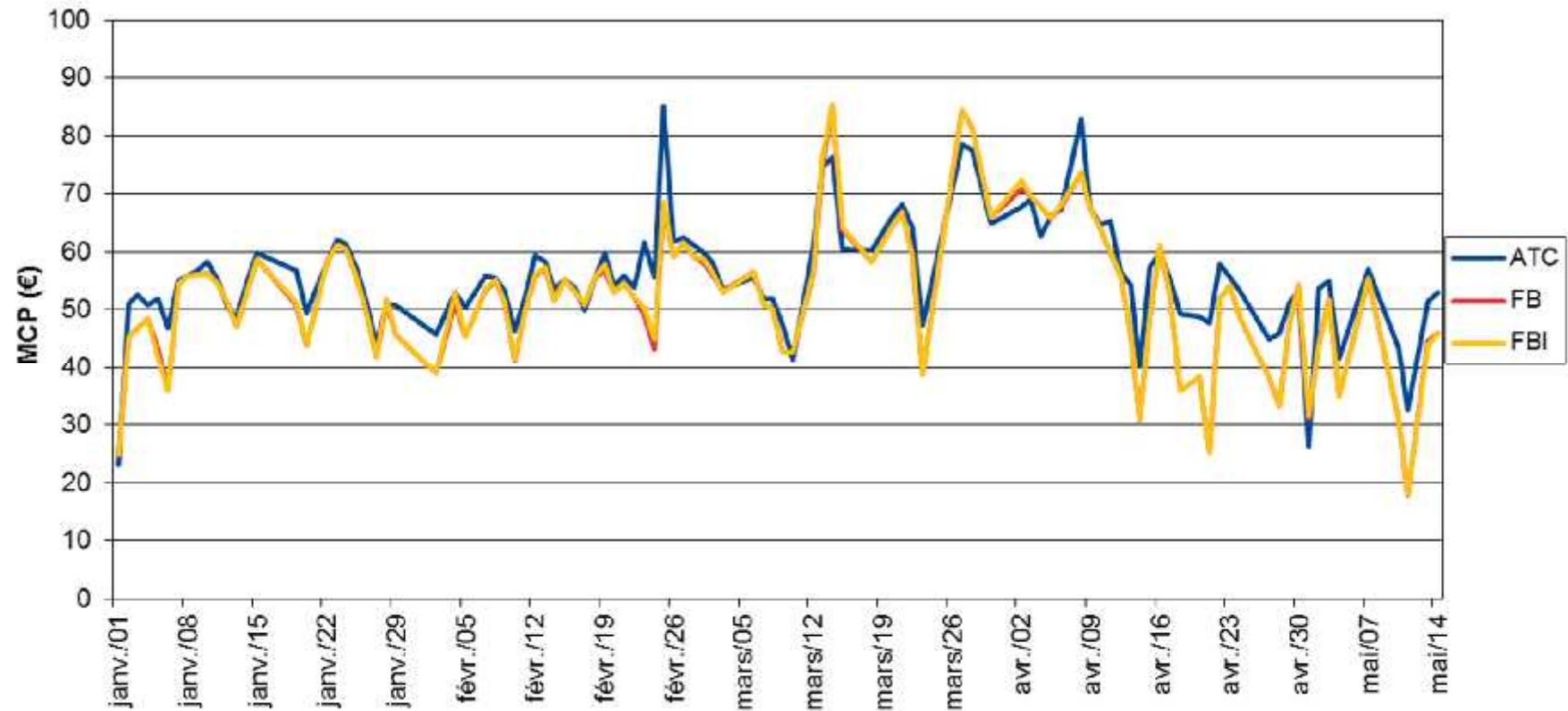
NL



AVERAGE BASELOAD PRICE



AVERAGE BASELOAD PRICE



INTUITIVENESS

	% Hours Non-intuitive	% of Congested hours Non-intuitive
FB	6,6%	9.7%

Number of Involvements	BE	DE	FR	NL
FB MC	13	18	2	89

The areas are said to **be involved in the non-intuitive situation** if they belong to one of these sets:

- The largest set of areas with the highest prices such that all areas of the set are exporting;
- The largest set of areas with the lowest prices such that all areas of the set are importing;

NEXT STEPS

Fine-tuning of the external parallel run

Public Consultation (until end of June)

Regulatory approval package (end of July)



CWE Flow-Based Project

**ADDITIONAL SLIDES
NOT PRESENTED DURING THE MEETING**



Flow-based capacity and prices

Flow-based capacity model in CWE:

- An integrated clearing of four DA power exchanges using a set of Flow-based constraints (PTDF).

Prices in FB MC do not follow the same properties as with ATC MC

- 1 single congestion can create 4 different prices
- Prices reflect the respective influence of each market on the congested CB
- Unlike ATC, in FB MC, the cheaper market can be forced to import and the most expensive market to export (non-intuitive!)*

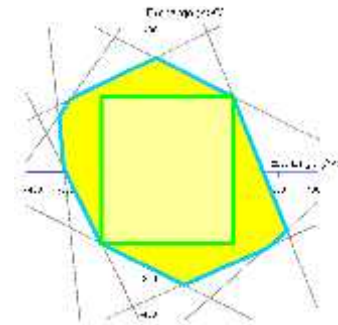
* Economic justification: maximization of the global CWE DA market welfare (at the cost of some local DA welfare)

Market Coupling Algorithm

The optimization by Cosmos aims at maximizing the DA market welfare until one CB is fully loaded (RAM fully used)

Control variable = 4 Net Positions

Input data = Order books
+ PTDF matrix (based on D2CF, CB list, GSK)
 \sum Net Positions = 0



Market Coupling Results under FB

Output of the algorithm =

- Net Position for each Hub
- (Possibly) one congested Critical Branch: the first one for which RAM is fully used

Without congestion:

Price convergence => one unique marginal price is determined

With congestion:

- The congested CB has a "shadow price" = the welfare increase that would be created by one extra MW capacity on this CB
- Prices reflect the respective influence of each hub on the congested CB

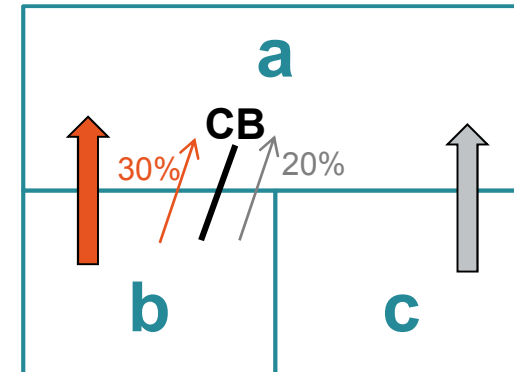
Example of “flow competition”

For the use of the congested CB, trade $b \Rightarrow a$ is in competition with trade $c \Rightarrow a$

$PTDF_{b \Rightarrow a}$ 30% of $b \Rightarrow a$ trade through the CB

$PTDF_{c \Rightarrow a}$ 20% of $c \Rightarrow a$ trade through the CB

$c \Rightarrow a$ trade induces less flows through the CB and will allow a better valorisation of the transmission grid



For a RAM of 100 MW on the CB: $100/20\% = 500$ MW may be exchanged from $c \Rightarrow a$
 $100/30\% = 333$ MW may be exchanged from $b \Rightarrow a$

Using less transmission capacity on the CB, the value of $c \Rightarrow a$ trade is $500/333 = 1,5$ times higher than $b \Rightarrow a$ trade; which corresponds to the ratio : $PTDF_{b \Rightarrow a} / PTDF_{c \Rightarrow a}$

With implicit auction, this leads to the following relation between prices P in the 3 different hubs a , b and c and corresponding PTDF:

$$\frac{P_b - P_a}{PTDF_a - PTDF_b} = \frac{P_c - P_a}{PTDF_a - PTDF_c} \geq 0$$

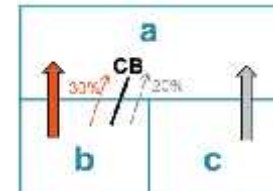
Prices-PTDF relation

For one congested CB and 3 areas, it can be proven that:

$$\frac{P_b - P_a}{PTDF_a - PTDF_b} = \frac{P_c - P_a}{PTDF_a - PTDF_c} = \frac{P_c - P_b}{PTDF_b - PTDF_c} = \text{Shadow Price} \geq 0$$

- Ranking of prices according to PTDFs:
if a CB is congested, the lowest the PTDF of the area, the highest its price:

$$PTDF_b > PTDF_c \Rightarrow P_c > P_b$$



- Trades with lowest impact on the CB ($PTDF_c$ in our example) will get priority.
Bids from producers in c will be selected even if their price is higher than P_b (up to P_c)
- Price differences are proportional to PTDF differences
⇒ As PTDFs are generally different for each hub, prices are also different.

⇒ In CWE, 1 congested CB creates 4 different prices

⇒ PTDFs (= model quality) have a direct impact on prices