

Flow-Based Market Coupling Issues Final Report

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*Commissioned by the Netherlands Authority for Consumers and Markets
(ACM)
Report by Berenschot Energy & Sustainability*

02-03-2015

Berenschot

Conclusions and recommendations

1. Loss of partial convergence after Flow-Based

Generally in FBMC, some countries have more often a different individual price, but (in comparison with ATC) this does not imply that these countries are isolated. Unlike ATC, FBMC maintains international competition for these cases.

This internal Flow-Based competition can be suppressed in cases of maximum net im- or export positions, leading to more isolated country cases. However, this is not as severe right now. It is recommended to monitor this further.

In this respect, there are no strong competition issues preventing FBMC introduction

2. Consequences of flow factor competition for parties in different countries

Flow-factor competition can cause competition bias: Dutch end-users obtain lower additional import flows from Germany than French end-users, when they bid the same price.

This happens in particular in constrained cases if Belgium is in a net import situation, already happening frequently. Dutch customers also face FBMC price rise on Dutch export situations. This situation could worsen if these cases would happen more often.

In this respect, there are some situations with competition bias. Given the benefits of FBMC in other respects, FBMC could be introduced now if there are sufficient guarantees on further development and improvements later on, like adaptation and/or harmonization of determination of PDTF's and critical branches, or bid zones inside larger countries, maintaining one price per country. One important precondition would be a total transparency on determination methods of PDTF's and critical branches.

Ultimately however, these issues could also result in a worsened security of supply for the Netherlands in a future situation. Therefore, FBMC improvements have to be absolutely guaranteed or, in absence of that, an unilaterally enforceable roll-back to ATC.

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1. Introduction

This study has been requested by the Authority for Consumers and Markets (ACM) in the Netherlands.

ACM supervises the energy market as well as market competition in general. From this responsibility, ACM has been reviewing the proposal by TSO's and power exchanges for the introduction of a Flow-Based Market Coupling (FBMC) in the region of Central Western Europe (CWE).

Preparation of this FBMC has been underway for many years, since the signature of the MOU in 2007 regarding electricity market integration in the CWE region (Belgium, France, Germany, Luxemburg, Netherlands).

Initially, a CWE Market Coupling based on Available Transmission Capacity (ATC) was realized in 2010. This has been highly successful with improvements in price convergence and economic surplus.

Changing the Market Coupling to Flow-Based principles has been presented to have additional advantages in these respects¹. Still, ACM has questions regarding market issues and competition issues with potential drawbacks, especially in no-convergence situations.

2. Content of the investigation

The project focuses on the competition aspects of Flow-Based Market Coupling (FBMC). These aspects are twofold:

Loss of partial convergence after Flow-Based

- FBMC has demonstrated to have more total convergence than ATC – based Market coupling (ATCMC): more situations occur where all countries have the same price.
- FBMC tends to diminish situations of partial convergence.
- Consequently FBMC shows more situations with countries having an individual price.
- We wish to study the effect on competition due to more isolated market areas.

Consequences of flow factor competition for parties in different countries

- Flow factor competition implies that competition is influenced by flow factors.
- One possible consequence is countries facing security of supply issues: although they bid the same price (or even maximum) as other countries, their imports are less. This is not the prime subject of this document.
- However, the same effect could also be seen in “normal” prices. Then it translates in groups of buyers/sellers in one country having a different market position compared to buyers/sellers from another country, even if they bid the same price.
- We wish to study this latter effect and its possible consequences.

3. Changing market conditions

The aforementioned issues seem minor when there is high price convergence e.g. like encountered in 2011, right after the introduction of CWE market coupling. However, the impact may be more severe in non-convergence situations.

- Since 2011, the forces enhancing market fragmentation have increased, resulting in more price divergence in CWE. On one hand, FBMC might remedy this situation. On the other hand, FBMC might also be more vulnerable in this situation.
- Distortions causing market divergence are: different fuel prices combined with different fuel mixes in countries, different national policies for renewable energy, different subsidy mechanisms, and other. These influences have been recognized at the EU level. It is still uncertain as to whether improvements can be made, and how fast.
- All studies on FBMC show that improved convergence by FBMC is also affected by a divergent market situation. Results depend on convergence already existing in ATC:
 - If the convergence under ATC is already substantial (e.g. 50%), FBMC will bring the convergence much closer towards almost 100%.
 - If the convergence under ATC is small (e.g. 10%), FBMC is likely to add another small proportion.
- Therefore, it is prudent to study FBMC introduction under the assumption that basic mechanisms causing market divergence may continue to exist: what are the pros and cons in this situation, and how can FBMC be applied in the best possible way. This is one of the reasons for doing this study.

4. Issue 1 - Loss of partial convergence

- FBMC has been demonstrated to have a more total convergence than ATC: more situations where all countries have the same price. On the other hand, FBMC diminishes situations of partial convergence, so there could be more situations with individual prices.
- We study the effect on competition due to (potential) more isolated market areas, because:
 - In an isolated country, there are less market parties, so there is less competition.
 - Therefore, in an isolated country, prices are more vulnerable to (upward) gaming.
 - The FB parallel run does not show this risk, because bids are based on ATC (where partial convergence is there). Under FB, market parties could show different behaviour.

We study this based on the outcome of the Flow-Based parallel run (FBPR), 2013/2014:

- Determine the share of different converged or isolated cases in ATC and FBMC:
 - Full convergence (4 countries having the same prices)
 - Partial convergence:
 - 3 converged + 1 individual (“Trio+1”)
 - 2 sets of 2 converging countries (“Two duos”)
 - 2 converging countries plus two individuals (“Duo+1+1”)
 - Total divergence: each country has a separate price
- Find out if there is a pattern (more individual prices, and for which countries)
- Assess the nature of competition in countries with an individual price in Flow-Based
- Assess the possible mitigating or worsening factors for this competition.

Full/partial coupling CWE area, ATC practice versus FBPR, 2013

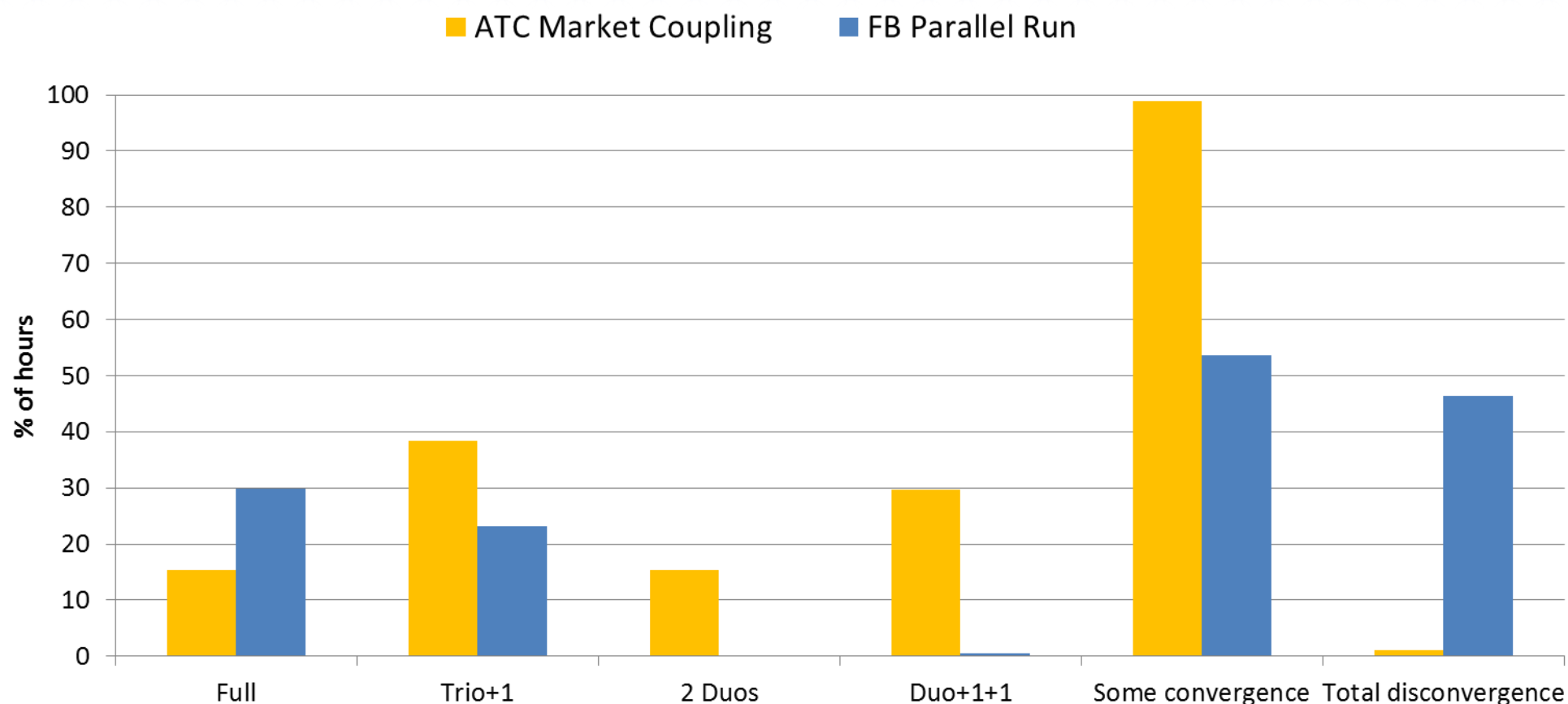


Figure 1. Share of hours with price convergence per type of coupling, showing a comparison between ATC Market Coupling and the FB Parallel Run in 2013. Source: Berenschot (data: CASC).

Results of the Flow Based Parallel Run (FBPR) 2013:

- Under FB, full convergence is indeed higher, but partial convergence diminishes strongly
- The gain in full convergence is much less than the loss in partial convergence
- The number of cases where each country has a different price increases dramatically

Full/partial coupling CWE area, ATC practice versus FBPR, 2014

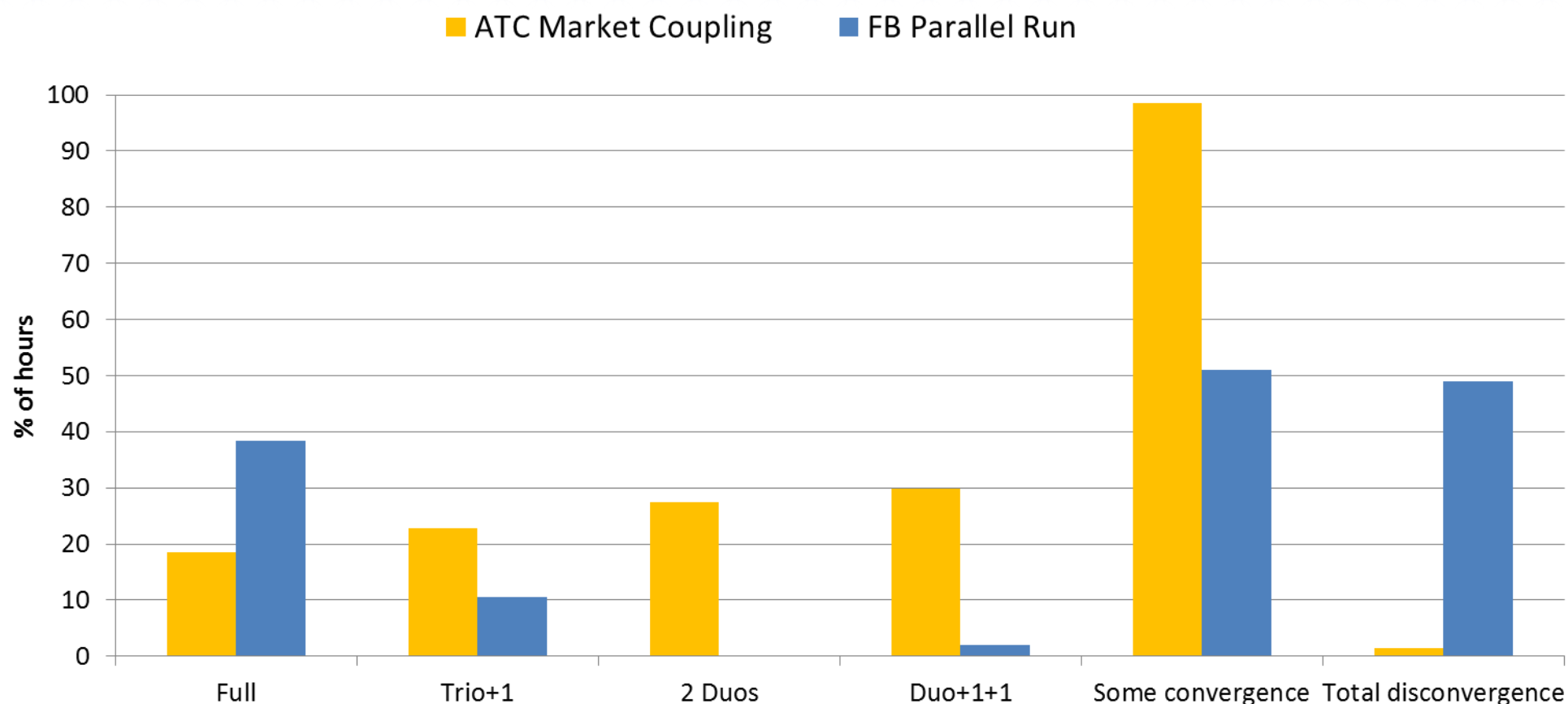


Figure 2. Share of hours with price convergence per type of coupling, showing a comparison between ATC Market Coupling and the FB Parallel Run in 2014. Source: Berenschot (data: CASC).

Looking at the same picture for 2014:

- Same patterns as in 2013
- This is remarkable because the magnitude of price differences was much less in 2014
- The number of cases with different prices has even increased (compared to 2013)

Country distribution of (more) individual price situations

Next, we look at the distribution of (more) individual price situations for the CWE countries. Is this evenly distributed across all CWE countries, or is it concentrated on some?

The graphs below show the time percentage of a certain country being coupled with at least one other country (or more), for each of the CWE countries, in ATC and FBMC. Again this is shown separately for 2013 and 2014.

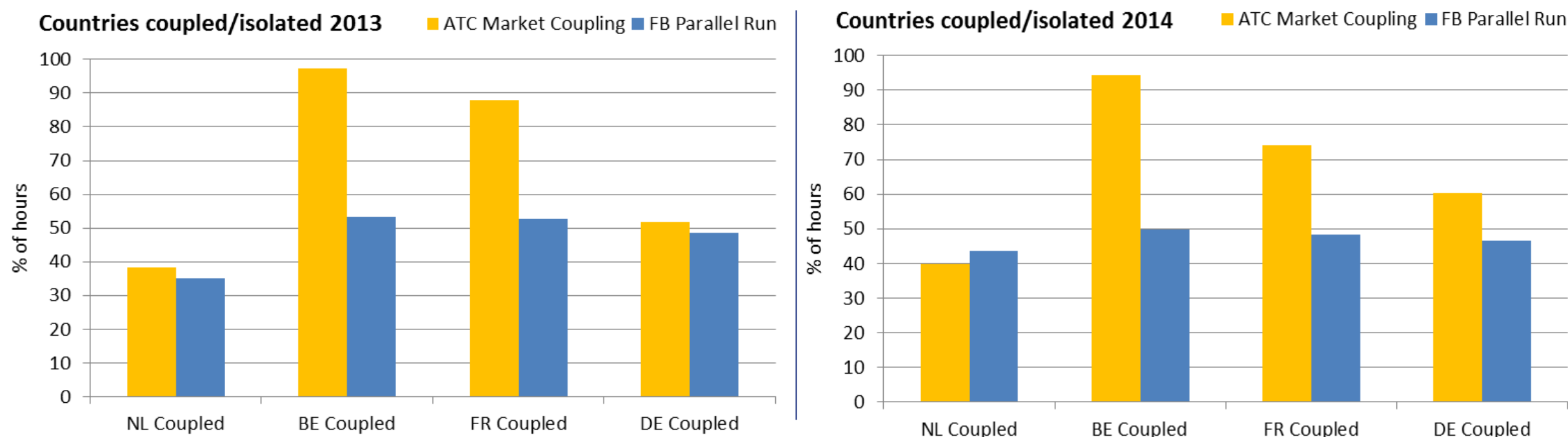


Figure 3. Percentage of hours of price coupling between CWE countries under ATC Market Coupling and the FB parallel run in 2013 (left) and 2014 (right). Source Berenschot (data: CASC).

Results:

- The rise of non-coupled situations concentrates on Belgium and France
- Germany shows this to much lesser extent: almost nothing in 2013, slightly more in 2014
- The Netherlands is almost not affected (2013) or even showing the opposite effect (2014)

From this perspective, there seems no issue for the degree of competition in the Netherlands: this is left unchanged under FBMC. But it raises questions on the competition in France and Belgium as these countries seem to become more isolated under FBMC.

Different competitive nature of individual country prices situations under FB: still international competition

In FB, when there is no full convergence, more countries have individual prices compared to ATC (less partial convergence). This seems a drawback, especially appearing in Belgium and France as shown.

However, there is also another important difference in FBMC:

- In ATC these situations cause a purely national competition. For instance, any additional demand could be matched only by national supply, without added import. This creates a higher gaming potential, especially if market parties predict this (by predicting isolated hours).
- in FBMC, this is different. Individually priced countries still experience international (flow factor influenced) competition. Additional demand could be matched by national supply and added imports. Therefore, individually priced countries in FB may not be really isolated like in ATC.

This supposes that this really happens in FB: it implies e.g. that additional demand in a “semi-isolated” high-priced country is partly matched by more imports (causing higher net import position). This is investigated in the following pages.

Test of international competition in FBMC

To test international competition in semi-isolated FB situations, we have plotted country prices versus net import positions. Figure 4 depicts the Netherlands.

Main question: does the net import position really rise in FB versus ATC, for the cases where the Netherlands is already importing at maximum in ATC?

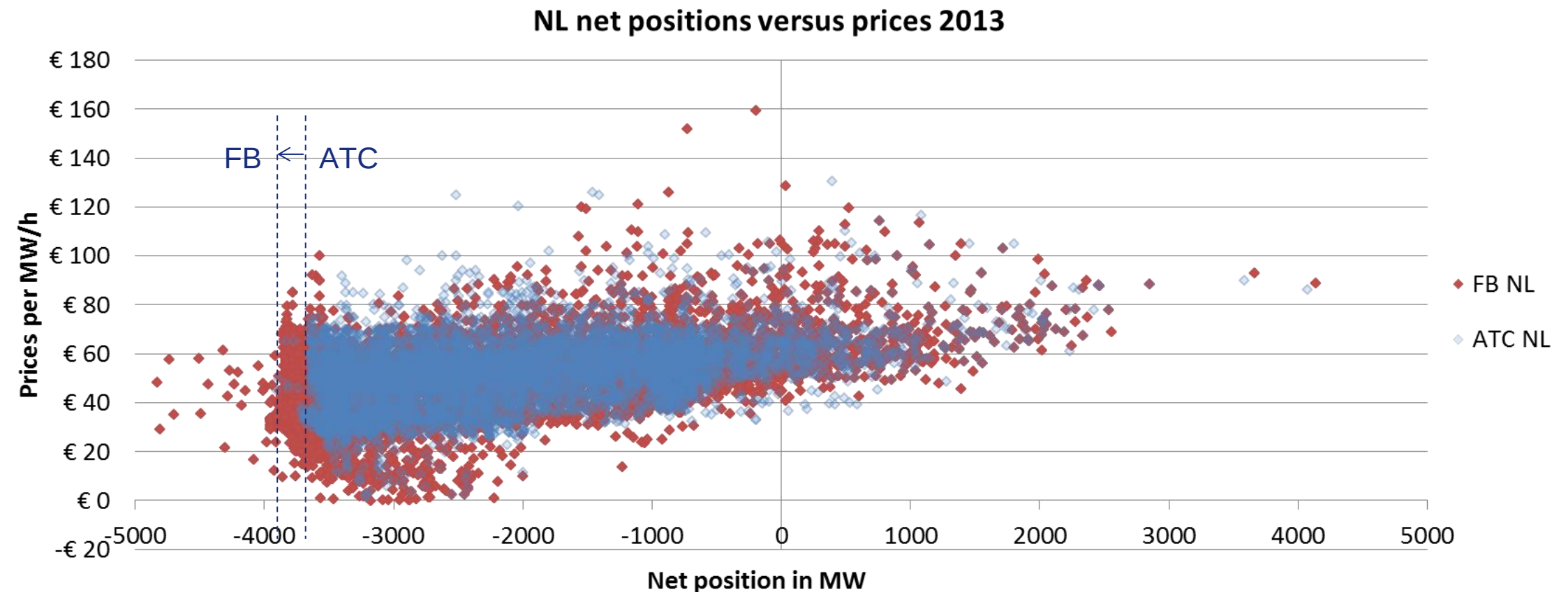


Figure 4. Hourly net import/export positions versus prices in the Netherlands under ATC Market Coupling and the FB Parallel Run in 2013. The arrow depicts a shift in import volume under FB compared to ATC. Source Berenschot (data: CASC).

Outcome: the net import imposition does rise, but only with around 300 MW (except a few exceptions). In practice, this limits Flow-Based optimization. This is due to total net import restrictions by TSO's ("external constraints"). We see this also in the fact that this is a limiting condition in many FBPR cases. Consequently, this limits international competition.

Test of international competition in FBMC at max import situations, continued

The plot for the Netherlands in 2014 shows essentially the same picture. There are more situations where total net import restrictions do not apply, (points to the far left, generally at lower prices).

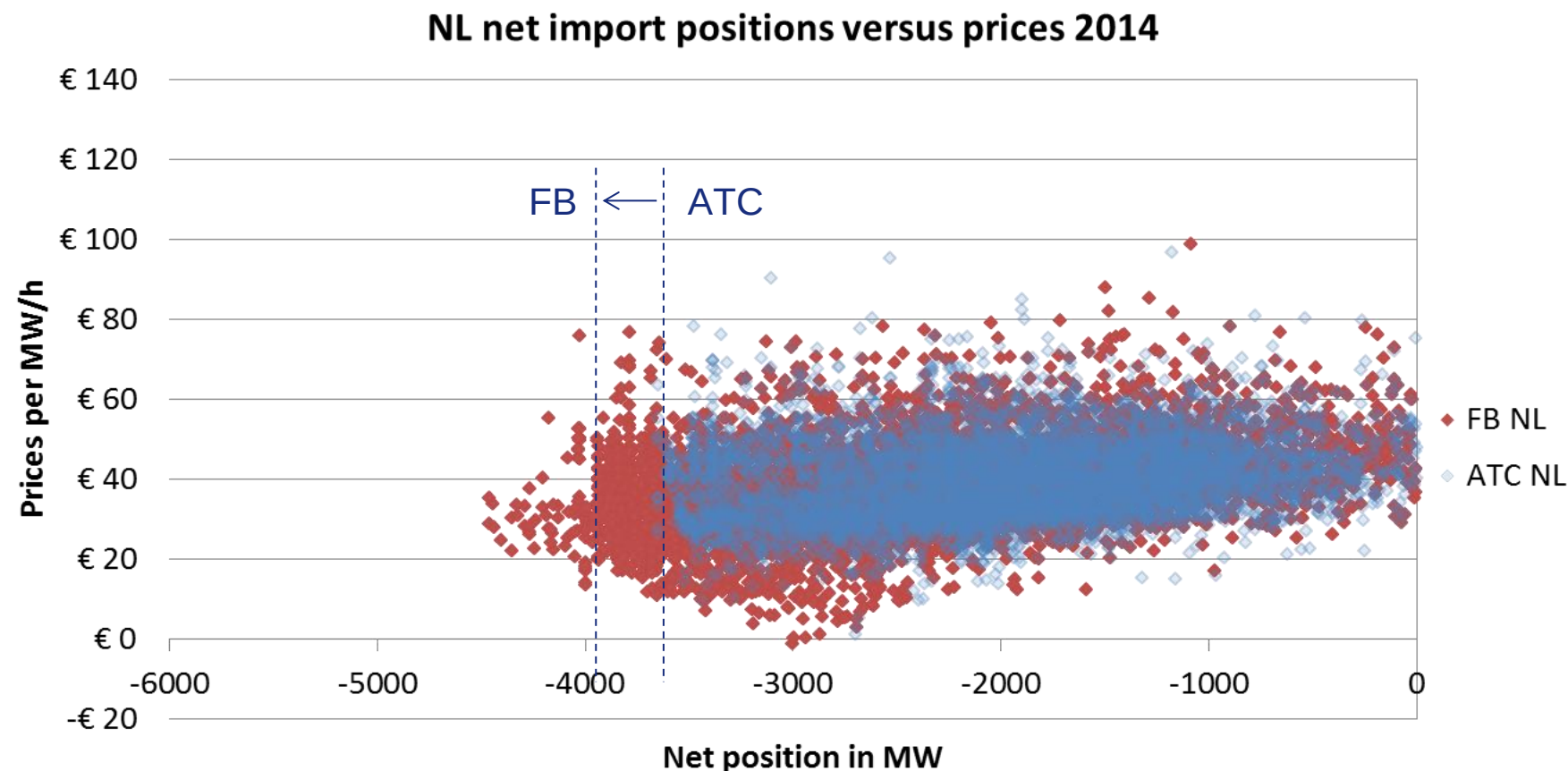


Figure 5. Hourly net import positions versus prices in the Netherlands under ATC Market Coupling and the FB Parallel Run in 2014. The arrow depicts a shift in import volume under FB compared to ATC. Source Berenschot (data: CASC).

It should be noted, that the net import restrictions (“external constraints”) have less impact on competition in the Dutch situation. It was shown that growth of the number of individually priced semi-isolated cases, from ATC going to FBMC, does not apply to the Netherlands to begin with. Hence the net import restriction applied by TenneT has less significance for competition, in the current market situation as encountered during the FB parallel run.

Histogram on occurrence of net positions in ATC and FB, Netherlands

When plotting the frequency of situations, it becomes even more apparent that the restriction on net import positions (“external constraints”) has a high impact in the Netherlands

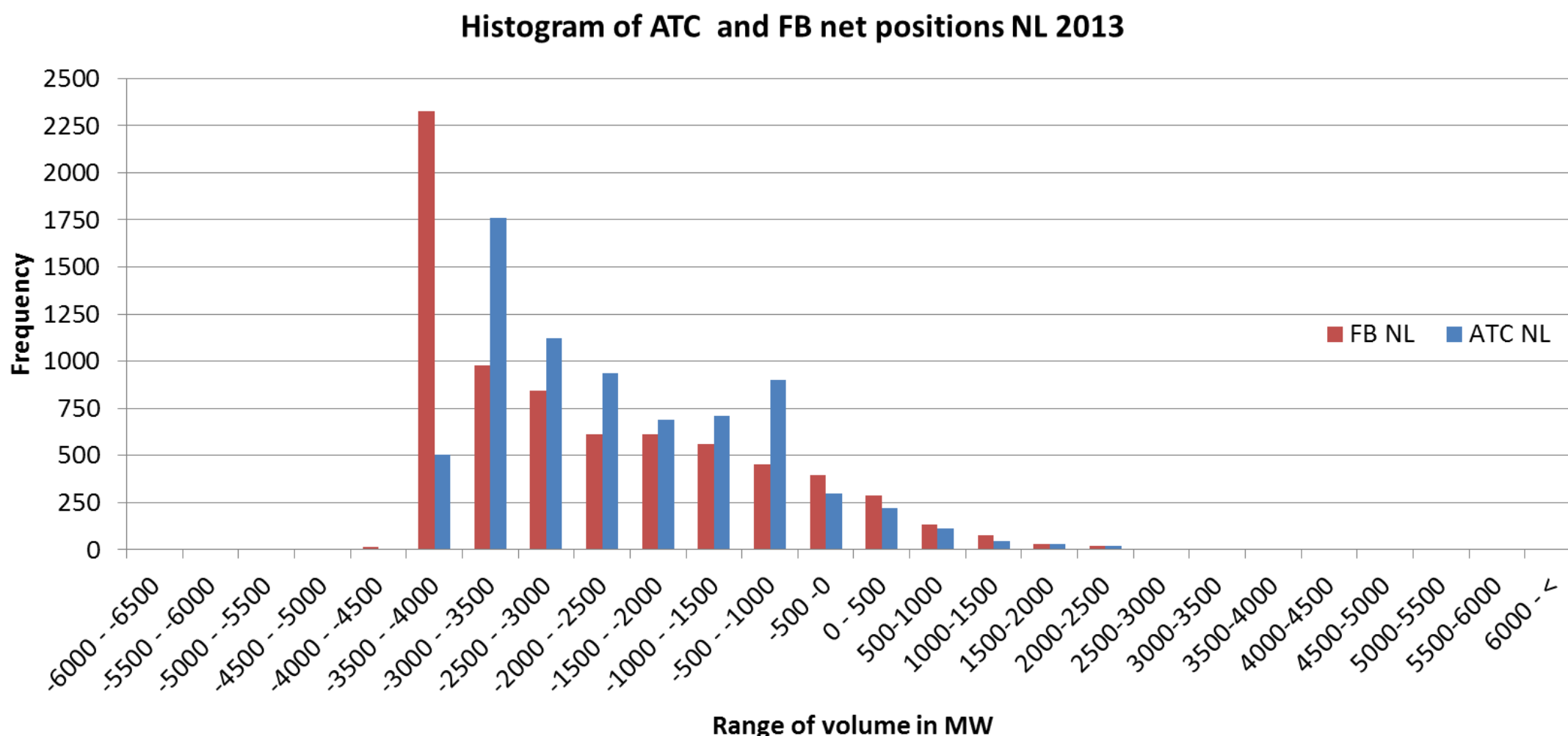


Figure 6. Distribution of ATC and FB net positions in MW for the Netherlands under ATC Market Coupling and the FB Parallel Run in 2013. Source Berenschot (data: CASC).

Checking net positions for the other CWE countries

As we have seen, restrictions on net import positions can cause additional limitations on the international Flow-Based competition, in the case of a rise of individually priced country in FB.

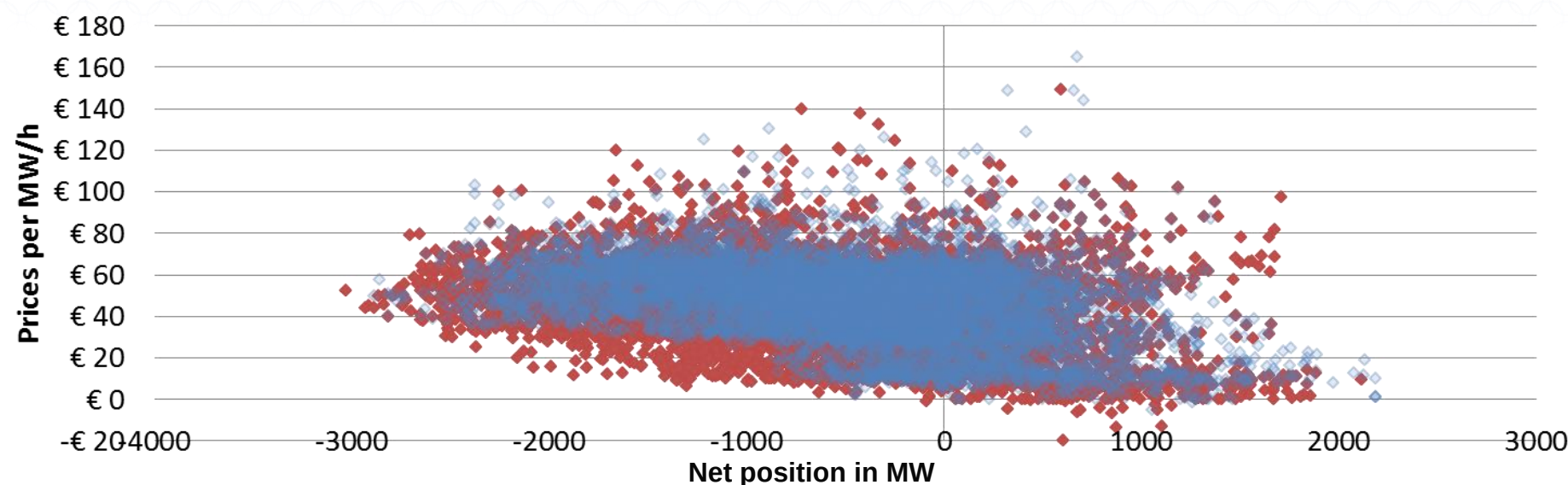
Although this is potentially seen in the Netherlands, in practice this does not have a severe competition impact, due to the fact that the Netherlands does not see a rise of individually priced country cases in FB, to begin with.

However, we have demonstrated that there is a big rise in individually priced country cases for Flow-Based in Belgium and France, and to smaller extent also in Germany. If a restriction of net import (or export) positions would apply there, the situations could be more severe.

In the following pages, we present the same analysis as done for the Netherlands for these countries.

Test of international competition in FBMC, Belgium

BE net positions versus prices 2013



The Belgian picture is very different from the Netherlands. Plots show an evenly distributed growth of points positions in all directions, without a sharp border.

This is an indication that international flow-factor competition works, even for the (many) cases that Belgium has an individual price in Flow-Based.

One important added note is however, that FBMC seems to add relatively little to the growth in net import or export positions for Belgium.

Histogram of ATC and FB net positions BE 2013

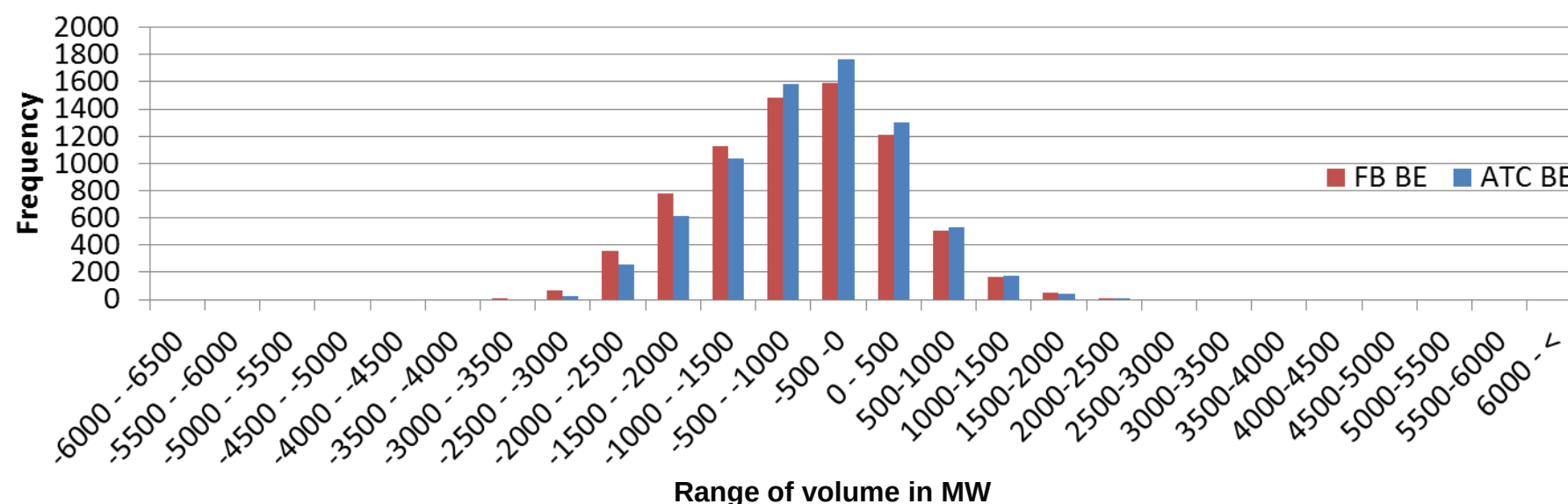
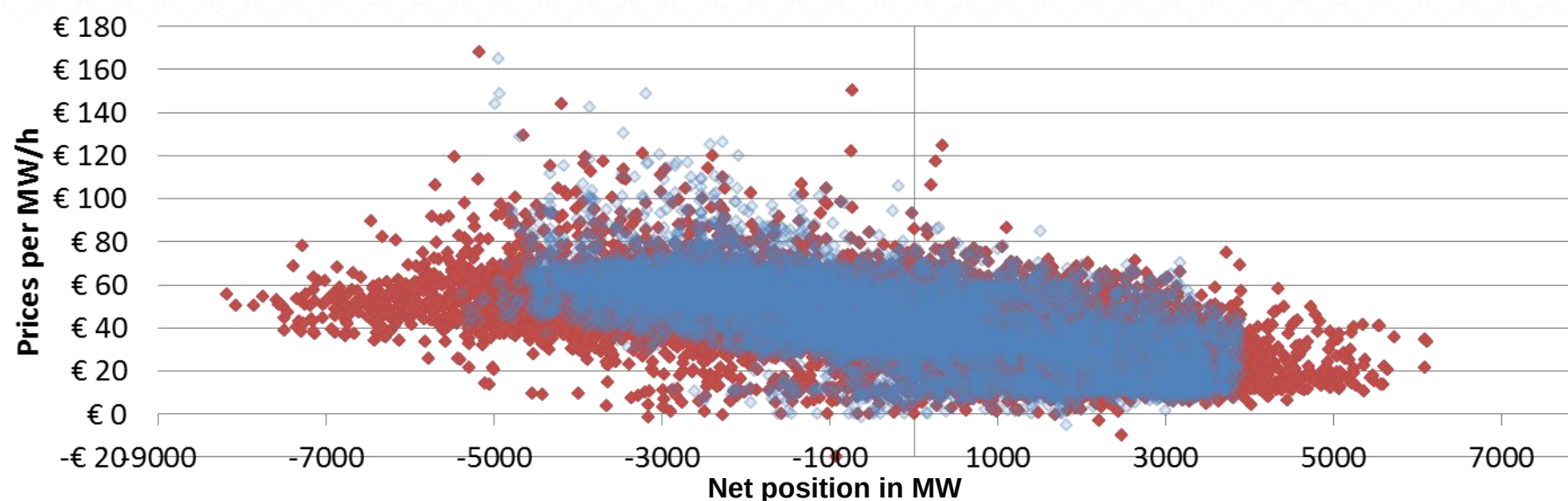


Figure 7. The top graph shows hourly net import/export positions versus prices in Belgium under ATC Market Coupling and the FB Parallel Run in 2013. The bottom graph shows a distribution of net positions in MW. Red represents FB and blue represents ATC. Source Berenschot (data: CASC).

Test of international competition in FBMC, France

FR net positions versus prices 2013



The French picture shows in one respect the same pattern as Belgium. Plots show an evenly distributed growth of points positions in all directions, without a sharp border.

This is an indication that international flow-factor competition works, even for the (many) cases that France has an individual price in Flow-Based.

One important added note is, that FBMC seems to have a much bigger added value for France, looking at the relative growth in net import or export positions (compared to Belgium).

Histogram of ATC and FB net positions FR 2013

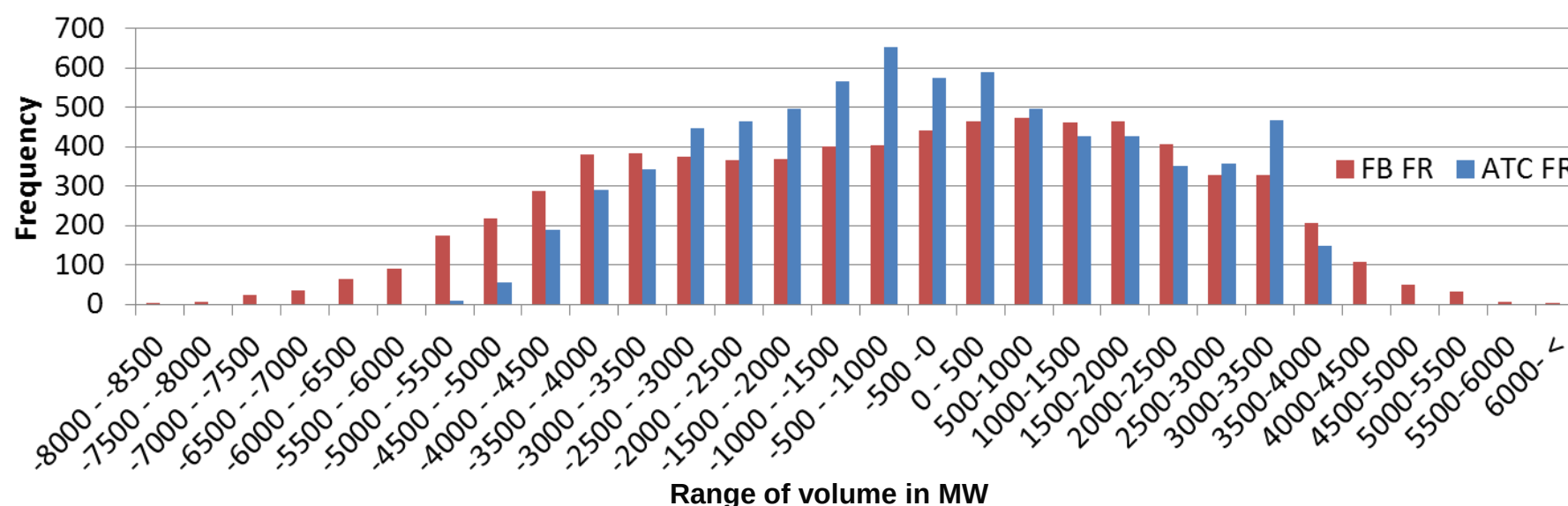
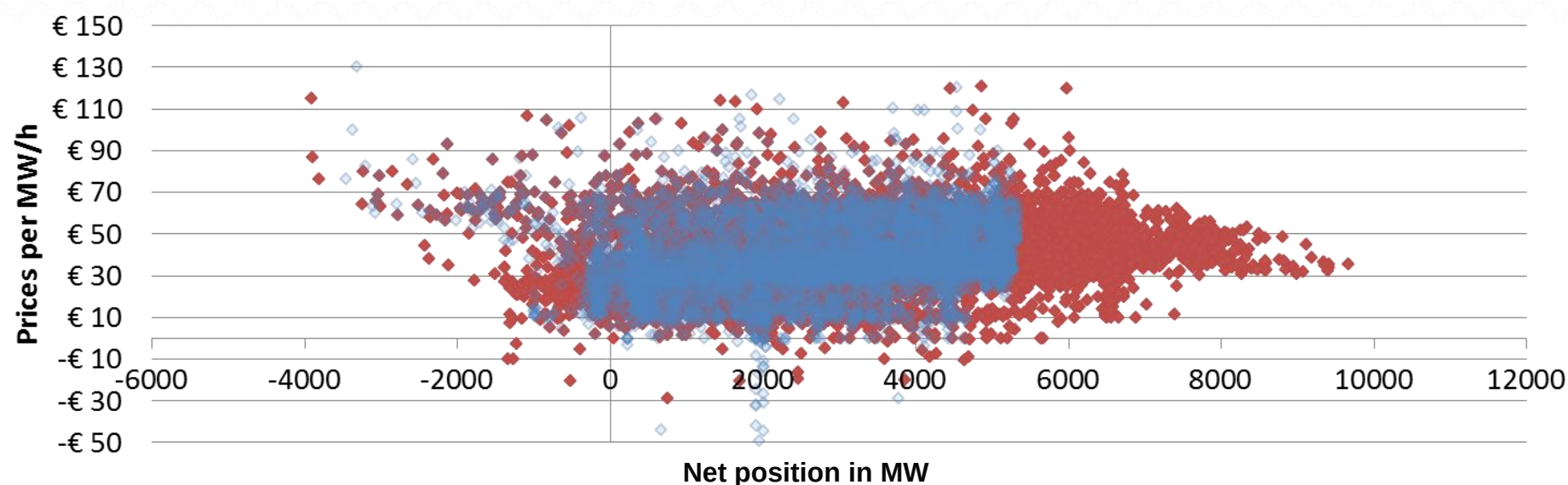


Figure 8. The top graph shows hourly net import/export positions versus prices in France under ATC Market Coupling and the FB Parallel Run in 2013. The bottom graph shows a distribution of net positions in MW. Red represents FB and blue represents ATC. Source Berenschot (data: CASC).

Test of international competition in FBMC, Germany

DE net positions versus prices 2013



The German picture is almost the same as French, in a mirror fashion. Whereas Flow-Based rises the imports in France, in Germany the added value is in the exports. Again, plots show an evenly distributed growth, without a sharp border.

This is an indication that international flow-factor competition works for Germany.

Like France, also Germany seems to have a bigger added value for Flow-Based compared to Belgium and the Netherlands, looking at the relative growth in net positions.

Histogram of ATC and FB net positions DE 2013

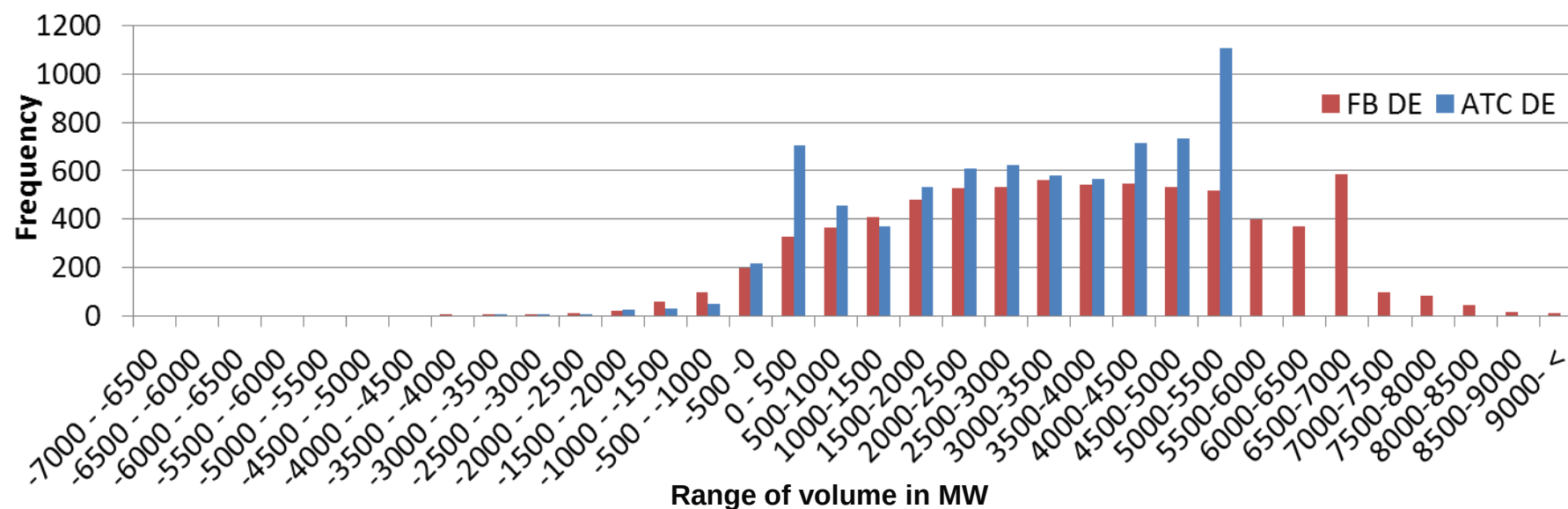


Figure 9. The top graph shows hourly net import/export positions versus prices in Germany under ATC Market Coupling and the FB Parallel Run in 2013. The bottom graph shows a distribution of net positions in MW. Red represents FB and blue represents ATC. Source Berenschot (data: CASC).

Lower price differences in FBMC are a small mitigation

Although country prices differ more often in FB, the average differences are still smaller (compared with ATC);

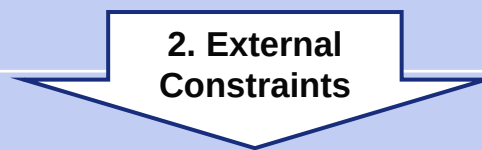
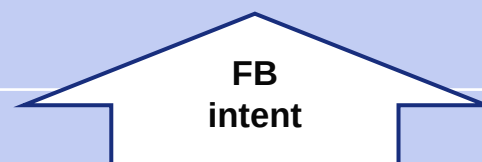
- The Root Mean Square of all price differences between all countries (6 differences per day, for all days) in 2013 is:
14,8 Euro/MWh in ATC ; 12,1 Euro/MWh in FBPR
- A lower average price difference reduces gaming potential for countries with low or mid price (upward potential more limited).
- However, ATC and FBPR does not differ that much in that respect.
- Moreover, this issue does not limit the gaming potential in the highest-priced isolated country (likely to be most severe).

Conclusions for issue 1. Loss of partial convergence

- Under FBMC, full convergence is higher, but partial convergence diminishes strongly. The gain in full convergence is much less than the loss in partial convergence.
- Therefore, the number of cases where each country has a different price increases strongly in FBMC. This effect largely concentrates on Belgium and France. It is smaller for Germany and negligible for the Netherlands.
- However, the growth of individual priced country cases is not always relevant, as in FBMC, individually priced countries do not face the same isolation as in ATC: international flow-factor competition still exists even if all prices are different.
- Individually priced countries under FBMC may still be isolated if the limiting condition is a maximum net import or export position. However, this is not the case for all countries showing growth in individually priced cases in FBMC (Belgium, France and Germany).
- For the Netherlands, it is the other way around: net import limits do apply, but this country does not show growth in individual-price cases in FBMC.
- There is no country showing both growth of individual prices, plus net import limits.
- Therefore, FBMC, compared to ATC, does not cause a negative competition impact from this perspective.
- Findings are summarized in the following table (next page) .

Overview of cases and competition consequences

Situation in ATC	Situation in FB	Effect on competition
Complete convergence: Competition across all countries	Happening more often	Better competition
Partial convergence: competition within sets of countries	Almost disappearing	Worse competition
Individual prices: only national competition (in ATC)	More often: Semi-isolated cases, with international flow-factor competition	Same or better competition
	Really isolated cases	Worse competition



Negative competition impact only occurs for countries showing both 1) and 2)

1. Happening for France, Belgium; less for Germany - not for the Netherlands
2. Happening for the Netherlands - but not for all other countries

5. Issue 2 - Flow factor competition

- Flow factor competition implies that competition is influenced by flow factors.
- One possible consequence is countries facing security of supply issues: although they bid the same price (or even maximum) as other countries, their imports are less. This is not the subject of this documents.
- However, the same effect could also be seen at “normal” prices. Then it translates in groups of buyers/sellers in one country having a different market position compared to buyers/sellers from another country, even if they bid the same price.
- We wish to study this latter effect and its possible consequences: what are the consequences of flow factor competition for parties in different countries?

Studied situations

Situation 1: Competition between end consumers in the Netherlands versus France, competing for exports from Germany to both countries. This is an often encountered situation.

In this situation there are two combinations possible in FBMC:

(A) NL-, FR-, DE+, BE-

(B) NL-, FR-, DE+, BE+

(Negative (-) stands for net import position and positive (+) stands for net export position)

Situation 2: Competition for volume of additional supply between producers in the Netherlands and Germany for exports to France (a less common, but every year emerging situation)

In this situation there are two combinations possible in FBMC:

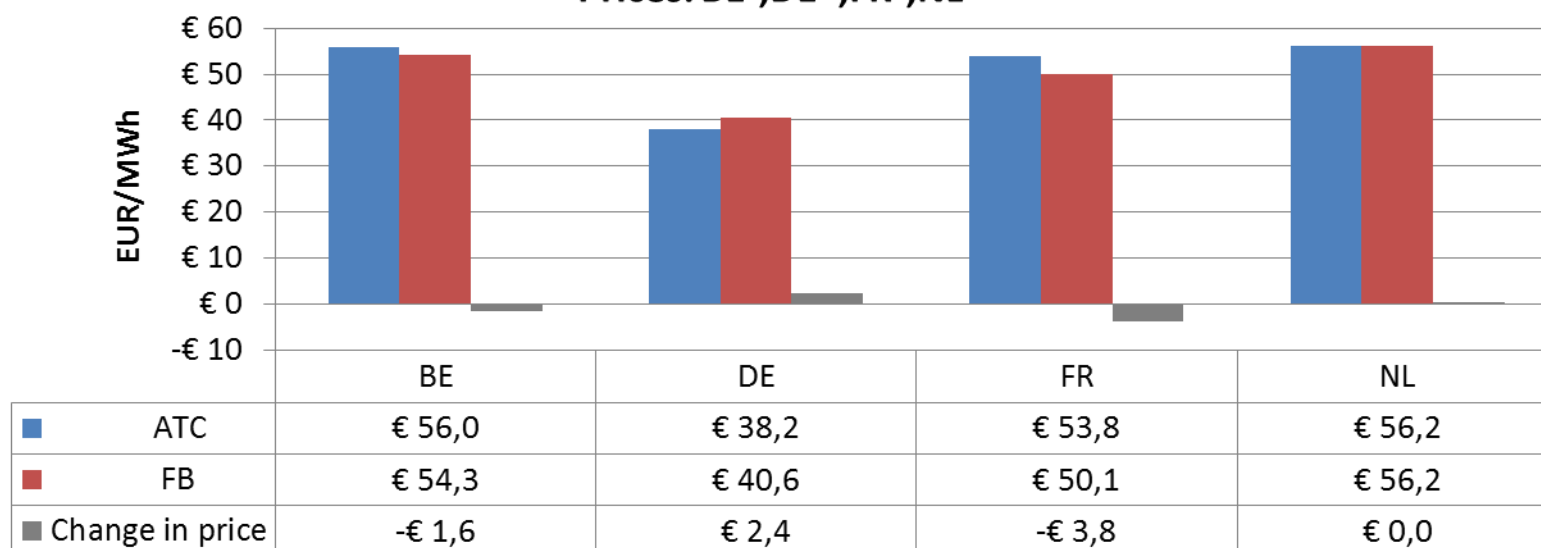
(A) NL+, FR-, DE+, BE-

(B) NL+, FR-, DE+, BE+

The analysis is done for 2013 and 2014 separately (2014 data up to October, because all 2014 data were not available yet). The following pages present 2013. The outcomes for 2014 confirm the 2013 picture and are presented in attachment 2.

2013 - Situation 1A: BE-;DE+;FR-;NL-

Prices: BE-;DE+;FR-;NL-



In this situation, the Netherlands, France and Belgium compete for power from Germany. This situation occurred in 1981 congested cases in 2013.

The Netherlands has the highest price in 1460 cases (74%), with an average price of € 56,2 per MWh. Of the importing countries, France has most often the lowest price. In total, France has the lowest price in 1532 cases (77%) with an average price of € 50,1 per MWh.

In this situation, France is able to import the most and for the lowest prices. Compared to ATC, France is able to import 993 MW more. The Netherlands is able to import just 98 MW more.

This situation show a negative bias for Dutch consumers versus French consumers when competing for imports from Germany.

Volumes: BE-;DE+;FR-;NL-

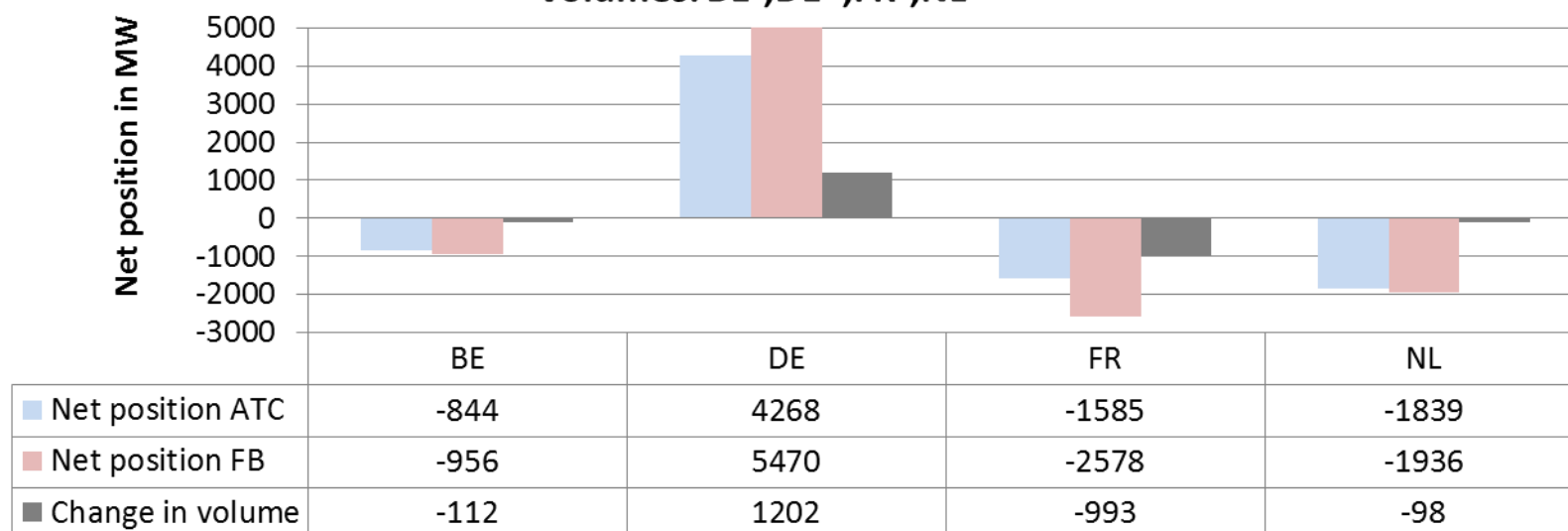
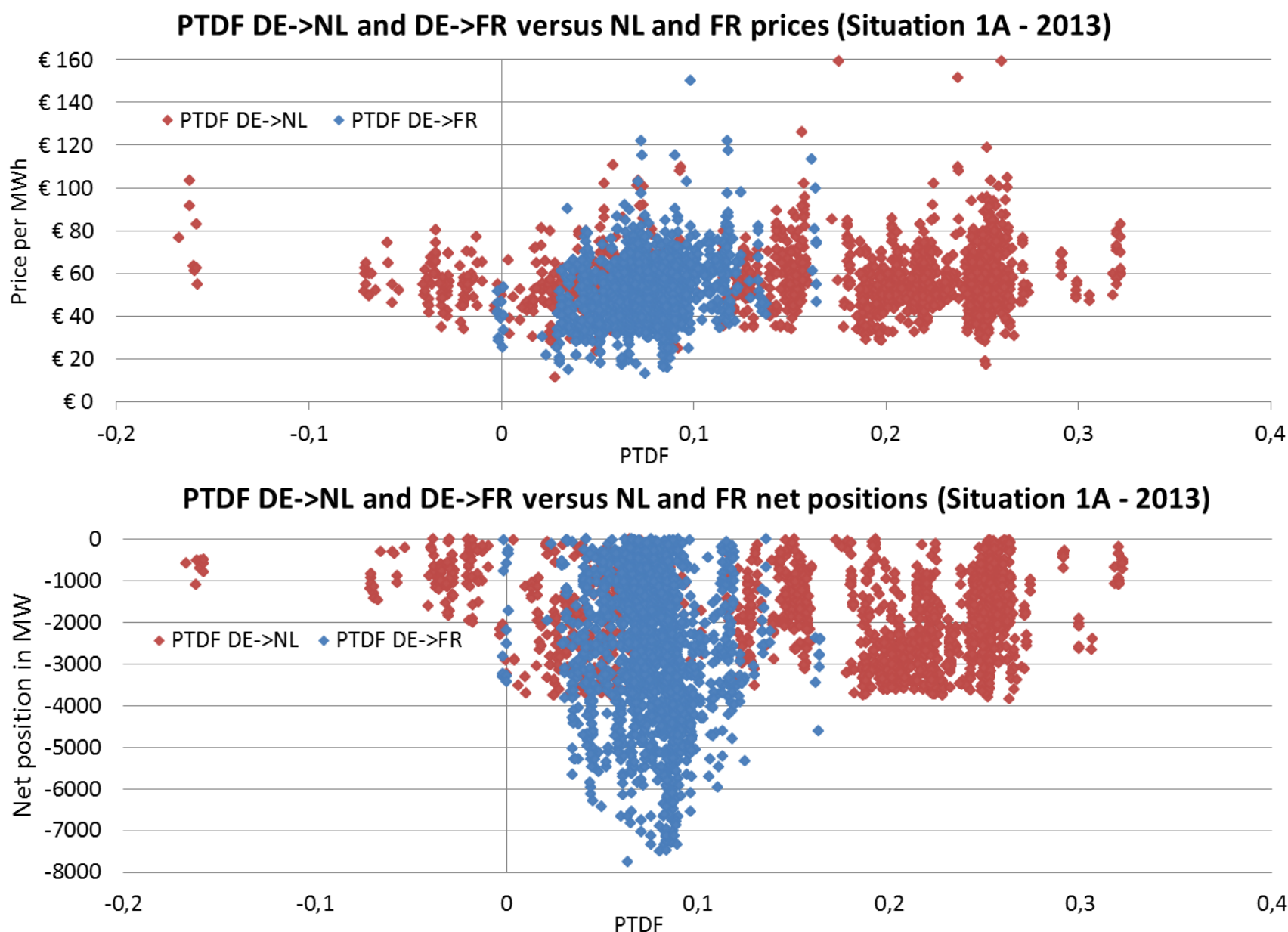


Figure 10. The top graph shows the change in price for each CWE country under FB configuration BE-;DE+;FR-;NL-.compared to ATC in 2013. The bottom graph shows the corresponding change in net import and export position. Source Berenschot (data: CASC).

Plot of PDTF's versus prices and net positions, sit. 1A



In these graphs the PTDFs for DE->NL and DE->FR are plotted against the corresponding prices (above) and net positions (below).

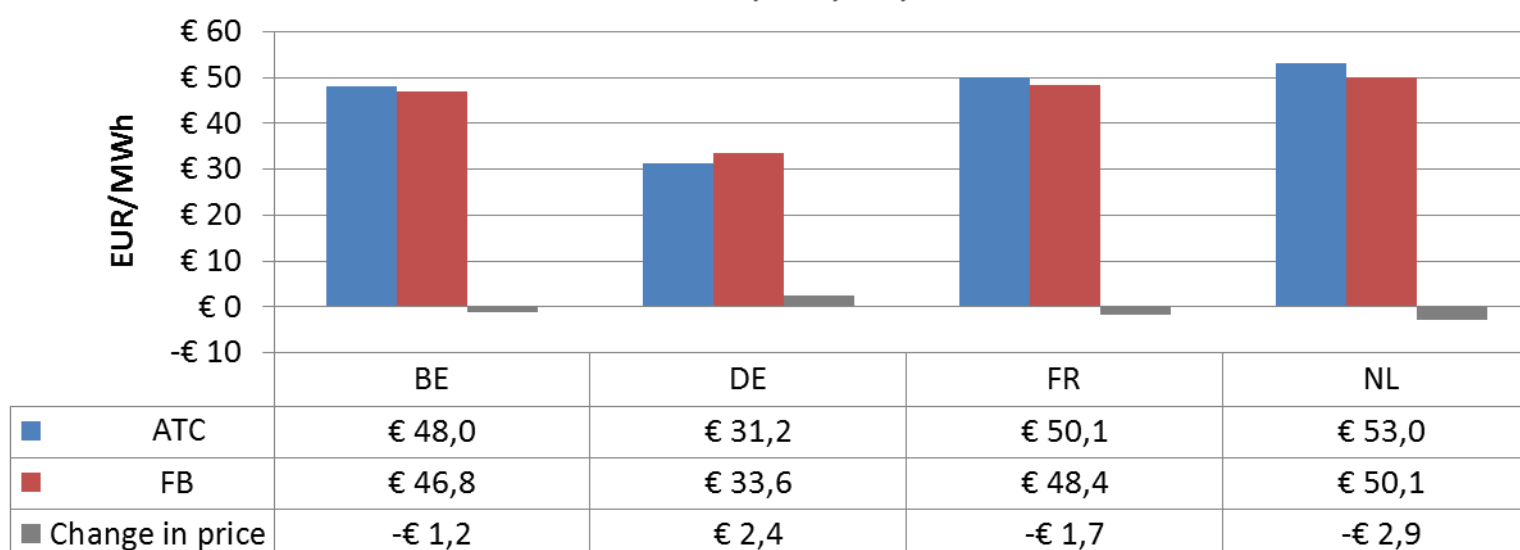
It shows that DE->FR has on average a far lower PTDF compared to DE->NL. This is consistent with France being able to import larger volumes than the Netherlands.

Another interesting observation is the fact that PDTF's for DE->FR are concentrated in a much smaller range, compared to the broader spread of PDTF's for DE->NL.

Figure 11. The top graph shows the hourly PTDF's DE->NL and DE->FR versus the corresponding prices in the Netherlands and France. The bottom graph shows the hourly PTDF's DE->NL and DE->FR versus the hourly net positions of the Netherlands and France. Source Berenschot (data: CASC; ACM).

2013 - Situation 1B: BE+;DE+;FR-;NL-

Prices: BE+;DE+;FR-;NL-



In this situation, the Netherlands and France compete for power from Germany and Belgium. This situation occurred in 432 congested cases in 2013.

The Netherlands has the lowest price in 200 cases (46%), with an average price of € 50,1 per MWh. France has the lowest price in 231 cases with an average price of € 48,4 per MWh.

France has most frequently the lowest PTDFs, namely in 230 hours (53%).

The Netherlands is able to import the most in this situation. Compared to ATC, the Netherlands is able to import 619 MW more. France is able to import just 450 MW more.

Thus, Belgium plays an important role in Dutch import situations. In the BE-situation studied before, Dutch consumers have difficulty competing for imports from Germany. In the BE+ situation, which is less frequent, this is the opposite.

Volumes: BE+;DE+;FR-;NL-

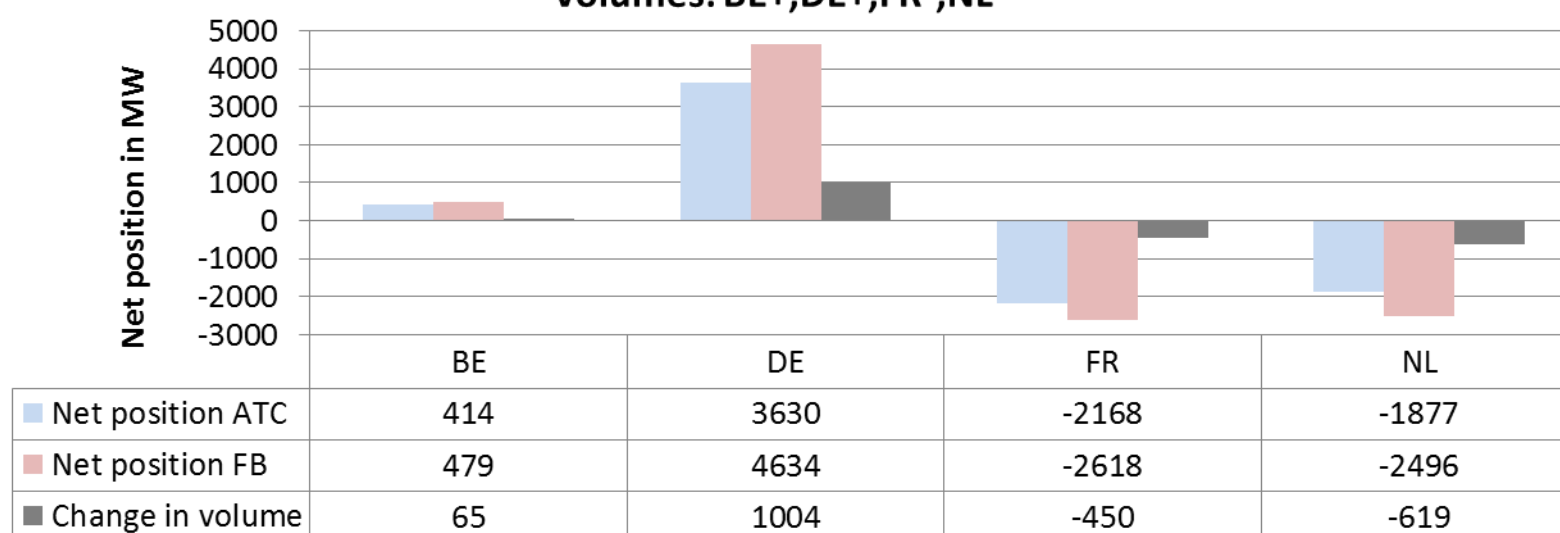
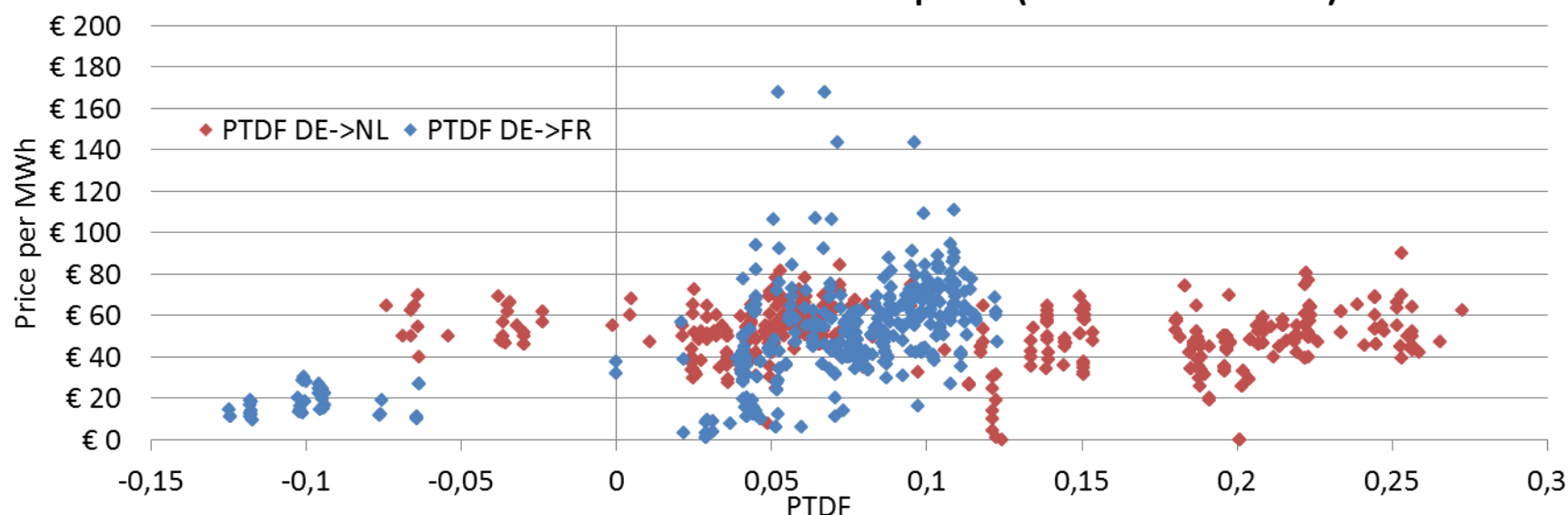


Figure 12. The top graph shows the change in price for each CWE country under FB configuration BE+;DE+;FR-;NL-. compared to ATC in 2013. The bottom graph shows the corresponding change in net import and export position. Source Berenschot (data: CASC).

Plot of PDTF's versus prices and net positions, sit. 1B

PTDF DE->NL and DE->FR versus NL and FR prices (Situation 1B - 2013)



In these graphs the PTDFs for DE->NL and DE->FR are plotted against the corresponding prices (above) and net positions (below).

Patterns are in one feature the same as for situation 1A: PDTF's for DE->FR are concentrated in a much smaller range, compared to the broader spread of PDTF's for DE->NL.

The difference is, that average of both PDTF's does not differ as much as situation 1A.

This is consistent with the fact that the Netherlands gets a bigger share of imports in this situation.

PTDF DE->NL and DE->FR versus NL and FR net positions (Situation 1B - 2013)

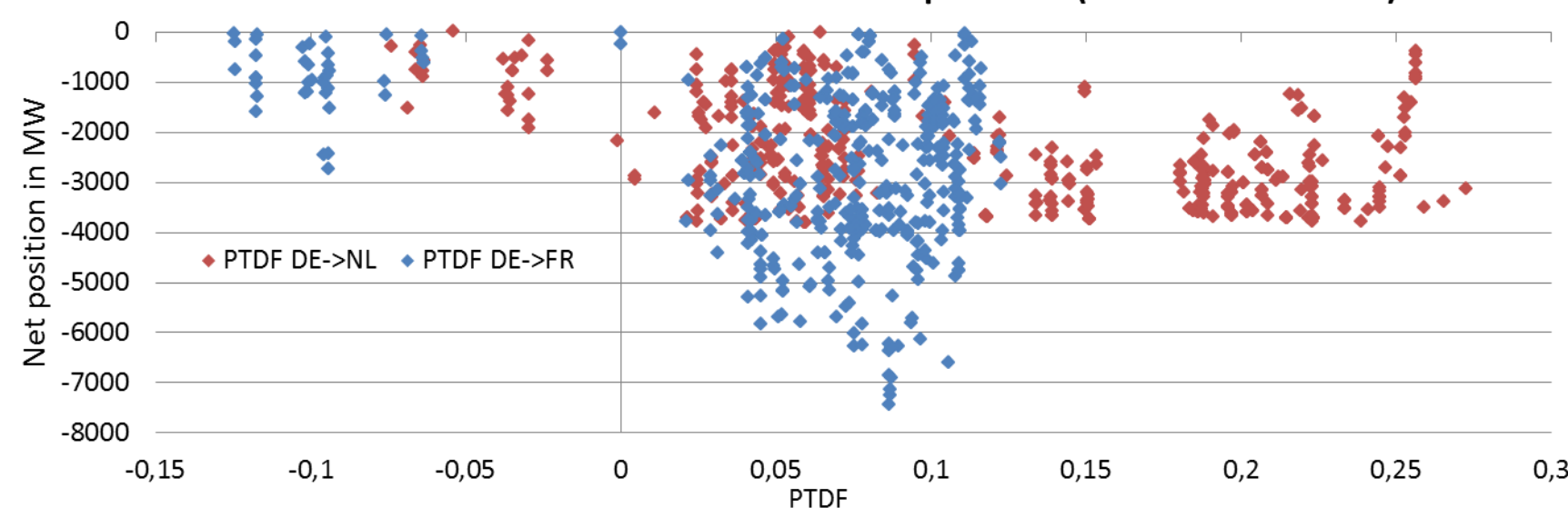
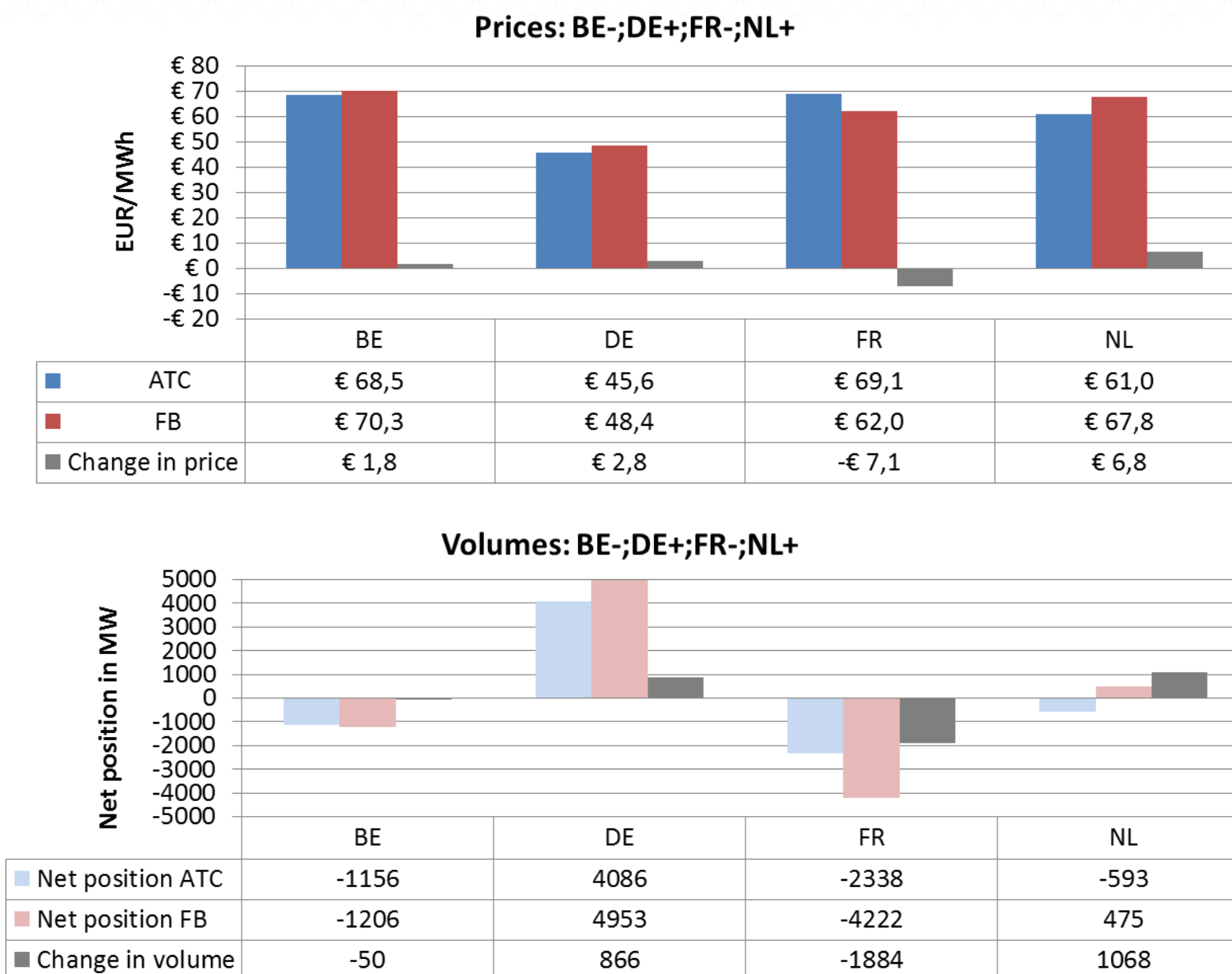


Figure 13. The top graph shows the hourly PTDF's DE->NL and DE->FR versus the corresponding prices in the Netherlands and France. The bottom graph shows the hourly PTDF's DE->NL and DE->FR versus the hourly net positions of the Netherlands and France. Source Berenschot (data: CASC; ACM).

2013 - Situation 2A: BE-;DE+;FR-;NL+



In this situation, producers in the Netherlands and Germany compete for exports to Belgium and France. This situation occurred in 141 congested cases in 2013.

The Netherlands has the lowest price in 15 cases (11%), with an average price of €67,8 per MWh. Germany has most frequently the lowest price of both countries. Germany has the lowest price in 125 cases (89%), with an average price of €48,4 per MWh.

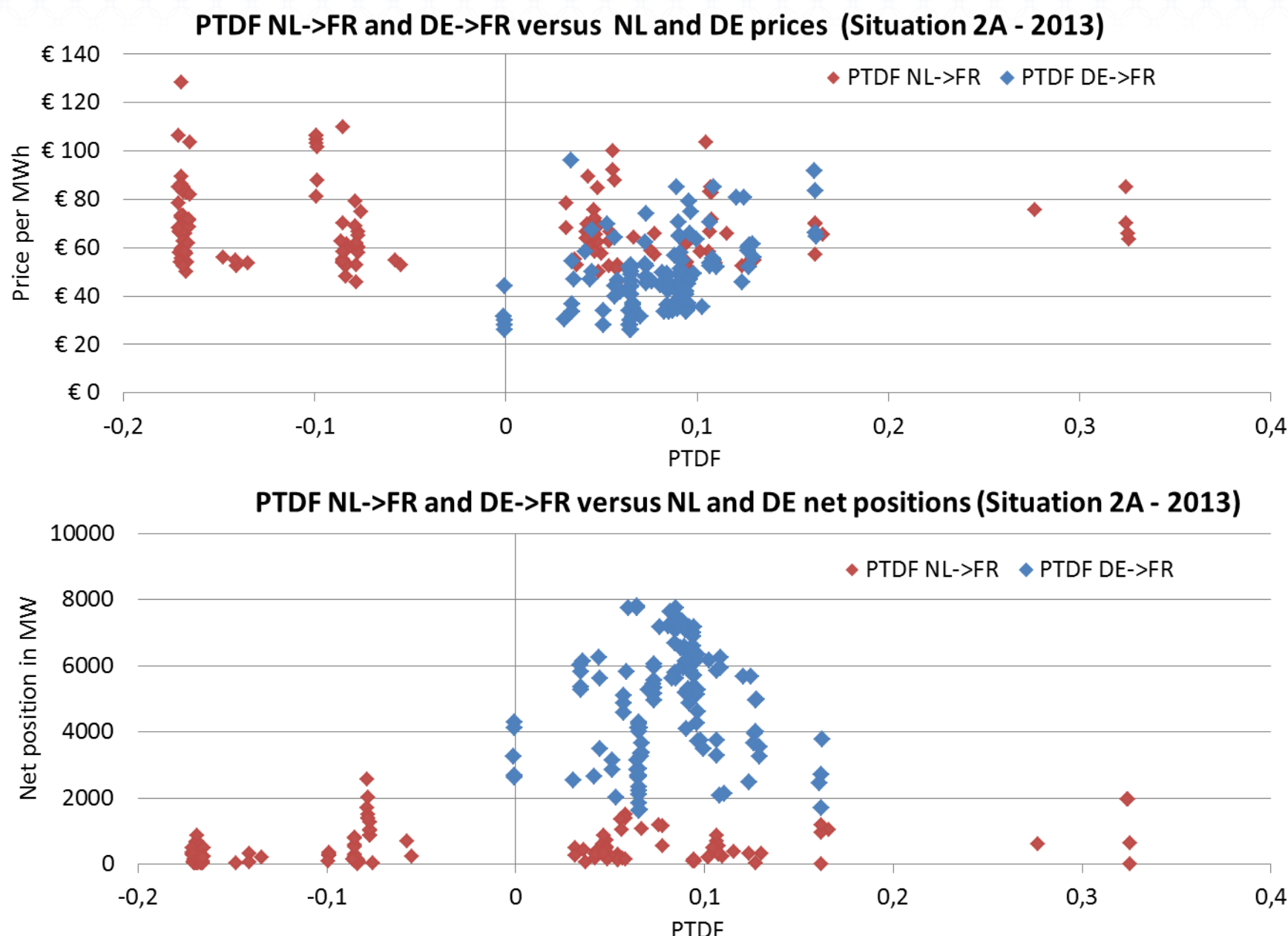
The average PTDFs for exports from the Netherlands and Germany are: NL>BE 0,026; DE>BE 0,142; NL->FR 0,034; DE->FR 0,082.

Both Germany and the Netherlands are able to export large volumes in this situation. Compared to ATC, the Netherlands can export even 1068 MW more. Germany can export 866 MW more in this situation, with an average export position of 4953 MW.

Conclusion: Dutch producers have a competitive advantage in this situation. This is at the expense of the Dutch end consumers being confronted with a much higher price.

Figure 14. The top graph shows the change in price for each CWE country under FB configuration BE-;DE+;FR-;NL+ compared to ATC in 2013. The bottom graph shows the corresponding change in net import and export position. Source Berenschot (data: CASC).

Plot of PDDF's versus prices and net positions, sit. 2A



In these graphs the PTDFs for NL->FR and DE->FR are plotted against the corresponding prices (above) and net positions (below).

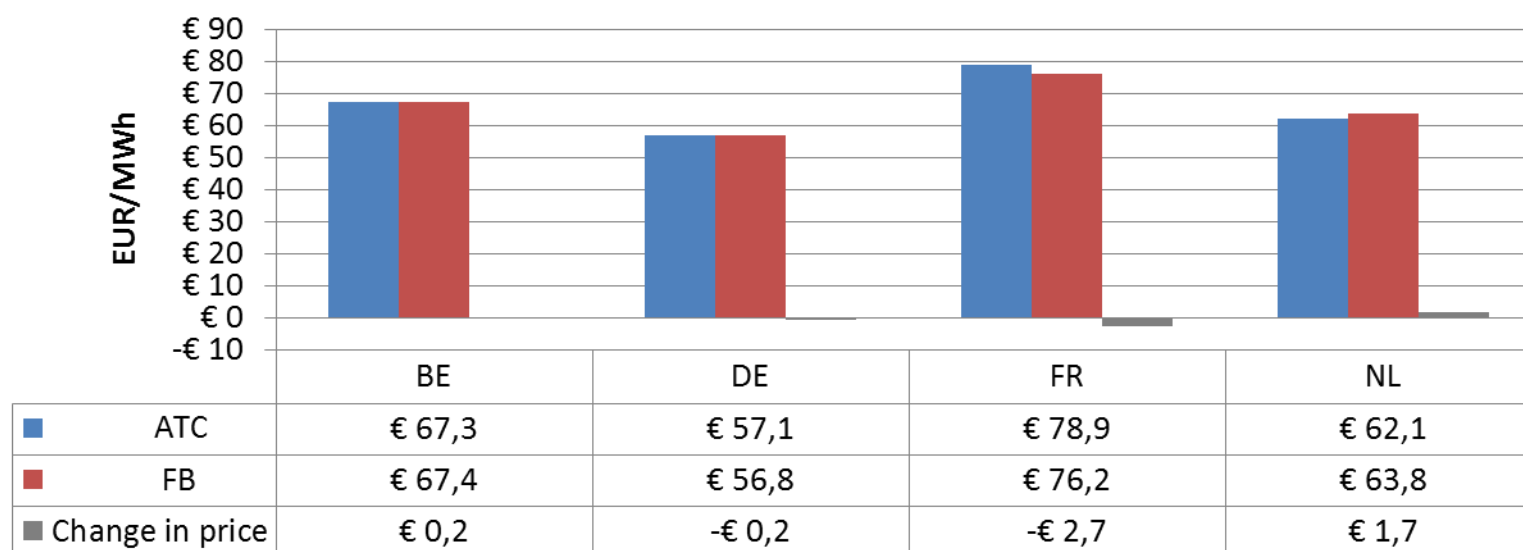
Again, PDDF's for DE->FR are concentrated in a much smaller range, compared to the broader spread of PDDF's for NL->FR.

An important feature is the large number of negative PDDF's for NL->FR, signifying occurrence of flows helping the transmission NL→FR. This is consistent with large exports from the Netherlands to France.

Figure 15. The top graph shows the hourly PDDF's NL->FR and DE->FR versus the corresponding prices in the Netherlands and Germany. The bottom graph shows the hourly PDDF's DE->NL and DE->FR versus the hourly net positions of the Netherlands and Germany. Source Berenschot (data: CASC; ACM).

2013 - Situation 2B: BE+;DE+;FR-;NL+

Prices: BE+;DE+;FR-;NL+



In this situation, the Netherlands, Germany and Belgium compete for exports to France. This situation occurred in 46 congested cases in 2013.

The Netherlands has the lowest price in 8 cases (17%), with an average price of €63,8 per MWh. Germany has most frequently the lowest price of all exporting countries. Germany has the lowest price in 37 cases (59%), with an average price of €56,8 per MWh.

The average PTDFs for exports from the Netherlands, Germany and Belgium are: NL->FR 0,047; PTDF DE->FR 0,073; PTDF BE->FR 0,030.

The Netherlands experiences the largest change in export position. Compared to ATC, the Netherlands exports 482 MW more with an average net position of 745 MW. Germany exports 141 MW less in this situation, with an average net position of 3132 MW.

Volumes: BE+;DE+;FR-;NL+

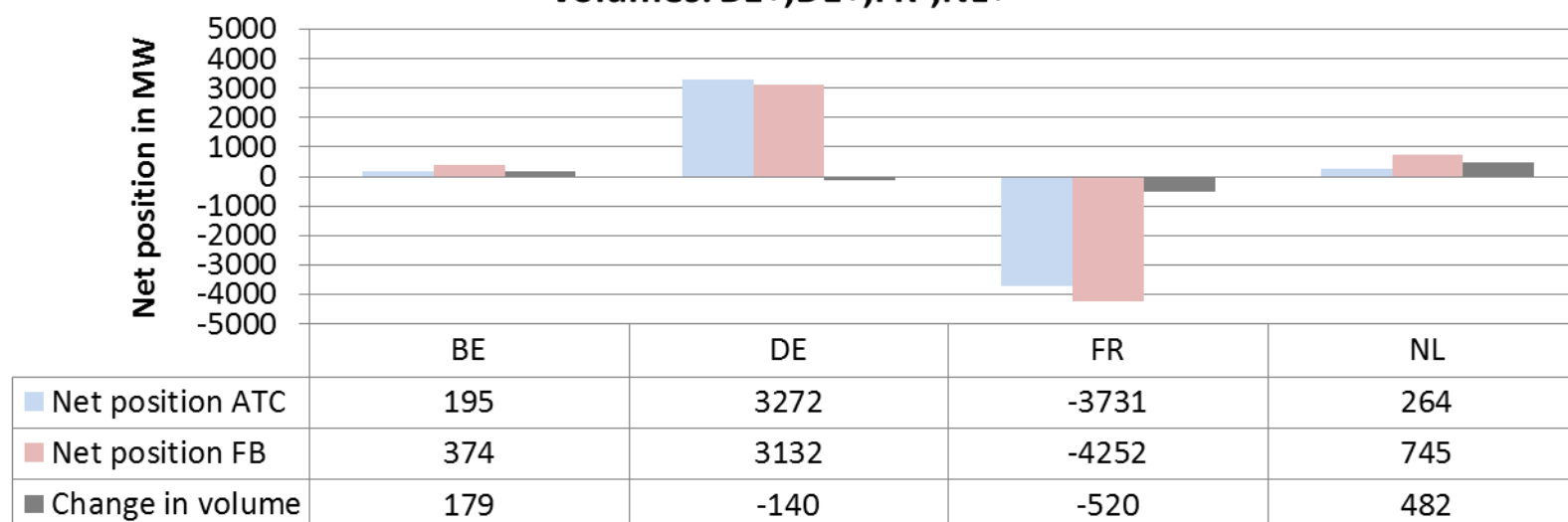
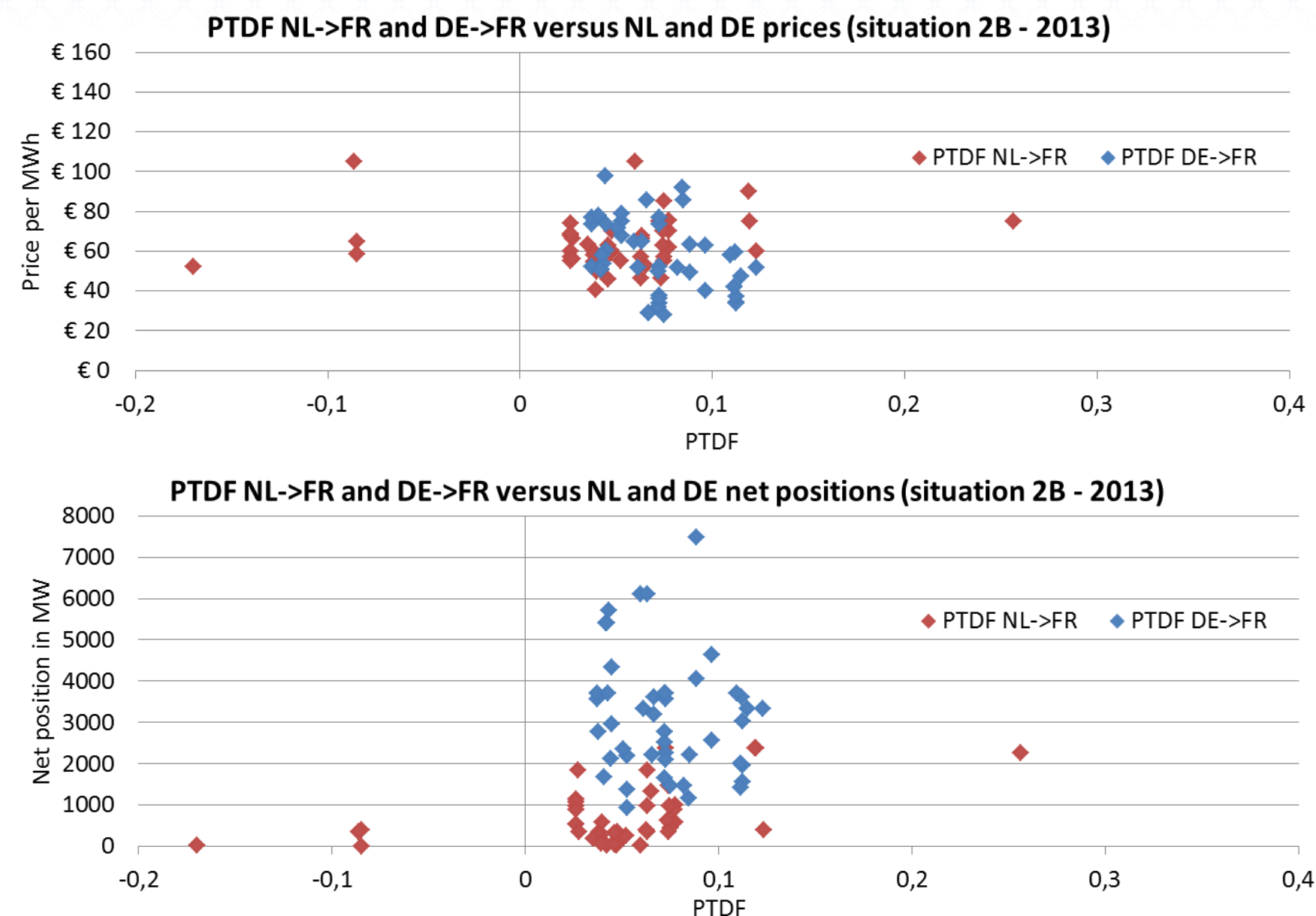


Figure 16. The top graph shows the change in price for each CWE country under FB configuration BE+;DE+;FR-;NL+ compared to ATC in 2013. The bottom graph shows the corresponding change in net import and export position. Source Berenschot (data: CASC).

Plot of PDTF's versus prices and net positions, sit. 2B



In these graphs the PTDFs for NL->FR and DE->FR are plotted against the corresponding prices (above) and net positions (below).

Again, PDTF's for DE->FR are concentrated in a smaller range, compared to the broader spread of PDTF's for NL->FR.

A number of negative PDTF's for NL->FR can be seen, signifying occurrence of flows helping the transmission NL→FR. This is consistent with large exports from the Netherlands to France.

Figure 17. The top graph shows the hourly PTDF's NL->FR and DE->FR versus the corresponding prices in the Netherlands and Germany in 2013. The bottom graph shows the hourly PTDF's DE->NL and DE->FR versus the hourly net positions of the Netherlands and Germany. Source Berenschot (data: CASC; ACM).

Results: 2. Flow factor competition – NL imports

Dutch consumers can be in a competitive disadvantage compared to French consumers in a constrained case with Germany exporting to both. This happens in certain situations:

- In constrained cases, when both the Netherlands and Belgium have a net import position. It does not happen if the Netherlands imports, and Belgium has a net export position. Overall: Dutch wholesale price is very dependent on Belgian im-/export position
- The competitive disadvantage for Dutch customers would also hold for the Netherlands as a whole. *Consequently, if the Netherlands should ever find itself in a severe shortage situation (which is not the case right now), it could obtain less imports than France even if it would bid the same price, creating a potential additional threat to security of supply (compared to ATC). In other words, the Netherlands could find itself in the current Belgian situation.*

When looking at the causes for this, there are many possible explanations.

- Overall, FBMC tends to increase the flows for larger countries, and especially France, despite smaller countries (like the Netherlands) having the same interconnector capacity.
- That could result from the fact that flow factors tend to be lower for bigger countries.
- The cause could also be in French PDTFs. The graphs show that these PDTF's are quite low, and in much smaller range than other PDTF's. There are also no critical branches inside France; all are on French borders. This deviates from other countries.

Recommendation: create complete transparency regarding PDTF determination. This is needed to find out if there is an issue with large/small countries, or in France specifically.

Results: 2. Flow factor competition – NL exports

Tested is the competition between Dutch producers versus German producers in a constrained case while both are exporting to France, researching if there is a competitive disadvantage for Dutch producers.

This depends on the Belgian im-/export position:

- In constrained cases with Belgium in a net import position, Dutch producers have a competitive advantage versus German ones, for export to France. Dutch price is raised upward in FBMC versus ATC.
- This is still the case if Belgium has a net export position, although less severe.
- FBMC outcome in constrained Dutch export situations for the wholesale Dutch price is upward, with a competitive advantage for Dutch producers, partly dependent on the Belgian situation. However, this is at the expense of Dutch consumers facing higher prices.

The issues regarding PDTF's as described for imports, are also valid in export cases. Again, flows tend to be higher for the bigger countries, and in particular France, despite smaller countries (like the Netherlands) having the same interconnector capacity.

Recommendation: create complete transparency regarding PDTF determination. This is needed to find out if there is an issue with large/small countries, or in France specifically.

Depending on that, remedies could be:

- Adaptation and/or harmonization of determination of PDTF's and critical branches.
- Bid zones inside larger countries, maintaining one price per countries.

Conclusions for issue 2. Flow factor competition

- The analysis shows FBMC drawbacks for Dutch end consumers in certain situations.
- These drawbacks appear in constrained case situations of the following nature:
 - a) When The Netherlands and Belgium are both importing: the effect is no price decrease compared to ATC, whereas customers in France do enjoy lower prices compared to ATC. This is happening quite often. The impact is not so severe: although in these cases the Dutch consumer does not benefit, he is not worse off; and overall FBMC effects are positive.
 - b) The Netherlands exporting: here Dutch producers have FFC competitive advantage, enjoying higher exports, and also at a higher Dutch price, compared to ATC. At the same time, Dutch customers would face substantially higher prices than in ATC. Although this does not happen very often, these are quite severe situations.
- The competitive drawbacks of FFC are relatively mild today but could become worse:
 - If Belgium would be in a permanent import situation (not the current case). If that would happen, the FBMC-caused drop of customer price (2,5 Euro/MWh) would vanish.
 - If the Netherlands would become a structurally exporting country. Then, Dutch customers would see a much higher price in FBMC than in ATC.
 - If the number of converging cases in FBMC would drop significantly. In that case, the effects as described above would happen more often.

6. Conclusions and recommendations

1. Loss of partial convergence after Flow-Based

Generally in FBMC, some countries have more often a different individual price, but (in comparison with ATC) this does not imply that these countries are isolated. Unlike ATC, FBMC maintains international competition for these cases.

This internal Flow-Based competition can be suppressed in cases of maximum net im- or export positions, leading to more isolated country cases. However, this is not as severe right now. It is recommended to monitor this further.

In this respect, there are no strong competition issues preventing FBMC introduction

2. Consequences of flow factor competition for parties in different countries

Flow-factor competition can cause competition bias: Dutch end-users obtain lower additional import flows from Germany than French end-users, when they bid the same price.

This happens in particular in constrained cases if Belgium is in a net import situation, already happening frequently. Dutch customers also face FBMC price rise on Dutch export situations. This situation could worsen if these cases would happen more often.

In this respect, there are some situations with competition bias. Given the benefits of FBMC in other respects, FBMC could be introduced now if there are sufficient guarantees on further development and improvements later on, like adaptation and/or harmonization of determination of PDTF's and critical branches, or bid zones inside larger countries, maintaining one price per country. One important precondition would be a total transparency on determination methods of PDTF's and critical branches.

Ultimately however, these issues could also result in a worsened security of supply for the Netherlands in a future situation. Therefore, FBMC improvements have to be absolutely guaranteed or, in absence of that, an unilaterally enforceable roll-back to ATC.

ATTACHMENTS

- 1) Reduction of international price differences under Flow-Based, 2013 and 2014
- 2) Flow-factor competition analysis for 2014

ATTACHMENT 1: Reduction of international price differences under Flow-Based, 2013 and 2014

- It was known that, in 2013, Flow-Based market coupling would have decreased the Dutch wholesale price by 2,34 €/MWh, compared with ATC.
 - The Dutch-German price gap would have decreased by 3,87: from 13,60 to 9,74 €/MWh
- In 2014 the price differences were much smaller to start with, in the current ATC situation
- Still, Flow-Based would have decreased Dutch price by the same (2,37 €/MWh) in 2014
 - The Dutch-German price gap would have decreased by 3,32: from 8,36 to 5,04 €/MWh

2013 wholesale day-ahead (all hours)			
	ATC	Flow Based	FB-ATC
Belgium	€ 46,84	€ 44,51	€ -2,33
France	€ 43,37	€ 42,51	€ -0,86
Netherlands	€ 51,78	€ 49,44	€ -2,34
Germany	€ 38,18	€ 39,70	€ 1,53
Dutch-German diff.	€ 13,60	€ 9,74	€ -3,87
2014 wholesale day-ahead (all hours)			
	ATC	Flow Based	FB-ATC
Belgium	€ 40,77	€ 37,24	€ -3,53
France	€ 34,53	€ 34,83	€ 0,30
Netherlands	€ 41,08	€ 38,71	€ -2,37
Germany	€ 32,72	€ 33,67	€ 0,95
Dutch-German diff.	€ 8,36	€ 5,04	€ -3,32

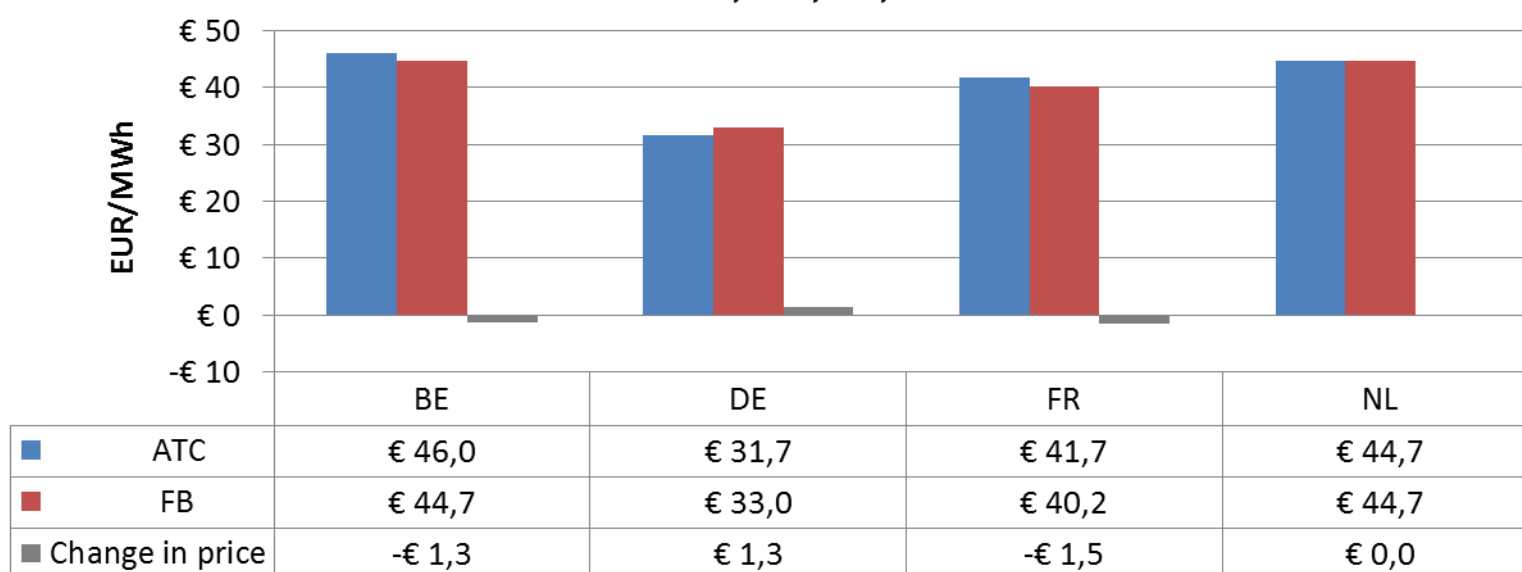
Table 1. Overview of ATC and FB prices for 2013 and 2014

ATTACHMENT 2: Flow-factor competition analysis for 2014

2014 - Situation 1A: BE-;DE+;FR-;NL-

2014 data: 01-01-2014 - 07-10-2014

Prices: BE-;DE+;FR-;NL-



In this situation, the Netherlands, France and Belgium compete for power from Germany. This situation occurred in 1163 congested cases in 2014.

France has in 824 cases (71%) the lowest price, with an average price of € 40,2 per MWh.

Of all the importing countries, France has most often the lowest PTDFs. France has the lowest PTDFs in 792 cases. The average PTDFs for imports from DE are: DE->NL 0,143 DE->FR 0,075 DE->BE 0,149.

France is able to import 489 MW more compared to ATC. The Netherlands is able to import 255 MW more.

Volumes: BE-;DE+;FR-;NL-

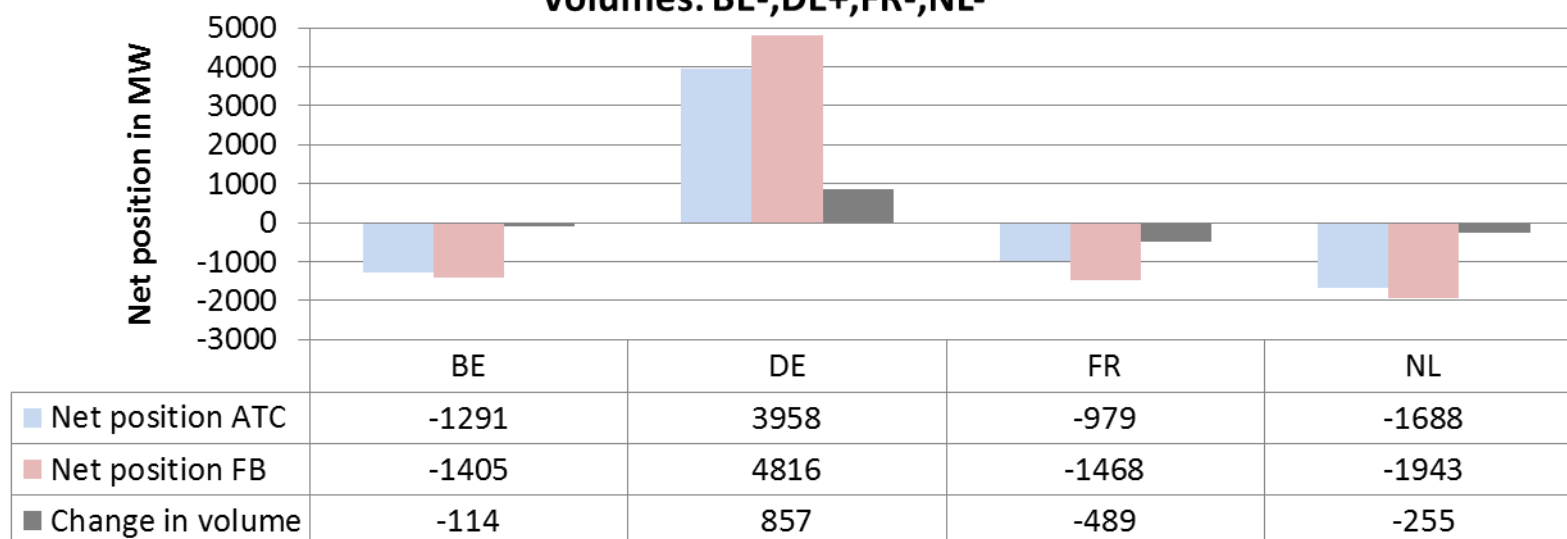


Figure 18. The top graph shows the change in price for each CWE country under FB configuration BE-;DE+;FR-;NL- compared to ATC in 2014. The bottom graph shows the corresponding change in net import and export position. Source Berenschot (data: CASC).

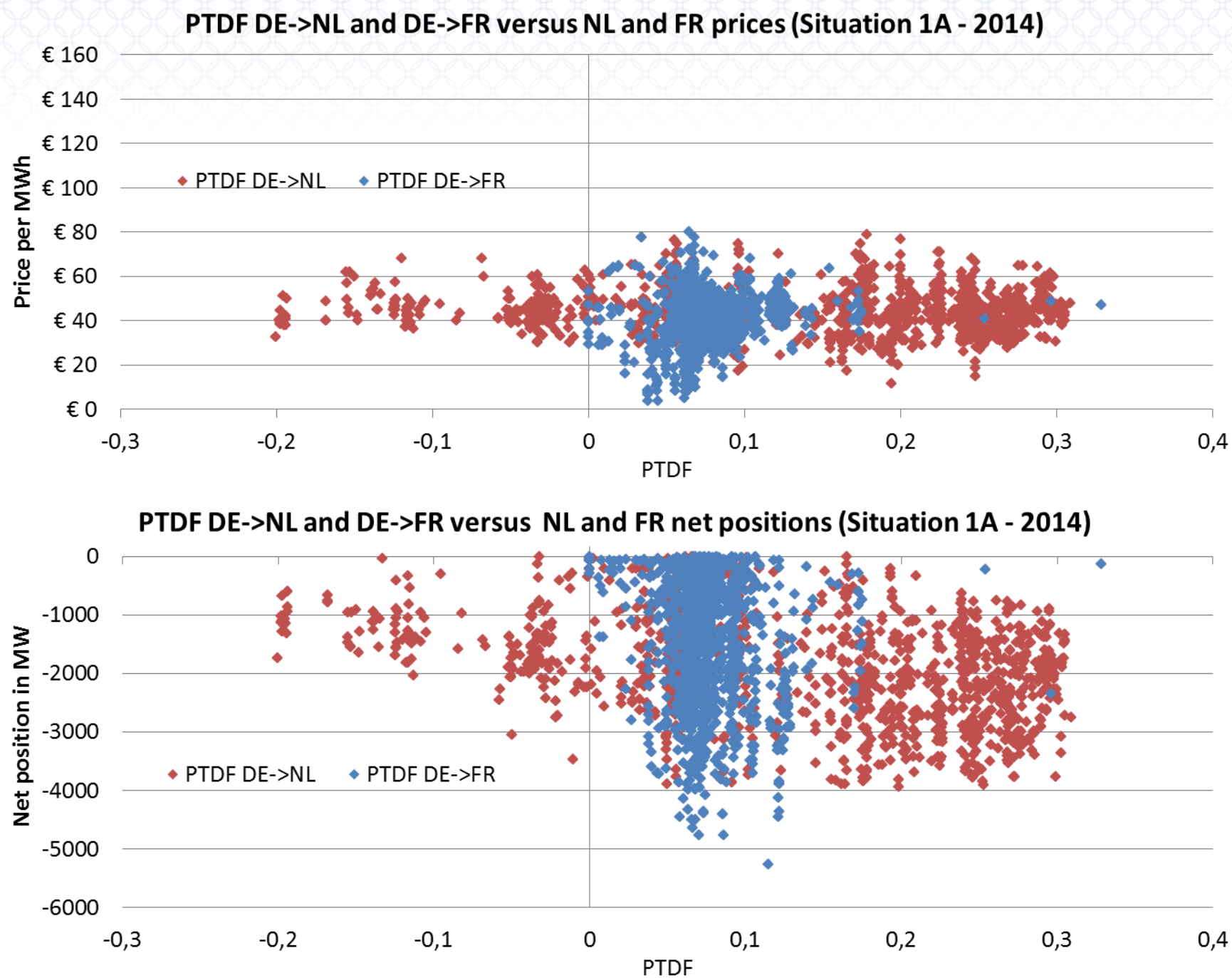
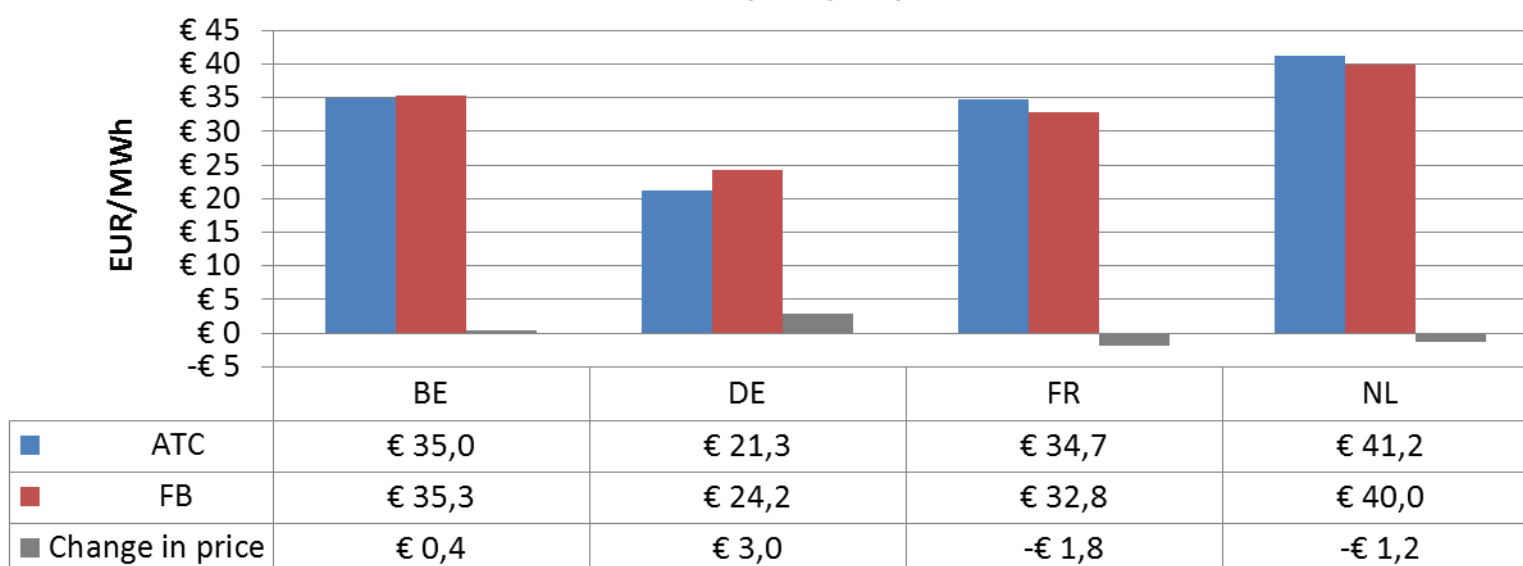


Figure 19. The top graph shows the hourly PTDF's DE->NL and DE->FR versus the corresponding prices in the Netherlands and France in 2014. The bottom graph shows the hourly PTDF's DE->NL and DE->FR versus the hourly net positions of the Netherlands and France. Source Berenschot (data: CASC; ACM).

2014 - Situation 1B: BE+;DE+;FR-;NL-

Prices: BE+;DE+;FR-;NL-



In this situation, the Netherlands and France compete for power from Germany and Belgium. This situation occurred in 78 congested cases in 2014.

Of the importing countries, the Netherlands has the lowest price in 23 cases (29%), with an average price of € 40 per MWh. France has the lowest price in 55 cases (71%) with an average price of € 31,8 per MWh.

France has the lowest PTDFs in 56 cases (72%). The PTDFs are: BE->NL 0,065 DE->NL 0,133 DE->FR 0,050 BE->FR 0,018.

The Netherlands is able to import 396 MW more compared to ATC. France is able to import 739 MW more.

Volumes: BE+;DE+;FR-;NL-

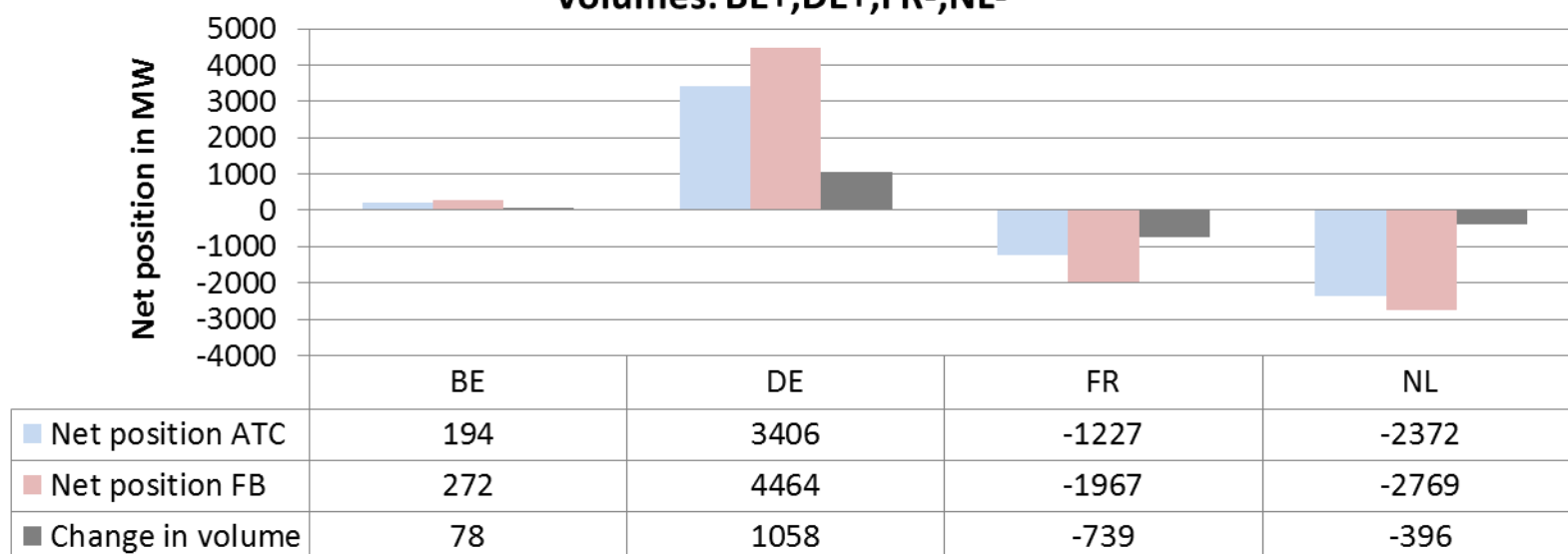


Figure 20. The top graph shows the change in price for each CWE country under FB configuration BE+;DE+;FR-;NL- compared to ATC in 2014. The bottom graph shows the corresponding change in net import and export position. Source Berenschot (data: CASC).

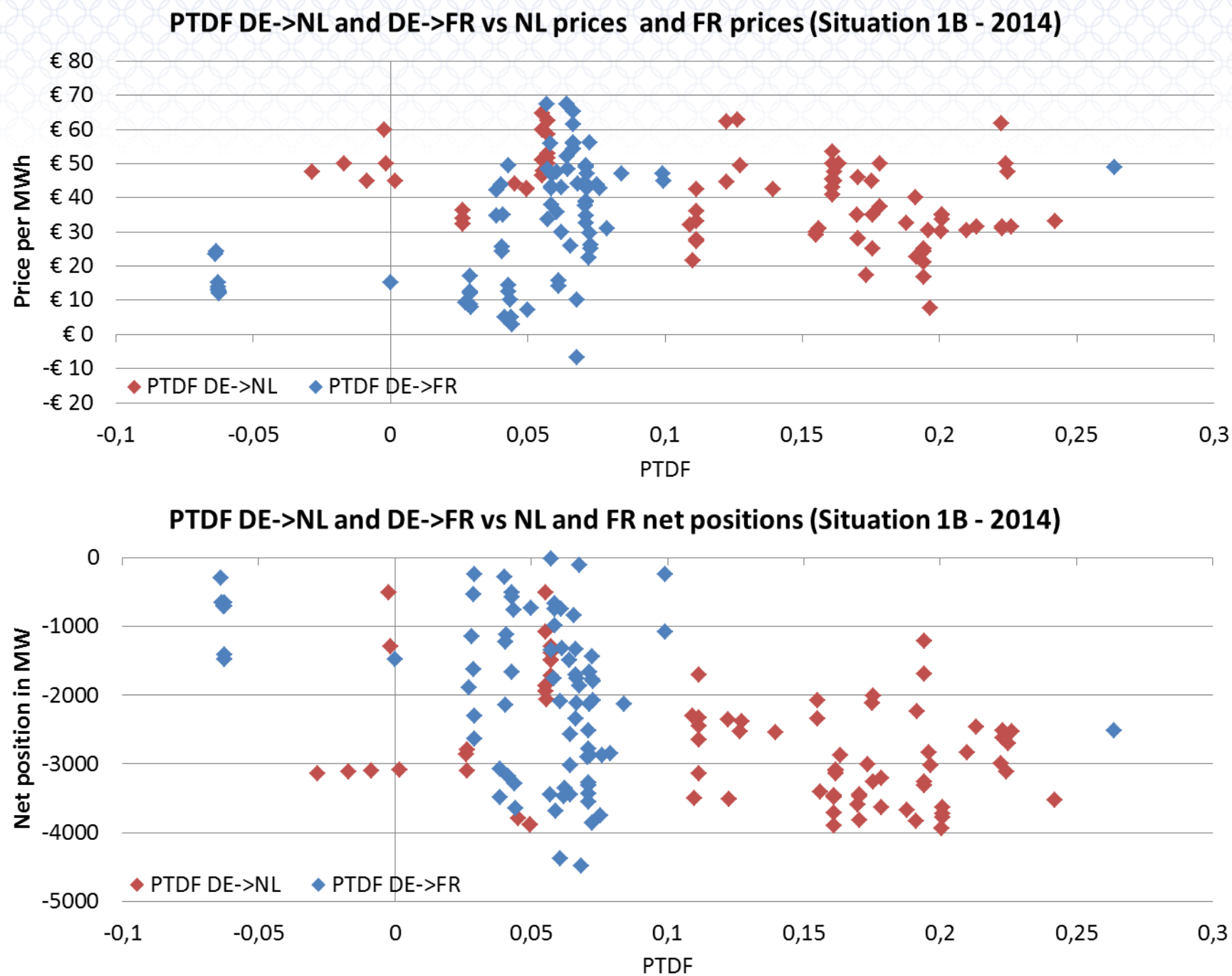
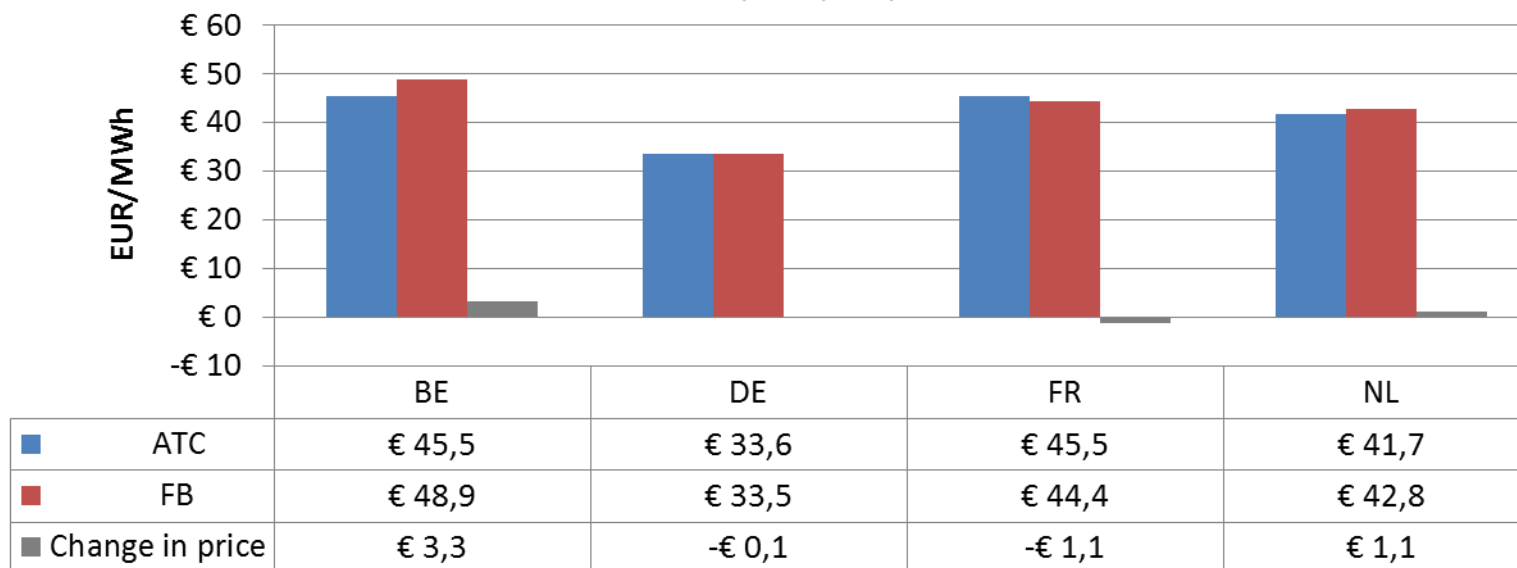


Figure 21. The top graph shows the hourly PTDF's DE->NL and DE->FR versus the corresponding prices in the Netherlands and France in 2014. The bottom graph shows the hourly PTDF's DE->NL and DE->FR versus the hourly net positions of the Netherlands and France. Source Berenschot (data: CASC; ACM).

2014 - Situation 2A: BE-;DE+;FR-;NL+

Prices: BE-;DE+;FR-;NL+



In this situation, the Netherlands and Germany compete for exports to Belgium and France. This situation occurred in 23 congested cases in 2014.

The average price of Germany is € 33,5 per MWh, The average price of the Netherlands is € 42,8 per MWh.

The average PTDFs for exports from the Netherlands and Germany are: NL->BE 0,104 DE->BE 0,154 NL->FR 0,042 DE->FR 0,093.

The Netherlands is able to export 337 MW more compared to ATC. Germany exports in this situation 249 MW less, but still holds an average net export position of 3390 MW.

Volumes: BE-;DE+;FR-;NL+

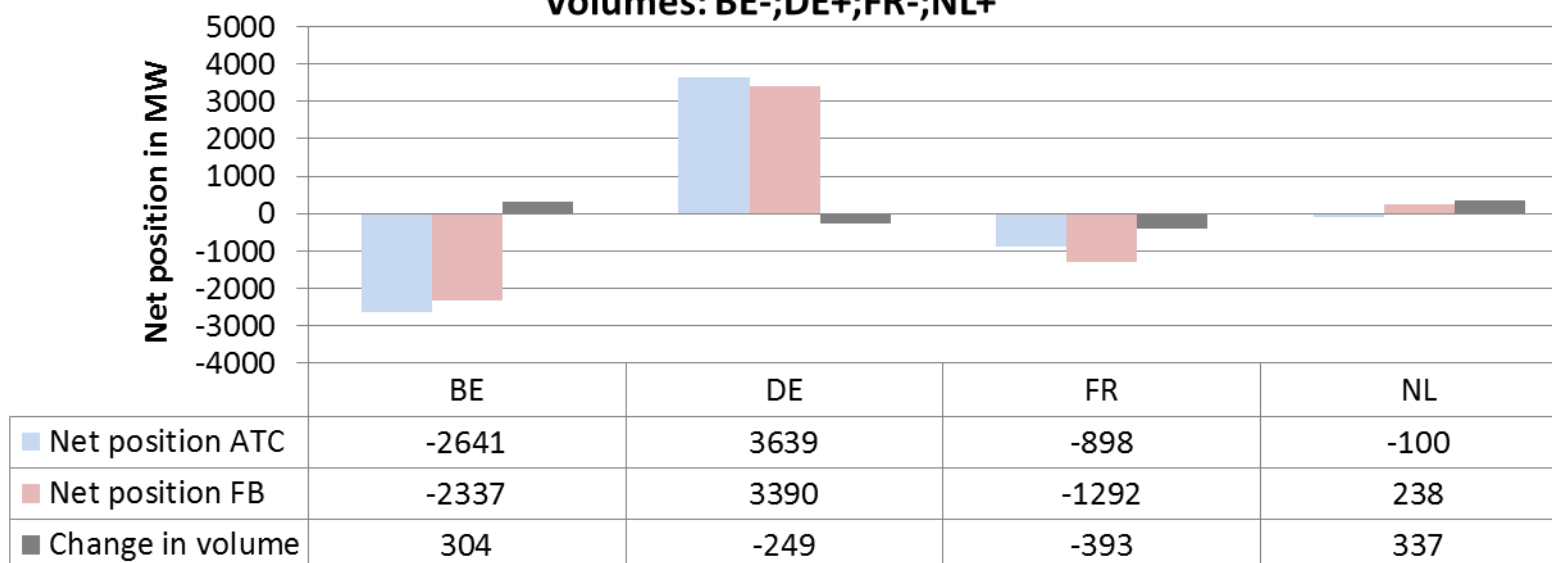


Figure 22. The top graph shows the change in price for each CWE country under FB configuration BE-;DE+;FR-;NL+ compared to ATC in 2014. The bottom graph shows the corresponding change in net import and export position. Source Berenschot (data: CASC).

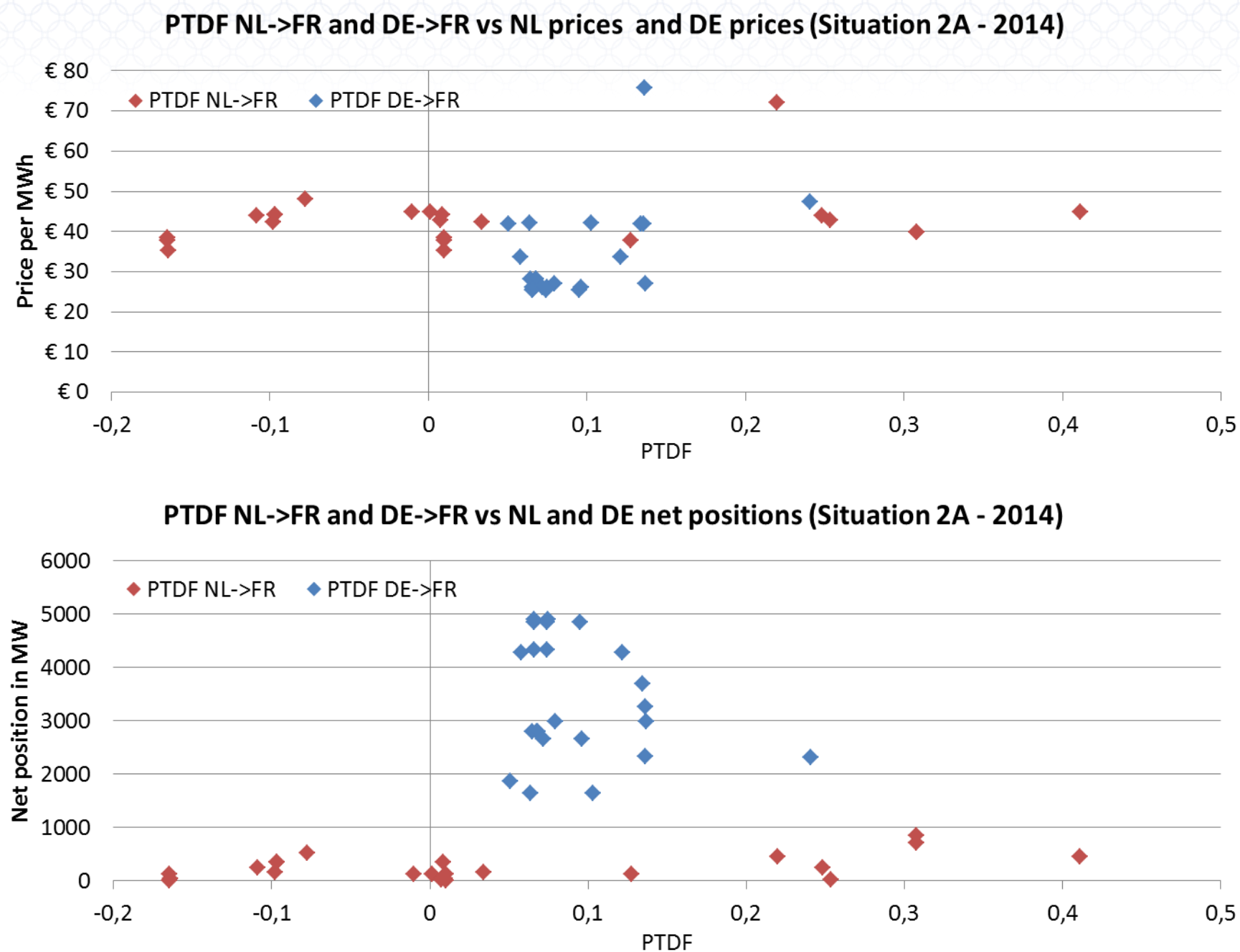


Figure 23. The top graph shows the hourly PTDF's NL->FR and DE->FR versus the corresponding prices in the Netherlands and Germany. The bottom graph shows the hourly PTDF's NL->FR and DE->FR versus the hourly net positions of the Netherlands and Germany. Source Berenschot (data: CASC; ACM).