



# **Reference Model for Cross-border Intraday Markets**

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# Contents

<b>1. Summary .....</b>	<b>3</b>
<b>2. Introduction .....</b>	<b>4</b>
2.1 Objective .....	4
2.2 Scope of Report and Assumptions .....	4
2.3 Current issues .....	5
<b>3. Fundamental Principles for Intraday Markets .....</b>	<b>6</b>
3.1 Introduction .....	6
3.2 TSO's role / function .....	6
3.3 Capacity determination and allocation .....	6
3.4 Firmness .....	7
3.5 Capacity pricing .....	7
<b>4. Reference Model .....</b>	<b>8</b>
4.1 Key advantages .....	8
4.2 Outline of the reference model .....	9
4.3 General description .....	11
4.3.1 Local Trading platform allocation .....	11
4.3.2 OTC allocation .....	11
4.4 Roles and responsibilities .....	12
4.4.1 Local Trading Platform Operator .....	12
4.4.2 Central Order Book Operator .....	12
4.4.3 Capacity Management Module Operator .....	12
4.4.4 TSOs .....	13
4.4.5 Market parties .....	13
4.4.6 Shipping agent .....	13
4.5 Main advantages of this model .....	13
4.6 Business process .....	14
4.6.1 Grid conditions changes .....	15
4.6.2 OTC cross border trade .....	16
4.6.3 Cross border trade via a trading platform .....	17
<b>5. Harmonization and Implementation Challenges .....</b>	<b>20</b>

# 1. Summary

This report represents ETSO's view on one of the reference models for intraday markets for cross border trading in Europe. This reference model is based on a continuous implicit trading principle. The analysis of other intraday allocation methods which are also recognised as valid by EC Regulation such as implicit and explicit auctions is out of the scope of this paper.

ETSO envisages that the models would evolve or be developed over time via a regional harmonisation and integration process by cooperation between the TSOs, market parties and supported by changes in existing legal, regulatory and inter-TSO arrangements as far as necessary.

The report starts with an introduction chapter describing the scope of the report, the objectives for intraday markets and an overview of the current issues. Chapter 3 describes the fundamental principles for an intraday market and Chapter 4 details the reference model solution based upon the principles and assumption described in Chapter 3. Finally, Chapter 5 describes harmonisation and implementation challenges.

For this report the Task Force Balance Management has taken into account:

- EFET- Position Paper – Intra-day power markets within and across European national frontiers. A practical approach to facilitate wholesale liquidity.
- Cross-border Intraday Markets – White Paper on a possible market model proposed by APX, Belpex, EEX and Powernext
- ELBAS model
- Developments within the ERGEG Regional Initiatives regarding intraday markets across Europe
- ETSO Position on Firmness of Cross border Trade

## 2. Introduction

### 2.1 Objective

The objective of this report of the ETSO Task Force Balance Management is to introduce a reference model for continuous trading based cross border intraday markets (IDM).

The objective for IDM is to provide an opportunity and to encourage market parties to self-balance in order to minimise balancing actions required in real time and limit imbalance exposure when:

- unforeseen events occur after Day Ahead Market (DAM) closure
- market parties have an open position which is permitted by market rules or has occurred accidentally<sup>1</sup>
- arbitrage

### 2.2 Scope of Report and Assumptions

This report will describe a reference model for continuous trading based cross border intraday markets. As described in Report 5<sup>2</sup> - Current State of Intraday Markets in Europe, an intraday market is defined as the possibility for trading between market parties after gate closure of the day ahead market and before final notification.

ETSO does not envisage a timeline nor implementation steps for any IDM model, as only individual TSO's, regulators and market parties within a region have the ability to progress changes. In addition, any developments need to take into account the various legal, regulatory and technical complexities within a region and is likely to require significant changes to the business processes and IT systems.

In addition an impact assessment on the socio-economic benefits, operational network security and long term security of supply are not considered within this report.

For the purposes of this report the importance of the IDM has been recognised due to the objectives described above. However for this reference model it is assumed that the volumes traded will be relatively small.

The reference model assumes that network security management is the main priority for the TSO's when facilitating the IDM and the TSO will ensure network security is maintained at all times.

The reference model assumes that each TSO and/or geographical region within Europe has an efficient and compatible day ahead market and balance market. For the purpose of this report and in this context "efficient" means capacity utilisation is driven by the market and the price, with no market power or gaming issues. "Compatible" means the markets (day ahead, IDM and the balance) facilitate trading of energy and capacity and do not create distortions or market power issues.

To illustrate compatibility; if the day ahead market uses a flow based approach the reference model assumes that the same approach will be used in IDM, as an ATC based IDM approach would not be compatible with a flow-based day ahead allocation. Another

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<sup>1</sup> Please refer to ETSO TF BM Report 5 – Current State of Intraday Markets in Europe, which can be obtained from the ETSO website - [www.etso-net.org](http://www.etso-net.org) for further details

<sup>2</sup> As above

compatibility characteristic is that the geographical regions with an integrated day ahead allocation and intraday allocation should preferably be the same.

These efficiencies and compatibilities are required to ensure that the IDM's are used for the goals above.

## **2.3 Current issues**

Report 5 detailed the important issues regarding IDM due to the implications that significant changes in physical positions by an IDM can have on the process of balance management and network security management such as:

- Open positions
- Congestion management
- Reserve management

However, providing a solution to such issues is out of the scope for the reference model because such detailed issues need to be fully assessed by the TSO's and the stakeholders within a region as part of the harmonisation and implementation of the model.

At present there is no generic solution available for all TSO's to address the issues discussed with Report 5, the model only aims to describe a reference solution and the possible harmonisation and implementation issues TSO's and market parties will need to consider. It is clear that the complexity of the issues will affect how, when and the timescales of the harmonisation and implementation of any reference model. For example, those TSO's which have the same or similar gate closure times and market rules surrounding open positions will in theory have less complex or fewer issues to address when implementing an IDM model across their respective borders.

## **3. Fundamental Principles for Intraday Markets**

### **3.1 Introduction**

Cross-border IDM must enable market parties for twenty-four hours per day to trade energy, acquire capacity and nominate the trade simultaneously (via OTC and/or trading platforms) to encourage self balancing. In addition the principles and tools of IDM should be compliant with TSOs' ability to maintain network security.

Consequently, the IDM needs to be accessible to all who wish to trade and processes and procedures must be transparent.

The described reference model is based on the principle of non-discriminatory access to the capacity for all market players and the principle of efficient trade. It should be noted that there are no prerequisites regarding number of trading platforms whatsoever. The fundamental principles for IDM from a TSO perspective are described below.

### **3.2 TSO's role / function**

The TSO's main objective with IDM is to facilitate an efficient market. TSOs should provide access to capacity on a non-discriminatory basis regardless of region/area or trading platform (OTC or PX) that provides market parties with the ability to party on the appropriate platform which best caters for their specific needs.

The main fundamental TSO function with the IDM is to make maximum capacity available to the market within network security limits. The TSO needs to assess and indicate to the IDM the available network capacity internally and cross-border which can be utilised by the IDM whilst maintaining network security.

A key principle of the reference model is that the capacity which has already been made available by the TSO for the IDM can only be accessed via requests of energy transfers.

However, the TSO should not be prevented from accessing the cross border capacity and/or the IDM for balancing, reserve management and congestion management purposes if this is compatible with the TSO's national regulations.

### **3.3 Capacity determination and allocation**

Capacity determination must be undertaken by the TSOs and be based upon last available information regarding network status and expected flows<sup>3</sup> taking into account TSOs requirements for balance and reserve management, in accordance with national regulations.

The TSOs will need to continuously assess and update available capacity for the IDM taking into account already agreed trades between market parties and current/expected changes across the network such as plant availability, changes in demand forecasts and other unforeseen events that have occurred. The TSOs should be permitted to update and remove capacity which has not been traded.

Capacity allocation should be based on obligatory usage<sup>4</sup>. For the reference model a first come first served (FCFS) principle is applied. This provides non-discriminatory access to cross-border capacity for OTC and trading platforms and it is compatible with operational security requirements.

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<sup>3</sup> Expected flows are based on state of the system, scheduling information, cross-border nominations etc.

<sup>4</sup> From a TSO perspective and to ensure non-discriminatory capacity access, capacity should only be obtained via an energy transfer who immediately full nominates the required capacity.

### **3.4 Firmness**

Capacity once nominated for the IDM is firm except in the case of force majeure which has an impact on network security.

ETSO position on firmness is described in further detail in a Report on Congestion Management – ETSO Position on Firmness of Cross border Trade.<sup>5</sup>

### **3.5 Capacity pricing**

In case of an implicit or explicit auctioning model for the IDM the capacity price could be set accordingly. With a continuous trading system it is difficult to determine the right price for capacity and in such a system the capacity could be free of charge.

Assuming that IDM results in low trading volumes a continuous trading system with no charge for capacity could be chosen.

However, it must be noted that free capacity for IDM may lead to a shift in traded volumes from the day ahead market to the IDM. From a TSO perspective this increases the amount of uncertainty closer to real time which can increase the reserve requirements for balance management. In addition the market loses the efficiency of D-1 coupling. However, if these effects become significant, capacity pricing may be introduced to provide appropriate incentives to counteract this situation.

Consequently, once the IDM is implemented TSOs, market parties and regulators will need to monitor the volumes and trends over time, and if necessary adapt the pricing methodology for IDM capacity.

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<sup>5</sup> A copy of this ETSO paper can be obtained at [www.ets-net.org](http://www.ets-net.org)

## 4. Reference Model

The reference model offers a number of advantages in terms of “usability” for market parties, transparency, increase of liquidity and efficiency, and is based on the principles described in chapter 3.

This model enables market parties to conclude energy deals and simultaneously acquire the transmission access rights on the interconnection or to acquire transmission access rights on the interconnection in order to finalize OTC transactions.

The trading platforms allocation supports anonymous trading. Bids and offers made in two different hubs can be matched, provided that sufficient cross border capacity is available between the two hubs. The procedure is transparent for the market parties. From the market party point of view, the platform provides no information about the locations (hub) of the bids and offers which are visible.

It should be noted that this model does not require a single trading platform.

Given the short timeframes available for the intraday market, the cross-border trades concluded in this market are irrevocable and also imply a “take it and use it principle” (obligatory use).

The model is based on a continuous trading closing at final gate closure and before the start of the delivery. The necessary lead time has to be defined by the participating TSOs (typically 1 hour ahead).

### 4.1 Key advantages

The key advantages for the reference model are:

- Market parties can trade continuously until final gate closure (e.g. 1 hour before start of the operational hour)
- Energy and capacity are linked which prevents the possibility of capacity hoarding and gaming
- Various market mechanisms are able to operate at the same time (trading platforms and OTC) which provides market parties with the ability to choose a platform which best caters for their specific requirements
- More efficient as it avoids unused capacity in short time frames

In addition this also provides a less complex solution within the short time scales of IDM and in terms of systems and processes and the reference model is also compatible with TSOs' operational responsibilities.

It should be noted that alternative capacity allocation methods are available such as capacity option rights which allow market parties the right to nominate whole or part of the allocated capacity at a later time based on later energy transfer or an obligation to “use it or lose it”. However such options do not facilitate all the advantages detailed above and hence are not further investigated within this report.

## 4.2 Outline of the reference model

The reference model allows the implementation of cross border intraday trade within a region constituted by several hubs.

This model is based on two main elements whose features are described below:

- the Capacity Management Module which is unique for the region,
- the part constituted by local trading platforms (Power exchange, brokers) agreeing to couple their markets via a Central Order Book. It should be noted that the model does not admit only one central order book (Figure 1), as several integrated order books could interface with the Capacity Management Module (Figure 2).

In the following descriptions, the “available capacity” means:

- for an ATC based model, the available capacity between 2 directly interconnected hubs
- for a flow-based model, the information required for a market party to know whether a given energy volume can be traded between two hubs, based on the estimated loading of all modeled critical branches.

The features of the main components of the reference model are:

- ⇒ **Capacity Management Module (CMM)** which gets the available cross-border capacity information from the TSOs:
  - initialises the intraday process, every day, at the end of the D-1 process
  - or revises in real time the available capacity value in case of changed grid conditions
  - allocates firm rights of capacity to the eligible users connected to it (order book operators, OTC user, TSOs for BM purpose,...)
  - calculates the new available capacity after each allocation or after changed grid conditions
  - publishes the updated values via web
  - makes the data exchange after each allocation to the involved TSOs.
  
- ⇒ **Central Order Book (COB)** which:
  - collects the bids and offers submitted to each of the participating trading platforms : the information that will be stored is price, volume and ID market to which the order was originally submitted
  - acts as a “filter” between local ID platforms : based on the available capacity, the COB will determine whether the bids and offers submitted in a market A will be made visible for trade in all the other participating markets.

In this reference model, the COB is a unique integrated order book as illustrated in Figure 1 below. This unique model will favour liquidity maximisation, which is a critical factor as there is a potential lack of liquidity within the IDM, consequently this provides the highest efficiency.

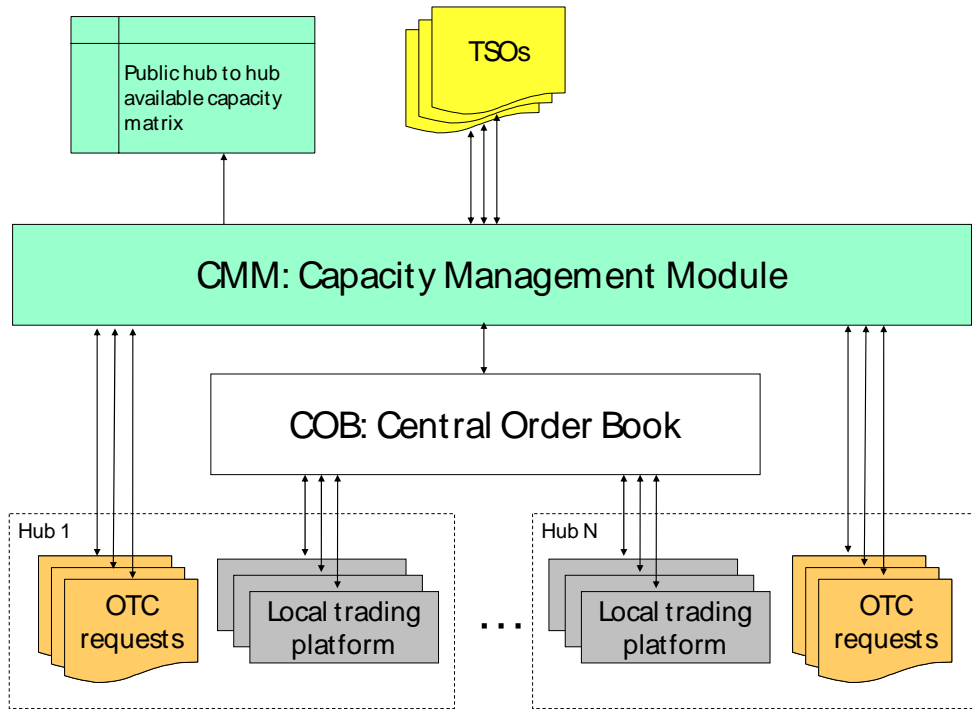


Figure 1

Nevertheless, it is possible to work with several integrated order books that could be connected to the CMM in the following way (Figure 2):

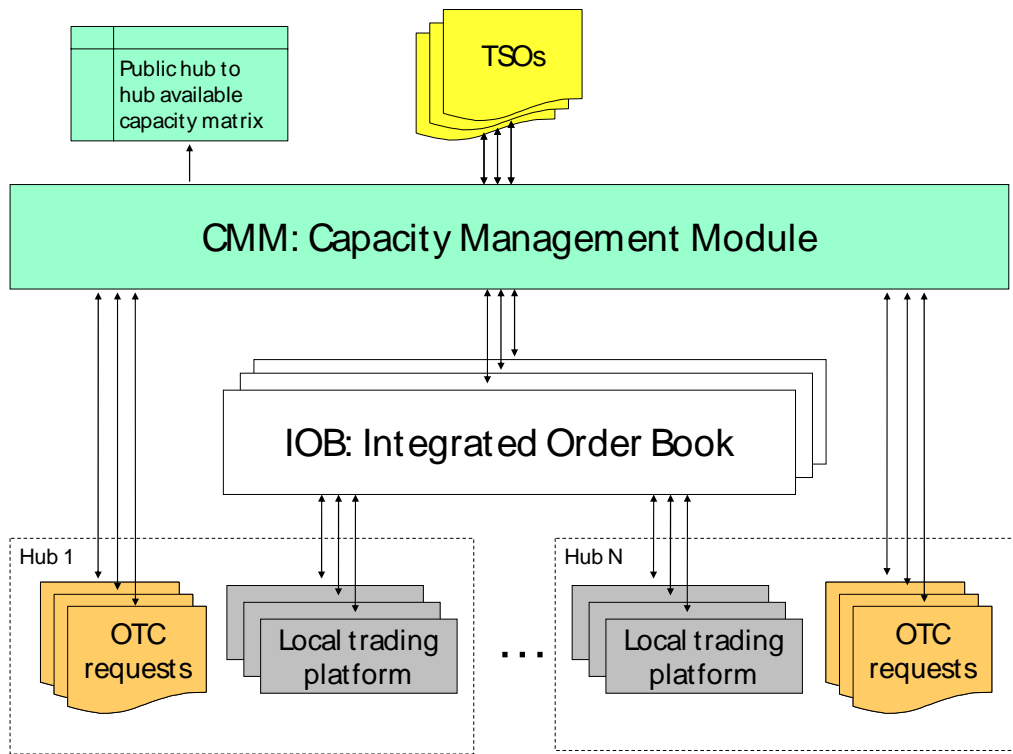


Figure 2

An integrated order book is an order book that combines the order books of two or more local trading platforms into one. Note that the central order book of Figure 1 is also an integrated order book.

### **4.3 General description**

For the sake of simplicity in the remainder we focus on the Figure 1 model (Central Order Book) only.

In order to participate in the cross-border intraday market, a market party either needs to be active on one of the trading platforms or needs to have access to the Capacity Management Module for OTC trade.

The energy transfer request business process will be designed in such a way that OTC and central order book requests are not discriminated. Whatever request comes first should be first processed. Note that a processed request may block further access for next requests because it may change available capacity.

#### **4.3.1 Local Trading platform allocation**

The local trading platforms shall offer services which enable the anonymous purchase and sale of energy (i.e. an order management system), mostly enhanced by the clearing and settlement arrangements. Typically, each platform is operated by a Market Operator, such as a Power Exchange or a broker. However, it is also possible that a unique operator operates a unique platform giving access to numerous different markets (as in the Elbas system).

On each platform, a connected market party shall see all the products available and these products will consist of energy offered for trade on its hub and energy offered for trade on another hub, as far as there is sufficient interconnection capacity available between the two hubs<sup>6</sup>. The process is dynamic and as soon as a cross border trade is concluded, the available capacity is modified and the visible offers to each market party are updated. The available capacity can also be updated by the TSO in case of changes to grid conditions. Consequently the visible offers are updated.

When a trade is concluded by matching an offer/bid from two market parties (1 and 2) connected on two different markets (A and B), the “shipping agent” plays the role of counter party for market party 1, from the point of view of Market Operator A, and plays the role of counter party for market party 2, from the point of view of Market Operator B.

After each allocation, the available capacity is updated and published on the Web.

#### **4.3.2 OTC allocation**

In the case of an OTC request, the energy transfer request must include at least the balancing obligation for the corresponding energy transfer of both parties involved.

After each allocation, the available capacity is updated and published on the Web.

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<sup>6</sup> As explained earlier the shown orders are anonymous to the market parties and no hub information is provided

## **4.4 Roles and responsibilities**

### **4.4.1 Local Trading Platform Operator**

The local trading platform operator has the role of providing local services required for the operation of the anonymous and continuous local trading platform. This platform enables the visibility of all the offers posted directly on the platform (for the same hub) or on another hub (as far as there is sufficient interconnection capacity). The local trading platform operator is locally responsible for all the services linked to the actual conclusion of the trades. This includes clearing, notification of the internal position of local market parties to its TSO, invoice and settlement, financial warranties etc.

The local trading platform operator sends all the offers/bids available on its platform to the COB and receives from the same module all the available cross border offers/bids, compatible with remaining interconnection capacities. The local trading platform operator is responsible to making the offers/bids available, together with local offers/bids, for its market parties.

This organisation requests contractual arrangements between the local trading platform operators sharing the same COB, the COB operator and all the involved TSOs.

### **4.4.2 Central Order Book Operator**

The COB operator must ensure the COB is updated. This COB lists all the available offers/bids on each platform and which of them are available for each trading platform. This is continuously updated as soon as

- (i) a transaction is concluded or
- (ii) the interconnection capacity made available by TSOs is changed.

As mentioned in the paragraph 4.2, the COB should be unique in order to ensure efficiency of the model by guaranteeing concentration of liquidity. This would therefore suggest that the activities of a unique COB operation should be under adequate supervision.

Depending on the selected model (unique COB or several IOBs), the COB/IOB operator could be a TSO, subsidiary of the TSOs, the Local Trading Platform Operators or a combination. Any implementation model is subject to locally applicable rules and regulations.

With consideration to the responsibilities of the COB operator, this operator shall have contractual agreements with CMM operator and with trading platform operators.

### **4.4.3 Capacity Management Module Operator**

The CMM operator is responsible for the allocation of firm capacity rights and to ensure the database of remaining available capacities is updated. Available capacities should be published on a web to ensure transparency. This could be done in the form of a hub to hub available capacity matrix, where each cell (i,j) provides the capacity available for the next cross-border energy transaction from hub i to hub j. In a flow-based approach this capacity has not the same meaning as the current ATC, because not just one but all available capacities are affected and can be changed after each accepted cross-border energy transfer request.

The capacity management and capacity allocation functions are crucial in terms of security of the system. Accordingly, these functions are direct responsibilities of the TSOs. They should either be directly operated by the TSOs concerned or can be outsourced by the TSOs to another party such as a subsidiary.

With consideration to the responsibilities of the CMM operator, this operator shall have contractual agreements with COB operators, the TSOs and the market parties for explicit access.

#### **4.4.4 TSOs**

TSOs are firstly responsible to define and update the available capacities on the interconnections (based on an ATC or a flow-based model). In this role, it is of great importance that they also define a clear delegation of responsibility concerning the allocation of capacity and respective adaptation of the available capacity to the CMM operator on the basis of the input from the TSOs.

TSOs also have to guarantee the firmness of all the nominated transactions (see also 3.4).

In addition TSO's need to ensure the actual physical realisation of the energy transfer corresponding to each transaction, with full respect of security of the system. They also need to assume other relevant tasks as far as assigned to them by national rules and regulations which can include:

- recording of the final positions of each market party
- determination of the imbalance settlement.

Note that in some jurisdictions these tasks are not assigned to the TSO.

#### **4.4.5 Market parties**

Market parties are required to subscribe to the defined processes and contracts in order to become eligible to take part in the IDM:

- with local market operator(s) to be able to take part in the organised intraday market
- or/and with the Capacity Management module operator to be able to take part in the OTC cross-border market.

#### **4.4.6 Shipping agent**

The Shipping Agent acts as a counter party with the trading platforms for all cross border trades (buying on the exporting platform and selling on the importing one, thereby performing, on the concerned hubs the necessary nominations).

The Shipping Agent would therefore need balancing agreements (BRP) or equivalent in each of the concerned hubs as well as being a member of each of the concerned platforms.

The TSOs, the Platform Operators or both together could undertake the responsibilities and activities of the shipping agent.

### **4.5 Main advantages of this model**

This reference model exhibits the following advantages:

#### **1. For the user of trading platforms:**

- Easy-to-use:
  - ❖ from a unique platform (and thus a unique contract for the access to the service), a market party can make offers immediately available on all the connected hubs; also the market party is able to view all the available offers from all the connected hubs
  - ❖ the market party does not have to be concerned with the acquisition of interconnection rights,
  - ❖ the market party can rely on financial security of its trades

- **Liquidity:**  
Intraday markets are inherently having low liquidity, the concentration on a potentially single virtual market of all the offers/bids contribute to reach the maximum possible liquidity for the IDM
- **Transparency:**  
On the organised market, all offers in volumes and prices appear to everyone. This increases the information made available to everyone and reduces the risks of gaming and abuse of dominant market position.

## **2. For the user of OTC access:**

Market parties who have already prepared a bilateral cross-border energy transaction can acquire the corresponding capacity rights on the interconnection via the OTC access.

This provides a unique competition process between all the market parties, whatever access method is preferred (trading platform or OTC). In both cases, the market parties will have equal access to the capacity information.

## **4.6 Business process**

The paragraphs below describe the business processes. They particularly underline interfaces and data exchanges between the different modules and parties.

The data exchanges related to the nomination process have to be defined by the relevant TSOs according to their local rules and are outside the scope of this report.

The prerequisite of this reference model is that the operational data (MPs' internal positions, exchange programs...) are nominated at each concerned party at the same time, whatever the nomination process is, in order to achieve coherency in the operational process.

Since the process consists of a number of steps involving several partners it is of utmost importance to make this process as reliable as possible to avoid any deviating information between these partners. This requires respective confirmation processes which consider the limited time frame. However, for the case of any problems of data exchange or data performance respective measures and procedures with clear responsibilities have to be developed.

#### 4.6.1 Grid conditions changes

The following diagram describes the business process to revise the available capacity on TSOs request in case of grid conditions changes:

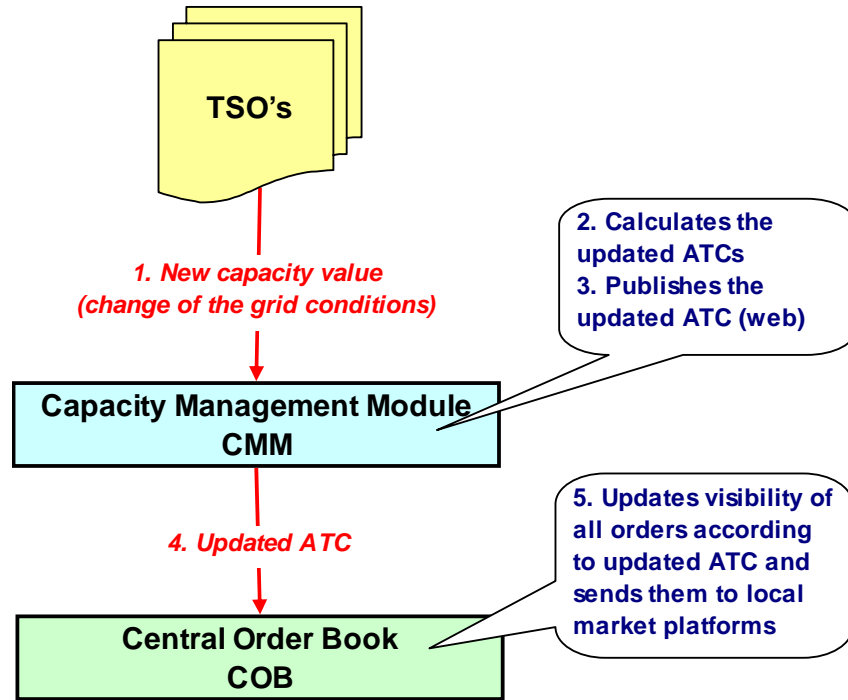


Figure 3

#### 4.6.2 OTC cross border trade

The following diagram describes the business process which leads to the implementation of an OTC cross border trade. Prerequisite is that the trade has been prepared in so far that trade volumes and periods and cross-border counterparty is already fixed subject to the acquisition of the corresponding cross-border capacity. This process then starts with the requests of one of the parties to acquire the cross border capacity corresponding with the prepared trade. In case there is sufficient capacity available, the requested capacity is allocated immediately and the respective nominations are made simultaneously. The detailed process of a cross-border trade is shown in Figure 4.

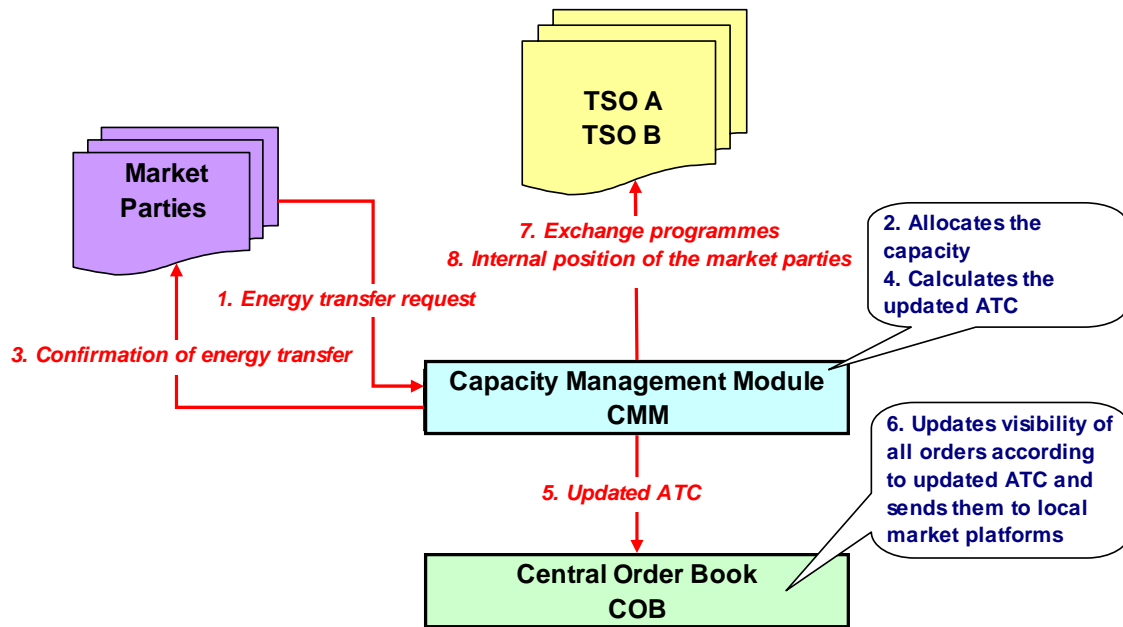


Figure 4

### 4.6.3 Cross border trade via a trading platform

For clarity reasons, the business process leading to a cross border trade via a trading platform is represented in three chronological steps:

- the submission of the order
- the analysis of the request and the confirmation of the trade
- the actions following the trade.

#### Submission of the offer:

In this example, a Member X places an order X on the market A platform. This order is visible to the Market B since the available capacity is higher than or equal to the offered capacity.

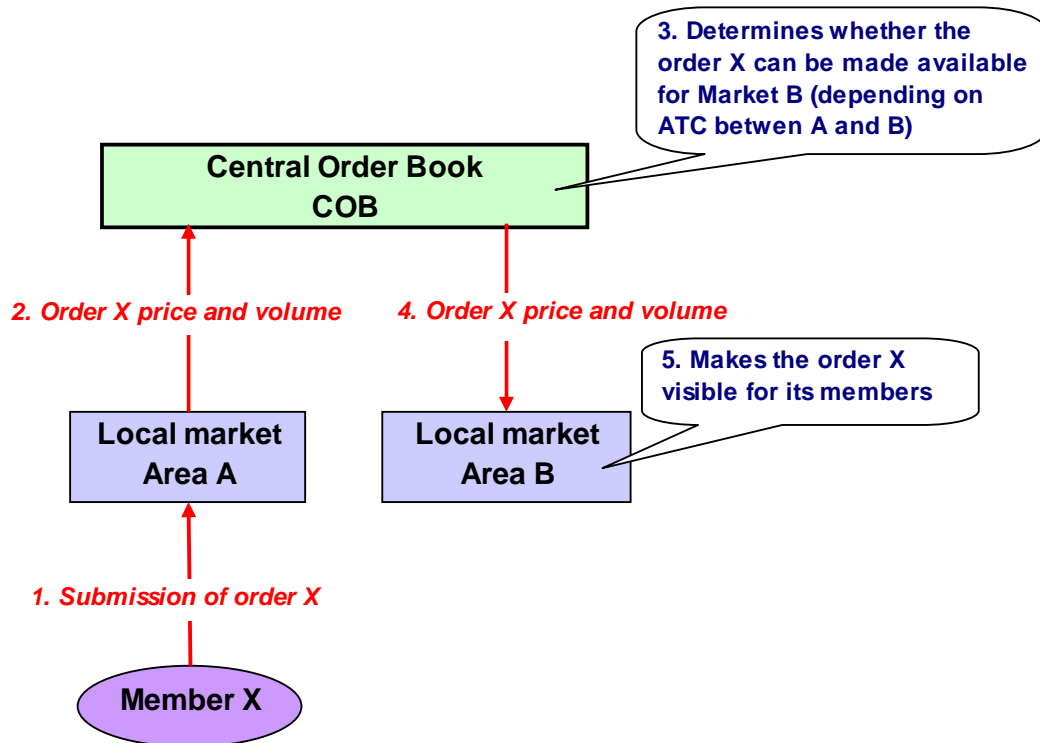


Figure 5

**Analysis of the request and confirmation of the trade:**

Assuming that an offer Y in Area B hits the order X in area A (member Y selects the order X), the following process will take place to lead to the trade confirmation<sup>7</sup>.

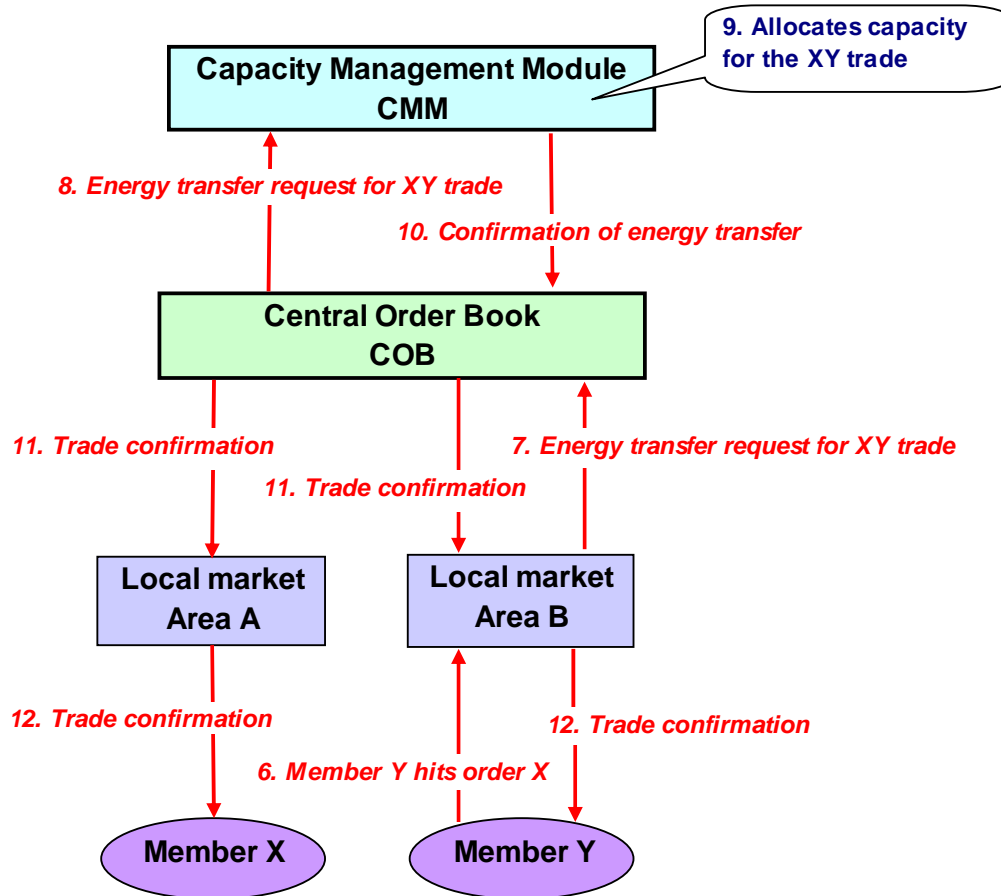


Figure 6

<sup>7</sup> It should be noted that the technical implementation of this business process will be subject to more detailed design considerations. For example, timing requirements could make it necessary that the matching process is technically executed at the COB level rather than locally.

**Post trade actions:**

Once the trade is concluded, post trade actions will be implemented to update and publish the available capacities and to nominate to the relevant TSOs the exchange programs and the member positions.

In the following example, the MPs' internal positions are nominated to the TSOs by the trading platform operators; however, other systems could be investigated by the TSOs such as a nomination done by the CMM.

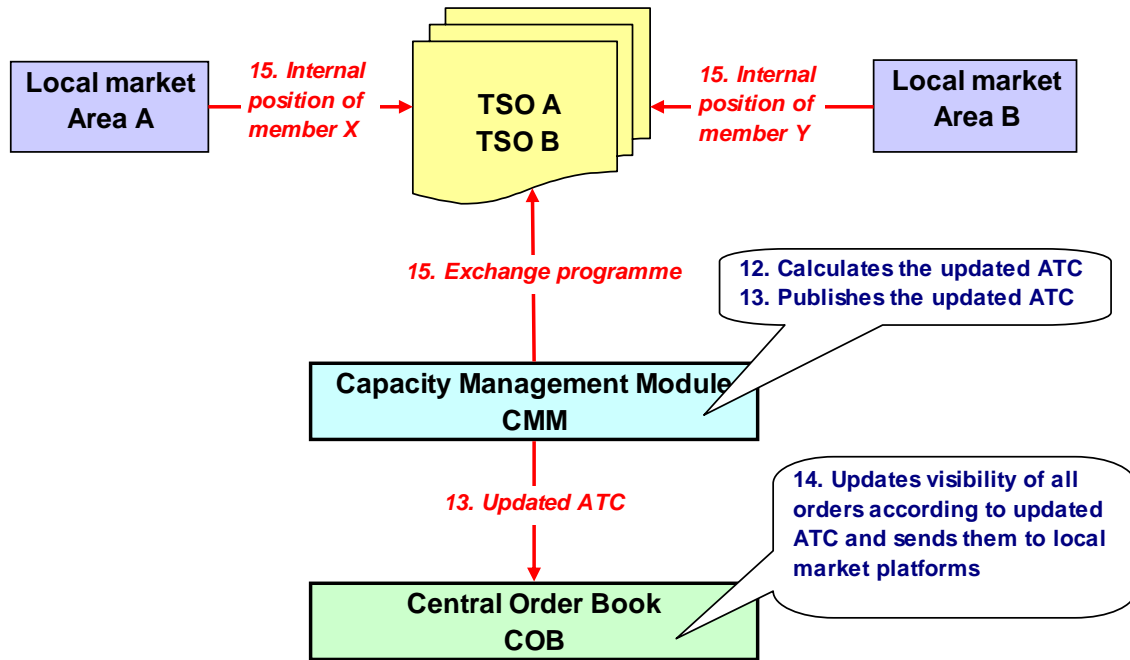


Figure 7

## **5. Harmonization and Implementation Challenges**

Implementation of the reference model leads to many regional harmonization and implementation challenges such as for:

- nomination processes
- market rules
- gate closure times
- contractual arrangements (e.g. collaterals, fees, membership requirements)
- TSO coordination arrangements