Cross-Border Intraday Markets

White Paper on a possible market model proposed by APX, Belpex, EEX and Powernext

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Objective and scope of this paper

Intraday ("ID") markets are an important tool for market parties to keep positions balanced as injections and/or off-take may change between the day-ahead stage and real time operations. The growth of intermittent generation capacity makes efficient ID-markets even more relevant.

APX, Belpex, EEX, and Powernext have already responded to the needs of the market by establishing transparent and efficient continuous traded ID-markets where market parties can easily find counter parties to trade out their ID-imbalances.

The possibility for market parties to trade out their imbalances would be much improved if they could not only benefit from the national available ID-liquidity, but also from the available liquidity in other areas, provided there is cross-border ("XB") capacity made available to support the integration of the liquidity pool.

Efficient cross-border intraday markets (or "XBID-market") do not only benefit market players but also TSO's: in addition to the increased efficiency in respect of the capacity utilization, a well-functioning IDXB market also is expected to have a positive effect on the overall control area imbalance, as the market players have more competitive liquidity at their disposal to trade out imbalances themselves. This may in turn lead to a reduction of the necessary amount of balancing means reserved by the TSO, increasing therefore the overall liquidity available for the market and the costs for reserving these balancing means.

Following the regulators' Action Plan, the TSOs of the Central West Electricity ("CWE") region are exploring different possibilities to implement a method for an intraday allocation of XB capacity.

Given the short timeframes available for ID trade, the most efficient way to allocate available XB capacity is via an implicit method - i.e., linking the capacity allocation to a XB energy deal. To guarantee the irrevocability of the XB deals, the ID capacity made available to the market by the TSOs must be firm. Furthermore, the irrevocability of the XB deals also implies that the "take it and use it principle" (obligatory use) applies.

As providers of organized markets that facilitate non-discriminatory access to liquidity, power exchanges can make an important contribution to XB congestion management based on implicit allocations. Power exchanges have a strong incentive to meet market participants' needs concerning traded products, as well as to develop successful energy markets. The Trilateral Market Coupling project is probably a good illustration of how combined know-how and close collaboration between power exchanges and TSOs in the development and operation of XB congestion management methods adds significant value for the market. The collaboration between power exchanges and TSO has been reinforced through the signature of an MOU by all the stakeholders of the CWE region that aims to expand the day ahead market coupling to the entire CWE region.

The added value of power exchanges in the establishment of XB congestion management methods has also been recognized by the Florence Forum. The latter has asked ETSO and Europex to write a common discussion paper on possible approaches for the implementation of regional and interregional capacity allocation methods.

This paper sets forth a joint view by APX, Belpex, EEX and Powernext (hereafter "the Exchanges") on a possible model for an efficient cross-border intraday market. The paper starts by summarizing some key features for an efficient XBID mechanism. This is followed by a description of how a possible model could work and its main components. The paper

concludes by summarizing the potential benefits of the proposed model and by raising a number of important questions that must be addressed in evaluating any XBID market model.

The intention of the paper is not to provide an in-depth technical feasibility study, nor does it attempt to solve all potential issues. The objective is to present the high level architecture and benefits of a possible XBID-market model that the Exchanges could provide in collaboration with the TSOs, in order to illustrate the issues likely to be faced by any XBID solution, and to help structure the evaluation of other possible models by stakeholders.

Key features of an efficient cross border intra-day model

An efficient XBID model should have the following features:

Cost efficiency

In evaluating the cost efficiency of a solution, attention should not only be given to the technical implementation costs. Costs for operating the market and associated systems, as well as costs for accessing and using the XBID market (market entry costs and overall transactions costs/risks) should also be taken into account in the overall evaluation. To this end, it is important to recognize that the existing power exchanges are already organized and equipped to operate markets, while the creation of a totally new platform is likely to cause unnecessary inflation of costs.

Efficient ID markets

The effort (costs, time, risk) required by a market participant to find the best ID deal should be as low as possible. Ideally, all ID available liquidity in respect of a specific hub, irrespective where it comes from (local ID liquidity or, with the use of the available XB capacity, foreign ID liquidity) should compete with each other, and be available to all market participants in a reliable and efficient way.

Transparent and non-discriminatory access to the available XB capacity

All participants should have equal access to the available XB capacity. The access arrangements should be such as to minimize unnecessary risk or cost.

Straight through processing

Since ID trading is likely to take place in very tight time schedules, the operations associated with an ID deal should be made as simple and robust as possible. Ideally, ID liquidity would be accessible via "one mouse click", wherever it comes from, with all necessary XB nominations being taken care of for the market participant. Furthermore, trades need to be firm and irrevocable.

Speed of transaction

In designing the XBID mechanisms and infrastructure care attention should be paid to the transaction speed and deal confirmation time. Any delay can create uncertainty on whether the transaction is completed or not, and increases the risk of cancelled transactions.

Extendibility

The XBID mechanism should be built in such a way so that it may be easily extended to other TSO areas not initially included in the XBID market.

Independent from the capacity determination model

The model should be built in such a way that it is independent of the capacity determination model used to assess the available ID capacity (NTC based or flow based).

Compliant with EU regulation

The model should be compliant with EU regulation, and more specific regulation 1228 on conditions for access to the network for cross border exchanges in electricity which prescribes that:

> *"Congestion management methods shall be market based in order to facilitate efficient cross border trade. For this purpose, capacity shall be allocated only by means of explicit (capacity) or implicit (capacity and energy) auctions. Both methods may coexist on the same interconnection. For intra-day trade continuous trading may be used."* [1]

How does the proposed market model work?

The proposal is based on collaboration between the Exchanges to allow their respective ID bids and offers to continuously match between them, irrespective to which Exchange and area they are submitted, provided that sufficient XB capacity is available (an implicit capacity allocation method) and grid security is not jeopardized. A central order book and matching engine maximizes the trade opportunities and prevents erroneous trades. Market parties only need to be a participant on their local exchange to have access to the potential liquidity across all the markets. A "shipping agent" mechanism – supported by TSOs and/or the power exchanges - would automatically take care of all XB nominations and settlements. This approach would allow building further on the existing notification, clearing and settlement arrangements already established by TSOs and exchanges today, thereby reducing the cost of implementation.

Furthermore, building on local initiatives, the proposed approach can take into account the different regulatory and operational characteristics of the involved areas.

Picture 1 gives an overview of the important components of the proposed market model.

- Assume Member PEX 1 submits a purchase order into PEX 1' Order Management System (hereafter "OMS") of its trading system (via Interface F). Depending on the local operational procedures of PEX 1, the order may go through a local validation process, for example to check whether the Member has sufficient collateral (check with Clearing System via Interface D);

- The Clearing and Settlement System may be part of an exchange trading system or a third party Clearing House;

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[1] *Guidelines on the management and allocation of available transfer capacity of interconnections between national Systems*, §2.1 – Commission Decision of 9 November 2006 amending the Annex to Regulation (EC) No 1228/2003 on conditions for access to the network for cross-border exchanges in electricity

- After local validation, the order is pushed to the Central Order Book (hereafter "COB");

- The COB is linked with the Congestion Management Module (hereafter "CMM") which, depending on the possible XB energy shipments as stored in the Capacity Matrix (hereafter), will determine whether an order can be made available for trading in other areas to that which it was submitted. The COB will, therefore, not only contain the price and order information, but also the areas in which it may be shown as available for trading;

- The Capacity Matrix contains information regarding the possible XB energy shipments as determined by the TSOs, based on an NTC or flow based capacity determination model.. The Capacity Matrix can be updated following two occurrences:

    - Changing grid conditions: information to come from TSOs; and

    - a XB deal: information provided by the CMM (or other platform);

- Assuming there is available XB capacity between the area of PEX 1 and the area of PEX 2, the purchase order of Member PEX 1 will, via interface G and interface H, be made visible to Member PEX 2;

- Member PEX 2 will not be able to distinguish whether an order shown on the trading system is a local order or an order coming from another area.

- Assume Member PEX 2 hits the purchase order, the following actions will occur (not necessarily in this order):

    - The trade is registered in the COB; and

    - Via the CMM the possible XB energy shipments between the concerned areas will be updated in the capacity matrix (reduction in some directions and, as a result of netting, increase of possible XB shipments in other directions); and

    - Based on the updated capacity matrix the CMM will update the COB (orders previously not visible in certain areas may, as a result of the change in ID capacity, now be made available for trade in this areas and vice versa); and

    - The updated COB will, via the OMSs of PEX 1 and PEX 2, update the order books visible to their members; and

    - The trade is registered in the Clearing and Settlement System of respectively PEX 1 and 2 for post trade processing.

    - The trade is processed by the Notification System of respectively PEX 1 and PEX 2.

Annex 1 sets out a full example for a 2-market model, based on an NTC based capacity model.

Picture 2 gives an overview of how, following a deal, the post trade processing could be organized:

- In all XB deals, the counterparty would be the Shipping Agent (hereafter "SA"). In the above example the SA would be buyer on PEX 2 and seller on PEX 1;

- The SA would be a participant on all the involved exchanges;

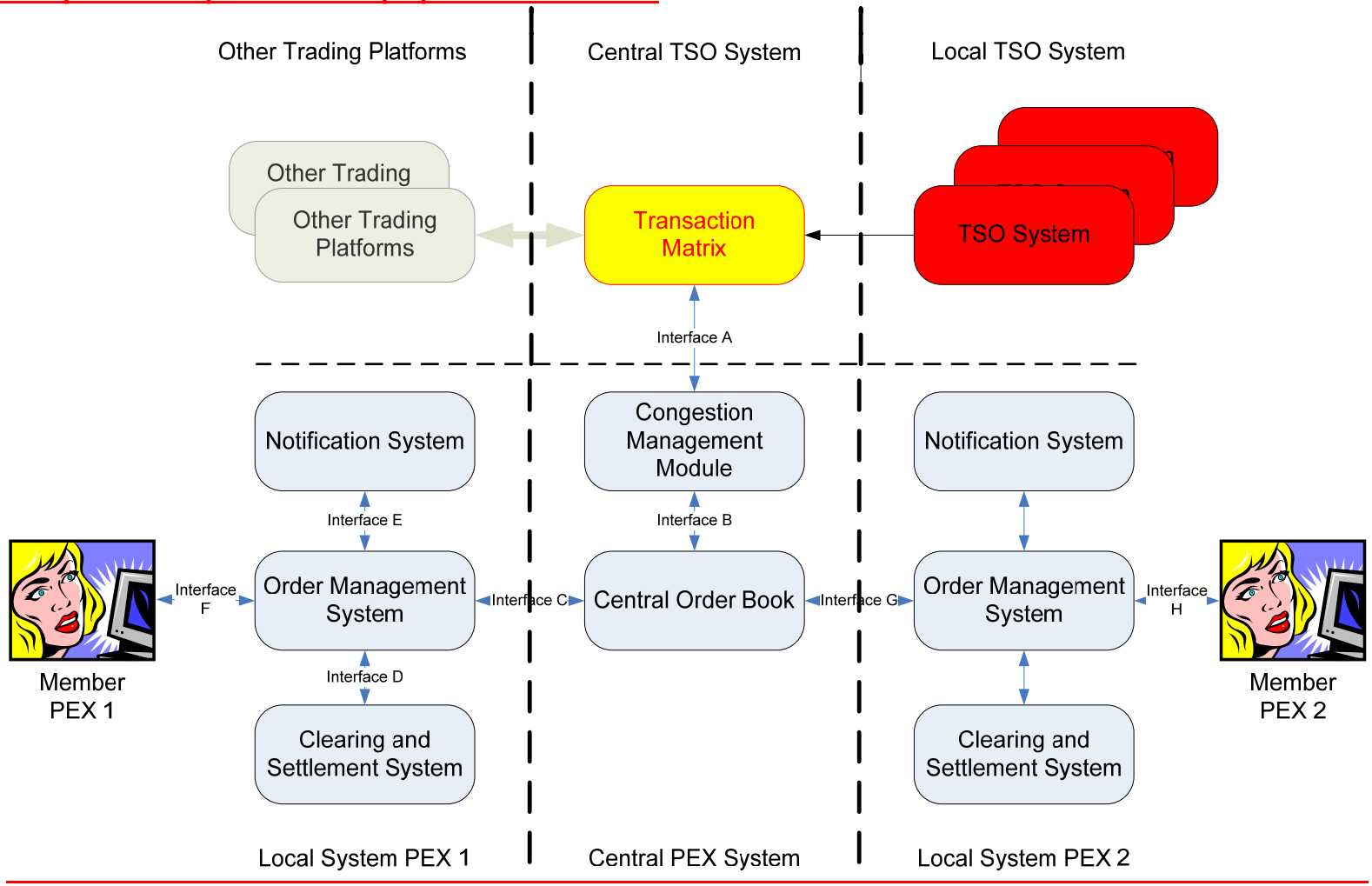
- Each exchange would clear transactions in its area using its normal clearing arrangements;

- The trades by the Member PEX 1 and the SA on PEX 1 would be nominated with TSO A according to TSO A's local nomination procedures, and likewise for TSO B;

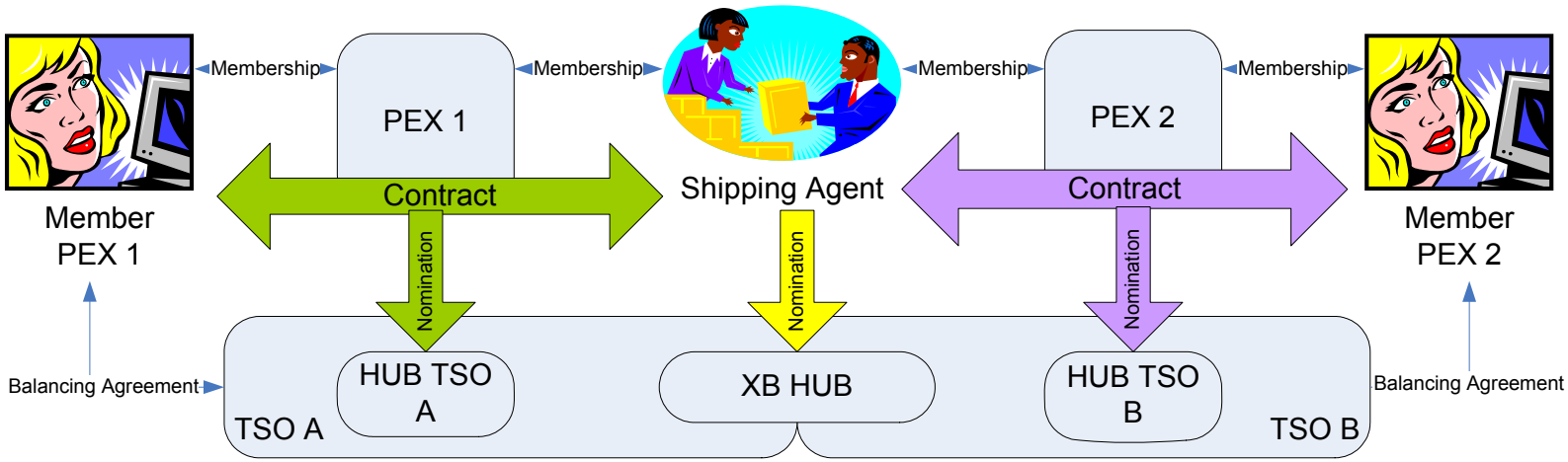
- The necessary XB nominations to ship the energy from the exporting TSO (TSO B) to the importing TSO (TSO A) would be performed by the SA. The SA would, therefore, close its position in the concerned areas. This shows that, despite the fact that Member PEX 1 and Member PEX 2 are involved in a XB deal, they don't have to be balancing responsible parties in both the concerned areas;

- Member PEX 1 purchase is cleared and settled according to the local arrangements of PEX 1 whereas Member PEX 2 sale is cleared and settled according to the local arrangements of PEX 2.

Picture One: Important components of the proposed market model



Picture two: Post-trade processing



Short description of the Key components

In what follows, a functional distinction/description of the key components is given, that will be part of the Central System. While, for the sake of clarity this functional description shows the key components as separate systems, further technical analysis may demonstrate that, to achieve acceptable levels of system performance or reliability, some of these components should be integrated.

Capacity matrix

The capacity matrix would, based on the available XB capacities, contain information regarding the possible XB energy shipments between participating areas. This information would be updated in (near) real time following a concluded XB deal (information coming from the CMM) or as a result of changed grid conditions (information coming from the TSOs).

The capacity matrix should be able to accommodate either a flow based or an NTC based capacity determination model.

The capacity matrix should be built in such a way that areas not initially participating in this XBID market could easily be added.

To ensure deal firmness, the ID capacity must be firm. In case TSOs can not guarantee such firmness ahead of any trades being concluded, trades will have to be concluded subject to confirmation by TSOs. In case this less desirable solution is implemented, special attention is required to ensure that the confirmation process is reliable and robust. Furthermore, the party "taking" the capacity (in above example this would be the SA) must use it (ID capacity rights must be obligations and not options).

As suggested by picture one, an architecture where not only the CMM would be connected to the capacity matrix (one-to-one architecture) but where also other platforms could connect to the capacity matrix could be considered (one-to-many). However, as explained hereunder such a model introduces some additional issues/challenges that need to be addressed carefully.

Congestion Management Module (CMM)

The CMM acts as a "'filter" between the different ID markets. Based on the information about ID capacity from the capacity matrix, the CMM will determine whether ID bids and offers submitted to another ID market will be made visible for trade. This information is stored in the COB. Furthermore, every time a XB deal is concluded, the CMM triggers an update of the information stored in the capacity matrix.

Central Order Book (COB)

The COB collects the bids and offers submitted to each of the participating exchanges. The information that will be stored is, amongst others things, price and volume of the order, the ID market to which the order was originally submitted as well as, based on the information of the capacity matrix, the other ID markets on which the bids and offers may be made available/visible for trade.

The COB also contains the matching engine, that matches bids and offers across the connected markets. This COB needs to be provided within a cooperation of Power Exchanges.

Shipping Agent (SA)

The Shipping Agent would operate as a counter party towards the power exchanges for all XB deals. The Shipping Agent role comprises of making the necessary XB nominations (i.e. XB shipment) and the financial settlement between the involved exchanges. This role can be performed by a single entity, or by several coordinating entities.

The proposed model is open for the Exchanges, the TSOs or the Exchanges, TSOs together or a Clearing house, to carry out the responsibilities of the SA, thereby facilitating the most suitable solution. A quick look at the existing initiatives in Europe shows that several models are possible:

- TLC: shipping agent role is contractually organized amongst the TSOs, which are members of their local power exchange. XB energy shipments are performed by the TSOs which transmit to each other the energy on their borders;

- Market Coupling Germany-Denmark: the responsibilities of the shipping agent are born by a distinctive entity which is a joint cooperation between Exchanges and TSOs;

- Nord Pool Spot: the shipping agent role is performed by the exchange (there is only one) which is in charge of the XB energy shipments.

- In case the same Clearing house operates for many Exchanges, (for example if ECC becomes Clearing house of both EEX and Powernext), this Clearing house could take the role of the SA for the concerned exchanges, as it would already be a participant of their markets.

Key advantages of the proposed system

Notwithstanding the fact that no in-depth technical study has been performed yet, the proposed model shows the following benefits/advantages:

- It builds on local initiatives in respect of ID markets, allowing it to take into account the regulatory characteristics of the different markets; and

- The principle of continuous trading allows market parties to contract immediately the necessary ID energy they need or to negotiate (anonymously) the price, without the need for (and risk associated to) contracting the XB transmission capacity separately; and

- Members of existing ID markets will benefit from additional liquidity without the need for additional membership or clearing arrangements; and

- Synergies for market participants between the ID market and the other markets provided by the exchanges (same participant interface, clearing of trading positions dealt with by the exchanges and/or TSOs or the clearing house, same agreement, net notifications, …); and

- Concentration of the liquidity of all participating exchanges available in a certain area on one single screen; the ID liquidity is not split over different screens, assuring

market participants of the best possible deal, assuring optimal capacity allocation, and maximizing the exchanged volume; and

- No harmonization required in respect of local nomination gate closures; and

- Reduced operational risk and cost due to "straight through processing": "one mouse click" needed to get ID liquidity, wherever it comes from; all necessary XB nominations are handled for the participant; and

- Because it capitalizes on existing infrastructures that have (in part) already been put in place by the exchanges (anticipating also cross border intraday arrangements that could be implemented), the proposed model may be expected to represent the most efficient solution in terms of development, deployment and operating costs as well as in terms of implementation time; and

- It is compatible with both the actual capacity determination model (NTC based) as with the one envisaged in the future (flow based). This could make the implementation path of the proposed XBID model independent of the agenda regarding the establishment of a flow based capacity determination model; and

- Market based model in line with the European regulation.

Implications/ challenges

The possible solution identified by the Exchanges illustrates a number of issues that would need to be addressed. Many of these implications are likely to be inherent to any solution seeking to meet the objectives set out in the introduction to this paper.

- Any solution will have to mitigate the risk of rejected transactions or time-consuming deal confirmation processes. This risk may be higher in a one–to-many architecture as the necessary capacity to allow a XB energy deal may not be available anymore (because taken up for a deal on another platform) at the moment of executing the deal. ;

- One-to-many solutions split the ID liquidity available in a certain control area over several platforms. This may imply:

    - Increase of time and costs needed to find the best ID deal possible; and

    - Allocation of XB capacity to a certain deal whereas a "better" counterparty may have been available on another platform.

- Any intraday capacity allocation model must be compatible with EU regulation and must mitigate as much as possible the possibility for market abuse. It is generally recognized that implicit mechanisms, where capacity is used as a means to facilitate the execution of the economically most optimal energy trades, are much less vulnerable to gaming and market abuse than explicit mechanisms. However, as in any market, appropriate market surveillance structures should be put in place to closely monitor market behavior and promptly detect any patterns of potential abusive behavior

- Although intermediary solutions might be worth implementing, any intraday capacity allocation model must in term be compatible with the day ahead capacity allocation model. As was demonstrated in TLC and in the various day ahead market coupling projects a successful implicit capacity allocation model requires close collaboration between TSO's and power exchanges from the early stages of the project on.

- The aim of any intraday cross border solution must be to offer a simple, fast, secure, error-free and cost efficient trading environment for the market participants. The increased technical complexity (and associated costs) of a one-to-many architecture and its feasibility in a flow based capacity allocation model has not been assessed yet. Such an assessment can only be performed in close collaboration between TSO's and power exchanges.

- Most of those issues arise notably in case both implicit and explicit mechanisms[1] coexist in a same one-to-many architecture; this is notably linked with the very nature of intraday continuous explicit mechanisms:

    - Allowing an explicit mechanism to run in parallel of an implicit one in a same one-to-many architecture may increase the risk of rejected transactions, as well as the time necessary to confirm deals;

    - Continuous explicit mechanisms may be more vulnerable to attempts of capacity hoarding, detrimental notably to the capacity available to the implicit continuous trading mechanism;

    - Eventually, explicit mechanisms do not allow the trading of firm orders, thus rendering impossible netting of capacity;

    - In case the explicit allocation of intraday capacity is maintained it is important that it runs on separate architectures. Furthermore clear arrangements based on objective criteria will be needed to split the available capacity to be allocated through the explicit and implicit allocation mechanism;

Conclusion

The Exchanges believe that they can be a valuable partner in the implementation of a XBID market based on an implicit capacity allocation.

Having experience in design, implementation and operation of markets, the Exchanges believe that close cooperation between Exchanges and TSOs in the design, development, implementation and operation of the systems involved in setting up an efficient XBID market could, as was successfully demonstrated with the various market coupling initiatives in the day-ahead market (e.g., Trilateral Market Coupling), be of great value for the market.

[2] The assessment of the compliance of a continuous explicit allocation mechanism with the EU regulation 1228 as mentioned in footnote 1 falls outside the scope of this paper.

The objective of this paper was to present the high level architecture of a possible model that shows potential benefits for the market and that should be evaluated together with other possible models.

APX, Belpex, EEX and Powernext together would like to discuss further with all involved stakeholders the ideas and advantages behind the presented market model as well as the technical, governance and cost implications of it.

Contact

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Annex 1: Worked out example (NTC based capacity determination model)

Initial situation

Local Offer Market A

	volume	price
Buy A	200	50
Buy B	100	45
Buy C	300	40
Sell A	300	55
Sell B	200	60
Sell C	100	65

Local offer Market B

	volume	price
Buy E	200	48
Buy H	100	30
Sell D	200	52
Sell F	100	57
Sell G	400	67

Available IDXB capacities

From/to	Hub A	Hub B
Hub A		200
Hub B	400	

What can be seen on the screens of the different ID markets? (assume all orders are divisible)

ID market A

	volume	price	Market of origin (not visible on screen)
Buy A	200	50	A
Buy E	200	48	B can be showed because of 200 MW IDXB form A to B
Buy B	100	45	A
Buy C	300	40	A
Sell D	200	52	B can be showed because of 400 MW IDXB from B to A
Sell A	300	55	A
Sell F	100	57	B can be showed because of (400 - 200 used to show Sell D) MW IDXB from B to A
Sell B	200	60	A
Sell C	100	65	A
Sell G	100	67	B 1/4 of Sell G (100MW) can be showed because of (400 - 200 used to show Sell D - 100 used to show Sell F) MW IDXB from B

ID market B

	volume	price	Market of origin (not visible on screen)
Buy A	200	50	A can be showed because of 400 MW IDXB form B to A
Buy E	200	48	B
Buy B	100	45	A can be showed because of (400 - 200 used to show Buy A) MW IDXB from B to A
Buy C	100	40	A 1/3 of Buy C (100MW) can be showed because of (400 - 200 used to show Buy A - 100 used to show Buy B) MW IDXB from E
Buy H	100	30	B
Sell D	200	52	B
Sell A	200	55	A 2/3 of Sell A (200MW) can be showed because of 200 MW IDXB from A to B
Sell F	100	57	B
Sell G	400	67	B

Assume someone in Market A hits Sell offer D: Sell offer D disappears from the market

The delivery of the energy in market A will require 200 MW of IDXB capacity from B to A, thereby freeing up 200 MW of capacity from A to B
What is the new situation: all changes are indicated in color

Local Offer Market A

	volume	price
Buy A	200	50
Buy B	100	45
Buy C	300	40
Sell A	300	55
Sell B	200	60
Sell C	100	65

Local offer Market B

	volume	price
Buy E	200	48
Buy H	100	30
~~Sell D~~	~~200~~	~~52~~
Sell F	100	57
Sell G	400	67

Available IDXB capacities

From/to	Hub A	Hub B
Hub A		~~200~~ 400
Hub B	~~400~~ 200	

What can be seen on the screens of the different ID markets? (assume all orders are divisible)

ID market A

	volume	price	Market of origin (not visible on screen)
Buy A	200	50	A
Buy E	200	48	B can be showed because of ~~200~~ 400 MW IDXB form A to B
Buy B	100	45	A
Buy C	300	40	A
Buy H	100	30	B can be showed because of (400 - 200 used to show Buy E) MW IDXB from A to B
~~Sell D~~	~~200~~	~~52~~	~~B can be showed because of 400 MW IDXB from B to A~~
Sell A	300	55	A
Sell F	100	57	B can be showed because of 200 ~~(400 - 200 used to show Sell D)~~ MW IDXB from B to A
Sell B	200	60	A
Sell C	100	65	A
Sell G	100	67	B 1/4 of Sell G (100MW) can be showed because of (~~400 - 200 used to show Sell D~~ 200 - 100 used to show Sell F) MW IDXB fro

ID market B

	volume	price	Market of origin (not visible on screen)
Buy A	200	50	A can be showed because of ~~400~~ 200 MW IDXB form B to A
Buy E	100	48	B
~~Buy B~~	~~100~~	~~45~~	~~A~~ cannot be showed anymore because not enough remaining capacity from B to A
~~Buy C~~	~~100~~	~~40~~	~~A~~ cannot be showed anymore because not enough remaining capacity from B to A
Buy H	100	30	
~~Sell D~~	~~200~~	~~52~~	~~B~~
Sell A	200	55	A ~~2/3 of~~ Sell A ~~(200MW)~~ can be showed because of ~~200~~ 400 MW IDXB from A to B
Sell F	100	57	B
Sell B	200	60	A Sell B can be showed because of (400 - 200 used to show Sell A) MW IDXB from A to B
Sell G	400	67	B