



NWE Day-Ahead Price Coupling: Questions & Answers

1. What is the NWE Price Coupling Initiative?

North-Western Europe (NWE) Price Coupling is a project initiated by the Transmission System Operators (TSOs) and Power Exchanges (PXs) of the countries in North-Western Europe (=> question 4). This cooperation aims at establishing price coupling of the day-ahead wholesale electricity markets in this region, increasing the efficient allocation of interconnection capacities of the involved countries and optimizing the overall social welfare.

2. What is the purpose of the Initiative?

The overall objective is to implement a day-ahead market coupling in the NWE region based on the price coupling principle, using one single algorithm, calculating simultaneously the market prices, net positions and flows on interconnectors between market areas. The single coordinated matching function is necessary to implement by 2014 the European Day-Ahead Target Model in order to optimize area and cross-border trades, based on implicit auctions and facilitated through Price Coupling of Regions (PCR).

3. What is PCR?

PCR, which stands for 'Price Coupling of Regions' is the initiative of seven power exchanges, APX, Belpex, EPEX SPOT, GME, Nord Pool Spot, OMIE and OTE to develop a price coupling algorithm embedded in a common system solution (PMB), with the goal that this infrastructure, including the algorithm, will be used for European Price Coupling.

The PCR parties signed the PCR Cooperation Agreement and PCR Co-ownership Agreement in June 2012. PCR is open to other power exchanges that want to join.

The NWE regions (CWE, Nordic-Baltic and GB) will use this PCR infrastructure, including the algorithm, for price coupling within NWE.

4. Which countries are involved in the Initiative?

The NWE Price Coupling initiative covers the Nordic region (Denmark, Finland, Norway, Sweden) , Great Britain, and the CWE region (Belgium, France, Germany, Luxemburg and Netherlands).

Although parties from the Baltic States and Poland are not directly involved, those areas are coupled to the Nordic market via NPS and this coupling will continue to be supported. The same applies for the Austrian market: Austria is not directly involved, but Austrian prices are determined at the same time as German prices, since they are part of a single bidding area. Overall, 15 countries will be coupled.

5. Who are the partners?

The 17 partners of this project comprise TSOs and PXs as follows: APX, Belpex, EPEX SPOT and Nord Pool Spot from the PX side; 50Hertz, Amprion, Creos, Elia, Energinet.dk, Fingrid, National Grid, RTE, Statnett, Svenska Kraftnät, Tennet B.V.(Netherlands), Tennet GmbH (Germany) and TransnetBW from the TSO side.



6. Regarding the number of partners, how is the project organized?

The project is led by a joint steering committee (JSC), consisting of responsible delegates of each partner. The JSC is chaired by one TSO and one PX representative.

The operational work is carried out by two working groups (WG), one technical and one legal, regulatory and market WG. Each of these WG comprises several Task Forces dedicated to a certain topic, e.g. Shipping, Algorithm or Regulatory questions.

7. What is the timeframe of the project until go-live?

Regarding a project of this technical complexity, high-level requirements and size, covering several countries with more than a dozen of companies involved, there are a lot of dependencies. The most important goal is the reliability and the robustness of the final solution, guaranteeing the best solution for market participants. The parties target a go-live by November 2013 subject to successful finalization of the testing of the price coupling solution and subject to receiving the necessary regulatory approvals in time. For further details we refer to the Monthly Progress Reports that are published on CASC's and all the PX's websites.

8. Why is the project not expected to go live according to the ACER roadmap?

The NWE parties started the project in 2011 based on the assumptions that most systems and procedures currently in place in the regions could remain. However, the outcome of the design phase has shown that quite some additions and changes must be introduced. The current market coupling systems in CWE and Nordic will be replaced by the PCR system. The EMCC solution for the CWE-Nordic interconnections will also be replaced by the PCR solution. New solutions must be introduced in GB and for the GB-CWE interconnections. Finally a few new requirements linked to preparations for extensions to other regional implementation projects have been considered. These changes, which are in fact development projects by themselves, have led to a longer implementation time of the overall project.

9. Which systems will be used?

Euphemia is the name of the algorithm that NWE will use. Euphemia is an algorithm developed by the Price Coupling of Regions (PCR) Initiative for a pan-European day-ahead price coupling solution. Euphemia starting point was the COSMOS system which has been in use since November 2010 for CWE and which has recently be introduced for the trilateral coupling between Czech Republic, Hungary and Slovakia. The general optimization model applied in Euphemia has also been applied in the Nordic-Baltic region via NPS SESAM system since late 2007 thus the key properties are already since many years well established in the NWE markets at large.



Euphemia is a Greek woman's name meaning 'well spoken of' or 'well-regarded'. As the algorithm name it consists of the prefix EU- and the acronym PHEMIA ('Pan-European Hybrid Electricity Market Integration Algorithm'). The algorithm is hybrid because it supports any mix of ATC-based and flow-based network models.

Each Power Exchange continues to use its own trading systems and has to ensure the compatibility with the coupling solution.

TSO systems will remain as much as possible the same as today in CWE and the Nordic-Baltic regions. Some marginal adjustments will be brought to these systems to be able to take into account the interconnectors between these two regions and with GB.

10. What does the algorithm do?

The algorithm matches energy demand and supply for 24 hours simultaneously and returns execution prices and the net position of bidding areas. This process maximizes social welfare (consumer surplus, supplier surplus and congestion rent) and takes into account limit prices of orders and network constraints. A large variety of orders and network features are taken into account and available according to local market rules.

11. How does the algorithm work?

The algorithm runs a combinatorial optimization process based on (i) the modeling of the matching problem, (ii) the implementation of dedicated branch-and-bound strategies and (iii) the utilization of a standard optimization solver. The code of the algorithm uses java and it is interfaced with the matching system via an Oracle database.

12. What exactly is the difference between the existing solution, consisting of CWE, the Nordic-Baltic Market Splitting and the ITVC between the two solutions?

At the moment, the prices and the flows in the Nordic-Baltic and CWE markets are calculated independently by using different price coupling algorithms; in a first step, the Interim Tight Volume Coupling (ITVC) solution calculates the flows between the Nordics and CWE based on all order books, which is then followed by the separate price calculations for CWE by APX, Belpex and EPEX and Nordic-Baltic by NPS where the ITVC flow results for the CWE-Nordic interconnectors are included in the relevant order books.

By implementing the NWE Price Coupling solution, the market coupling design will be simplified: One single algorithm will be used by the PXs via the PCR infrastructure and operational concept to calculate all market prices, net positions and cross-border flows at the same time, which will highly increase robustness of the system and efficiency of the markets.

13. What is the future role of EMCC which currently carries out the ITVC between CWE and the Nordic-Baltic?

EMCC was set to deliver interim volume coupling services on the interconnectors between CWE and Nordic. Price coupling as in CWE and later NWE is however the agreed target design for day-ahead markets in Europe. The NWE Price Coupling initiative will deliver a solution that will replace the



interim volume coupling. This will also facilitate reaching the target model of an integrated European power market by 2014.

14. What is the gain for market participants?

NWE Price Coupling will optimize the use of cross-border capacities in a region that accounts for three quarters of European consumption, delivering signals for a more efficient use of investments in the power sector across Europe. Market Coupling increases liquidity, decreases volatility, and optimizes buyers' and sellers' surplus across all involved markets.

15. How will this impact the end consumers?

The initiative will lead to an optimized allocation of capacities and contribute in this way to a higher security of supply. Furthermore, it will bring about a fruitful competition for the ongoing European integration projects, leading to more efficient use of power and productive investments in Europe.

16. Is the Initiative open for others to join?

NWE is restricted to the TSOs and Power Exchanges of the involved countries. However, there are several other regional market coupling initiatives (=> question 17).

17. Will Market Coupling be further extended after the implementation of NWE?

NWE is part of a bigger picture, the so-called European Price Coupling, a goal set by the European Commission and due to be implemented by end of 2014. To achieve this target, parallel market coupling initiatives have emerged, such as CWE, NWE, SWE and CEE.

To facilitate the overall integration process, several Power Exchanges launched the Price Coupling of Regions project, an open initiative that today comprises six major Power Exchanges across Europe. PCR's goal is the efficient deployment of a coordinated day-ahead price coupling algorithm by taking into account the contractual and regulatory frameworks of each region (=> question 3).

In parallel, the TSOs have through ENTSO-E established a task force together with the non-NWE TSOs in order to facilitate the extension to the remaining EU countries.

18. How does the NWE project interlink with the CWE Flow Based project?

The CWE Flow Based project and the NWE project are in fact two separate projects but they are indeed interlinked now, because the implementation schedules of both projects have become very close. Implementing NWE before CWE Flow Based has the advantage that the volume coupling algorithm of EMCC (which becomes obsolete after the NWE Price Coupling go-live) does not have to be adapted anymore.

19. How will the specific case of UK with two power exchanges be managed in NWE?

In order to form a common reference price for electricity across the two participating GB PXs Day Ahead Auctions (N2EX run by NPS and APX Power UK), it is necessary to design and operate an open access platform where all GB interconnectors and GB PXs can be connected. This open access platform, the so-called "GB virtual hub" operated by NPS (N2EX) will do this by allowing the liquidity



of connected GB PXs involved in the PCR algorithm to be pooled and, as a result, the cross border capacity of connected GB interconnectors to be allocated by the algorithm in a coordinated manner.

20. What are the fall-back solutions envisaged in case NWE market coupling cannot be successfully run?

For the fallback solution the NWE parties will continue with the current arrangements in place for the CWE region, the Nordic-Baltic region and the CWE-Nordic interconnectors (except the Baltic cable).

For the borders internally in the CWE region and for the CWE-Nordic interconnectors (except the Baltic cable) this means using the shadow auction system of CASC.

Internally in the Nordic-Baltic region, in case the NWE Price Coupling fails, NPS will perform a price coupling 'locally' for its own region. There will not be explicit auctions on a border per border basis in the Nordic-Baltic region.

For GB, the fallback mode will be explicit auctions for the IFA cable (on CMS IFA) and intraday allocation for the BritNed cable. Internally in GB the two markets N2EX (NPS) and APX will stay coupled as much as possible, but in rare cases these two PXs may have to calculate independent GB prices for their respective markets.

21. Why is the PCR approach based on a rotating principle that duplicates different market roles?

The underlying principle of the PCR is to build on the existing contractual, regulatory and operational solutions, setting at the European level the needed harmonization and governance principles. The decentralized governance structure aims at accelerating the implementation process. It is consistent with different local solutions (institutional and organizational) thereby facilitating its extension to other countries.

22. Will losses be considered (CWE and UK)?

According to EU Regulation losses on HVDC cables must in principle be activated if this improves the social welfare. However if this leads to hidden costs not identified so far then this principle can be reconsidered.

The NWE Project Parties are currently evaluating the inclusion of losses.

[A first meeting and discussion on losses on DC cables in the NWE Price Coupling between the NWE parties and the National Regulatory Authorities (NRAs) has taken place. The NWE Price Coupling project takes notice that the NRAs' working assumption is that losses should be taken into account by the algorithm for all HVDC connections with a common method unless there are other technical constraints for certain interconnections which would pose a social cost and reduce social welfare.

In this regard, the NRAs have indicated that they need more information to better understand the impacts and the technical consequences of taking into account such HVDC losses. The NWE TSOs have received on October 1st from the NRAs a list of questions. The answers to these questions currently drafted by the NWE TSOs in cooperation with the NWE PXs and external consultants. Preliminary draft answers have been presented at the IG Meeting on 20 February.



The approach for the activation of losses must in any way be harmonized as much as possible in line with EU Regulation, meaning that losses on HVDC cables must in principle be activated if this improves the social welfare. However if this leads to hidden costs not identified so far then this principle can be reconsidered.]

23. Is it conceivable that the NWE Price Coupling would go live without GB?

A go-live without GB is not foreseen by the NWE Project Parties.

24. How are the market participants' requirements taken into account?

As announced in the 1st Regulatory report, the project will organise two stakeholder meetings to ensure that an appropriate level of stakeholder involvement takes place. The first meeting was held on September 26th 2012 and the second stakeholder meeting will now be targeted for 14 June 2013.

The market participants will also be asked for input on the procedures, timings, fallback etc. early in 2013 by virtue of a Market consultation

25. Do you also plan to set up a website for the NWE coupling project? And if so, when?

A website can be a useful communication channel. However the parties want to emphasize that existing communication channels, such as account managers at the relevant PXs and TSOs, can be used to address individual questions, and therefore that will be the method applied for communication.

Furthermore, all relevant information on the NWE project, such as slides and other information from the 26th September NWE Stakeholder Forum, is available on the respective websites of CASC and the involved PXs. The material is also available on the website of ACER.



Annex: Definitions

Market Coupling

Market Coupling is a method to manage capacity congestion between adjacent power spot markets by optimizing the capacity allocation. It allows the matching of power exchanges' orders and the implicit allocation of the available cross border capacities received from the TSOs.

Market Splitting

In market splitting the implicit auction of transmission capacity is handled within the day ahead electrical energy auction by one single power exchange. Sometimes the transmission capacity between the internal bidding areas of a region is not enough to get a complete convergence of price, and the result is that there are different prices in different bidding areas. Thus the term 'market splitting' refers to the fact that the limited transmission capacity leads to a split between to market areas. Market Splitting is one example of a method that applies Price Coupling

Volume Coupling

Coordinated day-ahead Auction involving two or more power markets. Cross-border volumes computed by an Auction Office are transferred to the exchanges which enter them as price acceptant bids into their system. The calculated flows are based on anonymous order books and the available transmission capacities, while the pricing authority remains with the involved power exchanges.

Price Coupling

Price coupling between different market areas allows creating a single exchange zone – and consequently single price zones when interconnection capacities do not limit cross-border electricity exchanges. It improves the market liquidity and participates in the creation of a single European electricity market.

Price Coupling of Regions

Initiative by seven Power Exchanges to create a price coupling solution encompassing the markets from Portugal to Finland.

Flow Based capacity calculation

Method to calculate transfer capacity at several interconnections simultaneously in order to get rid of the capacity split between borders.