

**EuroPEX Position Paper on
Importance of Cross-border Intraday Markets and
the role of Power Exchanges**

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EuroPEX is a not-for-profit association of European power exchanges that represents the interests of the exchange based wholesale markets for electrical energy with regard to developments of the European regulatory framework for wholesale energy trading and provides a discussion platform on a European level.

Introduction

1. Now that the implementation of Day-ahead electricity negotiation markets, including cross-border trades, is underway in most of the electricity systems in Europe, it is the right time to generalize electricity trading using market mechanisms in the Intra-day timeframe (following the Day-ahead market up to close to delivery). The important growth of renewable generation, with the inherent difficulty in predicting at the Day-ahead time the production, also requires efficient market mechanisms for adjusting and balancing the positions of the market actors.
2. The importance of including cross-border trading in the Intra-day market mechanism is also evident especially for small systems well connected to bigger systems and, in general, in achieving the objective of an integrated European electricity system.
3. The “Guidelines on management and allocation of available transfer capacity of interconnections between national systems” requires in point 1.9 that by 1 January 2008 mechanisms for the intra-day cross-border congestion management be established.
4. Power Exchanges have proven their ability to manage independent, transparent and equal opportunity day-ahead markets and are in an excellent position to facilitate cross-border Intra-day markets by utilizing their existing contractual relations with participants and System Operators and also their platforms.
5. The paper summarize the main reasons why Intra-day trading is important, what are the critical issues to consider in designing the markets in this time frame and why Power Exchanges can help in managing solutions for this kind of markets. Finally the paper adds two appendices summarizing the organization and main results of two successful cross-border intra-day markets provided by Power Exchanges that have been in operation for several years.

Importance of intraday markets

6. Intra-day (“ID”) markets are an important tool for market parties to keep positions balanced as circumstances taken into account in the planning of injections and/or off-take may change between the day-ahead (“DA”) stage and nearer to real time operations.
7. The growth of intermittent generation capacity makes efficient ID-markets even more relevant since, as an example, wind and sunlight predictions are much more accurate close to delivery.
8. To open energy markets to small producers and retailers it is important to make available liquid adjustment markets (ID) where they can solve their supply problems at a competitive price. For a new entrant to the energy production business with limited physical flexibility, solving the consequences of a plant failure can be very difficult and expensive without a liquid ID market .

9. The possibility for market parties to trade would be much improved if they could not only benefit from the ID-liquidity available nationally, but also from the available liquidity in other areas where there is cross-border (“CB”) capacity available. This is especially important for relatively small markets that could benefit from the liquidity of larger markets. This is also in line with the European Commission’s objective to integrate national electricity markets in order to create a single EU electricity market (Internal Electricity Market or “IEM”).
10. The commercial capacity published by the system operators (“SO”, “SOs”) prior to day ahead, without a precise knowledge of the power plant operation schedules, could possibly be improved after the DA results are available since then they can rerun the security calculations with totally precise data, in a coordinated manner between all the SOs involved. For example in the UCTE synchronous area, DACF procedure could well be enhanced in order to provide the precise initial CB capacity for use by the market in the remaining hours before delivery. The new capacity can then easily be incorporated to the CB ID markets.
11. Furthermore, since ID trade normally responds to new system or participant requirements - like thermal power plant failures, general mistakes in temperature predictions, mistakes or updates of wind predictions, strikes, etc - the CB ID trade does not necessarily go in the same direction as the DA flows. While for instance DA market coupling/splitting mechanism will leave the interconnection fully or partially occupied in one direction, the full capacity, plus the netted capacity in the other direction, remain free and could be allocated to market participants that require it in the ID timeframe.
12. The “Guidelines on management and allocation of available transfer capacity of interconnections between national systems” requires in point 1.9 that by 1 January 2008 mechanisms for the intra-day cross-border congestion management be established.

Critical issues facing Cross Border Intraday markets

13. Liquidity is a critical issue for any market and also for the ID energy markets. Making it possible to bring together national available ID liquidity and ID liquidity available in other markets is therefore very important.
14. ID markets enable adjustments to the positions fixed at the DA gate closure, so they are naturally linked to the DA market framework. This relation between the two markets has to be carefully designed making sure that they are compatible and coherent in order not to create artificial arbitrage possibilities between them.
15. The European system-wide compatibility of the basic ID trading framework and the capacity allocation procedures is important for the success of the evolution of the IEM.

16. 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 made available in an individual price-zone (delivery-zone, where internal congestions are managed by the SO) irrespective where it comes from (local ID liquidity or, with the use of the available CB capacity, foreign ID liquidity) should compete with each other and be available to all market participants in a very efficient manner.
17. All market participants, regardless of them holding physical assets or not, should have equal access to the ID markets and available CB capacity. This implies that capacity should be provided on a firm basis, otherwise participation in the CB ID market would be effectively restricted to those companies that can handle the risk of curtailment, i.e. those parties having flexibility in the different involved areas.
18. The CB ID mechanism should be built in such a way that it allows for easy extension to other price-zones not initially included in CB ID market.
19. The trading arrangements should be built in such a way that they are independent of the capacity determination model used to assess the available ID capacity (NTC-based or PTDF-based).
20. To maximize the use of the capacities, and therefore to maximize the benefits of CB ID trade, netting of the allocated capacity has to be supported in any capacity allocation mechanism (instantaneously making the capacity in the direction opposite to the allocated direction effectively available). Immediate netting of the allocated capacity requires that the capacity is “obligatory use”.
21. Since ID timeframes are short, implicit allocation of capacity (implicit auctions or first-come-first-served mechanisms) together with an energy deal is more suitable than models where a market participant would be required to first acquire capacity before being able to conclude a CB deal (this way taking the risk of having acquired CB capacity without finding a suitable energy deal or having concluded a CB energy deal and not being able to ship it). To guarantee the irrevocability of deals under an implicit allocation mechanism the CB capacity should be offered on a firm and “obligatory use” basis.
22. In designing a solution, care attention should be paid to the transaction speed and deal confirmation time. Any substantial delay creates uncertainty whether the transaction is completed and increases the risk of cancelled transactions. Close cooperation between the different parties involved in the implementation of CB ID trading solutions, including the TSOs involved, is absolutely essential.
23. In evaluating the cost efficiency of a solution, attention should not only be given to the technical implementation costs. Costs for operating the system as well as costs for accessing and using the CB ID market (market entry costs and overall transaction cost/risk) should also be taken into account in the overall evaluation.
24. The main differences between Intra-day markets and balancing mechanisms are:
 - Intra-day is a participant to participant market. The purpose is to balance their energy positions and to allow participants to benefit from trading opportunities. Participation is voluntary and similar to the day-ahead market. Third party access is guaranteed.

- Balancing mechanism is a TSO-centric one (deals are subject to TSO's operational needs) that enables TSOs to assure internal balance and system integrity.

Power Exchanges can help in providing solutions for Cross Intraday Markets

25. It is generally accepted by the market parties that, given the short timeframes available for ID trade, the most efficient way to allocate available CB capacity is via an implicit method - i.e., linking the firm capacity allocation to irrevocable energy deals. As providers of organized markets that facilitate liquidity, power exchanges can make an important contribution to ID CB congestion management based on implicit allocations.
26. Introduction of straight through processing by Power Exchanges ("PX", "PXs"), in the general framework of implicit capacity allocation, implies significantly lower operational risk and transaction cost:
- a. Participants only need to be "balance responsible" parties in the area where they want to inject/withdraw energy. Also the PXs assure the involved TSOs that each PX trading party is a balance responsible party of the required TSO area.
 - b. Participants do not have to deal with CB nominations, since this task will be performed by the PXs.
 - c. A market participant only needs to be a member of the PXs operating in those price-zones they wish to physically trade in.
 - d. Financial clearing takes into account all the deals concluded via a particular PX, effectively netting the financial outcome of all of them. This also implies one set of financial collaterals and one financial transaction to be executed per settlement period.
27. Exchanges operate both continuous and auction style markets, which can both have benefits for trading in the ID timeframe. While continuous trading enables instantaneous confirmation of the trades executed and trading close to delivery, auction trading concentrates liquidity at predefined hours. Experiences from CB ID trading based on continuous and auction trading are respectively illustrated in appendix 1 and 2. If carefully designed, a combination of auction trading and continuous trading could be thought of as well.
28. In providing ID trading facilities, exchanges can build on existing infrastructure/arrangements they already have in respect of national ID markets. This could be beneficial not only in terms of the operations of the market (reliance on proven technology/platforms, high transactions speed, etc.) but also in terms of development time and cost of a CB ID solutions.

- a. Use of the trading, clearing and settlement systems already in place, and which have proven their performance in other markets operated by the exchanges, could reduce implementation costs and avoid additional transaction costs (apprenticeship of new technologies for members, additional end-user IT systems/monitors...);
 - b. Use of existing participant agreements could lower the overall implementation costs and lower the administrative burden for the market participants to access the CB ID market, thereby reducing market entry barriers.
29. Since PXs operate cleared markets, they offer easy and equal access to all the market. Furthermore the anonymity and transparency provided by PXs leads to non-discriminatory trading and higher liquidity for the benefit of all, thereby improving the efficiency of the market.

Conclusion: PXs have a valuable role to play

30. PXs have experience in how to design, implement and operate markets. As demonstrated in several DA congestion management projects, they have the know-how, operations and IT infrastructure and the right business models to support non-discriminatory and transparent pan-European markets.
31. Already today, PX have responded to market needs for ID trading by establishing transparent and efficient ID-markets where participants can easily trade out imbalances.
32. With this paper Europex's intention is to present a contribution to the ongoing debate about the establishment of CB ID markets. The paper illustrates clearly that, as is the case for DA congestion management methods, PX can play a valuable role in achieving an efficient, transparent and non-discriminatory CB ID solution for the benefit of the entire market, thereby contributing to the Commission's goal of creating a truly competitive IEM.

APPENDIX 1

INTRA-DAY MARKET SPLITTING AUCTIONS IN THE IBERIAN MARKET

1. IBERIAN MARKET AND BILATERAL CONTRACT ORGANIZATION

The Iberian Day-ahead market is a voluntary market where generation companies, retailers and consumers can freely participate, while they can also declare domestic and international physical bilateral contracts.

After the Day-ahead market, and the bilateral declaration time, open positions are converted to physical generation schedules by generation companies, to allow the system operators from Spain (REE) and Portugal (REN) to analyze the technical viability of the free decisions of the participants, and to counter trade to solve the foreseen constraints for next day. This result, together with the ancillary services markets results, is available from both systems operators at 16:00 hours. At that time is when the first Intra-day market splitting auction takes place.

The Intraday auctions markets started in Spain in April 1998 with a one sided implicit auction for all Spanish borders (France, Portugal, Morocco and Andorra) and since July 2007 it is operating in a full “market splitting” mechanism in the border between Spain and Portugal, and with the one sided auction in the remaining three borders. Therefore the Intraday market is being in operation eleven years

Back in 1998, when the Spanish market was designed, and taking into account the size of some of the biggest generation utilities existing in Spain, it was decided that, in order to promote the investment of new companies in the generation business in Spain, it was important to guarantee them that, together with a Day-ahead market that provides them with the opportunity to be treated in a fair and similar manner than the existing companies, the availability of an Intra-day adjustment market, to solve their supply problems within the day, at a public.

The way decided to guarantee this fairness, and since the physical schedule of all units was established at 16:00 hours the day before, due to security requirements of the SO, was to concentrate all the liquidity of adjustments needs of all participants in six intraday auction sessions.

There could be several ways of measuring the success of a market structure, but the best one is the amount of free investment that has taken place in the system. Since the beginning of the market **21,000 MW of new Gas Combined Cycle plants** (51 units using the 400 MW per plant average) have been installed in Spain reaching a very positive competitive situation due to the excess generation available.

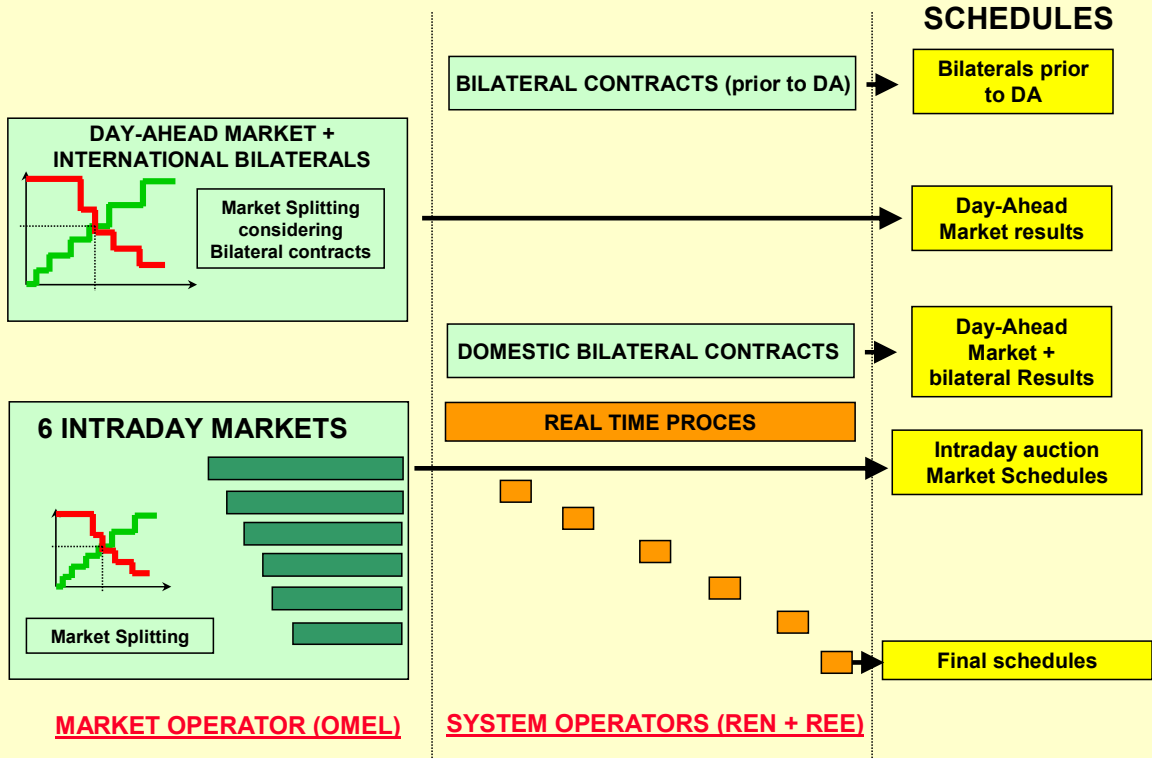
The Intraday auction markets work exactly in the same manner as the Day-ahead market, which is a full function market splitting. In all markets, Day-ahead and Intraday, the only difference between Portugal and the rest of the Spanish interconnections is that a different price is paid for Portuguese sellers and buyers, in case of congestion at the interconnection, while the Spanish price is paid to all the rest of participants from Spain and from the other systems that have interconnections with Spain.

The main points taken into account in the design of the Iberian Intra-day market were:

- Considering the existing sizes of some of the participants in the Iberian market, ID auctions is the solution that clearly provides same public prices available for all participants adjustments needs.
- It is possible to utilize almost identical rules, procedures, memberships and algorithms than in DA market splitting.
- Liquidity is concentrated at predefined hours which simplify the work for new entrants and smaller participants in the market.
- The coherence with the DA market splitting mechanism for cross-border congestion management minimizes the uneven arbitrage opportunities (both DA and ID produce “congestion rent”).
- The possibility of implementing a complete set of complex or block bids is important for certain less flexible participants, and also to send several bids for the same unit (selling and buying) into the same Intraday market session
- It is possible to combine Intraday auctions with continuous trading in shorter time frames.

The sequence of markets in operation in Iberia is explained in the following slide:

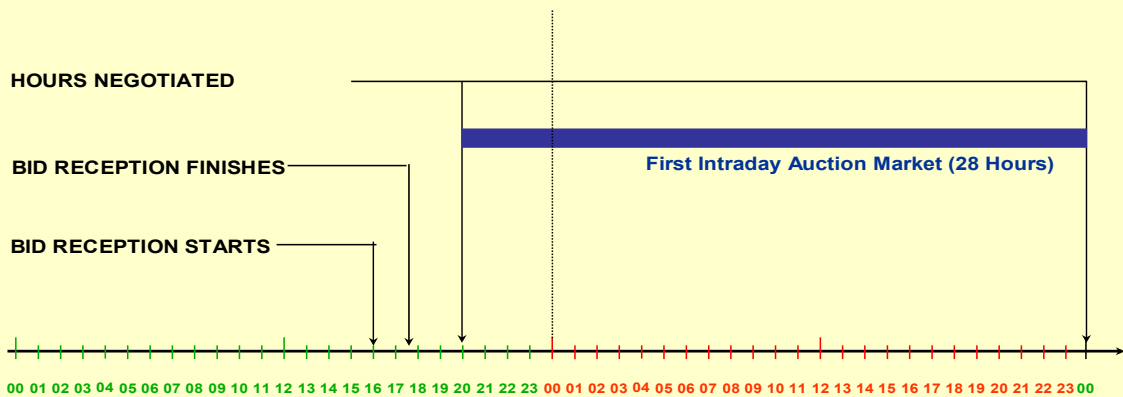
IBERIAN MARKETS + BILATERALS ORGANIZATION



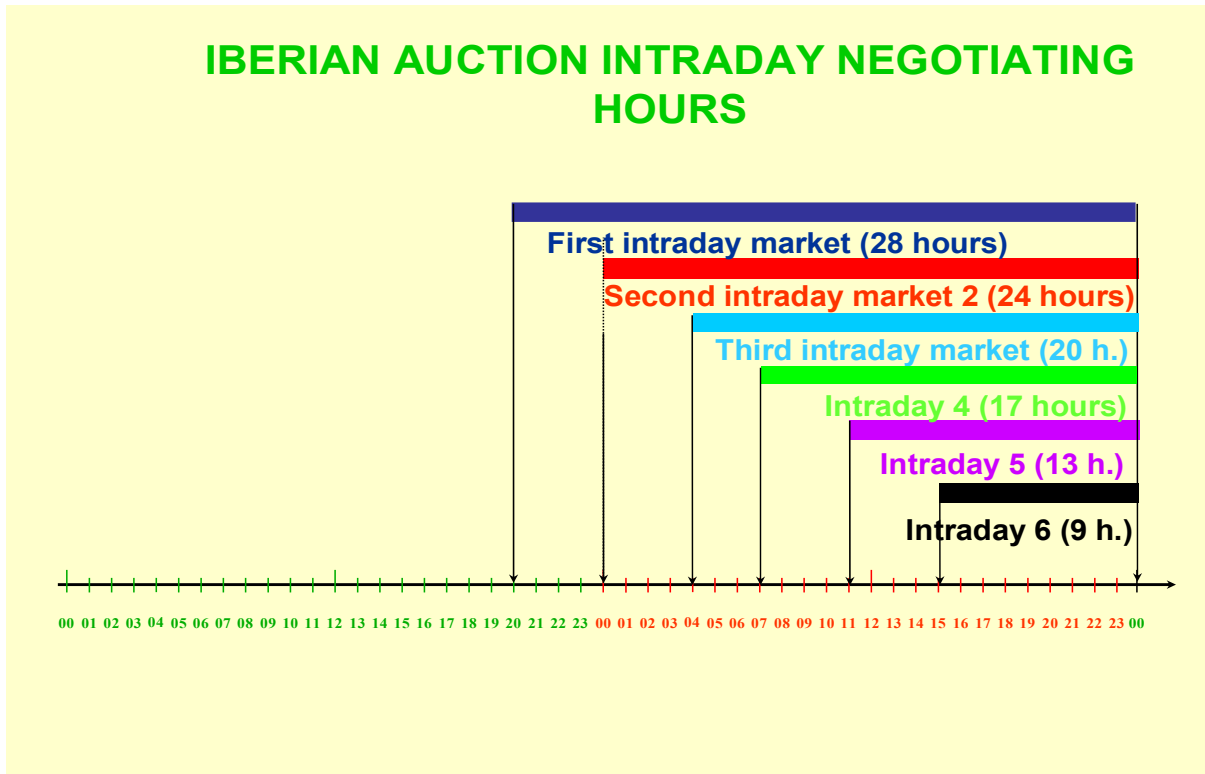
The hours negotiated in the first Intra-day market splitting auction are presented in the following slide:

IBERIAN FIRST AUCTION INTRADAY TIMING

FIRST INTRADAY MARKET



The six Iberian market splitting Intra-day auction negotiating hours are summarized in the following chart:



2. AUCTION BASED IBERIAN INTRADAY MARKET OPERATED BY OMEL - CHARACTERISTICS

The matching mechanism works essentially in the same way as the day-ahead market, including the splitting mechanism.

Since the market is closer to real time than the day-ahead market, and taking into account the possible needs of the participants, it offers the bidders a more complete set of complex or block conditions to be used in their bids.

Sellers and buyers intraday bids have available the following complex or block conditions:

- Minimum number of adjacent hours with the energy bided in the first block of the bid totally accepted in the number of hours indicated.
- Total acceptance of the first block of the bid in all hours.
- Total acceptance of the first block of the bid in one hour. If the condition is not fulfilled the complete bid for this hour is rejected but not the rest of the bid for other hours.

- Maximum amount of energy accepted in total (useful for hydro/pumping plants with a predefined amount of energy that they want to sell or buy on the remaining of the day).
- Minimum income (for sellers): If the matched part of the bid obtains, in total, an amount of money smaller than a number indicated, the bid will be rejected.
- Maximum payment (for buyers): If the matched part of the bid costs, in total, an amount of money bigger than a number indicated, the bid will be rejected.

All the above conditions are optional and a participant can always send a simple hourly bid if he wishes to do so.

It is possible for the same participant to send selling and buying bids for the same intraday session for the same bidding unit, if the session is cheap, he will buy, and if it is expensive he will sell (very useful for flexible participants)

In order to be compatible with the secure operation of the system, the possibility of accepting, prior to receiving the bids for the intraday session from the participants, limitations to bidding units, or groups of bidding unit, from the system operators (REN and REE) improves the acceptance by system operators of the auction intraday markets results.

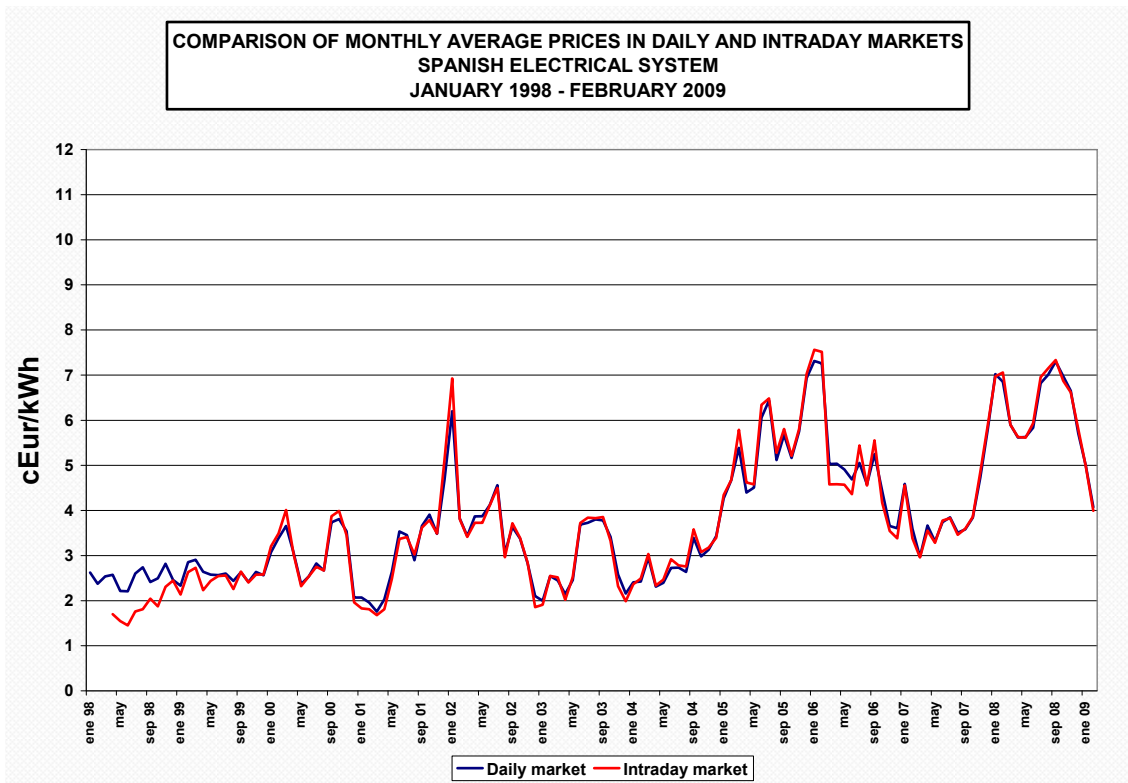
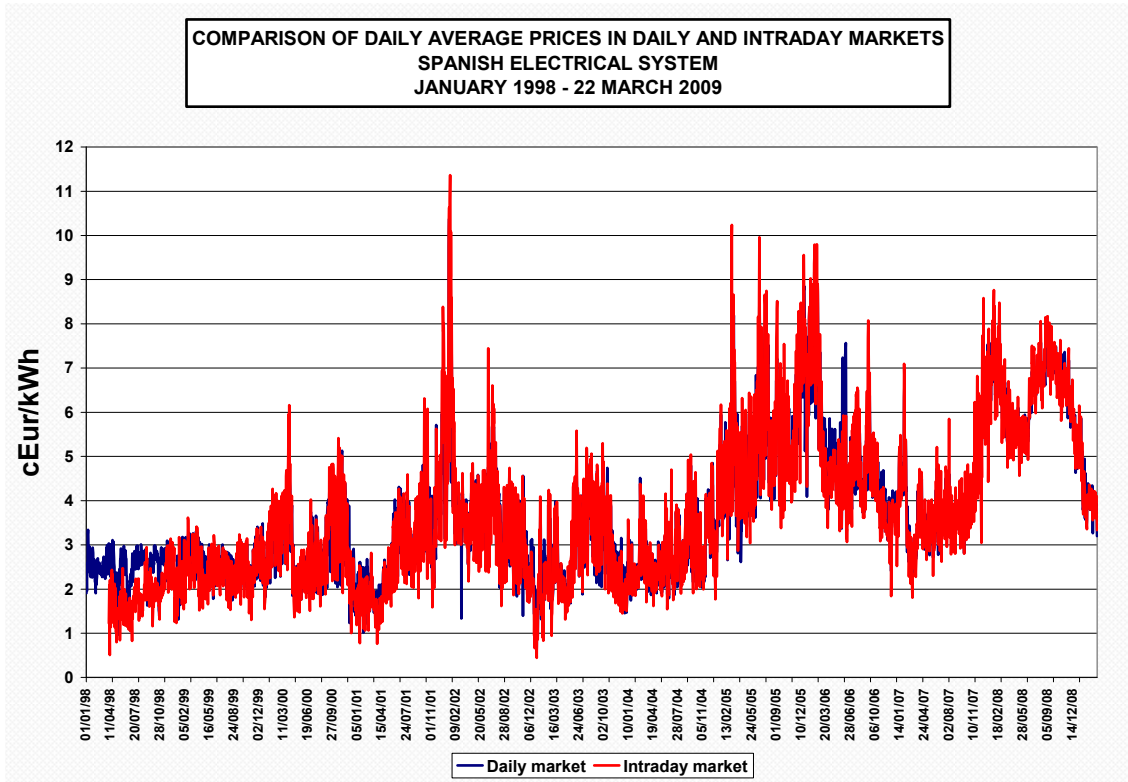
3. RESULTS OF THE SPANISH/IBERIAN INTRADAY MARKET

As far as cross-border capacity with France, Portugal, Morocco and Andorra, since 1998 it has been allocated in the intraday market sessions using the “unilateral implicit method” described in other EuroPEX papers for the day-ahead main the Portuguese system than in the Spanish system, in case of congestion in the Spanish-Portuguese interconnection.

Among others, there are two ways of measuring the success of this kind of ID markets:

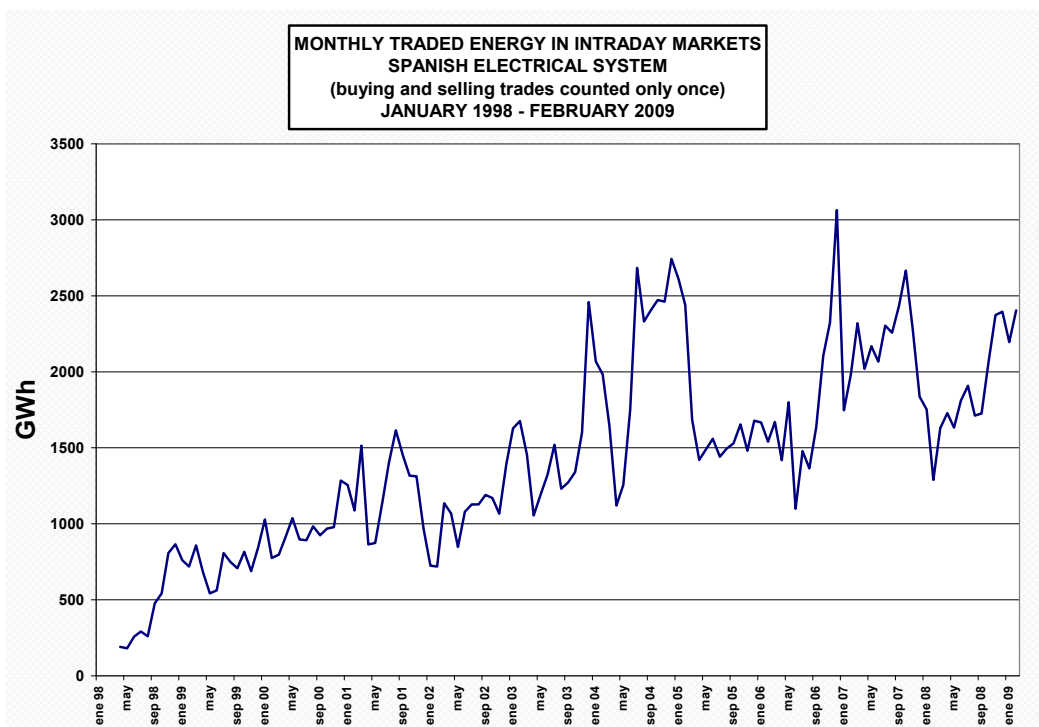
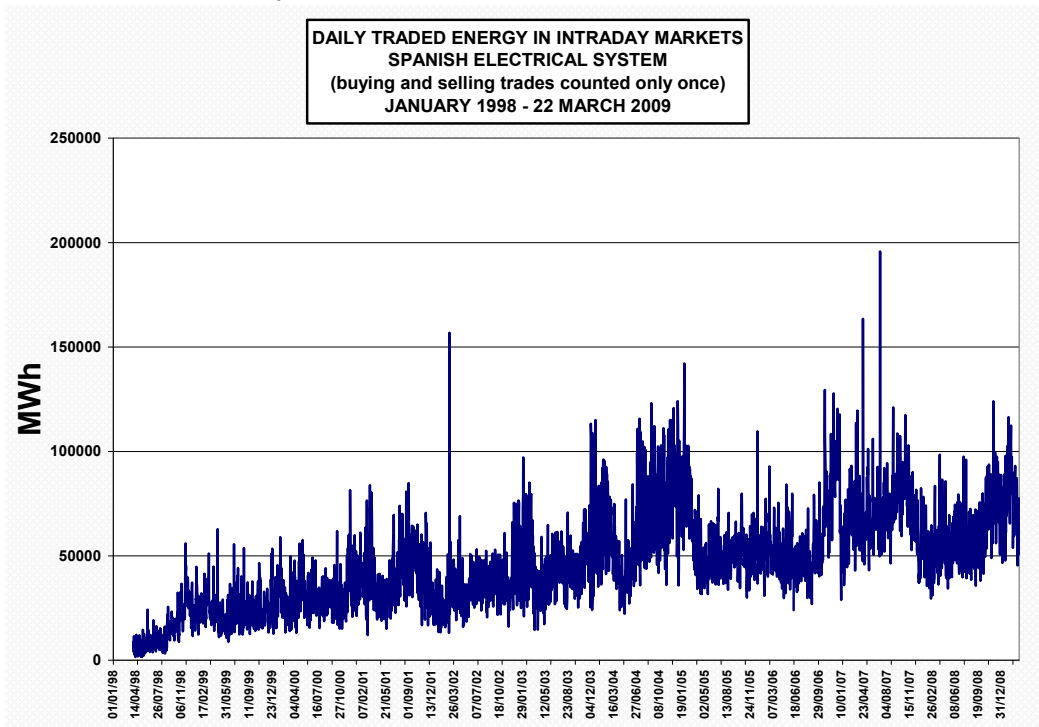
1. Coherence of the intraday market prices with the day-ahead market prices:

Although hourly prices are more volatile in intraday markets than in the day-ahead markets, in average they are quite similar. The following two charts represent the comparison of the daily average of the day-ahead market prices and daily average of the six sessions of the intraday market prices, and in the other chart the monthly average of the same values. As it can be seen in the charts, after the initial few months in 1998, the coherence of prices is quite significant.



2. Negotiated volumes in the OMEL intraday auction markets

The volumes negotiated in the Spanish/Iberian intraday markets are presented using two charts; the aggregated daily volumes, adding the volumes of the six intraday sessions of each day, and the aggregated monthly volumes, aggregating all the intraday sessions of each month. Volumes are around 9-10% of the day-ahead volumes.



APPENDIX 2

INTRADAY CONTINUOUS TRADING IN THE NORDIC REGION

1. THE ELBAS INTRA DAY MARKET OPERATED BY NORD POOL SPOT

The Elbas Market was opened for intra-day trading in and between Sweden and Finland in March 1999. It was the result of an agreement between the Finnish market place operator EL-EX (later Nord Pool Finland) and Nord Pool and based on a pre-study where also the owners of the market places, i.e. the Finnish, Swedish and Norwegian TSOs took part. The Norwegian TSO concluded that legal and other barriers existed for Norway to join the market, but in Sweden and Finland market parties, exchanges and TSOs found it important to change and strengthen the then illiquid national intra-day markets by enabling cross-border trade via an exchange based continuous trading system. As a consequence the existing intra-day auction in Sweden, called Balance Adjustment, which was operated by the TSO, was shut down and replaced by Elbas that was operated by the exchanges¹.

Since the start in 1999, the Elbas market has changed considerably, for example changed from trade in FIM and SEK to only EUR, changed trading system, opened for trade around the clock instead of 8-18, and expanded trading area to Denmark East (Aug '04), Germany (Sep '06), West Denmark (April '07), and Norway (Mar '09).

The Elbas market today provides continuous power trading 24 hours a day, 7 days a week covering individual hours, up to one hour prior to delivery². The traded products are one-hour long power contracts with delivery in the TSO control (bid) areas where the respective parties placed their bids/offers and are Balance Responsible. Both hourly bids and block bids can be traded.

The time span between the closing of the Day-Ahead Elspot Market³, and the actual delivery hour of concluded contracts is between 12 and 36 hours forward in time. Since consumption and production balances change, for example due to unexpected disturbances in production plants, players may need to re-balance their hourly electricity portfolios during those 36 hours. In addition, players can benefit from trading based on other parties' needs/wishes to buy or sell contracts.

For those purposes the Elbas Market enables continuous trading with contracts that lead to physical delivery (schedules) for the hours that have before been traded on Elspot and are more than one hour from delivery.

Nord Pool Spot AS is counterpart in all contracts traded on the Elbas market, thus performs economical settlement towards all parties and ensures that they post collaterals⁴, and all trades are then physically settled between participants and TSOs based on Balance Agreements.

¹ Trading at EL-EX Oy (Nord Pool Finland) and settlement/clearing via Nord Pool.

² In Norway contracts are from start in March 2009 closed 2 hours before delivery hour.

³ Elspot is where Nordic players balance their electricity portfolios for the next day and the day-ahead planned flow between Nordic bidding (and TSO control) areas is determined via the Elspot implicit auction mechanism, called Market Splitting.

⁴ Settlement and collateral posting is conducted daily in a process combined with Elspot Market.

2. FEATURES AND PRODUCTS IN THE ELBAS MARKET

Managing of cross border transmission capacity

An essential point in the Elbas market is managing the trading capacity between the bidding areas. When contracts for the following day opens in Elbas the cross border capacity is, somewhat simplified, the remaining capacity⁵ not used by the market in the Elspot implicit auction, adjusted for TSOs recalculation of system security and congestion constraints.

After an Elbas trade between parties in different areas occurs, the capacity between the bidding areas is automatically updated. If bottlenecks occur Automated Market Splitting divides areas dynamically, which means that buyers and sellers in the various areas only can see bids/offers from other areas that can be used based on existing capacities⁶.

Product characteristics

The product characteristics of Elbas are quite simple. For each and every hour of the day one power hour contract is quoted. At 14:00 CET or when the deadline for filing complaints on Elspot (normally) is closed, the hour-contracts for the next day are opened for trade in and between the Elbas market areas Finland, Sweden, Germany⁷, Norway, and East and West Denmark.

A power hour series can be traded for current day up to one hour before delivery hour in Finland, Sweden, Denmark and Germany, while in Norway only until two hours before delivery. In addition, after Nord Pool's Elspot price fixing (including notification),

Elbas power hours can be traded for the following day, thus normally opens at 2 p.m. The delivery is a preannouncement for the counterpart's electricity balance, i.e. linked to TSO Balance Agreement, either in Finland, Germany, Sweden, Denmark or Norway. The minimum contract size is 1 MWh/h and minimum tick size is 0.1 EUR/MWh.

Trading system and bid types

The participants on the Elbas market trade through a web based real-time trading system developed for continuous trading⁸. There are two types of bids available in Elbas; hourly bids and block bids.

⁵ It means the netted value after considering Elspot planned flow in other direction, i.e. if capacity in Elspot between Areas A and B is 1000 MW and then 500 MW is used in Elspot from A to B the initial Elbas capacity, before possible TSO security re-calculation, is 500 MW from A to B and 1500 MW from B to A.

⁶ A simple explanation of that principle is as follows: If we assume three areas, A, B, and C connected in a "straight line" (A to B and B to C) then a buyer in Area A can only see sales offers in Area B if there is available capacity from B to A and sellers in Area C can only see purchase bids in Area A if capacity is available both from C to B and B to A.

⁷ In Germany, the hour-contracts for next day are opened at 08:00 CET

⁸ In addition to the automatic trading system, there is a helpdesk service at Nord Pool Spot, through which participants during working hours can place bids by telephone.

Hourly bid

An hourly bid consists of the bid type (sell or buy), a price EUR/MWh and a volume in MWh for a given hour. The minimum price change is 0.1 EUR.

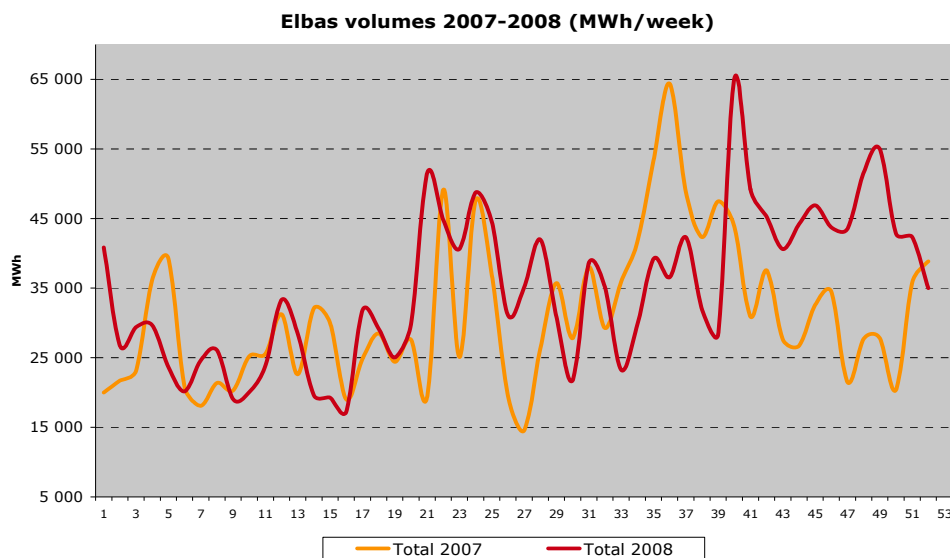
Block bid

Block Bid is an aggregated bid for several consecutive hours with a fixed bidding price and volume. A block bid must be accepted in its entirety; if accepted the contract covers all hours and the volume specified in the bid.

The bid and trade information are anonymous and they are set to order book firstly by price quotation and secondly by the time moment of quotation. The trade is concluded when bid and ask match. This concluded trade is immediately and automatically transferred to clearing.

3. RESULTS OF THE ELBAS MARKET

Since the inception of Elbas in 1999 the volume has gradually increased from 0.5 TWh in 1999 to 1.8 TWh in 2008 and active parties have increased from originally about 20 to close to 80 companies in March 2009.



Volume growth has been steady but not very fast, but it is clear that inclusion of more areas, i.e. more efficient cross-border trade facilitation and more parties able to trade, as well as improvements in system and market product and service aspects in recent years have increased volumes and participation.

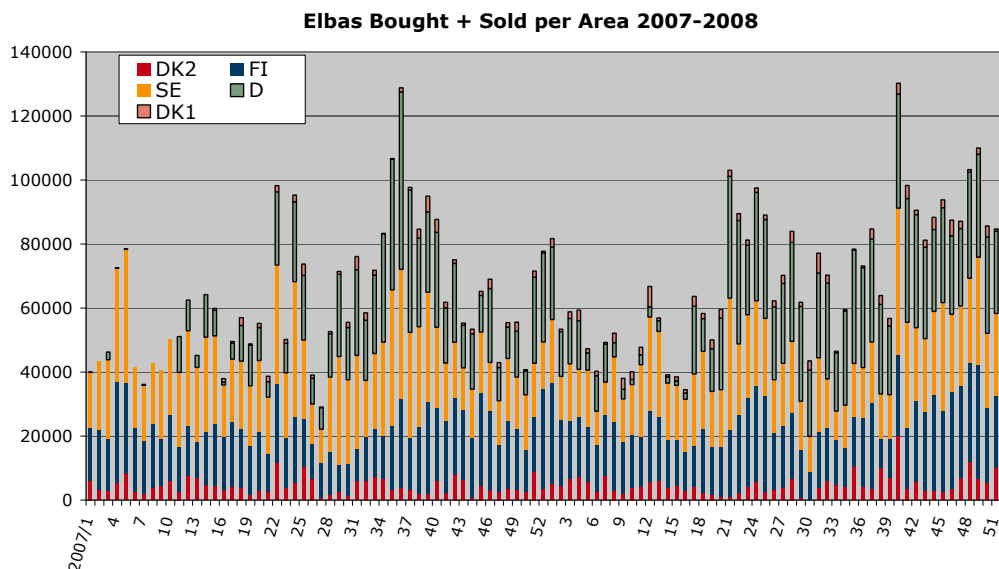
However, at least two key factors, both of them in fact positive from a market efficiency perspective, can be said to keep volumes down.

To begin with the Elspot day-ahead market is very liquid and enables market parties to efficiently trade and balance hourly needs, as they are required to do, for the following day. Secondly, imbalance charges based on activations of bids/offers in the TSO real-time Regulating Power Market are often fairly low compared with in other regions, due to considerable availability of flexible hydro power.

Active trading in Elbas to more precisely balance a portfolio shortly before real-time gives a good opportunity to reduce costs or earn money through an efficient and easy to handle electronic trading system. However, that fact is not always enough to cover potential market player's costs associated with having trading operations (personnel, etc.) around the clock.

Due to among others the fact that there are several market makers (i.e. parties constantly quoting buy/sell volumes in the trading system) the Elbas Market is rather liquid in terms of continually trading "smaller" volumes such as 10-20 MWh/h. However, it can also be said that the liquidity in Elbas is at times not enough to cover big unexpected changes in production or consumption, but those parties affected usually have "extra" production resources or can find trades bilaterally.

Also, part of the reason for the historically limited availability of big buy/sell volumes is the fact that the most liquid resources, i.e. those that quickly and inexpensively can be activated, in the Nordic Market are located in Norway which only very recently (Mar '09) has become part of Elbas Market. It is important to recognize that while the total Elbas volume may not seem that big there are many trades made for each hour and the system is used by over 70 parties whom trade within and between 5 different countries. That fact gives market parties a chance to keep their portfolios balanced via a competitive and secure cross-border market place platform. Furthermore, Elbas provides transparency to intra-day prices and how those prices correlate with day-ahead spot prices and with real-time Regulating Power Market prices and volumes.



Finally, the existence of the organised intra-day market Elbas enhances the trust and confidence some parties have in solving their purchase and sales needs in the Elspot Day-Ahead market. The reason being that Elbas improves their own ability to in a standardised, secure, and, not least important, independent way handle unexpected deviations in the planned hourly balance secured earlier in the day-ahead market.