Teasimed

TOWARDS AN EFFICIENT, ADEQUATE, SUSTAINABLE AND INTERCONNECTED MEDITERRANEAN POWER SYSTEM

Integrating the power markets in the south-west Mediterranean

A proposal for the design and the governance of the process

Med-TSO
MEDITERRANEAN TRANSMISSION SYSTEM OPERATORS

Co-funded by the European Union

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TASK 3 Identification and put into operation of some selected Interconnected Electricity Exchange Zones (IEEZ), with a view to increasing electricity exchanges in the region

Activity 3.1 Executing short-term demonstration project in the Maghreb Region

Deliverable 3.1.C Definition of the requirements, the processes and the operational agreements

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1. Executive Summary

This report aims to establish the essential prerequisites and principles of cooperation necessary for implementing a potential market model for cross-border power trading among Morocco, Algeria, and Tunisia, and at the same time not hindering the existing interconnections between the Maghreb and the European Union, as well as the interconnection with Libya.

To achieve this objective, the proposal presented in this report is divided into two parts, which form the backbone of this document. The first part is the Trading Design Proposal, which outlines the necessary guidelines and procedures for the effective functioning of the cross-border power trading market. The second part is the Governance Framework, Regulatory Framework, Market, and Transmission Grid concepts, which outline the legal and regulatory framework necessary to ensure smooth and efficient operation of the proposed market model.

5.1 The trading design

In the first part, based on the previous tasks of this project, being the Regulatory Framework Analysis and Benchmark Analysis and several consultation workshops (which included a deep dive into the specifics of the region), a pragmatic design is proposed for cross-border cooperation in three phases starting from the current situation.

The **objectives** of the market model are:

- Use the existing interconnection capacity in a more efficient way;
- Build a cross-border market that is compatible with the principles of the Internal European Energy Market to facilitate a future harmonization with the EU Markets. The aim is not the harmonization as such but enhancing the cross-border exchanges while respecting the diversity of local setups;
- Adopt a multi-phase approach to build progressively on current commercial arrangements without creating a big bang and considering each country's specificities.

This section summarizes the key features recommended for the power market coupling of Morocco, Algeria, and Tunisia. It considers three phases of trading development where Phase 3 reflects cross-border trading compatible with the Internal European Energy Market principles. Phase 1 is based on the current state of commercial trading

agreements between the TSOs and builds progressively toward Phase 3. Phase 3 is achieved when at least one of the three countries has opened the cross-border market to additional participants on top of the TSOs.

In Phase 1, the current bilateral agreements are improved with an enhanced process of pre-defined prices, which enables the TSOs to modify prices depending on the market and grid situation, and with some additional specific commercial aspects (see Part 2 [1]). This proposal would be a light modification of existing commercial terms that cannot affect the technical operation of the current power flow systems and exchanges between the 3 TSOs.

In Phase 2, the principle of pre-defined price is opened more widely so that the TSOs participate in daily auctions. Each TSO builds a daily order book. The optimization of the order books in an auction, considering the cross-border constraints, allows to create implicit allocation of cross-border transmission rights and optimizes the exchange possibilities between the three countries. Although this phase could be developed directly from the current situation, the project partners deem it more appropriate to implement it after Phase 1. The objectives of applying a phased approach are to implement changes progressively and to build on the progresses piled up from the previous phase.

In Phase 3, the implicit cross-border auction market is opened to additional participants in at least one country. An independent market operator steps in to organize the market neutrally with standard procedures (see Report 3.1.C Part 2). The participation of other market participants is supposed to bring more competition and liquidity in the regional trade for the benefit of all grid users. This phase requires a range of changes in the regulatory framework of the involved countries.

Phase 3 opens the cross-border power market to other participants besides the TSO and is based on local regulatory changes and the implementation of standard procedures.

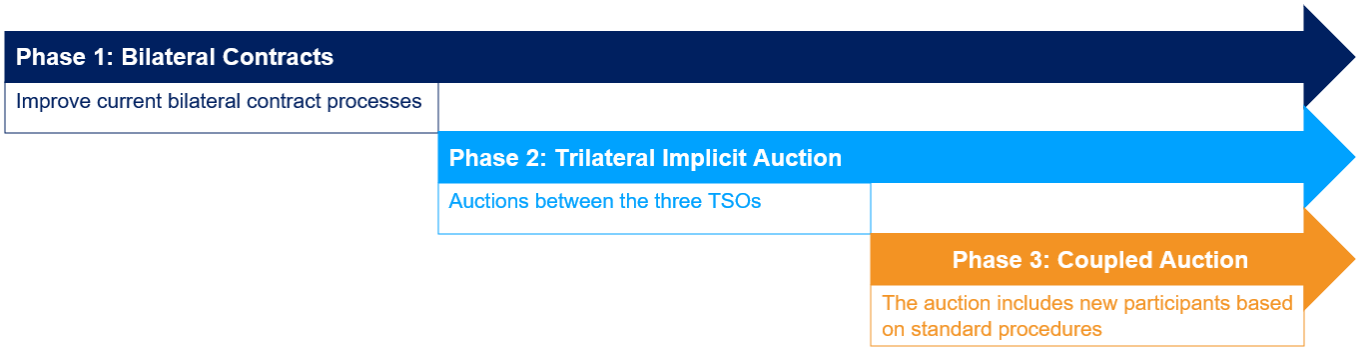

Figure 1 Design approach in 3 Phases

5.2 The Governance Framework, Regulatory Framework, Market and Transmission Grid concepts

Part 2 of the Med-TSO Maghreb Trading Platform Project describes the aspects of the proposed trading platform design related to:

- Governance Framework
- Regulatory Framework
- Transmission Network Concepts
    - Cross-border capacity calculation
    - Wheeling Charges
    - Treatment of losses
    - Compensation of involuntary flows
- Electricity Market Monitoring, Integrity and Transparency

Each section of this report includes a general explanation of the topic, international examples and specific recommendations for Phase 1, 2 and 3 of the proposed market design to be implemented in the Maghreb region.

Part 1 The trading design

2. Introduction

The TEASIMED Project, Task 3 "Identification and put into operation of the selected Interconnected Electricity Exchange Zones", includes Activity 3.1 "Executing short-term demonstration project in the Western Region (Maghreb): Zonal Platform for Power Trading", where the "Definition of the requirements, the processes and the operational agreements" is Deliverable 3.1.C.

This report is Part 1 and covers the Trading Design Proposal. It describes the features of the selected target model for cross-border power exchanges, as well as the two intermediary phases to reach it. It is based on previous deliverables of the project: the Regulatory Framework Analysis and the Benchmark Analysis.

The Trading Design Proposal is based on the expertise of EPEX SPOT to design new markets and of Elia Grid International for topics related to the transmission system operation. The proposals further include the specificities of the region, as requested by Med-TSO and the TSOs of the Maghreb. Figure 2 describes the project set-up and stakeholders.

The proposed design builds on existing bilateral agreements between Tunisia and Algeria on one side, and Algeria and Morocco on the other side. Although the content of these bilateral agreements is highly confidential, some of their generic features have been shared with the project partners to make a proposal based on the current exchanges and procedures.

Figure 2 Project Organization

3. Objectives

The objective of this report is to recommend a trading design for cross-border trading of power between Morocco, Algeria, and Tunisia, based on the Reports of Deliverable 3.1.B Regulatory Framework and Benchmark Analysis and the different workshops held with the stakeholders.

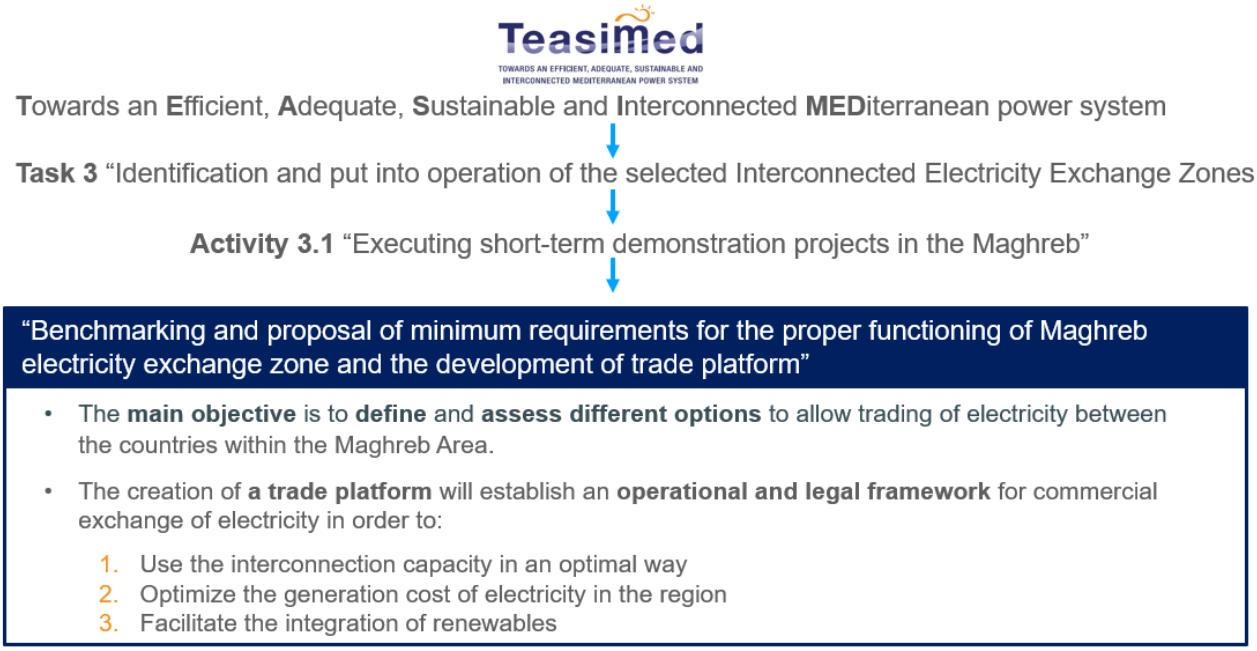

Figure 3 Objectives of the Project

The design definition gives an overall functional picture of the envisioned power cross-border trading design. The trading design will be compatible with the general principles of the EU Internal Energy Market to allow the current commercial cross-border exchanges between Spain and Morocco to continue and not impede future cross-border exchange evolutions. Further coupling with Italy and Libya through Tunisia could also be considered in parallel to the proposed Phase 3. The design foresees eventually in Phase 3, a third-party access right to cross-border capacity in at least one of the Maghreb countries and offers a market-based allocation of cross borders rights to ensure fairness amongst participants.

- The third-party access rights mean that the transmission system operators grant equal access to their local grid and to the cross-border wholesale market to all allowed stakeholders, while taking into consideration the local balancing rules applied equally to these parties, being consumers and generators or any other type of participant allowed to participate to the cross-border market.

- The regulatory oversight of the market rules and third-party access rights application allows the cross-border market to work according to the applicable legislation. This ensures a level playing field amongst market participants.
- The market-based allocation of cross-border rights ensures that cross-border electricity rights are fairly allocated between market participants. A market-based allocation will allocate the cross-border rights to the parties giving the highest value to these rights. Implicit and explicit cross-border rights allocations were described in Deliverable 3.1.B - Part 1: Benchmark Analysis [2].

The Internal Electricity Markets in electricity are based on	Necessary steps
The third-party access right. It requires the System Operators to treat all third parties - be they producers, consumers or any other entity - on the same level playing field and grant them access to the wholesale market **Market based allocation** of cross border rights: to ensure that the barriers to cross-border electricity flows will be progressively removed;	• Market opening to all stakeholders • Local balancing rules • Unbundling • Regulatory oversight • Implicit or explicit allocation of cross border allocation rights **Cf Deliverable 3.1.B - Benchmark Analysis*
The design of the **European Internal Energy Market** will be considered for the long-term design.	

Table 1 Principles of the European Internal Energy Market

It is understood that evolving from the current situation in Maghreb to a target cross-border power market compatible with the principles of the European Internal Energy Market is a big step. Therefore, in the proposed approach, we will detail the different steps to follow to reach this goal.

4. Approach

As discussed during the workshops held on 30th May 2022 and 12th October 2022 (Tunis), the following principles are included in the Trading Design:

- Possibility of design evolution is considered to propose realistic and pragmatic phases
- The Trading Design Proposal includes intermediate Phases that are realistic and applicable to the situation in the Maghreb region
- A pragmatic approach and not too complex to implement
- The Design shall be compatible with the regulatory situation in Maghreb region where today there is no competition at local level in the Maghreb countries. Therefore, the proposed design should have no impact on the energy transactions at local level
- Compatibility in the long-term with the European model shall be ensured
- Trilateral trading is envisaged between the 3 countries
- Currently there are two bilateral inter-TSO agreements but no multilateral agreement among the three TSOs.
- Enhancement of the existing principles under the bilateral TSO cooperation
- Involvement and improvement of the role of an independent third party for more TSOs coordination in Maghreb

Three distinctive design phases are proposed to build on the current situation towards a cross-border power trading design, compatible with the principles of the European Internal Energy Market.

- Phase 1 reflects current rules and regulations in place and improves the possibilities of bilateral cross-border trading between Maghreb TSOs with a more flexible way to determine the price of the energy traded.
- In the Phase 2, the cross-border Trading Design is improved with a trilateral trading auction proposed to optimize the needs and offers of the three TSOs together with the cross-border constraints. It requires the organization of a single trading platform.
- Phase 3 develops the auction principle created at Phase 2 and opens it to other allowed market participants in at least one country. A set of rules and processes are necessary to organize the third-party access to the wholesale cross-border power market.

For each Phase, the following features will be addressed:

1. Participants
2. Contract counterparties

3. Products
4. Price determination
5. Type of cross border capacity allocation
6. Market organization and market rules
7. Payment and nominations

	Phase 1	Phase 2	Phase 3
Participants	TSOs		TSOs and other market participants
Trading contracts counterparties	Bilateral	Trilateral	Multilateral
Products	Hourly and block daily and intraday products		
Price determination	Pre-determined price range with internal guidelines	Auction clearing price	
Type of cross border capacity allocation	No allocation necessary in a bilateral environment	Implicit allocation of cross border capacity	
Market organization and market rules	Bilateral agreements	Trilateral market rules	Market rules
Payment and nominations	Unchanged, with no central counterparty	Bilateral settlement	Central counterparty

Table 2 Main features of each design Phase

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5. Main features of the proposed design

This chapter gives a general overview of each phase of the proposed design. In the next chapter (Design Pieces) each aspect will be detailed.

5.1 Phase 1

The Phase 1 builds on the current bilateral agreements and operational procedures used for commercial exchanges between the Maghrebin TSOs. It improves the current contracts with the aim to increase the volume of electricity exchanged between TSOs while not disturbing excessively the current regulatory, technical, and organizational arrangements.

In Phase 1, the commercial bilateral agreements remain bilateral between the TSOs. This means that the commercial exchanges are aligned with the geographical topology of the grids of the three countries. The bilateral agreements are set as forth:

- between TSOs of Morocco and Algeria
- between TSO of Algeria and Tunisia

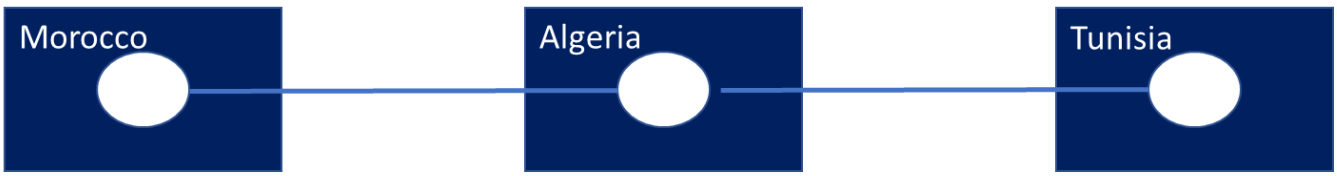


Figure 4 Cross-border trading integration of Morocco, Algeria, and Tunisia in Phase 1

The bilateral agreements are private and confidential, and their content is known only to the participating parties. The products traded in existing bilateral agreements are traded for delivery the same day (intraday) or the next day (day-ahead). During different workshops the project members reiterated their need to trade short-term products (day-ahead and intraday).

In Phase 1, as the commercial agreements are bilateral, there is only one TSO from each side of a border who can access the cross-border capacity. Therefore, there is no complexity in the cross-border rights allocation since the bilateral agreements use the cross-border rights on each side of the border. Phase 1 will focus on the evolution of the price determination for the transactions. Other current contractual dispositions such as operational processes, payment schemes and management of metering can remain unchanged, unless decided by both parties.

Since the conclusion of the bilateral agreements in 2007 and 2014, most of the exchanges have been commercial exports from Algeria to its neighbours. Recently, exports from Algeria to Tunisia have increased significantly in 2020 and 2021.

The bilateral agreements define the energy price in advance. The buyer informs the seller of its intention to buy a volume for delivery the same day or the next day. The price is fixed in the bilateral agreement for three months or can be changed at the request of one party. The validation process of the price change requires a heavy administrative approval process between the two parties. The validation of the high management of the companies is required.

The accepted volume range is:

- Algeria-Tunisia: between 50 and 600 MW
- Algeria- Morocco: between 50 and 200 MW

Regarding the volumes, the seller commits to deliver the requested volume. It means that once the bilateral agreement is set, the seller cannot modify its offered volumes unless there is a force majeure or technical unfeasibility.

This system of pre-defined price is in practice comparable to a continuous market where the seller is filling the order book with sell orders for all hours at a pre-defined price and for a given maximum volume. The buyer triggers a transaction at the offered price when it is deemed appropriate. Compared to a continuous market with many sellers and buyers, the sell orders are inelastic since these are always the same. There are no active buy orders. It means that the buyer is not actively offering some buy orders with buy price and volume.

The proposed modification rationale will be detailed in the Chapter 2. Design Pieces, Section 2.4 Price determination. To switch progressively to a free price determination, it is proposed that in Phase 1 TSOs move from common pre-defined prices to common pre-defined price ranges. For example, for 3 months, there would not be any more a pre-

defined price at x EUR/MWh, but a pre-defined price range between y and z EUR/MWh for the transactions. Furthermore, the seller TSO will be able to update its prices weekly for each delivery hour within the agreed price range.
In addition, each TSO would set up internal rules to be followed by the operators when offering or accepting a price depending on the technical and economic conditions. This would create boundaries in which the operators could work and conclude transactions autonomously while respecting the company's interests.

Each week (or at a different frequency if deemed better by the TSOs) the potential seller(s) would send to the potential buyer(s) the prices for the following week. It is suggested to apply a weekly frequency of prices updates, as it is a good trade-off between forecasting accuracy, leaving enough time to modify dispatching (extra plants…), while limiting the time spent to price updating. The proposed prices would fall in the pre-defined price range of the bilateral agreement and follow the internal rules of the seller TSO. Prices could be different per hour of the day, and a different price could be proposed for the deals done in the day-ahead and intraday timeframe.
The Day-ahead and Intraday timeframes should be defined ex ante in the bilateral contractual framework. A simple definition could be before a certain hour (15.00 for example).
Then the operator from the buyer TSO would be able to trigger some exchanges based on the prices offered by the seller and his own company guidelines.

The bilateral agreement would keep on fixing the maximum volume of each transaction. The potential buyer would inform the seller that there is an interest in buying power for the next day (day-ahead) or during the same day (intraday). The volume shall respect the boundary rules of the bilateral agreement.

To conclude, current bilateral agreements will remain unchanged for a large extend, except the fixed single pre-determined price, in Phase 1. Instead of a fixed price determined in advance for the next three months, the bilateral agreement would include minimum and maximum absolute price boundaries of the exchanges. Additional internal rules would organize how TSO operators can manoeuvre with more flexibility on a day-to-day basis with an adaptation of the prices to physical and market constraints of both parties. This is a way to reduce price inelasticity due to a fixed price during a long period and increase the trading possibilities while keeping the management oversight of the transaction prices. This mechanism is further detailed in the Chapter 2. Design Pieces, Section 2.4 Price determination.

5.2 Phase 2

Phase 2 is the intermediate phase between the improved current bilateral agreements and the optimal cross-border market compatible with the European Internal Energy Market principles.

Its novelty consists in the introduction of an auction between the three TSOs. It means that the bilateral agreements would be replaced by trilateral market rules and a new multilateral agreement , having all three TSOs abide by the same rules.

In Phase 2, the results of the auction can result in commercial exchanges of electricity between the three TSOs as forth:

- between TSOs Morocco and Algeria
- between TSO Algeria and Tunisia
- between TSO Morocco and Tunisia through Algeria

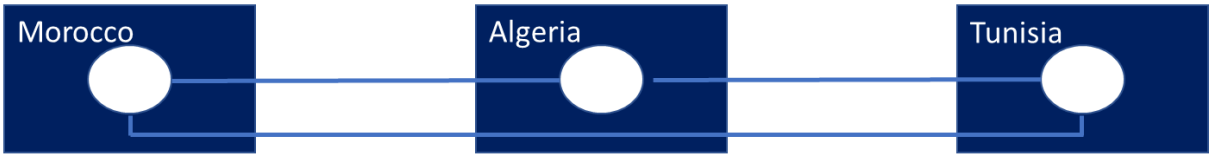


Figure 5 - Cross border power trading integration of Morocco, Algeria, and Tunisia in Phase 2

This auction between the three TSOs allows to implicitly allocate the cross-border capacity and the energy exchanged in an optimal way(cf. the Benchmark analysis 3.1.B chapters on TLC and SAPP). Concretely it means that some exchanges can take place directly between Morocco and Tunisia, if the welfare create by those exchanges is higher than other exchanges between Algeria and Morocco or Algeria and Tunisia. There is a proper cross-border allocation which is implicit, and for each border two TSOs are in competition to obtain cross border rights.

According to the preferences expressed by the stakeholders during the workshops of the project, the product traded is a day-ahead product for delivery the next day. Potential additional bilateral transactions between the TSOs on the

intraday timeframe remain possible, with a residual intraday capacity taking into account the capacity already allocated in the day-ahead timeframe, as in Phase 1.

Schematically, the price is determined at the intersection of the offer and demand curves, considering the acceptance of block orders. It means that the TSOs shall elaborate bids to participate to this auction.
The order book of each participant TSO includes some prices and volumes which can be different for each hour. This is a novelty compared to the current situation and Phase 1, where the volume requested by one TSO must be accepted by the other TSO unless there is a technical unfeasibility or a Force Majeure.
The organization of the auction can already at this stage be performed by a neutral counterparty. The market rules are shared between the three TSOs, and the same rules apply to the three TSOs. Payments can take place bilaterally as they are currently performed without the involvement of the neutral counterparty. Each TSO shall commit to pay its due to the other two TSOs according to the auction results.
This new set-up requires elaboration of wheeling agreements, market rules, new way to submit orders, and potentially the involvement of an independent third party. This is further detailed in the Part 2 of this report – Governance, Regulatory, Market and Transmission Network Concepts.

5.3 Phase 3

The Phase 3 represents the optimum objective of the cross-border trading between the three areas. It is compatible with the principles of the European Internal Energy Market. The following features can be observed:

- Third party access to the regional trading market, at least partially
- Oversight from regulatory authorities

The Phase 3 is not mandatory to be reached by all countries at the same time. It can be envisaged to have a phased approach like in SAPP (Southern African Power Pool) example described in the report Deliverable 3.1.B-Part 2: Benchmark Analysis, where some countries have a single buyer while others have an open wholesale market with several market participants.

6. Detailed description of the Trading Design elements

6.1 Participants to the regional trading

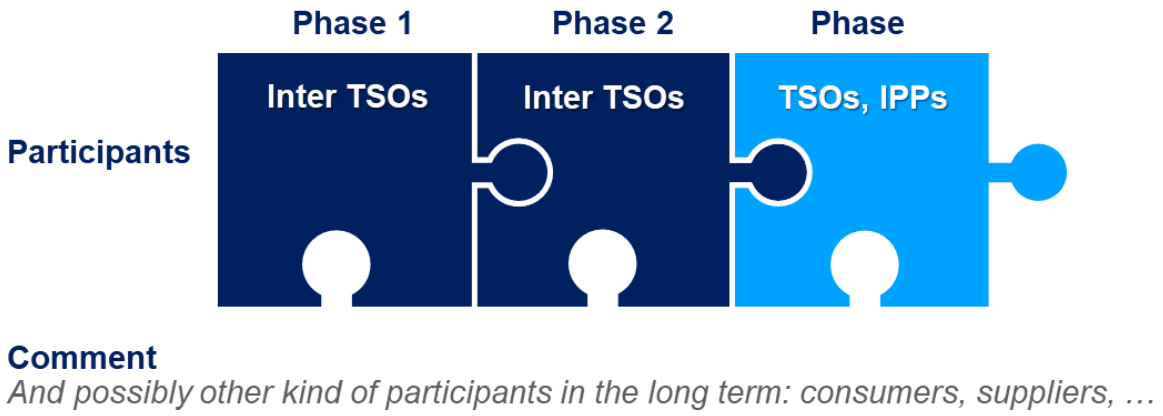


Figure 6 - Participants to the regional trading for each phase.

The project stakeholders identified the TSOs as the first interested parties to perform cross-border exchanges between Morocco, Algeria, and Tunisia. It was highlighted that the focus should be first to develop cross-border exchanges within the current framework, and the project should build on developing the exchanges with progressive increments. That is why in Phases 1 and 2 the market parties are the three TSOs: ONEE, SONELGAZ and STEG. In the Phase 3, additional participants such as Independent Power Producers (IPPs), consumers, suppliers, or any other marker party depending on the market opening status in each country have access to the cross-border trading platform. Libya could also join the process. The conditions of participation of new participants to the cross-border market are detailed in the Implementation and Gap Analysis.

6.2 Contractual relations between the Participants to the regional trading

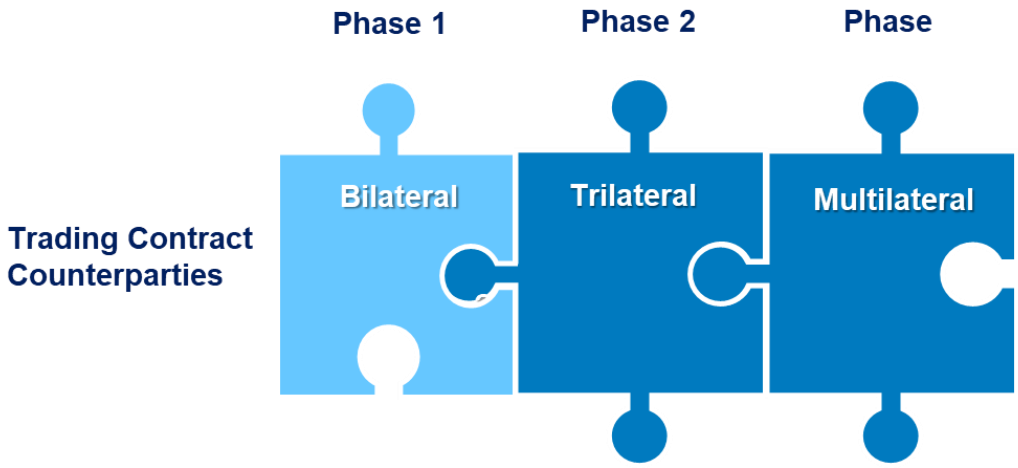


Figure 7 Contractual relations between the Participants to the regional trading in each phase

This aspect is detailed in the Report Part 2: Governance, Regulatory, Market and Transmission Network Concepts.

In Phase 1, the commercial agreements remain bilateral between two TSOs as described above and in the Report Part 2. The bilateral agreements are private and not known besides the two counterparties. To make sure that the TSOs can fulfil their commercial commitments towards the other TSOs, it is recommended that TSOs calculate boundaries for their net import and export values. They should not commit to export or import commercially more than these boundaries. In case these boundaries are reached, for example if Algeria receives imports requests from Morocco and Tunisia which are exceeding Algeria's net position boundaries, some clear rules should be developed in advance to organize the decision process. To ensure that transactions are balanced, and fairness is ensured, the rules should be known in advance and respected, whatever the rule. The implementation of a more advanced market coupling relies on trust of the parties. Trust shall rely on common rules and a contractual scheme which are explicitly defined in advance to solve all potential conflicts and mistrust.

In the Phase 2, the bilateral agreements from Phase 1 are replaced by one single multilateral (trilateral in our case) agreement, requiring more coordination. The auction optimizes the needs of the three TSOs, and its results are

binding. If one TSO rejects the results of the auction, then the whole auction results are unapplicable, and no exchange can take place on that day. A reason why a TSO would reject the outcome of the auction is because results are not "secure". Thus, it means that capacity calculation process should be clear, coordinated and that all operational procedures (fall back etc.) are defined.

It shall thus be ensured that the rules governing the cross-border trade are known and fulfilled by all the parties so that the auction mechanics can work smoothly. Clear rules on Force Majeure, emergency procedures and dispute settlement (penalties, …) should be foreseen in the multilateral agreement and the appended market rules. They should be agreed by all parties (see Report Part 2). A neutral third party could already ensure the role of market operator even if not yet mandatory.

In the Phase 3, there are more companies having the right to access to the cross-border trading platform in at least one country of the Maghreb. One participant does not know whom its counterparty is. It is a multilateral anonymous market where a central counterparty is necessary to make sure that all buyers fulfil their payments, and all sellers commit to deliver the promised power. Each trading participant must sign a Trading Agreement with the market operator and organises its balancing (through a Balancing Responsible Party Agreement or another regulatory way) with the system operator of the country where he wants to inject or withdraw power.

6.3 Products to be traded

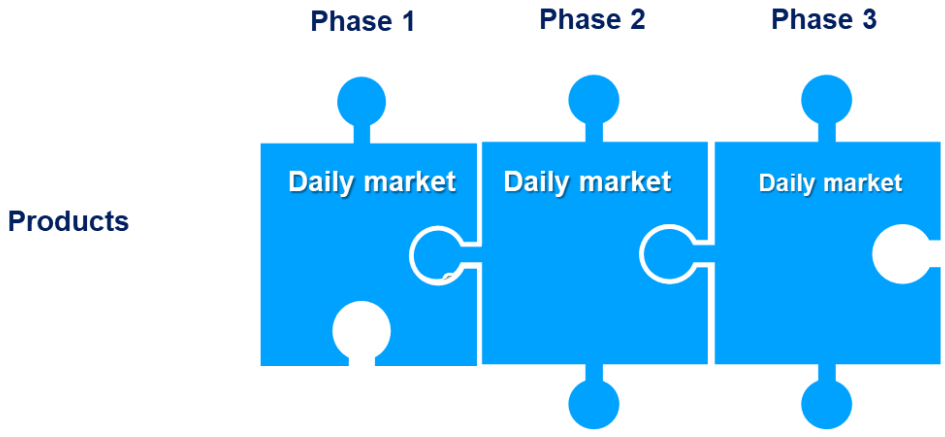


Figure 8 Products to be traded in each phase

For convenience of the commercial exchange, the product shall be standardized. It means that buyers and sellers agree in advance on the exact shape of the product so that the day-to-day negotiation to finalize the exchange and the cross-border capacity allocation is easier. It is important that the parameters of the product(s) to be exchanged fit the buyers and the sellers willingness to exchange, otherwise the transaction will not take place due to a lack of appetite from the market participants. From the workshop discussions, it was highlighted that TSOs see a real interest in trading products covering their respective peak times which take place successively in the three countries. They also expressed the need to be able to trade together blocks of several contiguous hours.

The product to be traded cross-border between the three TSOs is similar to the current product. It represents hours for delivery the next day.

The characteristics of the standard electricity product encompass the following features in the table below.
The parameters proposed can be adapted by the TSOs. These parameters are to be set at once in the market rules or in the agreements before the exchanges take place. For example, the trading days in a perfect optimal market are all 365 days of the year. However, if participants cannot participate on some weekend days because their employees are off, it is pragmatic and more efficient to organize the trading days only on working days to ensure that the trading periods will always see some exchanges. To sum up, the best parameters are those which will establish the best framework for exchanges.

PRODUCT PARAMETERS FOR A CROSS-BORDER POWER DAY-AHEAD MARKET BETWEEN ALGERIA, MOROCCO, AND TUNISIA (HOURLY PRODUCTS IN D-1)				
	Comments	**Phase 1**	**Phase 2**	**Phase 3**
Underlying	Electrical power transiting over a power transmission system managed by a TSO, which defines the voltage, frequency, cosine ϕ (displacement factor) and cut-off frequencies, in compliance with the contractual and legal obligations applicable to the general power grid.			
Delivery	In Phase 1 and 2, the exchanges are only cross-border since there is only one participant (TSO) in each country.	Delivery at the border		Delivery at any injection or withdrawal point on the relevant power transmission system.

<table>
<tr><td>Trading days</td><td>Year-round every day</td><td colspan="2">It can be limited to working days if agreed so in the market rules. If this case, the last day before the weekend allows to trade delivery days from the next day after the trading day until the next trading day</td></tr>
<tr><td>Tradable Contracts (Expiries)</td><td>A tradable contract is a unit product which can be traded (a hour of the day)
Hour 01: the period between midnight and 1:00
Hour 02: the period between 1:00 and 2:00, and so on and so forth
Hour 24: the period between 23:00 and midnight
Tradable contracts can be bound into blocks of contiguous hours (see more details in the line “Block Orders” and below the table)</td><td colspan="2">The same standard shall be applied to refer to the same time. Example: UTC+1</td></tr>
<tr><td>Opening of the Order Book</td><td>Period during which the participants can submit their orders</td><td rowspan="2">Some operational timings shall establish the time window of the transactions
- When the seller sends his weekly price list
- When the buyer can request to buy energy</td><td>To be decided in the market rules example: 10 days before the auction gate closure</td></tr>
<tr><td>Closure of the Order Book</td><td>Daily at a given time</td><td>Time to be set, example 10.00 am on D-1 before (D: Delivery Day) which allows the participant(s) to trade next on the European auction at 12.00 through the Moroccan-Spanish border</td></tr>
<tr><td>Publication time</td><td>The time at which the auction results are released to all participants. It is important to have a pre-defined time so that all participants know the results at the same time and fairness is ensured.</td><td>Not applicable in Phase 1</td><td>It shall be set as early as the auction results are calculated, leaving some sufficient processing time. Example: 30 minutes after the auction gate closure</td></tr>
<tr><td>Clearing and Settlement</td><td>How the invoices and payments are executed</td><td colspan="2">Trade information is invoiced and paid monthly through bank transfers</td><td>Trade information is automatically transmitted from the trading platform to the central counterparty, for settlement of the contracts.</td></tr>
</table>

Delivery procedure	How the TSOs are informed of the internal and cross-border power flows	TSOs are informed as they are the only participants. In Phase 1, the cross-border flows correspond to the energy exchanged in each bilateral contract. In Phase 2, the cross-border flows are an input for the trilateral auction.	Nomination by the central counterparty and, if applicable, by the relevant balancing responsible entity to the TSO (depending on the TSO balancing approach).
Minimum and maximum prices	The price boundaries are necessary to run auction calculations, and are described in the market rules. It can be decided either: • To leave the boundaries very wide to allow the expression of all economic interests • To narrow the boundaries to ensure that the participants do not come with an extreme price	The boundaries can be narrowed to reflect the limited autonomy left to the TSOs' operators in charge of triggering the exchanges. Example: 0 € / 200 € Some additional rules can be defined internally to ensure that the operators act for the best interest of their company. For example, in a normal situation to be defined with factual parameters, a buyer decision maker can decide internally to leave the room to the operational buyer to buy at a price no higher than x€/MWh (still in the market price boundaries) Different rules can be set for scarcity situations.	
Price characteristics	The prices shall be of a specific type and respect some rules	Example: Orders are submitted in integer Euro per MWh (no decimals or fractions)	Example: Orders are submitted in Euro per MWh to one decimal place
Quantity characteristics	The quantity submitted by each participant must fulfil the same characteristics in terms of number of decimals.	Example: In full MW	Example: In MW with one decimal digit
Block Orders	Blocks orders are combining several hours on the same delivery day. All hours of a block shall be exchanged together. If one hour cannot be exchanged, then the whole block is not exchanged.	Example of pre-defined block order (to be adjusted and reduced): • Block baseload covering hours 1 to 24 • Block peak load covering hours 9 to 20 • Block night covering hours 1 to 6 • Block morning covering hours 7 to 10 • Block high noon covering hours 11 to 14	

		• Block sun-peak covering hours 11 to 16 • Block afternoon covering hours 15 to 18 • Block evening covering hours 19 to 24 • Block rush hour covering hours 17 to 20 • Block off-peak 1 covering hours 1 to 8 • Block off-peak 2 covering hours 21 to 24 • Block business covering hours 9 to 16 • Block middle-night covering hours 1 to 4 • Block early morning covering hours 5 to 8 • Block late morning covering hours 9 to 12 • Block early afternoon covering hours 13 to 16

Table 3 Product specification proposal for cross border trading integration of Morocco, Algeria, and Tunisia

Application :

As an auction principle, each participant fills an order for each hour of the day. It means that he uses the blank order template of prices and volumes indicating the price boundaries.

Price €/MWh	**-500**				**3000**
Volume MWh					

Table 4 Example of blank order template with [-500;3000 €/MWh] as price boundaries Source EPEX SPOT

The participant must fill the volumes requested at the price boundaries. It can be zero. In addition, he can insert additional price milestones and corresponding volumes as below.

Price €/MWh	-500	20	21	22	3000
Volume MWh	10	10	0	-60	-60

Table 5 Example of order
Source EPEX SPOT

The auctions can allow the management of various kinds of orders which can be introduced progressively depending on the liquidity level of the regional market. We can notably stress the following ones:

- **Standard hourly order**: price and volume for one hour of the day.
  Stepwise or piecewise orders are feasible – usage of either stepwise or piecewise orders must be decided in the design phase.

  - **Stepwise orders** are orders where the market participant specify each point of their preference curve which takes a step form.

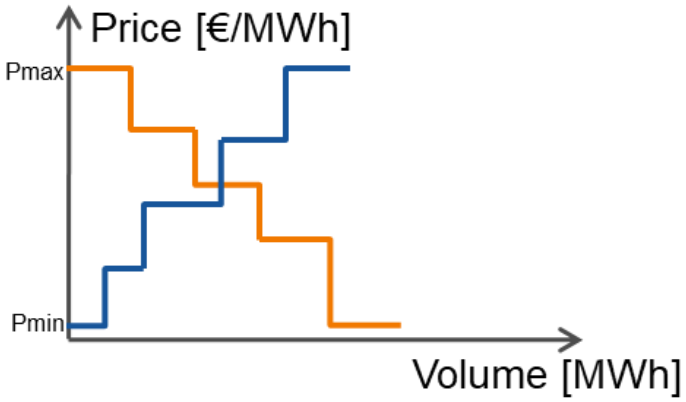


Figure 9 Auction with stepwise orders

- **Piecewise orders** are orders where the market participant acknowledges that the algorithm will interpolate the order preference between each point of the order. The order curve can take a linear shape or a step form if the participant decides so and builds its curve accordingly.

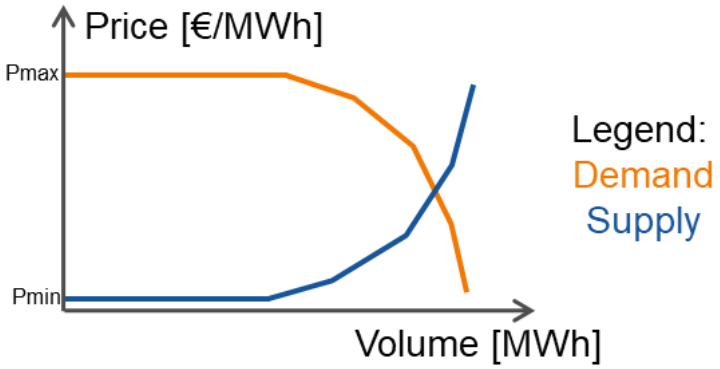


Figure 10 Auction with piecewise orders

- **Block order**: combination of single hours which depend on each other for their execution. Depending on the parameters set in the matching algorithm, Block orders can be non-curtailable or curtailable and executed partially over the hours according to a minimum acceptance ratio (any value between 0 and 1) to be entered by the participant.

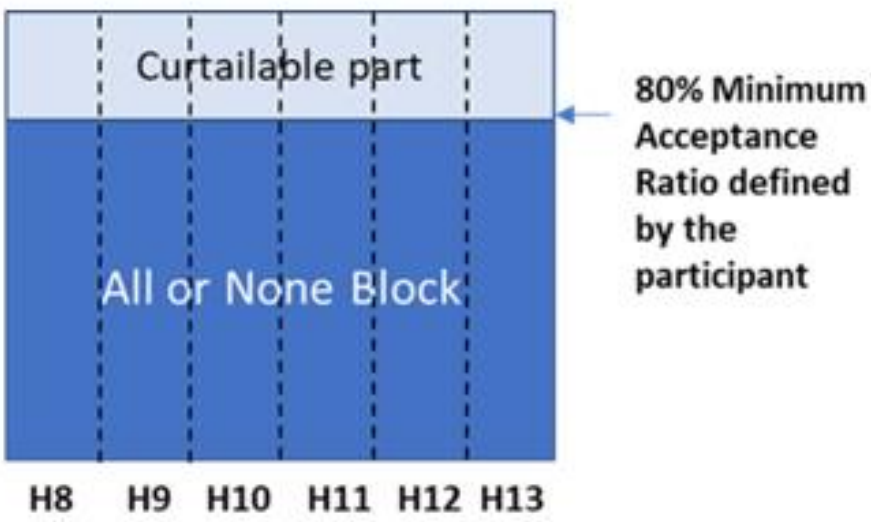


Figure 11 Curtailable block order in an auction

The maximum number of blocks to be submitted and the maximum block size is to be tested from a market point of view to check that block orders will not affect the auction performance and results. If a block is too big, it risks being never executed because it does not find sufficient volume counterparty, or not be executed despite its price being in the money, its acceptance would change the market result (Paradoxically rejected Block order).

Besides standard blocks some more complex block orders can be developed:

- **Loop block orders**: families of two blocks which are executed or rejected together. They allow to bundle buy and sell blocks to reflect storage activities

Figure 12 Loop block order in an auction

- **Linked block orders:** a set of block orders which have together a linked execution constraint.

  A child block order has the execution constraints of a standard block order and can be executed only if the parent block order it is linked to, is executed. A block order is a parent block order if the execution

of a "child" directly depends on its own execution. A parent block order can be executed alone if the child block order is not executed.

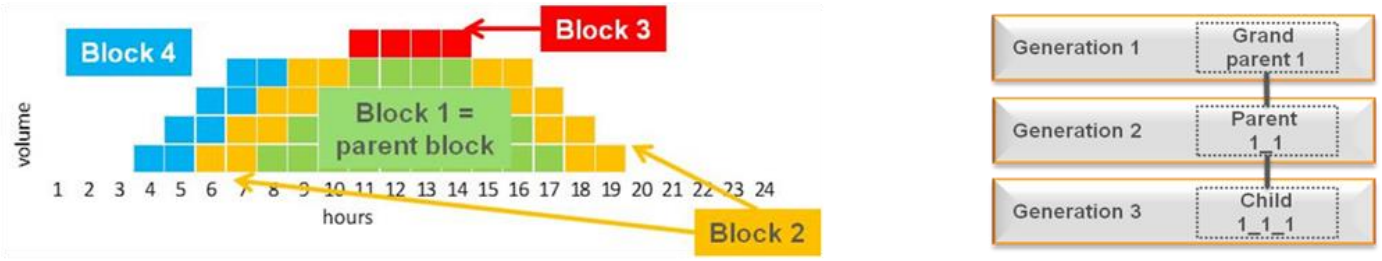


Figure 13 Linked block orders in an auction

- **Exclusive group of non-curtailable block orders**: a set of blocks within which a maximum of one block can be executed. An exclusive block order is a block which is part of an exclusive group and fulfils the execution constraints of a simple block order. A block order in an exclusive group is executed if it is in the money and if it optimizes the total welfare.

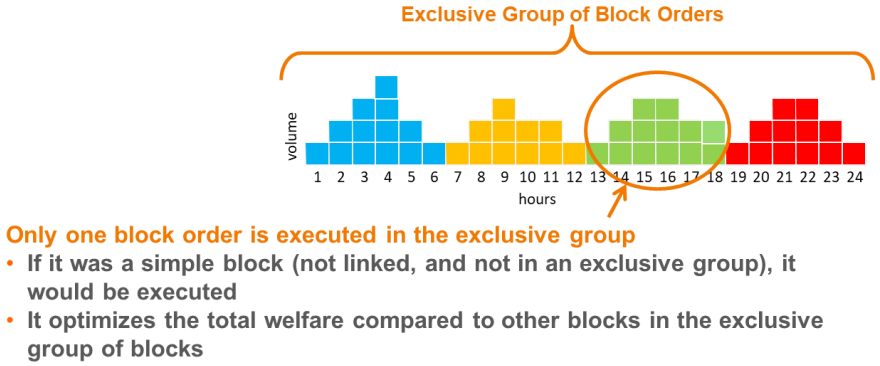


Figure 14 Exclusive block orders in an auction

For matters of simplicity, the number and complexity of block orders to be implemented in Phase 2 could be limited to a few pre-defined blocks to allow the TSO participants to get used to it and to avoid that blocks create too many constraints on the auction results.

6.4 Price determination

Price determination is the backbone of trading market design. Once the participants and the products to be traded are defined, the price determination will shape the rest of the market procedures.

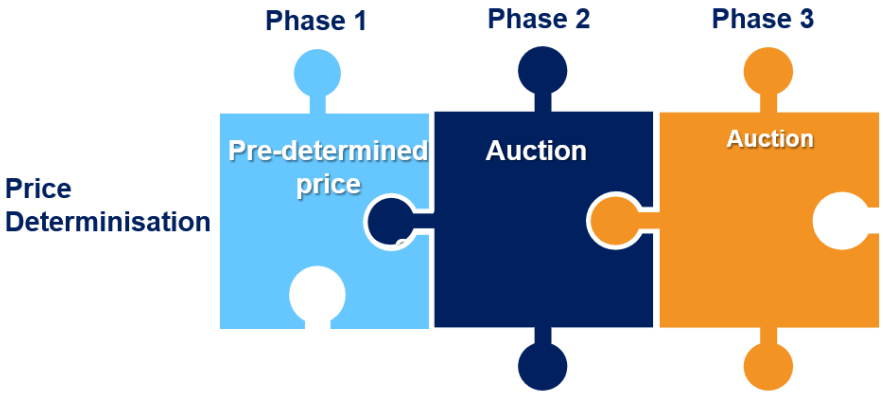


Figure 15 Price determination for each phase

Phase 1

According to the experts of the project beneficiaries, a fixed price for day-ahead exchanges for three months is the main obstacle to increase the exchanges between the three countries because a fixed price for three months does not allow to take into consideration the different economic and operational situations which can occur through the days and months for the buyer TSO as well as for the seller TSO. It is therefore suggested to work on the price setting pattern to evolve towards a more flexible process. This will allow the TSO stakeholders to exchange more based on prices which will reflect increasingly their needs and technical constraints.

The seller TSO has the interest to optimize the volumes sold. It means that it would make the most in trying to sell more power when it needs it less. In other words, the price can be lower in the off-peak times of the seller because at these times power is less needed and has less value for the seller. On the other side, the seller might encounter some technical constraints which increase its system scarcity at some times. At these moments, the price can be higher because the interest to sell is lower.

Moreover, the seller shall take into consideration that if the price is too high, there will be no transaction at all and no profit for the seller.

The following figures demonstrate through random price willingness from buyers and sellers that when the price is flexible, there are more exchanges opportunities than when the price is fixed for a prolonged period. The length of the

orange segments in Figure 16 is longer than the length of the red segments in Figure 17. The orange segments appear when the price of the buyer is higher or equal than the price of the seller. In such time windows, buyer and seller should find a common ground of understanding to exchange.

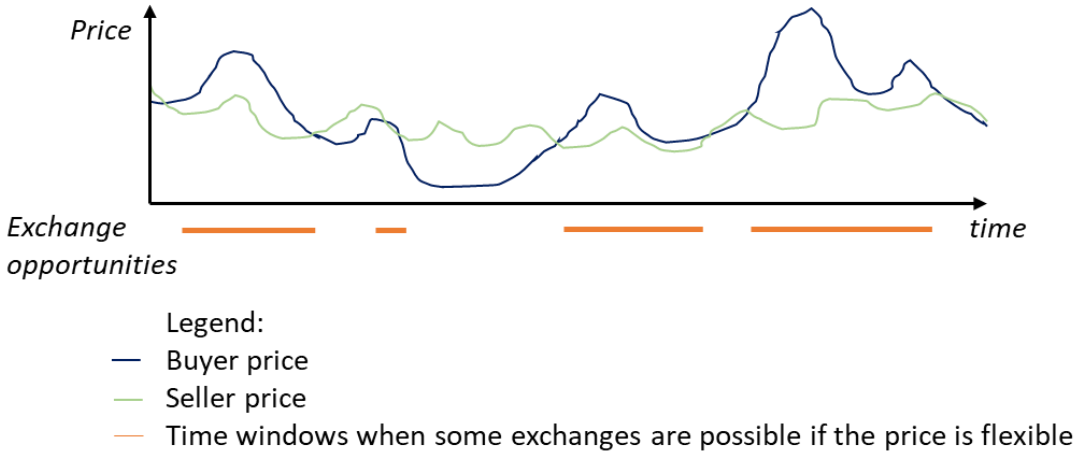


Figure 16 Exchange opportunities when the price is flexible

When prices evolve, a former buyer can become a seller depending on its willingness to pay or be paid which is made efficient using dynamic prices.

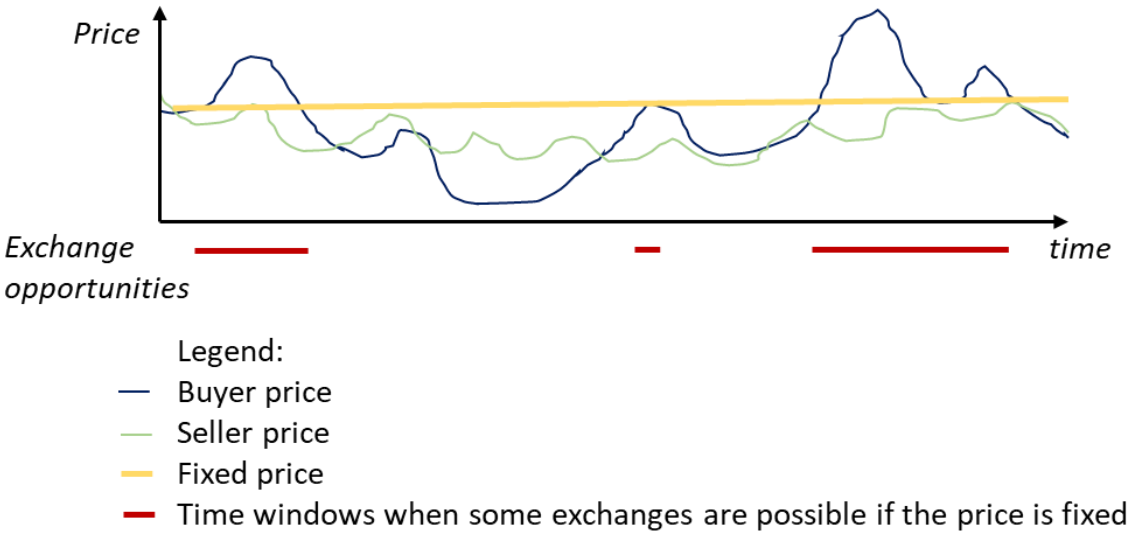


Figure 17 Exchange opportunities when the price is fixed

Concretely, in Phase 1, each company would establish some internal guidelines to determine the price transaction to be proposed, to be updated when necessary. These non-public guidelines would specify the rules to be followed by the operators when they trigger a transaction.

In the following example, the TSO seller has 3 internal rules:

1. To propose prices between 40 and 80 EUR/MWh.
2. To follow a usual pattern for week and week-end-days - example below on green days.
3. To price the power more expensively to reflect a foreseen constraint on the local grid – example on the orange days where for example a maintenance is foreseen.

Day-ahead price in Eur/MWh	Monday 09/01/2023	Tuesday 10/01/2023	Wednesday 11/01/2023	Thursday 12/01/2023	Friday 13/01/2023	Saturday 14/01/2023	Sunday 15/01/2023
Hour 1	40	40	50	50	40	40	40
Hour 2	40	40	50	50	40	40	40
Hour 3	40	40	50	50	40	40	40
Hour 4	40	40	50	50	40	40	40
Hour 5	40	40	50	50	40	40	40
Hour 6	60	60	70	70	40	40	60
Hour 7	60	60	70	70	40	40	60
Hour 8	60	60	70	70	40	40	60
Hour 9	60	60	70	70	40	40	60
Hour 10	60	60	70	70	40	40	60
Hour 11	60	60	70	70	40	40	60
Hour 12	60	60	70	70	40	40	60
Hour 13	60	60	70	70	40	40	60
Hour 14	60	60	70	70	40	40	60
Hour 15	60	60	70	70	40	40	60
Hour 16	60	60	70	70	40	40	60
Hour 17	60	60	70	70	40	40	60
Hour 18	60	60	70	70	40	40	60
Hour 19	60	60	70	60	40	40	60
Hour 20	60	60	70	60	40	40	60
Hour 21	60	60	70	60	40	40	60
Hour 22	40	40	50	40	40	40	40
Hour 23	40	40	50	40	40	40	40
Hour 24	40	40	50	40	40	40	40

Table 6 Example of Day-ahead prices proposed by the seller TSO seller for week 01

On the buyer side, some rules shall also be determined upfront instead of agreeing with the seller price for a long duration. Even if the buyer is a price taker, it has different interests in buying depending on the time of the week and on its economic and technical constraints.

Example of rules for the buyer:

1. To accept a price only if it is between 0 and 50 EUR/MWh
2. To buy always when the internal marginal cost is higher than 50 EUR/MWh
3. To buy when the price is lower than its marginal unit to be calculated in advance, and consider the difference as a positive income to be deducted from financial exposure
3. To buy in priority when the grid margin is very tight to avoid black out
4. To limit the financial exposure to x euros / dollars per month

Phases 2 and 3

When implementing a new organized regional trading platform, it is common to set up an auction to gather liquidity and create a transparent price which is relied on by all market parties.

Therefore, it is proposed to have as an objective to implement an auction in Phases 2 and 3 to establish the basis of an implicit cross-border capacity allocation. This cross-border implicit auction for day-ahead products is following the models of the TLC and SAPP implicit cross-border auctions described in the Report Benchmark analysis 3.B.1. In the Phase 3, it onboards new market participants in addition of historical trading entities.

The organization of an auction does not impede to keep on exchanging bilaterally on continuous manner. For successful new markets, the first challenge is to gather liquidity. The auction is organized regularly at pre-defined times, and this allows market participants to come together and trade at the same time.

The Phase 2 will be the intermediary step between Phases 1 and 3. To move on swiftly to the Phase 3 without having too many changes at once and given that Phase 3 also onboards additional market participants, it is proposed to implement the auction price determination in Phase 2.

Example of order books and welfare in a market with 3 TSOs participants in countries A, B and C

Rules:

- Each participant fills an order book for each delivery hour; an order can be “buy” for a price range and “sell” for a different price range
- Participants send their orders without knowing the others' orders (blind auction).

- The algorithm ensures that the welfare is optimized, it means that:
    - All preferences set in the orders are fulfilled
    - Buyers and sellers are equally treated
- The auction algorithm finds a solution which creates the most value for all participants, considering the order books and the cross-border constraints. The value created for a participant is the difference between the price paid or received, and the price which the participant agreed to reach, multiplied by the volume exchanged. The sum of values created for all participants and the congestion revenue are summed and this is the global welfare which is optimized by the algorithm.
- The portfolio allocation allows to determine the volumes bought and sold buy each participant
- Prices and volumes are communicated to the participants
- Once the market results are confirmed, they are binding, and each TSO should commit to deliver the power or pay the corresponding amount. After the result confirmation of the auction results (i.e. in real time), the auction results cannot be voided anymore. Parties unwilling to pay or deliver the corresponding power should be exposed to the penalties foreseen in the market rules (see firmness principle in Report Part 2).

Parameters:

Available cross border capacity:

- A->B 400 MW
- B->A 400 MW
- B->C 600 MW
- C->B 600 MW

individual order books

	TSO A		
Hour 01	**Price in Eur**	**MWh**	
Min price	0	200	a positive figure is a buy order
	20	200	
	21	0	
	40	0	
	41	-50	a negative figure is a sell order
Max price	100	-50	

Graphical representation of orders

	TSO B	
Hour 01	**Price in Eur**	**MWh**
Min price	0	0
	19	0
	20	-100
	49	-100
	50	-400
	74	-400
	75	-800
Max price	100	-800

	TSO C	
Hour 01	**Price in Eur**	**MWh**
Min price	0	500
	19	500
	20	300
	49	300
	50	50
	74	50
	75	0
Max price	100	0

Figure 18 Example of order books in an implicit auction with 3 TSOs as participants

In this example, the orders are piecewise. The line between two points (volume; price) of an order can be interpolated linearly.

For the demonstration, on this example the orders are interpolated to display a volume for each intermediate price for all orders as below.

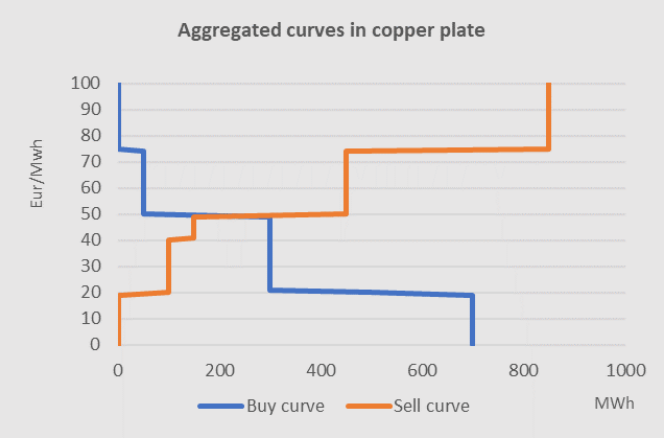
It allows to create the market buy and sell curves simply by adding the buy orders on one side and the sell orders on the other side.

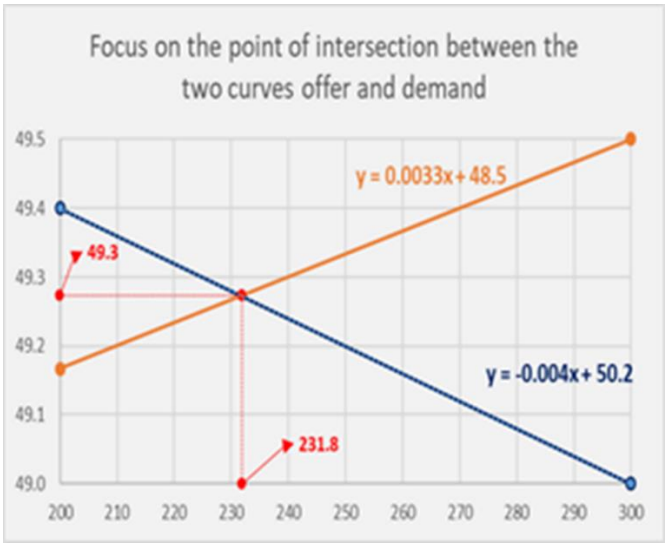
Interpolated order books

	TSO A	TSO B	TSO C
Price in Eur/MWh	MWh	MWh	MWh
0	200	0	500
19	200	0	500
20	200	-100	300
21	0	-100	300
40	0	-100	300
41	-50	-100	300
49	-50	-100	300
50	-50	-400	50
60	-50	-400	50
74	-50	-400	50
75	-50	-800	0
100	-50	-800	0

Auction in copper plate mode

Price in Eur/MWh	Buy curve	Sell curve
0	700	0
19	700	0
20	500	100
21	300	100
40	300	100
41	300	150
49	300	150
50	50	450
60	50	450
74	50	450
75	0	850
100	0	850





Market clearing volume in copper plate	231,8 MWh
Market clearing price in copper plate	49,3 Eur/MWh

Figure 19 Auction results in the example where the cross-border capacity constraints are not reached

The solution found by the auction algorithm respects transparent rules that can be audited (see Report Part 2). Schematically, the market price and volume executed are at the intersection of the buy and sell curves considering the acceptance of block orders. It is calculated with linear interpolation of the market buy and sell curves and looking for a maximization of the welfare, i.e., consumer surplus, producer surplus and congestion rent.

Reverting to the order books, the portfolio allocation process crosses the market price on each individual order curve to calculate the volume bought and sold by each participant. In the example, it provides the following results still with linear interpolation:

TSO A buys	50 MWh
TSO B sells	231,8 MWh
TSO C buys	181,8 MWh

y	Quantity x		
Price	TSO A	TSO B	TSO C
49	-50	-100	300
50	-50	-400	50
Curves	y = 50	y = -0.0033 x + 48.667	y = -0.004 x+ 50.2
49.3	-50	-181.8	231.8

	Sells	Buys
TSO A	50	
TSO B	181.8	
TSO C		231.8

Table 7 Portfolio allocation in the example where the cross-border capacity constraints are not reached

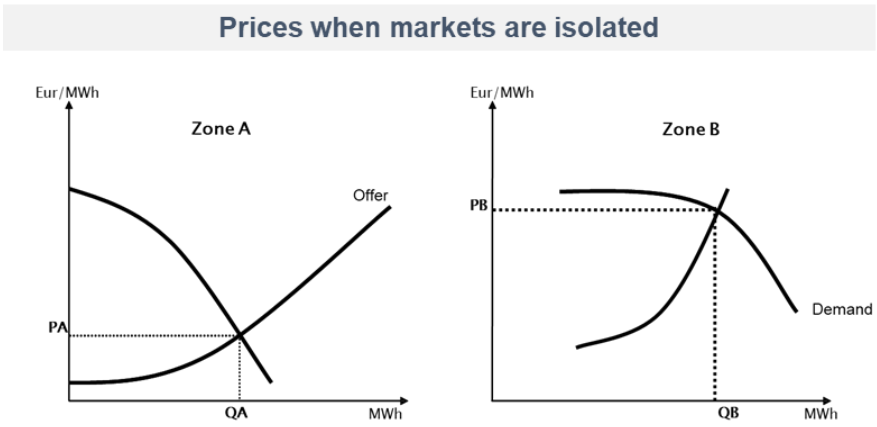
The price paid by the buyers and received by the seller is the same: 49,3 EUR/MWh. This calculation is performed for each hour of the day traded in an auction. All auctions for a day are performed at the same time if there are blocks of several hours so that the results for all hours are coherent.

In this example, the available cross-border capacities are sufficient to flow the energy requested by the participants. That is why the price is equal for all participants.

Schematically, with implicit cross border capacity allocation, the cross-border capacity is treated as if it were additional offer or demand for each bidding zone.

In case the cross-border constraints are reached, there can be a different price for each zone. The price difference between bidding zones is the price of the capacity. The price difference between the adjacent areas is multiplied by the cross-border flow of a given saturated border. The corresponding amount is the congestion rent which is to be distributed to the TSOs according to a pre-defined sharing key. Simple proposals for a sharing key at inception are to distribute fairly the congestion rent between involved TSOs on a 50%/50% basis, or with a sharing key based on the export quantity.

The following figure shows the different cases of congestion in a cross border implicit auction.



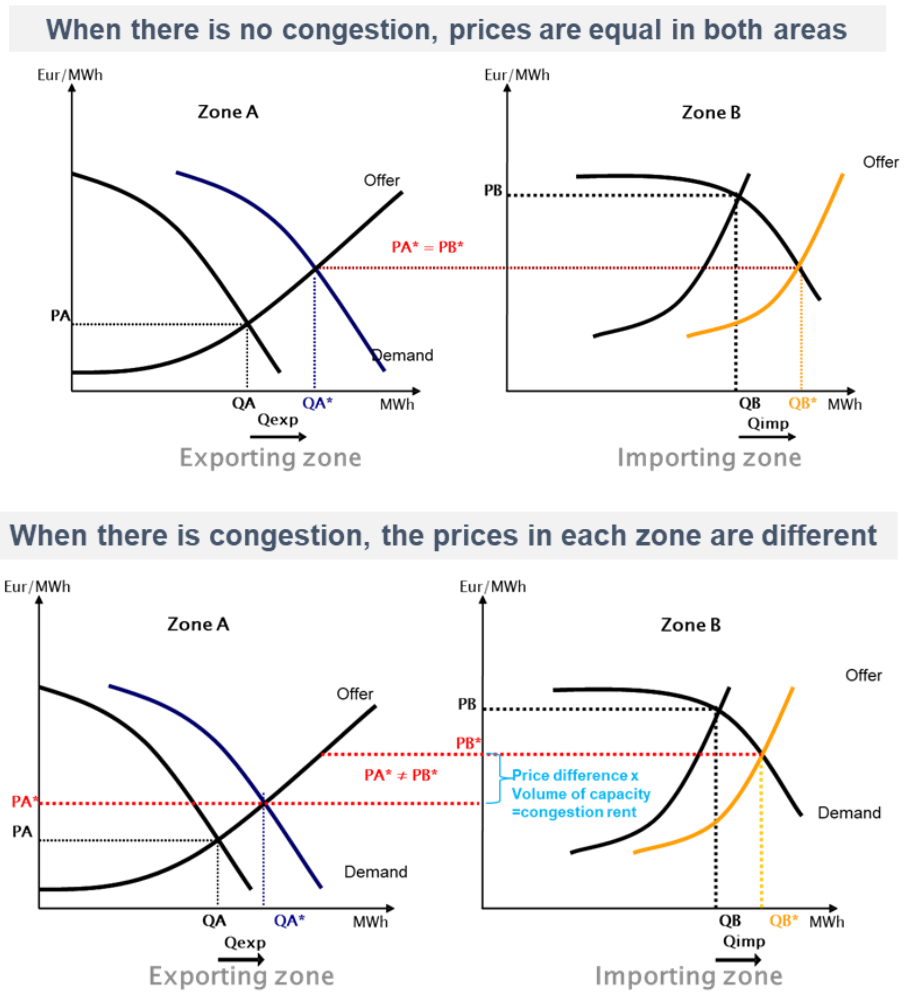


Figure 20 Implicit cross-border auction in isolated mode, when there is no congestion, and in case of congestion

When the areas are isolated, there is one price per area if there are buyers and sellers in the same area. In the Phase 2, there is no local market. So, when there are no cross-border exchanges, there are no local market prices either. When there is sufficient cross-border capacity, the market is functioning as though it were a copper plate and there is a single market price for all areas.

When there are some cross-border capacities, but it is not sufficient, the prices can be different in each area.

Phase 1 will be preparation of participants to the auction in Phase 2. To smoothen the process and give leeway to the operators to increase the level of volumes exchanged cross border, it is suggested to let the operators decide on the price within a price band of a minimum and maximum price range to be set in the bilateral agreements with additional

rules to be set internally for each company. These internal rules can also depend for example on the tightness of the national grid. The idea is to introduce some flexibility in the price setting to increase the power exchange possibilities between the three TSOs while fulfilling some internal rules to be developed.

In Phases 2 and 3, the buyers and the sellers shall send order books including different prices and volumes for each hour. The minimum and maximum prices are defined in the auction market rules. It is still advised that internal company rules organize how the operators can build orders and with which degree of autonomy.

6.5 Type of cross-border capacity allocation

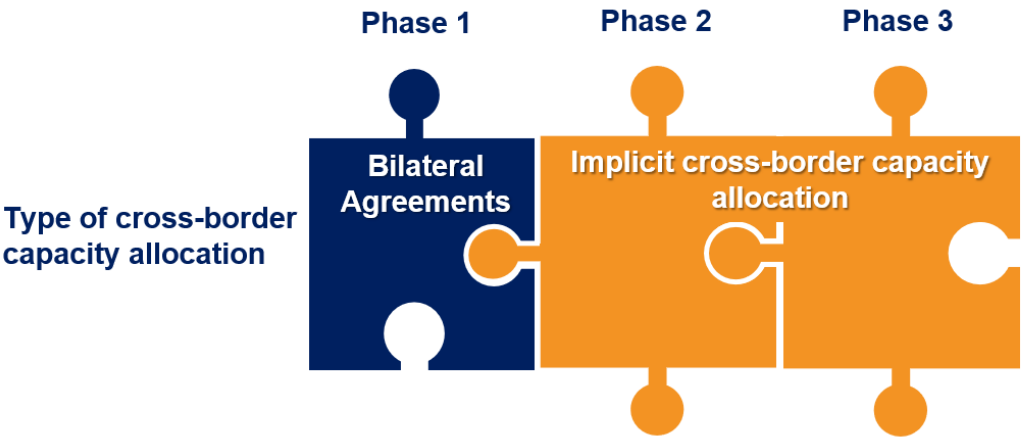


Figure 21 Cross border capacity allocation for each phase

In Phase 1, the exchanges are bilateral between two TSOs. The allocation of the cross-border capacity is simple since on each side of the border there is only one participant. There is no competition for the cross-border capacity and each TSO can use all the cross-border capacity for its own use.

As from Phase 2, even though there are only three TSOs participants, the auction allows to allocate the cross-border capacity implicitly together with the energy bids.

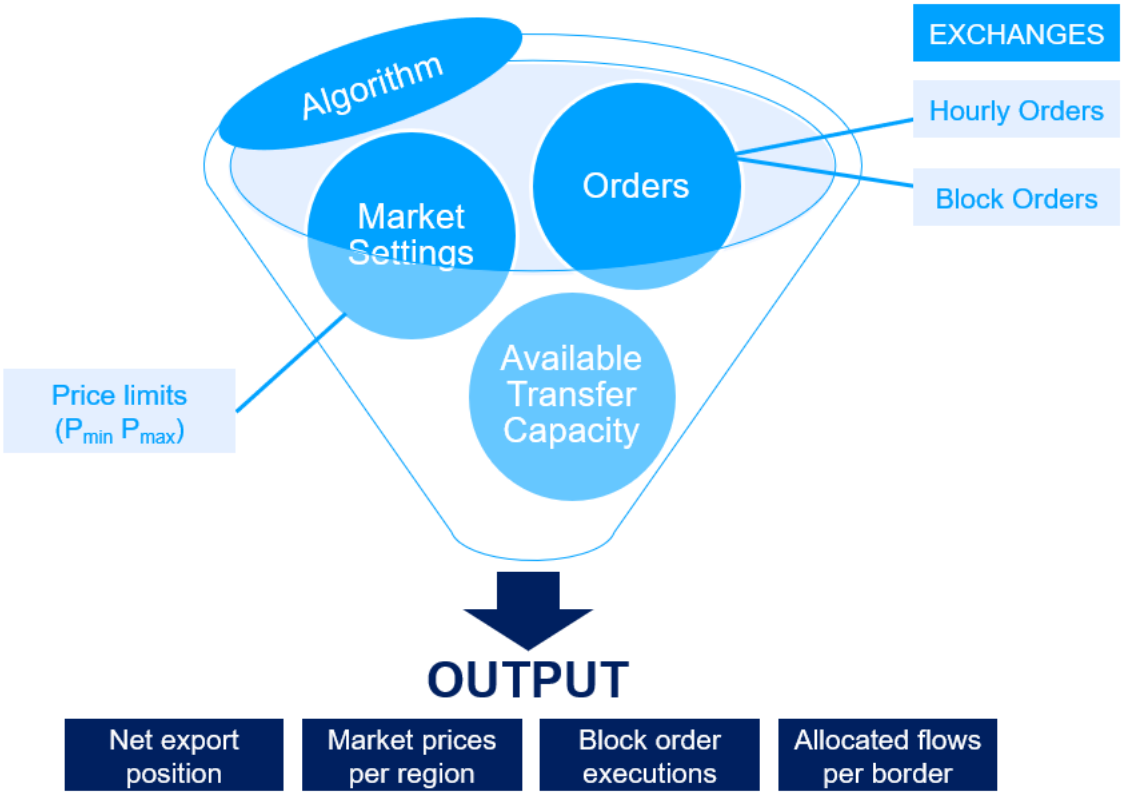


Figure 22 Implicit cross-border auction inputs and outputs

As output of the algorithm a positive net position means export, and vice versa.

In Phase 3, it is foreseen to apply a market-based allocation of cross border rights to be in line with the European Internal Energy Market. As the power price is determined through an auction, implicit cross-border capacity allocation makes more sense because the cross-border capacity allocation is performed implicitly together with the energy order books in one go. This is following the models of the coupled auctions described in the Benchmark analysis 3.1.B for the Trilateral Coupling TLC and the auctions of SAPP.

6.6 Market organization and market rules

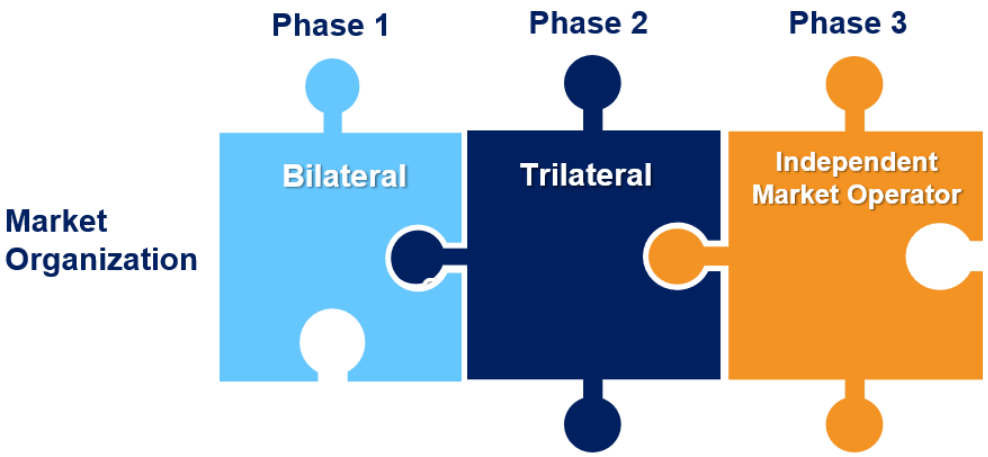


Figure 23 Market organization in each phase

In Phase 1, bilateral agreements will organize the power exchanges as these exists today. No specific neutral independent party is necessary if we consider that the capacity calculation remains as it is.

In Phase 2, the three parties will be involved in a trilateral multilateral agreement (see Report Part 2). Each TSO must abide with the auction rules and the NTC of each TSO. Although not mandatory, it can be convenient to have a neutral third party organizing the cross-border market trading on a neutral and transparent way. This can help to support discussions and conclusions of the agreement and the market rules.

In Phase 2, some simplified tasks could be performed already by a neutral market operator, if preferred by the TSOs. It is however not necessary to implement a complete and sophisticated market platform which would be costly and are not required for only three market participants. The settlement process can remain as it is organized in Phase 1.

The auction rules are necessary to describe the products to be traded, the processes to be followed for the submission of orders, the principles of the algorithm, the roles, the responsibilities of the independent third party, if any, and the settlement part as from the current bilateral agreements. The idea is to build on current bilateral agreements and the developments occurred in Phase 1. If the payment methods already in place with some monthly payments are working fine, there is no need to change it; it can remain in place, with the adaptation necessary for the multilateral agreement. For example, the auction will be easier to run if all three TSOs use the same currency as Euro or US Dollar. It will avoid

applying some cumbersome foreign exchange rates. A common language should also be selected to ease communication. It could be Arabic or French for example.

In Phase 3, the number and type of market participants will increase, and the organization of the cross-border market requires an independent market operator to manage the cross-border market platform (see Report Part 2, Section 3.2).

Regular tasks performed by the Independent Market operator encompass the following value chain:

Figure 24 Activities performed by a power market operator

Its role will be to:

- Draft and govern the market rules
- Onboard market participants and make sure they abide by their local laws and regulations
- Receive cross-border commercial constraints calculated by TSOs
- Provide a platform to receive the order books from participants (receiving/validating the offers/bids)
- Calculate the prices and executed quantities for each order (trades)
- Publish the price for a transparent market
- Perform the settlement of the transaction through a central counterparty
- Send the market results to the participants, the clearing entity (if another entity than the market operator) and the TSOs
- Perform the market surveillance and report to the regional and local regulatory authorities, when appropriate.

6.7 Payment and nominations

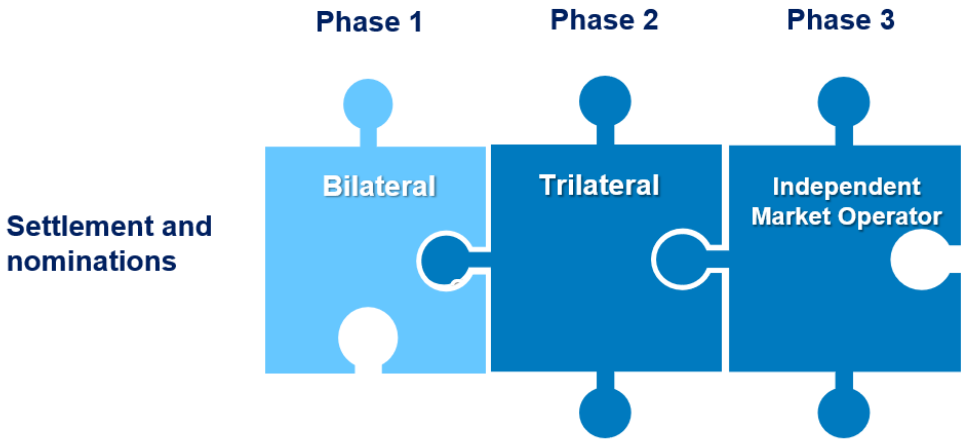


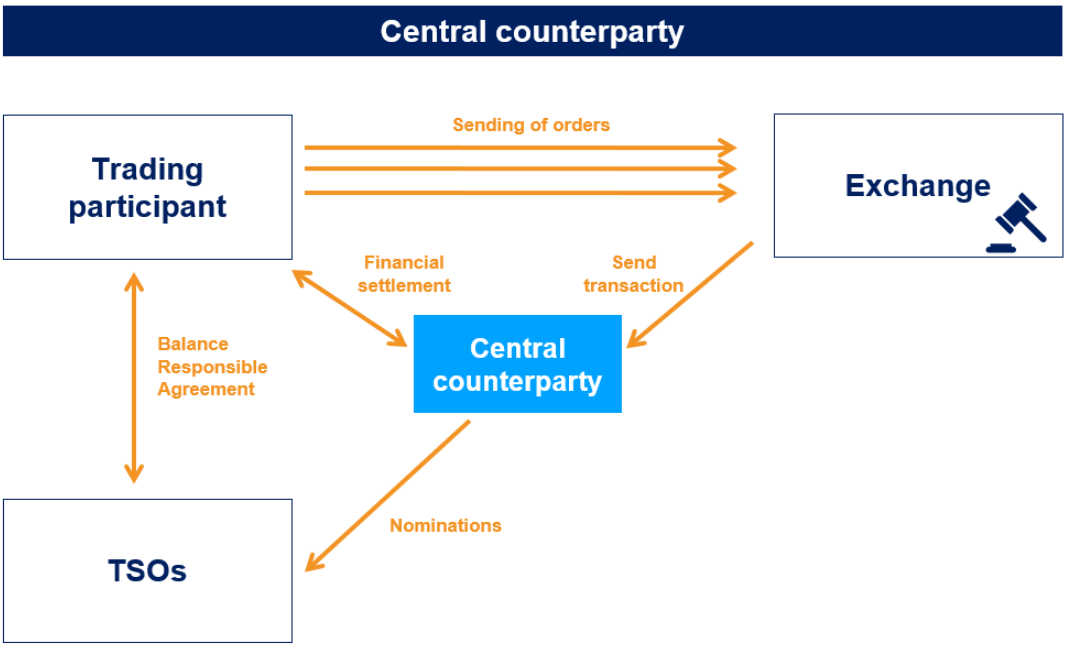
Figure 25 Settlement and nominations in each phase

In Phase 1, the arrangements of current bilateral agreements can be kept unchanged if the parties agree.

Amounts to be invoiced are calculated and invoiced monthly. The seller transmits the invoice at the latest on the 10th of the month following delivery. The payment is done through bank transfer.

In Phase 2, the current and Phase 1 payment method are adapted to the auction results. The payment can remain bilateral monthly. However, the participants shall commit to the auction results to ensure its global coherence.

In Phase 3, a standard auction tool is used to organize the payments between many participants. The central counterparty becomes the unique buyer for all sellers, and the unique seller to all buyers. It is guaranteeing the physical and financial settlement of transactions. The central counterparty steps between the buyer and seller and assumes the counterparty risk. It is necessary in an anonymized market or when the number of participants makes that trust cannot be any more the basis for the payment between many parties. In the event of a default of a trading member, the central counterparty guarantees payment and delivery of the transactions. It works with the deposit of collaterals to ensure that the risk of default of a company will not harm the regional market.



The central counterparty is the unique buyer of all sellers and the unique seller for all buyers. It ensures that all payments and nominations are performed after the transactions are done

Figure 26 Central counterparty role in the settlement of transactions

The auction trading tool usually includes a trading limits check function to limit the financial risk of default of participants. It allows to decrease the financial warranties asked to participants to trade on the market since the financial exposure of the participants can be better controlled. Trade limit values are determined in relationship with the financial guarantee of each member. Orders are checked against all applicable limits and, if accepted, lead to reduction of each by the exposure of each order entered onto the trading system. After an auction, the trading limit values are updated with the auction price and the executed quantities to determine the order exposure. The trading limit definition is performed in cooperation with the banks and follows a process that defines every 24 hours a new limit, for example, every day at 16:00 CET. The goal is to act as a safety net and reasonably block an order entry in proportion with the ability to be financially exposed. However, the process is flexible enough to avoid unnecessary restrictions.

7. Conclusion

This part of the report describes how cross-border exchanges of electricity could be improved between Tunisia, Algeria and Morocco. Exchanges have been taking place between Algeria and Morocco, and between Algeria and Tunisia for many years, but with very low volumes. The TSOs have therefore already established bilateral commercial agreements, which can be enhanced progressively.

To achieve an improved regional market coupling model, making the most of physical interconnection lines compatible with the European Internal Energy Market, it is suggested to adopt an approach in three phases. In Phase 1, current bilateral agreements would only be modified to improve the pricing process. The objective is to keep the current contractual framework and fine-tune it to pick the low-hanging fruits of a more flexible pricing process. In Phase 2, an auction would be organized between the three TSOs. An auction algorithm would improve the negotiation process of Phase 1, with an optimization of the cross-border constraints usage together with the commercial preferences of TSOs. In Phase 2, ONEE and STEG could exchange directly (through Algeria), which is a real novelty. In Phase 3, the auction is opened to more market participants in at least one country. It implies setting up the corresponding market rules and agreements and the implementation of a neutral market operator. All three phases are compatible with the electricity trading arrangements between Spain and Morocco and, in the future, between Tunisia and Italy.

This Trading Design Proposal will allow the TSOs and other stakeholders to develop cross-border power exchanges in the Maghreb region.

Part 2 the Governance Framework, Regulatory Framework, Market and Transmission Grid concepts.

8. Governance Framework

Introduction

This section describes the different aspects of the governance framework for a regional power trading platform and includes specific recommendations for setting up such a structure in the Maghreb region.

8.1 Governance Framework for regional trading markets

8.1.1 Examples of regional governance framework

8.1.1.1 The Regulatory governance framework of the regional Southern African Power Pool

The Southern African Power Pool (SAPP) was created out of strong political will for regional economic and social integration through sharing of resources among twelve of the **Southern Africa Development Community (SADC)** member countries. The establishment of the power pool "SAPP" was therefore done within the framework of the existing Regional Economic Community (South Africa Development Community – SADC) giving a strong political and economic support for the nascent regional electricity market. The SAPP governance structure is consequently anchored at national government level with an **Intergovernmental Memorandum of Understanding (IGMOU)** signed by SADC member ministers of energy already back in 1995. This established SAPP as an institution in the region. In parallel, an **Inter-utility Memorandum of Understanding (IUMOU)** was signed by all national power utilities in 1995 to establish the SAPP management structures.

The **Agreement Between Operating Members (ABOM)** sets the SAPP functional structure, use of specialist working groups, member obligations, functional expectations and operational modalities at high level. The **Operating Guidelines** that stipulated specific member roles, obligations, rules, standards and procedures were then developed to guide interconnected operations of the SAPP grid.

The most important agreement regarding trading in SAPP is the "**SAPP Markets Book of Rules**" that has been refined and improved over time to keep pace with market developments. Individual SAPP member countries are at widely differing stages of electricity sector deregulation; the legal and regulatory arrangements permitting access to national networks vary between countries. The agreements entered into between SAPP members, including those IPPs who wish to trade with SAPP utilities, contain a number of specific provisions relating to third party access. SAPP rules are open for direct trading, but limiting regulations are national.

Governing Documents of the SAPP

1. The inter-Governmental Memorandum of Understanding
2. The Inter-Utility Memorandum of Understanding
3. Agreement Between Operating Members
4. Operating Guidelines
5. SAPP Coordination Center Constitution

Source: SAPP

Figure 27 Governing documents of the SAPP

The SAPP is structured with various committees that enable full participation by members and the protection of their interests at all levels. At the government level, **a Council of Energy Ministers** meets at least once a year to address policy issues, provide political leadership, and, where necessary, establish institutions. The SAPP falls under the responsibility of the Directorate Infrastructure and Services of the SADC (SADC-DIS). **An Executive Committee**, made up of the CEOs of the national power utilities, is the highest SAPP management decision-making body. Below it, a **Management Committee,** consisting out of senior management of the different members. The main function is to oversee the management of SAPP and coordinating the **four expert subcommittees** (operations, electricity trading, environment, and planning).

The **Coordination Centre** is the SAPP legal entity which implements projects, undertakes research, and advises committees on expert matters. It also operates the competitive market, monitors system operations, and carries out any studies that may be required. The SAPP CC reports on member performance/compliance according to set criteria, and it keeps records and exchanges of information among members. It also acts as the face of SAPP, regionally and internationally. The coordination centre has its own constitution.

The responsibilities of the SAPP Coordination Center

1. Monitor the operation of the Power Pool
2. Monitor Transactions between Operating Members and between Members and Non-Members

3. Monitor the inadvertent power flows and the returns in kind between members
4. Provide routine daily reports, data and information relevant to the operation of the Power Pool to the Operating Sub Committee and to the Members
5. Monitor and advise on the use of the Operating Guidelines.
6. Monitor and report on the control performance criteria, as specified in the Operating Guidelines, to all the Operating Members.
7. Convene, following a disturbance affecting the parallel operation of the pool, a disturbance committee.
8. Provide information and give technical advice or support to Members of SAPP, in matters pertaining to parallel operation.
9. Evaluate the impact of future projects on the operation of the pool and advise the Operating Sub-Committee accordingly.
10. Perform Various operational planning studies to highlight possible operating problems.
11. Give advice on short-term and long-term operating problems.
12. Perform studies to determine transfer limits on time lines and inform Operating Members accordingly. Monitor Adherence of Operating Members to these limits.
13. Establish and update a database containing historical and other data to be used in Planning and System Operation studies
14. Monitor the availability of the communication links between the Control Centres of the Operating Members and between these Control Centres and the Co-ordination Center.
15. Advise of the feasibility of wheeling transactions
16. Gather and act as the official custodian of data pertaining to transactions between Operating Members and Between Operating Members and Non-Members.
17. Monitor the calculation and implementation of the various types of Reserves.
18. Carry out projects and assignments as directed by the Operating Sub-Committee.
19. Monitor the protection performance on all tie line and the co-ordination of their protection.
20. Monitor adherence to the Agreement by the Operating Members, inter alia regarding Accredited Capacity Obligation and calculate the penalties for insufficient Accredited Capacity and their re-allocation among members.
21. Disseminate the generation and transmission maintenance schedules received from the operating Members and advise on the adjustments that are required to maintain at all times the contractual pool reserves and the agreed upon services.
22. Co-ordinate the training of the Members staff and if necessary, organize training seminars focusing on the operation of the interconnected system.
23. Prepare and issue annually control performance summaries report for the benefit of the Operating Sub-Committee.
24. Facilitate trading in the Day Ahead Market (DAM)

Source: SAPP

Figure 28 - Responsibilities of the SAPP Coordination Center.

The **Regional Electricity Regulatory Association (RERA)** was established by SADC as a national regulators' association in July 2002. Its mission is to facilitate the harmonization of regulatory policy, legislation, standards and practices and

to provide a platform for effective cooperation among energy regulators within the SADC region. Being a voluntary association of regulators, it operates in an advisory capacity. RERA is planned to be transformed from an association to the regulatory authority of SADC (SARERA).

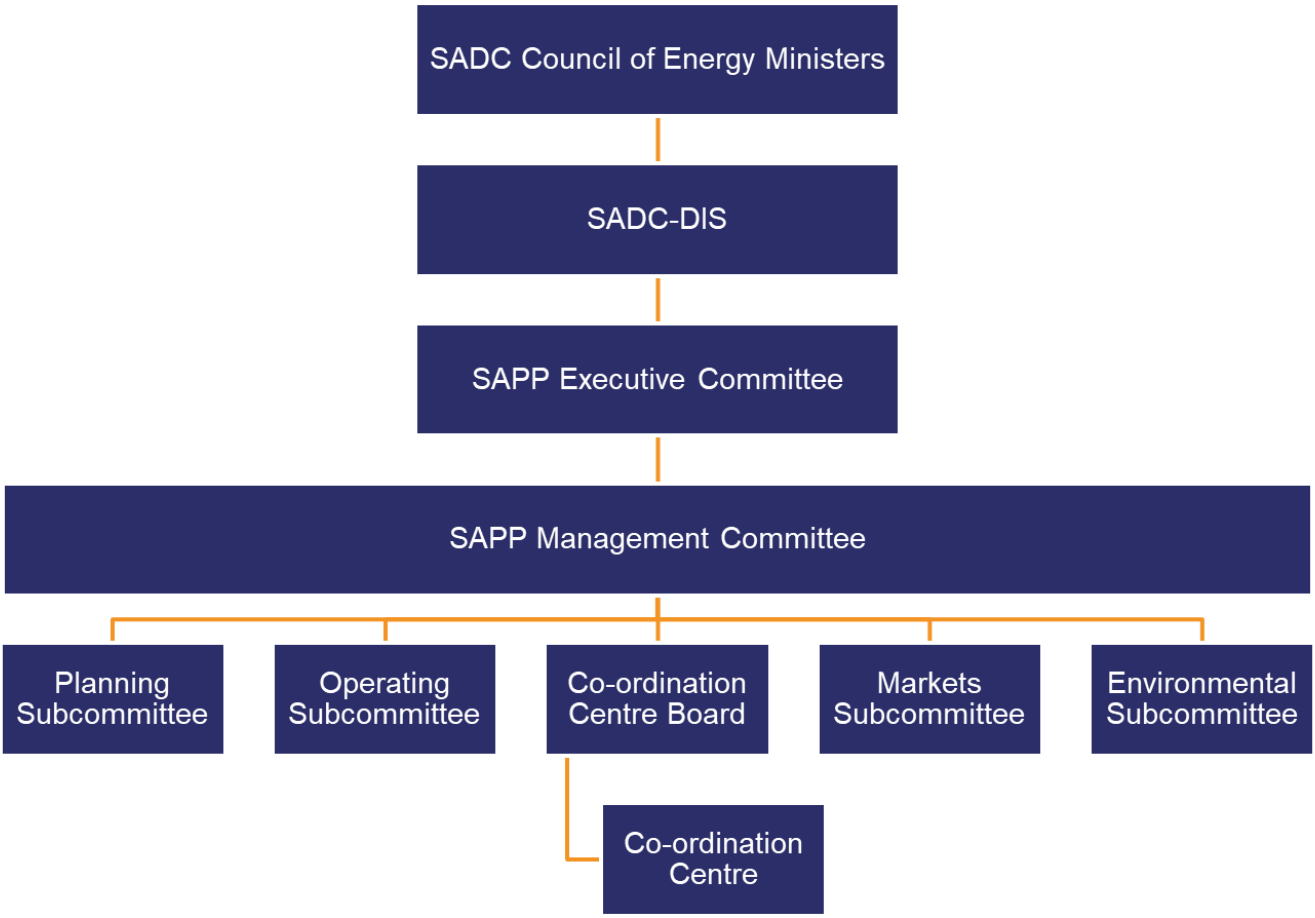


Figure 29 - Governance structure of the SAPP.

SAPP is a good example of no need to unbundle, privatize and have full national market deregulation to initiate effective cross border trading. In the African “multi-type” regional market, many different national market types coexist with a regional market design with implicit capacity allocation : a single buyer (without a national market) is presented together with a national competitive market. Both of these types of markets can bid on the cross-border capacities.

8.1.1.2 The Regulatory governance framework of the European Tri-Lateral Market Coupling

The Tri-Lateral Market Coupling (TLC) was launched in November 2006 (see report 3.1.B.3 "Benchmark Analysis", Section 4) between the power exchanges of three European countries: France (EPEX Spot), Belgium (Belpex) and The Netherlands (APX) to allocate implicitly and on a coupled way the available day-ahead capacity. This Tri-Lateral Market Coupling is the result of intense cooperation between the power exchanges starting back in 2004, highly encouraged by their respective TSOs, to implement a cross-border approach for congestion management through market-based mechanism (as requested by the European directive 2003/54 EC and the Regulation n°1228/2003, of 26 June 2003).
The key features of the governance of this market coupling are the following:

Key Features of Governance	
Concept	Market coupling is a service provided by the power exchanges to the local TSOs
Control	a unique agreement with all parties; a joint steering committee; unanimous decisions
Regulation	Local regulation applicable to each TSO, Tri-Lateral market jointly approved by each national regulatory authority
Market Coupling system	Partially decentralized, iterative, heuristic-based, price coupling
Transmission model	Available Transfer Capacities (ATCs), no loops
Cross-border shipping	Bilateral TSO-TSO

Table 8 Key Features of Governance.

The global governance of the TLC is coordinated by a supervisory board, **the Joint Steering Committee**. Each party has one voting representative at the Steering Committee; decisions are taken by unanimity of the parties entitled to vote, being all of them except the matters subject to decision by the power exchanges only (as listed in the Umbrella Agreement).
The Joint Steering Committee is assisted by an **Operations Committee**, and by an **Incident Committee**:

- The Operations Committee is the platform for discussion and decision on certain issues as assigned by the Joint Steering Committee, when of interest to all parties, to the TSOs only or to the power exchanges alone.
- The Incident Committee is an operational committee which may, in circumstances preventing the normal operations of the Market Coupling, decide to deviate from the principles to keep the market functioning. It tries to find alternative ways to decouple some exchanges from the cross-border market, if any, and takes into

account the interest of TSOs, power exchanges and market participants. Any party may call a meeting of the Incident Committee. Its decisions are limited to the specific day for which it has been called but binding to all parties.

In addition, the shareholders of the common trading platform (APX, Belpex and Powernext) appointed a **Supervisory Board** responsible for the general supervision of the market operations and delegated the daily management to a Management Board.

The TLC Market Coupling is organized with several layers of agreements :

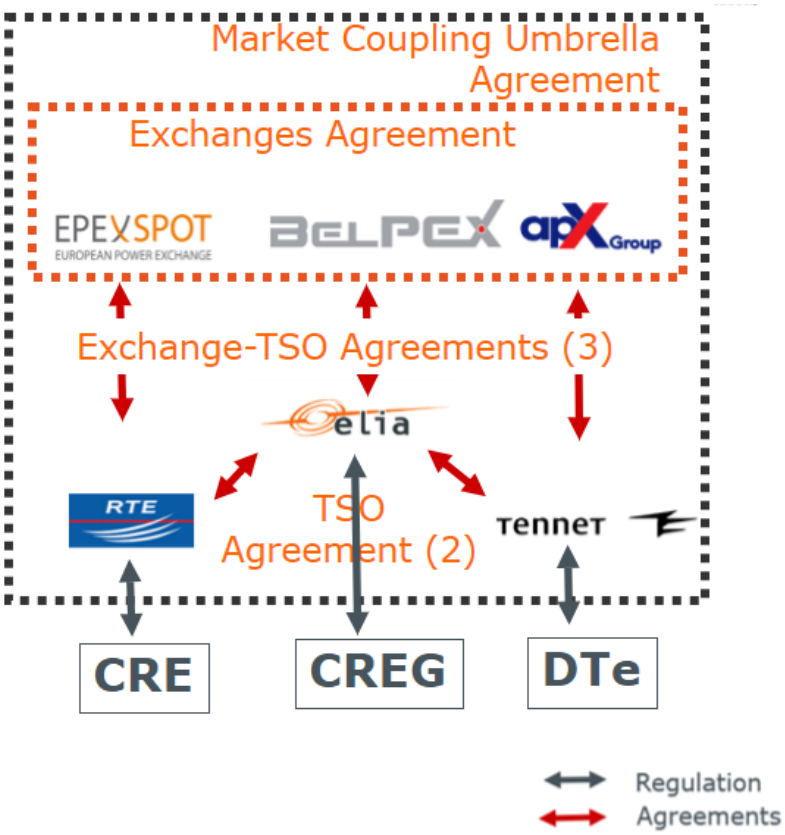


Figure 30 - Trilateral Market Coupling Organization Structure.

- **A Market Coupling Umbrella Agreement**, signed by all parties (TSOs and Power Exchanges), covers the matters of general interest and prevail to any other agreements, while the subsidiary agreements address the other – more specific – topics: this multilateral agreement, and its technical appendices, sets up the general principles, rules and objectives of the TLC Market Coupling, the roles and responsibilities of each party for the development and the operation of the TLC MC, identifies the main assets/components and process flows and

their dependencies with the subsidiary agreements. Finally, it describes the contractual scheme and governance of the Market Coupling, the liabilities, the impact of force majeure, the dispute resolution, the possible suspension of the agreement and the cases for its termination.

- **Two bilateral mirroring subsidiary TSO Agreements**, signed bilaterally by the two adjacent TSOs (by RTE and Elia on the one hand ; by TenneT and Elia on the other hand): the TSO agreement details how to calculate and publish the available daily ATCs, how to notify and ship the cross-border flows (how the TSOs settle among them the purchases or sales of energy made on the power exchanges, the "TSO market results"), the related liabilities, how to share the congestion revenues among the TSOs and how to guarantee firmness.
- **One subsidiary Power Exchanges Agreement**, signed by the three power exchanges (Powernext (now EPEX Spot), Belpex and APX): it outlines the way to design, develop, maintain, adapt and operate the power exchange solution (algorithms and systems), as well as the operation of the market coupling, according to the operational procedures.
- **Three subsidiary Power Exchange-TSO Agreements**, signed bilaterally by the two local entities, the power exchange and its corresponding TSO: RTE and Powernext, TenneT and APX, Elia and Belpex. It covers the way the TSO will participate on the power exchange and the central counterparty, how the ATCs are provided to the Power Exchange (PX), the reception and validation of the results, how the PX performs the nominations of the TSO schedule and the TSO processes them, the modalities of payment by the TSO or by the PX and the collateral scheme, the arrangement of a system of service credit payable to the PX for each day of incident without power exchanges.

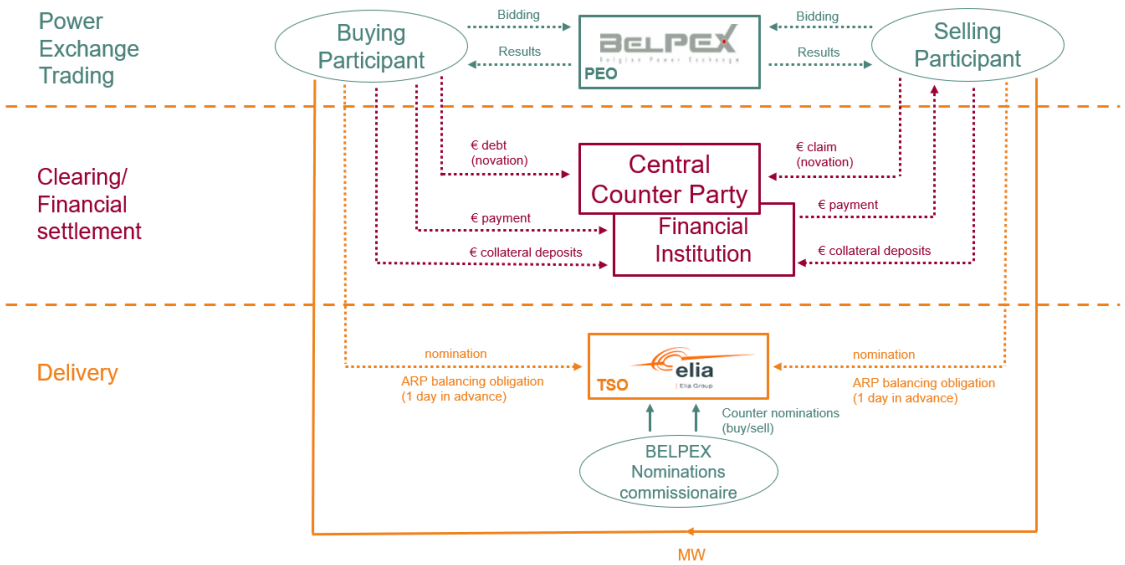


Figure 31 - Overview of interactions within the TLC Market Coupling.

8.1.1.3 Lessons learned and main recommendations

- **Initiating an effective cross border trading can be decoupled from national market deregulation** and consequently does not impose to unbundle, privatise and/or have similar local market structure. Practically this means that some local "markets" may participate in the regional trading platform through their vertically integrated national utilities, whereas generators, IPPs and/or large customers may participate from other countries. A **"**multi-type**"** regional market allows each national markets to follow their own path at their own rhythm, rather than attempting to harmonise national-level structures. It means that the regional short-term market is usually operated based on the residual volumes on top of the national markets, offered by the local responsible single buyer or the system operator, or by the allowed market participants. To be noted that the drawback of this weak degree of integration refrains for more optimal use of common resources such as transmission grids, thereby increase the payback periods of infrastructure/trading platform investments and reduce the economic outcome for the participants. It can even be worsened if the regulatory framework of a country allows imports only when the demand exceed national generation capacity available in the country, and exports only in case of capacity being in excess of the domestic demand.

The proposed regional trading design should be applicable for multiple countries and variable levels of market liberalization. It should not force in any ways a member country to introduce changes to its internal regulations. However, a minimum harmonization of regulations is nevertheless required to allow the functioning of the regional trade and the regional governance structures. The proposed regional trading design can be summarized as being a "national control, regional cooperation" scheme.

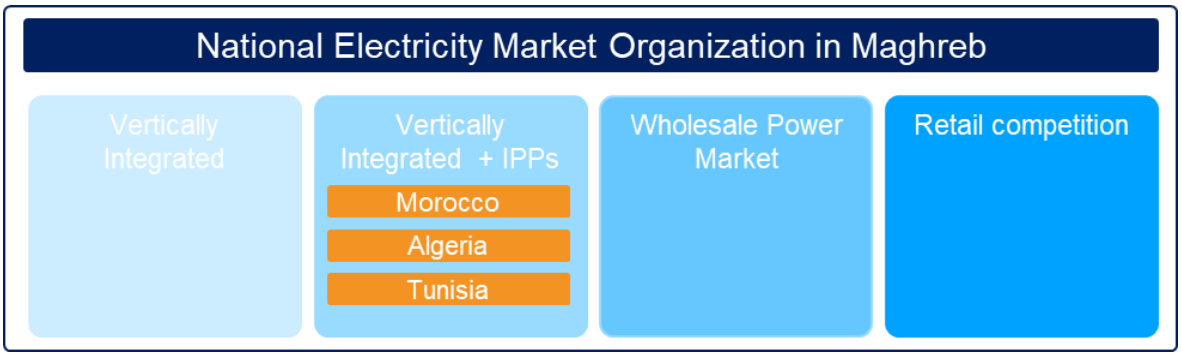


Figure 32 – Overview of the national electricity market organization in the Maghreb region.

Such a flexible regional trading design helps such a market to be functional even in tense situations where members join or leave the centrally organised regional market due to violence, fragility, economic or political decisions. For example, if one TSO reduces the use of its transmission network by neighbouring TSOs due to political, technical (e.g., local congestions, issues with local grid constrains) or economic (e.g. non-payment of wheeling charges due to the transit network). It has a reduced impact without jeopardising the whole regional market. This presupposes of course to have a trading among more than three /four jurisdictions.

The ways to accommodate different market structures among its members are the followings :

- Each TSO keeps control of dispatch planning and system operation;
- Regional commercial relations are governed by the principles of non-discrimination and reciprocity but taking into account the potential structural variations across the national markets. Therefore, the participation in the regional trading market at the national level depends on national-level laws and regulations;
- Trading design should not impose specific local requirements;
- Operational simplicity must be aligned with the adequate cooperation level that can be expected from the participating national markets and/or operating systems.

- The **layers of the regulatory framework needed to operate the market** are usually the following:
  - Intergovernmental Memorandum of Understanding, governed by national Governments : general political support at Ministries' and governments' levels, principle of the market operator and areas of work. The MoU is the "letter of comfort" for all external stakeholders about the engagement at political level. This political document is unlikely to be adapted ; it is not required to publish it;
  - If needed – *national Energy laws*, governed by the national Parliaments: high-level market design set-up, general governance, set-up of the regional regulatory authority;
  - *Regional Operational Agreement* between the operating entities (in our case, the TSOs), governed by the said operating entities. It is recommended not to publish it; its national regulatory approval depends of the national rules. As detailed in Section 8.2, such an inter-TSO agreement outlines the content of the cooperation of the interconnected TSOs, roles and responsibilities of all involved entities to ensure technical operation of the trading platform, the basic content of the trading rules and procedures to be managed by the regional market operator or the operating entities, etc. These high-level contractual principles are further developed in the Trading Rules and Procedures, documents easier to amend on a regular basis when needed. This

Agreement can also contain pure transmission issues to be organized among the concerned TSOs, for instance management of available transmission capacity, methodologies to calculate the wheeling charges and grid losses, the way to grant third party access of market participants to their local network (if not organized by local legislation). This agreement can be adapted but will require a negotiation process to grant unanimity among all signatory parties (with maybe a local regulatory/political approval);

- *Market Code or operating guidelines*, governed by the regulatory authority (if any) or by Ministerial authority: establishment of organizational structure of the market operator and areas of work, set-up of the market design and agreements required, detailed roles and responsibilities of all involved entities. These documents must be published to allow transparent functioning of the regional market;
- *Market Rules*, governed by the market operator (sometimes approved by a regulatory authority (if any) or by Ministerial authority): the market rules detail all rules governing market segments and products operated by the market operator. They are providing the global and detailed technical frame for participation and operation of the regional trading platform. They are applicable to the market operator and to the market participants. These documents must be published to allow transparent functioning of the regional market;
- *Trading Procedures*, governed by the market operator : the trading procedures contain the work processes and procedures to be followed on a daily basis by the market operator and the market participants (e.g. details of the settlement processes, criteria for participation, etc.). These later documents can be updated on a very regular basis, without approval process from the authorities, each time the concerned procedure is outdated or has to be adapted to follow the enhanced market design. These documents must be published to allow transparent functioning of the regional market.

JAO Joint Allocation Office

Communication guide

This document aims to detail the communication channel a market participant needs to use depending on the content in order to communicate with JAO for auction related matters.

	Reason for communication	Communication channel to be used						
		Servicedesk platform	Email	Website Publication	eCat	Mail	Phone	As per fallback notification
JAO informs the Market Participant	Confirmation or refusal of change by Market Participant (modification/amendment)		x					
	Confirmation or refusal of the creation of the user account		x					
	Confirmation of acceptance or refusal of the Bank Guarantee or collateral modification		x					
	Collateral incident		x					
	Information about application of fallback procedure		x	x	x			
	Confirmation of entered data into Auction Tool		x				x	
	Data exchange to Market Participants in case of fallback procedure			x				x
	Postponement of Auction		x	x	x			
	Auction cancellation		x	x	x			
	Reason of auction cancellation			x				
	Information about curtailment		x	x				
	Triggering event and estimated duration of curtailment			x				
	Sending the invoice		x					
	Notification of assignment and subcontracting		x					
	Market messages (information about amendments, updates of the rules, forms, platforms etc.)		x	x				
The Market Participant informs JAO	Information about observed problem with the use of the Auction Tool by Market Participant		x				x	
	Request to enter data into Auction Tool by Market Participant							x
	Request for alternative procedure of non-automated payment by Market Participant		x					
	Payment dispute by Market Participant		x			x		
	Any question, information request or issue	x					x	
	Contestation	x						
	Sending of documents/files for registration, modifications, collaterals or the auction tool (please refer to our "Overview of document requirements" available under Support/Resource center/1. Registration)	x				x		
	Password reset request for user in the Auction Tool	x						

Figure 33 - Example of trading procedures – JAO Communication Guide.
(Source: JAO)

- **The regional regulatory framework should be harmonized on the several topics, as the main task of the regional regulatory authority in collaboration with the national/local regulatory authorities**.

  It will require common acceptance and approval from national Ministries/regulatory entities and/or system operators utilities from all Maghreb countries. It means that such a fully developed framework can only occur for the long-term phase, whereas the short and mid-term phases will be based on voluntary inter-TSO agreements without any need to formal governmental approvals or revision of the national regulatory framework (or a minimal volume of formal approvals from relevant national authorities). In any case, it should not be higher than what is strictly required to ensure market and system interoperability, especially in a pilot trading design phrase. It should

avoid interfering unduly and unnecessarily interfering in the detailed operation of the individual system and market organization.

To be noted that national Ministries/regulatory entities need to agree at least on the following items to ensure smooth approval process and aligned vision on the framework to put in place to allow a well-functioning trading design of the regional market :

- What are the national Ministries/regulatory entities powers and responsibilities in cross-border trading;
- Organize the national approval process in such a way that national regulatory decisions are compatible among each other;
- Align the timings of the national regulatory interactions for proposed market rules and documents to be approved.

The **Association of Mediterranean Energy Regulators**, MEDREG, might be of a great support in this regard, to help national regulatory entities to develop their expertise in market regulation and to develop regional cooperation mechanisms. Specifically, as this association wants to support the regulatory entities of the MEDREG countries (among other objectives):

- To reach a properly functioning electricity market, which will allow the efficient use of interconnections by allocating transmission capacity in the most efficient way.
- To develop an efficient cross-border trade, which should be implemented on all interconnections. This to stimulate the competition between different national markets and to increase regional integration, as well as the security of supply.

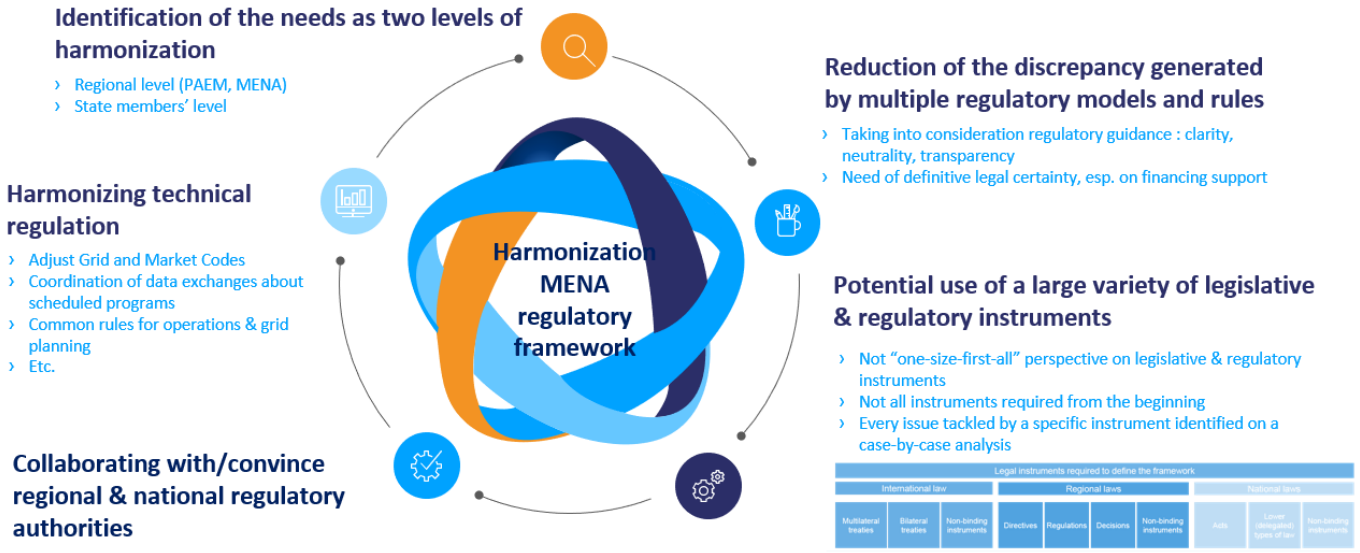


Figure 34 - Harmonization of the MENA Regulatory framework.

Here the list of the topics related to regulatory framework to be harmonized for Phase 3:

- Develop and implement regional transmission pricing guidelines, to determine wheeling charges and cost allocation of network losses;
- Develop principles and harmonised rules for pricing ancillary services and balancing services;
- Develop harmonised codes of practice and technical standards for system operators to facilitate regional electricity trading;
- Develop template agreements to facilitate regional electricity trading;
- Evaluate the existing licenses /develop new licenses for cross-border trading facilities, importing and/or exporting market participants;
- Keep oversight of the agreements signed by the market participants and of all the discussions about their enforcement, to recommend regular revisions of these mechanisms and market rules to the benefit of market participants or global well-functioning of the trading platform;
- Implement guidelines for dispute resolution procedures at market operator level and via an independent appeal structure, possibly handled by the regional regulatory authority itself if it is not a party to the dispute;
- Implement rules and guidelines for monitoring and surveillance of operation of the trading platform, including regular audits of the trading and settlement systems;

- Develop regular reporting requirements of the market performance of the regional trading platform to the national stakeholders and investors in the region ;
- Implement harmonised codes of practice and technical standards;
- Implement cross border financial and settlement transaction frameworks;
- Develop data handling, storage and security procedures linked to the transparency and market monitoring functions of the market operator and the regulatory authority itself;

Table 9- Responsibilities of the regional regulatory authority in Phase 3

RESPONSIBILITIES OF THE REGIONAL REGULATORY AUTHORITY IN PHASE 3		
LEGAL RESPONSIBILITIES	Regional Regulatory Harmonization	Support the different national regulatory authorities/Ministries in the development of the legislative framework (recommendations, guidelines, secondary acts, licenses, etc.) and support the regional alignment and harmonization to facilitate the development/change of the legislation related to the regional market.
	Dispute Resolution and Sanctions	Implement guidelines for dispute resolution procedures at market operator level and via an independent appeal structure, possibly handled by the regional regulatory authority itself if it is not a party to the dispute; develop and apply penalties and sanctions if non-compliance with the regional and national rules applicable to the regional market (e.g. transparency reporting, respect of license conditions, discrimination or limitation to third party access, etc.).
ECONOMIC RESPONSIBILITIES	Wheeling Charges	Develop and implement regional transmission pricing guidelines, to determine harmonized wheeling charges applicable to the regional market
	Market Fees	Approve the fees related to the registration to the market and its use, to be imposed to the market participants by the market operator
	Compensation of Transmission Losses caused by cross-border transit flows	Develop and implement regional transmission pricing guidelines for cost allocation of network losses
MARKET RESPONSIBILITIES	Regional Electricity Market Regulation, Facilitation and Evolution	- Develop template agreements to facilitate regional electricity trading; - Develop principles and harmonised rules for pricing ancillary services and balancing services;

		- Propose and approve changes to the market framework and rules (including market rules); - Implement cross border financial and settlement transaction frameworks
	Market Surveillance and Monitoring	- Implement rules and guidelines for monitoring and surveillance of operation of the trading platform, including regular audits of the trading and settlement systems; - Develop regular reporting requirements of the market performance of the regional trading platform to the national stakeholders and investors in the region ;
	Capacity Building	Promote the development and improvement of the regional market, among local authorities and potential market participants, on a transparent and non-discriminatory way and based on the regular reporting on the Market Surveillance and Monitoring
TECHNICAL RESPONSIBILITIES	Regional technical guidelines and rules	- Develop harmonised codes of practice and technical standards for system operators to facilitate regional electricity trading.

- **The governing set-up of the Maghreb regional market** should be based on **neutral rules (technology and access)** allowing for non-discriminatory access for each allowed market participant, by national and/or regional regulatory entities. It means to ensure flexibility in the market rules to allow access to the market depending on the national market specificities and extend of the local market opening.
- **Set-up of regional entities is needed only for the Phase 3 "long-term" to operate the regional trading platform and to implement regional market monitoring.** It will also give time to switch from a "national mentality" of each stakeholder as power entities, consumers, institutions and regulatory authorities to a "regional mentality" ; this can only be done with regular involvement of all stakeholders during the pilot phases of the trading project to build trust that this scheme serves only for the global social welfare of the region and will not prejudice local / national markets.
  - A **regional regulatory entity** will have for responsibility to : ensure compliance with the legal framework and market rules; monitor the operations of the regional market and facilitate its development; promote competition and watching over anticompetitive practices; resolve conflicts and imposing sanctions to market agents; approve charges for services provided at regulated rates. It will have a key role to enhance regional cooperation and progressive harmonization of rules and their interpretation between national /local power

sectors. This organ can be composed of representatives of the national regulatory authorities/commissions in each member country cooperating together or a full regional regulatory authority with supranational authority. Its main capabilities should be the followings: independent from the market operator and from political sensitivities, technically competent, understand the challenges of the regional market coupling and trading, able to develop/approve adequate and transparent market rules/agreements/fees for all market participants, keep the trading platform's costs under control, have enough advisory and decision powers to ensure a transparent, reliable and neutral trading to support regional development and attractivity for investors.

- A **regional market operator** will have the responsibility to :
    - Organize the contractual relations with the market participants ;
    - Receive cross-border commercial constraints calculated by TSOs
    - Operate the market on a neutral daily basis by receiving/validating the offers/bids and clearing the market(s);
    - Operate the trading system and the algorithms used for the price calculation (if any) ;
    - Publish the prices for a transparent market
    - Perform the settlement of the transaction through a central counterparty
    - Operate the clearing and settlement processes, with regards to financial settlement, collateral management and invoicing/credit notes management ;

- **The TSOs are, in most cases of regional market coupling, the driving entities of the set-up of an inter-operable market ensuring trade cooperation across region by sharing flexibility resources more widely than only at national level.** In this context, the TSOs must cope with an entire set of new challenges at operation and management levels, and should adapt their company strategy and grid governance:

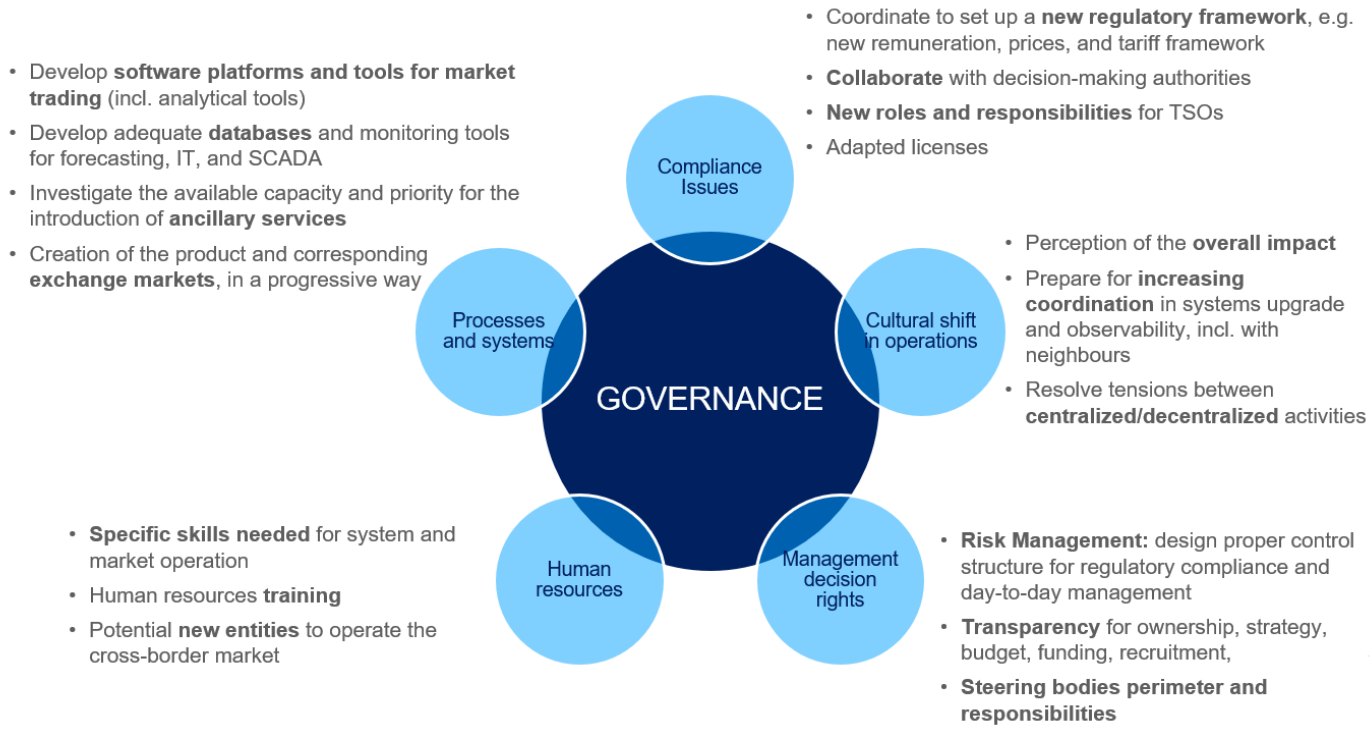


Figure 35 - Governance Model of a trading platform.

The **governance model of the trading platform** should receive a political support of the countries concerned by the regional market, through an Inter-governmental Memorandum of Understanding, signed by the Governments of the member countries and considered as the empowering legal instrument, in its long-term stage when third parties should have access to the regional trading. An Agreement between the managing parties (the system operators) will provide the trading platform with a detailed mandate and a stable governing structure. To be noted that close cooperation between the operating members of the market and of the related grids is critical to ensure a successful implementation, from the early stages up to the mature regional trading platform. That is why we recommend that the governance organs of the future independent market operator for the Maghreb region keep the TSOs as main shareholders, as in many other regional electricity market operators.

This governing structure of the trading platform has several layers, being usually the following ones:

1) *A supreme governing body*, providing the strategic guidance and political oversight, designated by the Ministries of Energy of the member countries or by the shareholders owning the trading platform, in case of a market developed by non-governmental entities. To be noted that these shareholders are often the TSOs of the member countries, considering the close collaboration needed between the TSO and the power exchanges

in cross-border markers: the shareholders of JAO being 22 European TSOs or the holding of TSOs, HGRT, being shareholder at 49% of EPEX Spot:

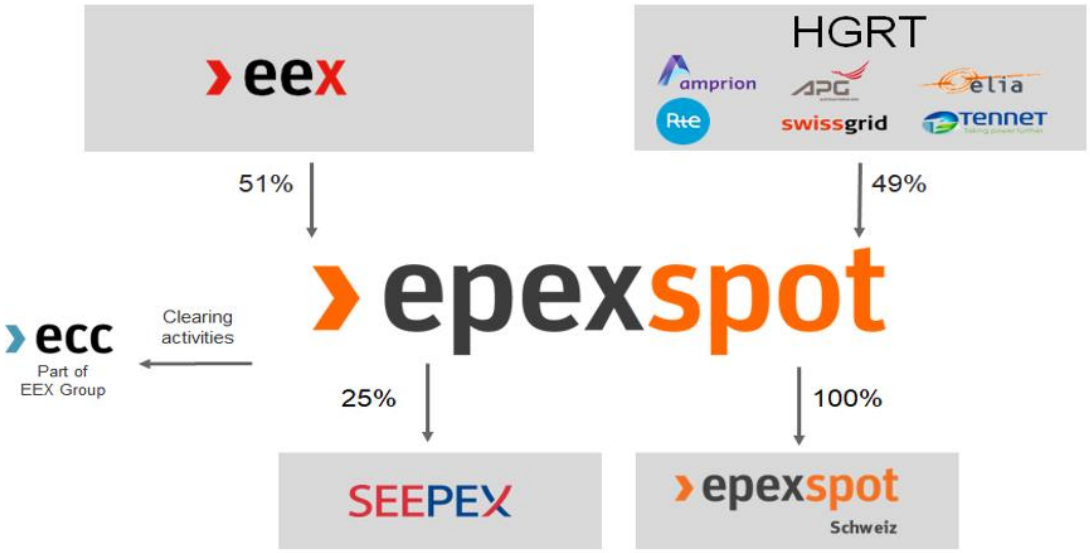


Figure 36 - Shareholding structure of EPEX SPOT.

2) a *supervisory body* responsible for policy formulation and monitoring of execution, "the Steering Committee" consisting of heads of the system operators or of selected utilities representative of the activities of the trading platform;
3) an *operational entity* handling the day-to-day activities of the trading platform (administrative, operations, logistic, etc.), being "the Market Operator" with its own staff. A general manager is the responsible person of the well-functioning of the Market Operator and will report the activities to the Steering Committee and more largely outside;
4) a *market participants' advisory body* can be foreseen, to reflect the types of users of the market, to ensure adequate transparency and trust into the market mechanisms and to advise the Market Operator on topics of interest for its participants. These topics can cover operational, regulatory, contractual and/or organizational domains to influence the direction, design and operation of the markets segments from their perspective and needs. Such an advisory organization will also be the one performing regular capacity building with all relevant stakeholders and market participants (potential and existing), one critical element to ensure the success of the set-up of this new regional market.

- **The governance model should be kept simple and robust, to ensure fast implementation, flexibility in the long-term and large use of the market platform:**
  - The trading platform operated by the regional market operator should be trusted by each market participant, and keep in mind the infancy stage of the market design. The common rules applicable to all market participants should be easy to implement and not require too complex/costly IT developments and daily operations ; a trusted entity should act as central counter party (the CCP) to ensure the payments.
  - The trading model should allow practical, flexible and fast implementation that allows the market to grow with its members and at the same time. The flexible model of the trading means it should be easily adaptable to evolutions of the geographic zone covered by the regional market, of the type of market participants, of new products or of new interconnections.
  - The trading platform operated by the regional market operator should not require overcomplex operational procedures and IT systems, to keep its global implementation at a reasonable level of costs (costs of the required systems and the daily operational costs of the market segments), and not requiring too strong and complex harmonized framework.
  - Administrative and budgetary burden should keep in mind the reduced trading in the beginning, to ensure a beneficial situation or at costs even with small volumes of trade.

- **The ultimate regional trading (Phase 3) should be designed to attract liquidity with following characteristics:**
  - Giving access to more market participants (especially the IPPs and large consumers), some participants might be forced to participate to the market segments, avoiding to use the regional trade as a “residual” power market but rather a fully implemented market solution within the portfolio of the market participants.
  - It implies a lot of capacity building actions towards potential market participants and public entities, to support the opening of the regional market and to suppress any kind of obstacle to the said access.
  - Finally, a future coupling to other regional markets close to the Maghreb region (the Pan-Arab Electricity Market in the Gulf region (PAEM), Iberian Market, the Internal European Electricity Market, the African Single Electricity Market (AfSEM), ,…) might be a long-term target to increase this liquidity and regional price signals.

8.1.1.4 Overview of Governance Framework for different phases

In this last section an overview is given of the **governance framework for each phase** of the market design.

- **Phase 1:** Nascent bilateral trading arrangements do exist between the system operators, with price ranges fixed with a min-max price. In Phase 1, the current trading mechanism is improved, as well as some elements of the existing bilateral agreements.
- **Phase 2:** leaving the bilateral trading arrangements towards a global multilateral agreement between the TSOs and the maximal use of the existing transmission infrastructure. It can be characterized as the following : the regional trading is not high, and the use of the regional market is part of each country's solution to increase security of supply by granting a support of its neighbouring TSOs by using short-term markets (day-ahead and intraday segments). Such a market arrangement can be developed relatively quickly as it does not require high degrees of harmonisation. In this trading model, domestic electricity markets are cleared first using respective domestic generation with any surplus or deficit traded and balanced with the trading partners.

  Key elements : (1) multilateral agreement between the TSOs; (2) pilot trilateral trading with auctions; (3) market platform ; (4) TSO Steering Committee organized within the multilateral agreement.
- **Phase 3:** Set-up of an independent market organization function for operating a regional trading opened to third market participants (e.g. from a department of the TSOs up to a full regional market operator). It requires a higher degree of system harmonisation and political agreement among participants although it does not require the same domestic market structures. The governance will be achieved through (1) an MOU at Governmental level, (2) approval of market rules, (3) agreements with the market participants, (4) development of processes to share data and transparency, (5) set-up of an independent market organization function operating under a license describing its activities.

8.2 Inter-TSO Agreements

This section describes the different agreements and the contractual framework that needs to be established between the different TSOs and/or other potential stakeholders, in order to organize a well-functioning regional electricity market.

Introduction

There are different stages and ways to develop the required contractual framework for the operation of a regional trading platform. This contractual framework is materialized with an **Inter-TSO Agreement or a Regional Operational Agreement** between the operating entities of the market. Its main purpose is to outline the roles and responsibilities

of all involved entities to ensure technical operation of the trading platform, the basic content of the trading rules and procedures to be managed by the regional market operator. Specific transmission issues must also be organized among the TSOs, for instance management of available transmission capacity, methodologies to calculate the wheeling charges and grid losses, the way to grant third party access of market participants to their local network.

The drafting process is usually the following, considering that steps 1 and 2 are more "nice to have" steps in the drafting approach than compulsory stages when the parties have already some experience to work together and have clearly defined their common objectives:

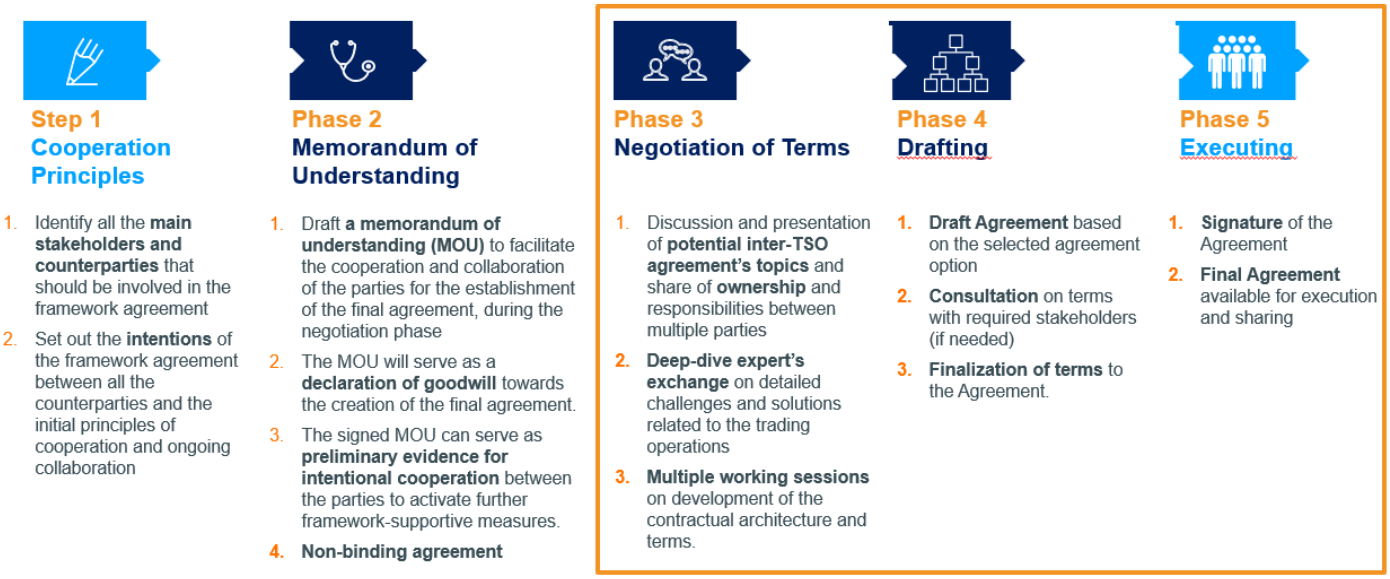


Figure 37 - The different stages to develop a contractual framework.

8.1.2 Examples of Inter-TSO Agreements for regional trading

8.1.2.1 Inter-TSO Agreement in Tri-Lateral Market Coupling

The Inter-TSO Agreement used in the Tri-Lateral Market Coupling is an agreement subsidiary to the Market Coupling Umbrella Agreement, signed bilaterally by the two adjacent TSOs (by RTE and Elia on the one hand; by TenneT and Elia on the other hand). The main objective of the Market Coupling is to provide for a transparent and non-discriminatory day-ahead capacity allocation system in accordance with the legal obligations. In this context, the Inter-

TSO Agreement defines how the TSOs send the daily available ATCs to the power exchanges / CMFO[1], how the market coupling daily program is defined between the two TSOs for each settlement period (how to notify and ship the cross-border flows (how the TSOs settle among them the purchases or sales of energy made on the power exchanges, the "TSO market results"), what are the related liabilities (they fully refer to the main Umbrella Agreement liabilities regime), and how to guarantee firmness. The Inter-TSO Agreement details also the fallback procedures in case of partial or total decoupling between the local markets, or in case of absence of communications means between the parties. The Agreement covers the financial provisions between the parties: how to share the congestion revenues among the two TSOs, the revenues and costs relative to the volume tolerance and relative to cash management, and how to do the reconciliation and the invoicing process. The Agreement gives the bank details for the payments and how to treat financial incidents or errors. The dispute resolution process is the one of the main Umbrella Agreement, except the reduced duration of the amicable settlement. Duration and termination process of the Inter-TSO Agreement are also similar to the one of the main Umbrella Agreement. The Inter-TSO Agreement has a confidentiality clause. Finally, the Agreement organizes a bilateral steering committee and an operational committee between the two TSOs to coordinate the obligations' implementation under the Inter-TSO Agreement. The communications between the parties are organized on a very pragmatic way, with emails, fax, etc.

Several appendices complete the Agreement : a list of definitions ; a procedure describing the monthly operational reconciliation using a pre-agreed XML file exchanged between the two TSOs for each settlement period, as described in the main TSO-Agreement ; an appendix describing the calculation of the cash management of costs and revenues between the three TSOs on a bilateral way, for each day and each settlement period (including the interest rate, the day of the trading week during which the collection or payments are done, and the valuation formula for each TSO if its position is a sale) ; the list of the contact details. To be also noted that these appendices can be adapted by simple means of agreed minutes of the bilateral steering committee, a very light procedure to face the numerous potential evolutions of these appendices, but – of course – only within the limits of this Inter-TSO Agreement that is subsidiary to the main Umbrella Agreement.

[1] CMFO is the entity in charge of the functional operation of the market coupling coordination module.

The bilateral Inter-TSO Agreements are completed by a trilateral Service Agreement between the three TSOs: TenneT is appointed to provide the clustering and exchanges of electronic formalized messages between the TSOs and/or the power exchanges, by using the UTCE (Union for the Coordination of the Transmission of Electricity) electronic highway.

8.1.2.2 Contractual framework of the CWE Market Coupling

The global Framework Agreement of the Central West European (CWE) Market Coupling, signed by all the TSOs and all the power exchanges of the CWE region in October 2010, is far more elaborated than the Umbrella Agreement used for the Tri-Lateral Market Coupling, the very first coupled electricity market in Europe. Most of its general and governance elements are very relevant for the Multilateral Agreement to be developed for the regional trading platform in Maghreb region.

It sets forth the terms and conditions under which the parties will cooperate to operate and maintain the CWE Market Coupling. It describes the contractual framework (that main framework agreement and the subsidiary ones), the principles of cooperation (best efforts obligations, active cooperation and good faith cooperation on equal basis), the task allocation between the parties considering their respective competences (e.g. the power exchanges doing their daily matching of electricity orders and price determination, by jointly performing the allocation of ATCs through the market coupling system ; the TSOs jointly putting at disposal the calculated ATCs, managing the congestions, granting the PTRs for cross-border exchanges, and managing the security of the grid). It mentions each type of technical and market coupling components, put at disposable by power exchanges and/or TSOs globally or individually. It imposes the way to collaborate on a daily basis on the market operations, for each step of the market coupling, in normal mode, with backup procedure, in case of activation of fallback procedure, and if a rollback is required after a maximum of two months after the launch of the market coupling. The firmness principle states that the TSOs accept that cross-border nominations can be subject to potential curtailment on the day of delivery for exceptional circumstances (reasons of security of supply as defined by the German law or force majeure's cases): in such cases, the power exchanges and the central counterparties are not subject to any financial damage or benefit regarding the imbalance settlement done by the TSOs, due to the imbalance created by the said curtailment.

The CWE Framework Agreement foresees also a simulation facility, being a tool to simulate market's behaviour based on historical market coupling data.

The Agreement organizes the intellectual property rights of all developments used by the market coupling. The governance of the CWE MC is carried on thanks to a steering committee, supported by a secretary, an operation

committee, an incident committee, a development committee and any ad-hoc working group(s). The individual and joint costs and remuneration are also very well detailed, the TSOs bearing ultimately the costs generated by the power exchanges and charging them within the local tariffs, after endorsement or formal approval by the national regulatory authority (if subject to such national validation process). If the costs are not approved, the case is considered as an hardship case and the conditions of the Agreement are readjusted between all the parties. The CWE Framework Agreement organises the external communication in that way : each party is free to express its opinion or position about the CWE MC in its own name, provided it does not affect negatively the joint or individual parties' interests or their reputation. If the communication requires confidential data, the explicit consent of the other parties(y) is required beforehand. In case of a breach of this obligation, a public correction of the communication can be imposed, in addition to other possible compensation. The parties can decide to launch a website for the general public, one party being appointed by the other for its development and maintenance.

The cooperation with public authorities is also mentioned, with a mutual cooperation principle to provide the requested information if the regulatory/ministerial request is motivated, necessary for a well-identified purpose, narrow enough, confidentially managed and clearly defined. A non-confidential version of the information is provided if the authority is willing to publish its decision or the treatment of its request.

The liability principle applies to all direct damage occurring after the MC launch date, even if the claim is originated from the implementation /development phase of the MC. No joint and several liability is foresee: each party is liable for its own commitments only, even in case of joint developments or commitments. If the breach is due by several parties, the indemnification is divided in equal parts between the jointly performed parties against the claiming party.

In addition to the classic legal clauses, the Agreement foresees also an exclusion clause of one or more parties in specific cases, to be decided by the steering committee, and organizes the consequences of such an exclusion on the market coupling operations, in terms of rights and obligations. The dispute resolution (amicable settlement and arbitration) is well developed.

This Framework Agreement is completed by a multitude of technical and legal appendices, describing all elements of the market coupling operations.

8.1.2.3 Existing PPAs and trading design

Long-term bilateral contracts for cross-border trade, up to 10-30 years, called "power purchase agreements" (PPAs) are increasingly viewed as an attractive option for the developers of power (renewable) projects to enter into, as they

give certainty to buyers and sellers regarding energy prices over the financing period of the infrastructure projects. All markets are facing significant growth in the numbers and volumes of energy covered by PPAs for this reason. PPAs are negotiated directly between buyers and sellers as “over the counter” (OTC) contracts. Being multi-years agreements, they are expected to be traded alongside the introduction of trading market platforms.
One example of such contract is the EFET (European Federation of Energy Traders) standard Individual Power Purchase Agreement [3]. The EFET contracts are standard templates which cover a substantial extent of the trading agreements features. The bilateral parties adapt it to their proper needs. These contract templates for power exchanges are used widely in Europe between companies trading bilaterally.

In addition, capacity allocation calculation approach are taking take into account a number of factors, including the previously allocated cross-zonal capacity, meaning by which capacity is reserved for long term cross-border bilateral contracts for example.

- The Available Transfer Capacity (ATC) is the NTC less the AAC (Already Allocated Capacity)
- AAC = all already allocated capacity from previous timeframes.
- NTC (Net Transfer Capacity) = TTC (Total Transfer Capacity) – TRM (Transmission Reliability Margin).

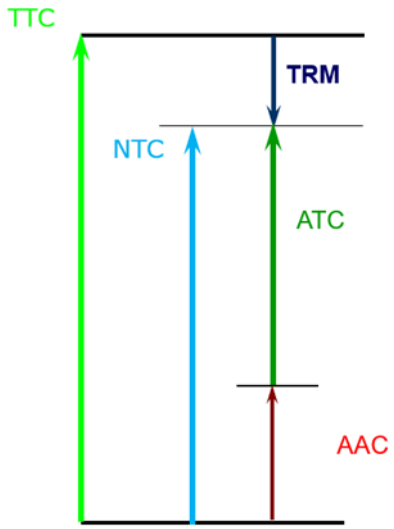


Figure 38 - Calculation of Available Transfer Capacity (ATC).

In Section 3 a more detailed explanation is given on how the TTC, TRM and NTC values could be determined. The PPAs have therefore pre-emptive rights over the capacity based on the date of signature of their bilateral agreements. To

ensure nevertheless a maximum of liquidity within the regional trading platform, it is recommended to impose a declaration of the bilateral agreements at the bidding period of the day-ahead market and to release the unused capacity to the intraday /close to real-time market segment ("use it or lose it" approach for bilateral contracts).

8.1.3 Lessons learned and main recommendations

8.1.3.1 Guiding principles when developing a Multilateral Inter-TSO Agreement

Several guiding principles must be used to develop the most appropriate contractual framework between TSOs and related to the operations of the trading platform.

- Before starting to draft an agreement, it is beneficial to lay out the objectives of the Multilateral Inter-TSO Agreement in order to enter the negotiations and drafting stage with clear parameters in mind. Objectives can be either related to qualitative measures or they can be tied to specific KPIs that are related to minimum requirements for commercialization of interconnectors between the TSOs. Usually, these objectives are set by the national regulatory authorities and then, the TSOs are developing the contractual frame keeping these objectives in mind. As an example, the following agreement's terms can be used to promote transparency and liquidity in a market.
- The Multilateral Inter-TSO Agreement should take into account the exact scope to cover in our case of the trading platform for Maghreb region, the Multilateral Inter-TSO Agreement should have a large scope to cover not only pure inter-TSO matters, but also the design and the operation of the trading platform. The agreement content should then reflect the market design selected (i.e., settlement, money flows, standard agreements, results publishing etc). The TSOs will indeed, be responsible for this regional trading during the Phase 2, directly or through a subsidiary entity.
- Regarding the concepts used, the definitions should make available all the information behind certain terms or relevant calculations, algorithms, or optimisation functions
- Regulatory support from national regulatory authorities is needed throughout drafting especially if the NRA's have some critical concerns about some key elements of the trading design or the costs recovery. Depending on the exact scope of their competence, the NRAs have to approve the Multilateral Inter-TSO Agreement, to be consulted or be just informed. Clarification in due time of the competences of the NRAs and their concerns is critical; it is highly advised to align between the TSOs and the NRAs at the beginning of the drafting of the Multilateral Inter-TSO Agreement (e.g. the Moroccan NRA, ANRE, has the competence "to approve the cross-border access rules").

- The Multilateral Inter-TSO Agreement should be built in such a way it privileges adaptability, when keeping considerations for future states. This long-term vision should consider the future state of collaboration between the current 3 TSOs and possible addition of other collaboration or contract parties, including other TSOs or an independent trading operator for managing the commercial transactions in the long-term Phase 3, or even future evolutions of the geographic scope or of the products traded. In this context, the text of the Agreement itself should be future proofed for the general concepts, or built in an enough flexible way. As for example, all technical design and details can be developed in appendices allowed to be adapted by simple means of agreed minutes of the bilateral steering committee. That would give a very light procedure to face the numerous potential evolutions of these appendices.

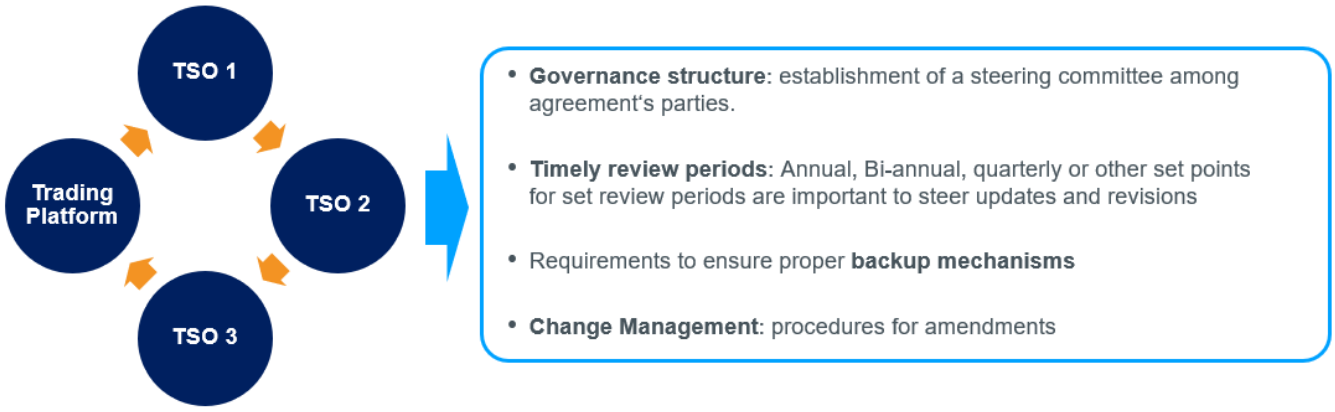


Figure 39 - Adaptation and review aspects of a multilateral agreement.

8.1.3.2 Possible contractual framework configurations for the Multilateral Inter-TSO Agreement

Several approaches can be used to configure the contractual framework of the Multilateral Inter-TSO Agreement. The selection of the most appropriate one will depend on the exact scope and the parties involved in this Multilateral Inter-TSO Agreement:

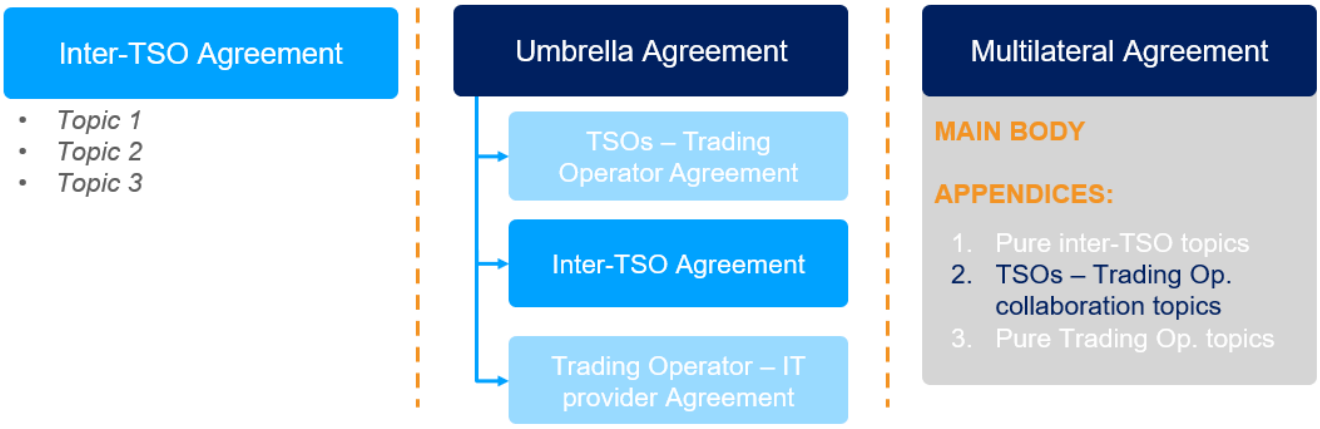


Figure 40 - Comparison of the structure of different types of agreements.

An **Inter-TSO Agreement "*stricto sensu*"** is a document signed by all TSOs (in our case a trilateral agreement) that defines the pure TSO topics:

- How TSOs determine trade capacities (ex. Calculation and allocation of capacities)
  - Specified exchange of data and data requirements from each other
  - Defines settlement procedure of trade
  - Costs coverage and TSO remuneration (i.e. Congestion rent)
  - Set-up of wheeling charges for transit TSO
  - IP rights, software solutions

An **Umbrella Agreement** is one unique "governing" (Umbrella or Framework) agreement under which several independent subsidiary agreements are established (can be at a later data or when drafting the Umbrella Agreement) with multiple configurations of parties. It covers the matters of general interest and prevail to any other agreements, while the subsidiary bilateral agreements between parties into sub-agreements address the other – more specific – topics. One of the subsidiary agreements is the **Inter-TSO Agreement "*stricto sensu*".**

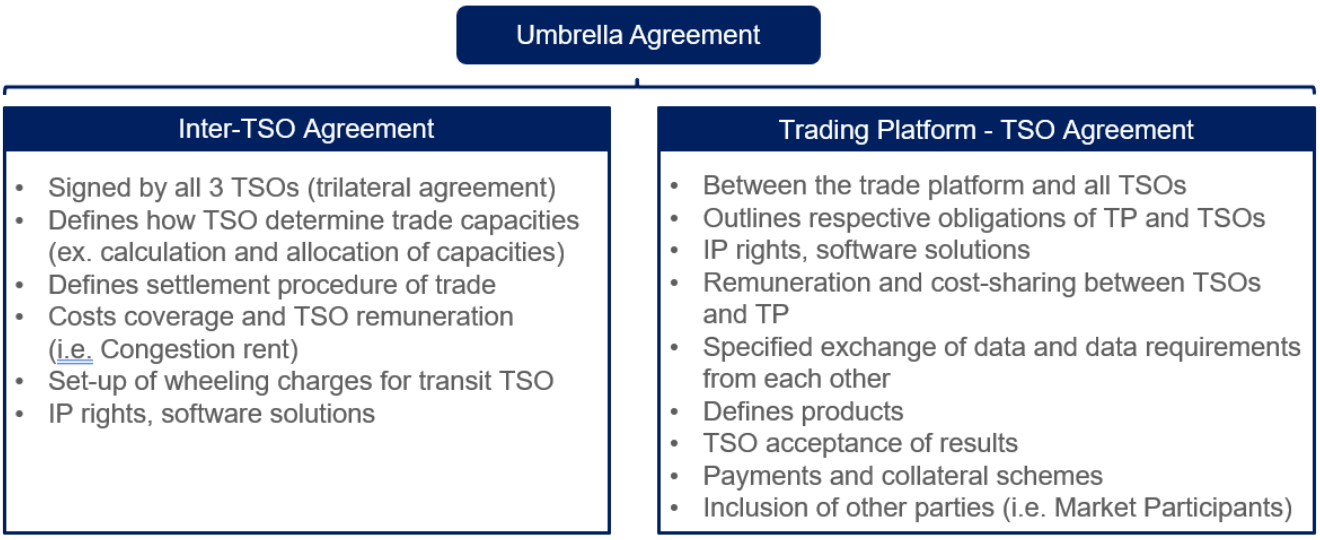


Figure 41 - Illustration of an Umbrella Agreement.

A **Multilateral Agreement** includes multiple parties and sets out rules of operation within one unique agreement, with a main body and a multitude of appendices covering all aspects needed for the operation of the trading platform and the cross-border activities of the TSOs. It sets out operation and cooperation principles with possibility of individual appendixes on technical/administrative content. One of these appendices is the **Inter-TSO Agreement.**

Each of these approaches has its strengths and weaknesses.

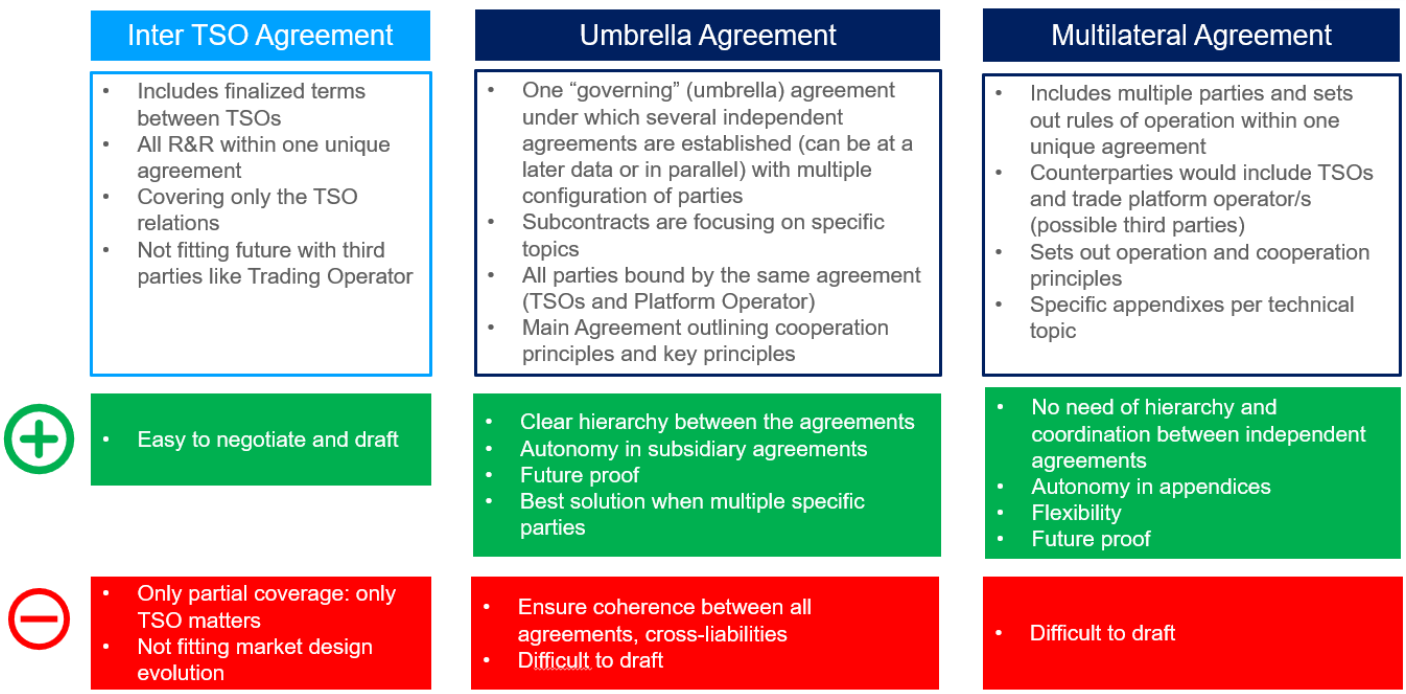


Figure 42 - Strengths and Weaknesses of different types of agreements.

Recommendation

Considering the pathway of the development of the trading platform for the Maghreb countries, we highly recommend to go for the Multilateral Agreement's type of approach. It will be easier to implement, by giving the adequate flexibility to add new partners and counterparties, and to develop the necessary new appendices only when needed.

8.1.3.3 Development of the Multilateral Agreement for the Maghreb trading platform

Moving from bilateral agreements to a multi-lateral agreement will allow the TSOs to manage the trading platform or to delegate this activity to an external party. The trade design should be kept in mind when drafting the future Multilateral Agreement, in order to identify the key elements of the agreement (what are the principles guiding commercial trade between the three 3 TSOs, understanding of the product specification, harmonization efforts and foresight into further market development, etc) and map the actions for drafting the agreement

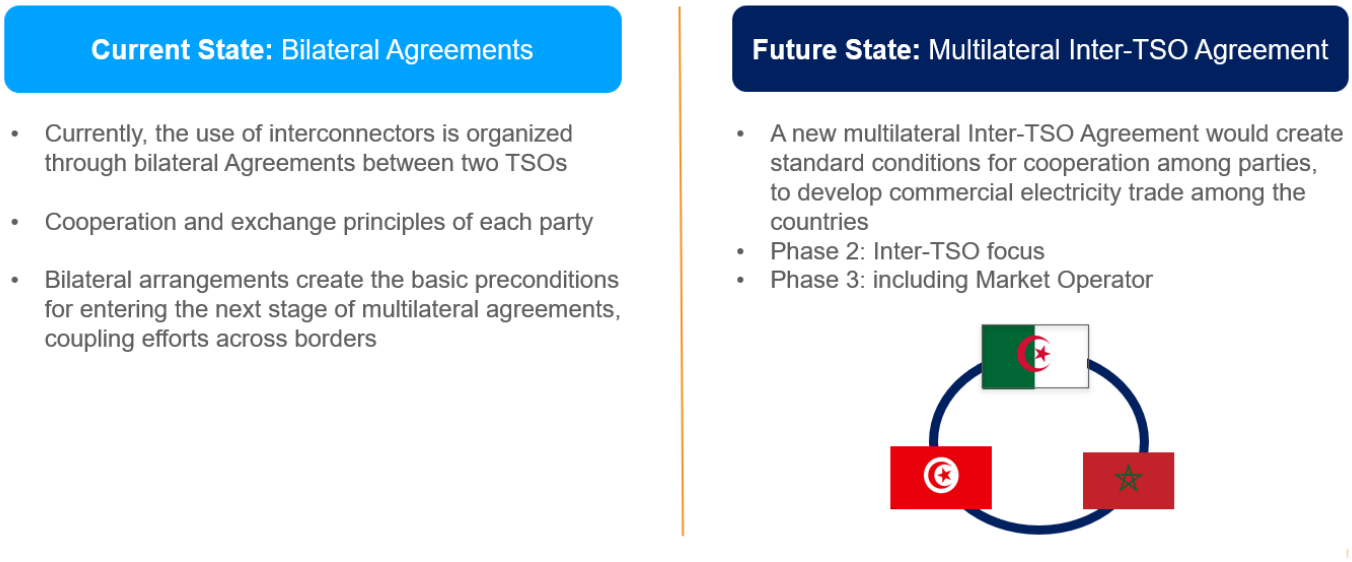


Figure 43 - Bilateral Agreements vs. Multilateral Agreement.

The bilateral trade agreements governing current commercial flows of electricity between Algeria and Tunisia, as well as Algeria and Morocco, have been concluded first in 2007 between Sonelgaz and ONEE, and then in 2014 between Sonelgaz and STEG. The last contract between Sonelgaz and STEG was signed in 2018 and will end in 2023; a new contract with STEG will have to be renegotiated in 2023. These contracts were drafted in a framework of 'mutual support'. No governance bodies have been set up in this context, whereas the technical context is discussed at the technical committees of COMELEC. The communications is done on a case-by-case basis without any structured process.

These commercial exchanges of electricity are based on a voluntary and explicit request from one party of a specific volume, during a certain period, to be agreed by the other party (the agreements do not cover non-programmed exchanges). The power is asked for a minimum period of three continuous hours, considering the operational aspects of the generation power plants used for export. These requests can be done for the same day or for the following day (D+1), for volumes within a predefined range (DZ-TN : between 50 and 600 MW (Defence plan above 600 MW); DZ-MA: between 50 and 400 MW). In addition, exchanges can be planned until 1 week upfront until real-time. In this case, more flexibility can be offered (no blocks of many hours), to the opposite of short-term requests when dispatching program has not foreseen this exchange. In this latter case, a new machine has to be started and a minimum number of hours is needed to consider the minimal profitability of the activated power plant.

The party that needs to deliver the electricity has the obligation to fulfil its commitment (firmness), except in case of technical problems or in case of force majeure as defined in the national legislation. In such a case, the requesting party is compensated for the non-occurred exchange, with an higher compensation if it happens close to real time.
The prices for the requested electricity are fixed in EUR for the duration of the bilateral trade agreements and are the same for both involved TSOs. The prices are a yearly weighted average price, based on a security of supply's principle and not based on the commercial value of the electricity (even if the marginal cost of the electricity production is known). They can be revised every trimester if both parties agree but this requires an amendment to the bilateral trade agreement (meaning a relatively heavy signature process within the TSOs).
The electricity traded is invoiced to the party having asked for this volume, on a monthly basis, and based on metering devices installed on the interconnectors. The settlement is done at last the 5th working day of the M+1 and the invoice sent at last the 10th working day of the M+1. The payment is done through international transaction respecting international tax and customs rules. Due to the fact that exact measurement of the commercial flows is rather difficult at the interconnection point, the invoicing is done based on what has been commercially agreed or, for large volumes, on a contradictory way. Penalties are foreseen in case of late payments.

A Pan-Arab market initiative has started in the region with the development of detailed processes and template agreements to be used[2] within a future Arab integrated market for the MENA and Arab States. This contractual framework seems to split the commercial and technical aspects and was presented to all stakeholders of the Maghreb countries. Even if some countries have signed an MOU to join the future Arab integrated market, this initiative seems very premature, not enough pragmatic and consequently not yet accepted in the region.

For the **short term (the Phase 1)**, the current bilateral agreements can be improved on the following points, to obtain a higher level of flexibility and to increase the exchanges to reach a real commercial framework:

1) To clarify the concept of technical impossibility, based on the national grid codes and on the system operation requirements

[2] The project having not received a copy of these documents, they have not been taken into consideration for the analysis of the inter-TSO Agreement and the governance framework.

2) To introduce an undetermined term to the bilateral contracts
3) To introduce a flexible price range per hour without being forced to amend the bilateral contract each time: see the trading design for Phase 1; an upcoming amendment of the existing agreement should propose the methodology for calculation of the price or a range for the price

It is advised to keep the invoicing system as it is because it seems to work well and to avoid changes in the customs processes and to make the process even more complex.

As a conclusion, the Phase 1 of the trading design is limited to some specific changes and can be developed within the existing bilateral agreements. It would be a good opportunity to seize the revision of the bilateral agreement between Algerian and Tunisian system operators to negotiate it in such a way that it implies the principles of the Phase 1 of this project.

For the **mid-term (Phase 2)**, a new Multilateral Agreement, seen as the collaboration agreement between the three TSOs should be developed. The content of the Multilateral Agreement will be divided in two main categories, shared within the main body and the technical appendices.

For the **long-term (Phase 3)**, the Multilateral Agreement used during Phase 2 and its appendices will be adapted / completed to take into account of the evolutions between Phases 2 and 3 :

- significant evolution of the parties with the introduction of an independent market operator and the formal split of the TSO and marker operator role,

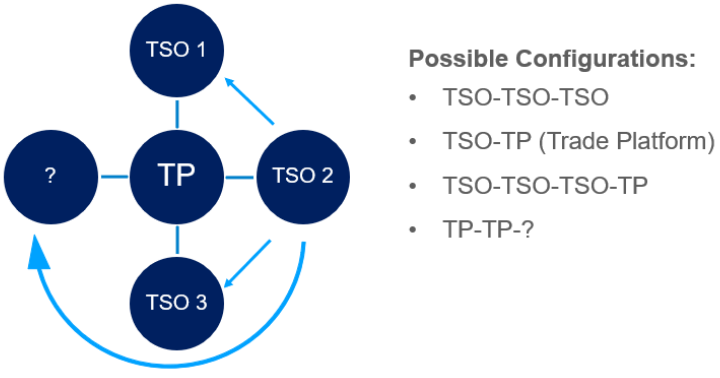


Figure 44 - Different types of configurations for the multilateral agreement.

- the enlargement of the market participants to IPPs and/or large consumers, including additional responsibilities and liabilities to the parties to the agreement, new possible risks, etc.,
- the possible extension of the geographic scope of the trading platform (e.g. enlargement to GECOL) :the possible new products and more complex procedures to handle
- etc…

8.1.3.4 Content of the Multilateral Agreement

The content of the Multilateral Agreement will be divided in two main categories, within the main body and the appendices. The appendices should cover the inter-TSO matters, the trading design matter, the administrative details. Here below a possible split of the content :

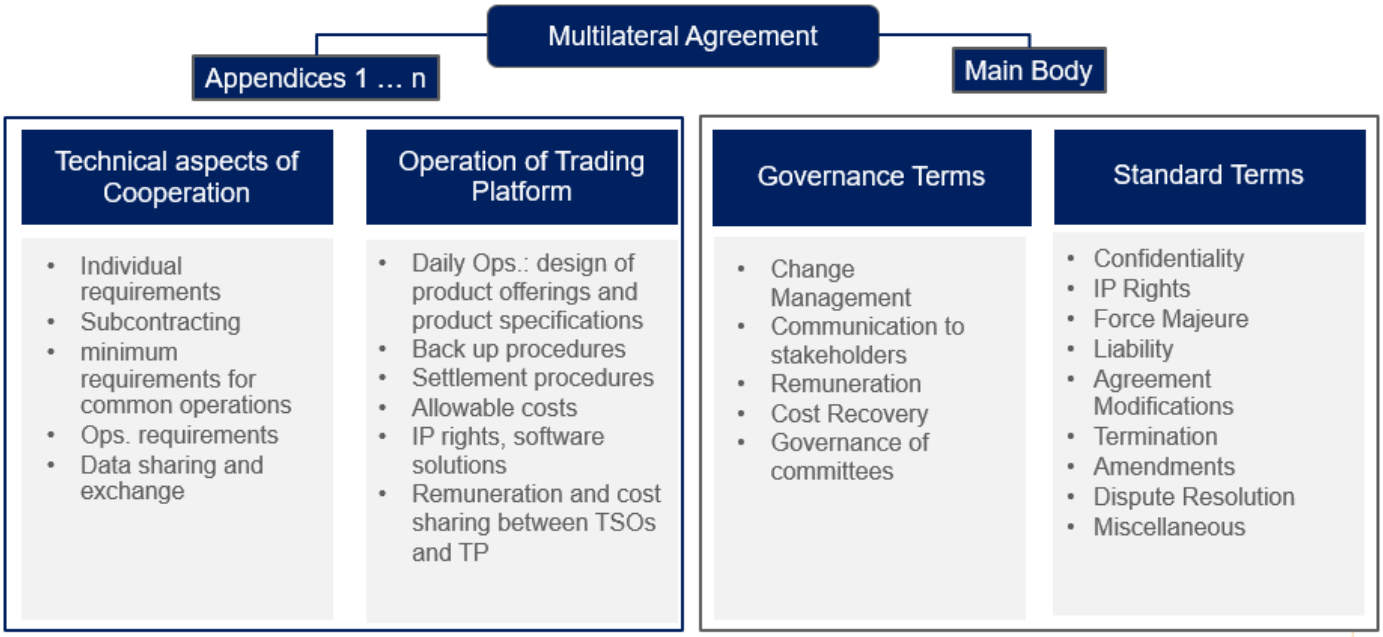


Figure 45 - Multilateral Agreement Structure

Main body

The main body of the agreement shall contain the standard terms, being the description of the general contractual principles, and the governance of the trading platform:

- Definitions
- Membership to the Agreement : description and conditions for participating entities (this point will evolve from Phase 2 to Phase 3, with the set-up of the Market Operator). An exclusion clause of one or more parties can be envisaged in specific cases, to be decided by the steering committee, if the consequences of such an

exclusion on the market coupling operations can be handled without suppressing the essence of the market coupling.

- Cooperation principle : best efforts obligations, active cooperation and good faith cooperation on equal basis
- Global scope of the Agreement : regarding the geographic scope of the Agreement, the parties might have the right to enter to other market coupling with other areas, but they must inform the other parties within a reasonable deadline before the effective launch and share all necessary information to evaluate the respect of their legitimate rights. If not, the hardship procedure can be launched to find a mutual acceptable solution.
- High level description of each appendix. The appendices should cover the inter-TSO matters, the trading design matter, the administrative details.
- Hierarchy of the documents covered by the Agreement: this point is especially important if subsidiary agreements (e.g. specific services offered by some parties to the entire members) or local subcontracts (e.g. local IT maintenance, staff support to implement the trading platform, etc.) are foreseen within the global contractual architecture.
- Entry into force, duration of the agreement, suspension and reasons for termination – status of previous agreements : this point is especially important to move from the bilateral trade agreements to the Multilateral Agreement.
- Change management : revision process of the agreement and of the appendices (periodicity, role of the governance organs, impact of the revisions to the global agreement, etc.). A specific lighter/faster procedure can be developed to modify the appendices, different than the one used to review the main body.
- Cost management /remuneration : identification and management of individual and joint costs for trading development and operations (through set-up of operational fees or share of costs among the shareholders of the trading platform), determination of the wheeling charges for transit grid, invoicing processes (collaterals or credit lines for market participants can be envisaged to secure further the costs recovery), cost recovery and remuneration process of the participating entities to the trading platform. The Agreement can reuse the relatively standard principle that the TSOs are bearing the ultimate trading platform costs, not covered by the market fees or the congestion rent (if the costs recovery is organized so), and charging these costs to the local transmission tariffs, if they are formally approved by their national regulatory authorities (if subject to such national validation process). If the costs are not approved and the fees cannot be increased, the case is considered as a hardship case and the conditions of the Agreement are readjusted between all the parties.

- Firmness principle: the Agreement shall describe the liability and cost impact of the firmness deadline's principle when an operational issue occurs within a transmission grid (e.g. congestion, need of redispatch, reduction of the injection, etc.), that reduces the flows foreseen after the orders have been considered as firm. Due to the firmness principle, or the market participants should be compensated on a predefined cap / for the entire volume of firm transactions, or the TSO(s) should activate balancing services to compensate the non-imported volume of electricity within its system. Confidentiality : of technical, commercial, financial and administrative information for general public, among parties, and regarding requests from the public authorities (NRAs, Ministries…). It can be foreseen that the requested information is provided only if the request is motivated, necessary for a well-identified purpose, narrow enough, confidentially managed and clearly defined. A non-confidential version of the information is provided if the authority is willing to publish its decision or the treatment of its request.
- Intellectual Property Rights : the Agreement shall organize the intellectual property rights of all developments used by the market coupling, in particular determines to whom belongs the IP of the programs, simulations and tools developed for the trading platform, and under which conditions the others participating entities can use them.
- Liabilities: which party is liable for what and to which extend in case of a default in the performance or in the obligation, based on the law applicable to the agreement (limited liability) ; mitigation measures (obligation to mitigate the damages and to cooperate particularly when unexpected difficulties occur); insurance obligation ; claim of a third party due to the non-performance of a party, etc.
- Communication means: who and how communication is organized to third parties. Mutual cooperation among the parties should be the key principle in relation with public authorities and general public, as "a one voice principle". The agreement organizes also how to launch a website for the general public, and which party is appointed by the others (or a third party) for its development and maintenance.
- Force Majeure : definition ; obligation to inform the other parties ; obligation to minimize the damages suffered from the other parties and caused by the force majeure; adjustment of the agreement if needed;
- Hardship cases, especially how to recover non-covered costs
- Dispute resolution mechanisms:
    - mechanisms for settlement of deviations in trade volumes, failures and for delays in trade or payment.
    - mechanisms to settle disputes that may arise in the development of cross-border arrangements and market frameworks.

- Governing law

The governance terms cover the governance and management principles like the types of committees and their duties, the representation of the parties, the decision process, etc. As foreseen in other regional market's organization, the governance should carry on through a steering committee for general guidance and strategic decisions, and a daily management body (handling the operations, the incidents, the relations with market parties and externals, and any ad-hoc tasks).

Inter-TSO matters

- Provision of the daily individual or joint ATCs by the TSOs (in the matter case, jointly calculated, aggregated and communicated) to the trading platform
- Operational Requirements
- Data sharing and exchange
- Cross-border nominations to the respective TSO based on local net positions
- Non-programmed "Unvoluntary" (non-intended) exchanges

Trading Platform matters

- Type of trades: technical descriptions of product offered and product specifications
- Daily Operations in normal procedures: the calculation of the market coupling results (the matching of the exchanges) and provision of the market results to the TSOs (the net positions), the publication of the final market results
- Type of market participants : conditions for participating entities (this point will evolve from Phase 2 to Phase 3, with the opening of the trading activities to third parties)
- Backup procedures, and fall-back procedures (if any)
- Settlement procedures
- Collection of congestion rent and payment to the designated entity

9. Cross-Border Capacity Calculation and Allocation

9.1 Introduction

Using accurate and secured cross-border capacity is a key element of any well-functioning regional electricity market. Both the calculation of the available cross-border capacity, as well as allocation of that capacity to the different trading participants, are critical processes.

- The **capacity calculation** process consists in translating the physical transmission grid constraints into maximum volumes of commercial exchanges (i.e., transmission capacities) that can be used as limits between different zones of any market trading platform. In that way, no specific assumptions about the grid situation need to be considered in the market allocation algorithms: all physical constraints should be reflected in the transmission capacities computed and communicated by the TSO of each zone.

- The **capacity allocation** process aims at defining how much volume of commercial exchange is used by market participants between the different bidding zones. For each border, these cross-border exchanges should not be over the transmission capacities communicated by the TSOs. The way to allocate the exchanges depends on the market design and timeframe (yearly, monthly, day-ahead, intraday, balancing). While explicit methodologies impose the stakeholders to separately bid twice for energy and cross-border transmission capacities, implicit algorithms directly integrate the cross-border capacities allocation process into the energy market global optimization in such a way that the stakeholders do not need to bid for cross-border capacity anymore (i.e., the usage if cross-border capacities will be determined within the energy market optimization itself). In general, going towards implicit and integrated allocation methodologies significantly improves the efficiency of the market process, as depicted in the figure below: in Europe, implicit allocation processes have been introduced mainly in the day-ahead market as of today, whereas intraday and balancing timeframes still rely a lot on explicit processes.

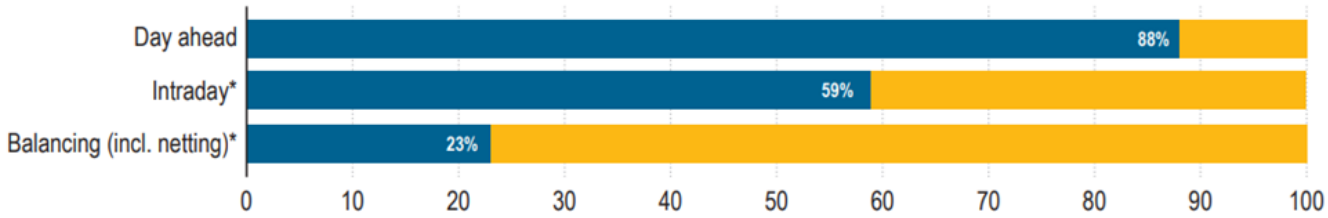


Figure 46 - Level of efficiency in the use of interconnectors in Europe in the different timeframes (%use of available commercial capacity in the 'right economic direction') – 2019
Source: ACER Monitoring Report

9.2 Capacity Calculation Methodologies

9.2.1 Overview of Situation in Europe

In Europe, The European Third Energy Package (2009) required a suite of European Network Codes covering grid connection, markets, and system operation. One of the market codes is the Capacity Allocation and Congestion Management (CACM) guidelines which entered into force as European law on 14th August 2015. This sets out the rules for regional European Day-ahead (DA) and Intra Day (ID) Markets. The CACM guidelines set out the processes for calculating cross-border capacity for DA and ID markets and how network congestion is managed. Along with the CACM guidelines, the capacity calculation and allocation target methodologies are defined in two other guidelines: Forward Capacity Allocation (FCA) guidelines for the long-term timeframe prior to day-ahead, and Electricity Balancing (EB) guidelines for the balancing timeframe which starts after the closure of the ID markets (in general one hour before real-time).

The CACM guidelines allow two approaches to calculate cross border transmission capacity:

- Flow-based - FB
- Coordinated Net Transfer Capacity - (c)NTC

The flow-based option should be used unless TSOs can demonstrate that the flow-based approach would not be more efficient than the Coordinated NTC approach. The following figure illustrates the target implementation in Europe:

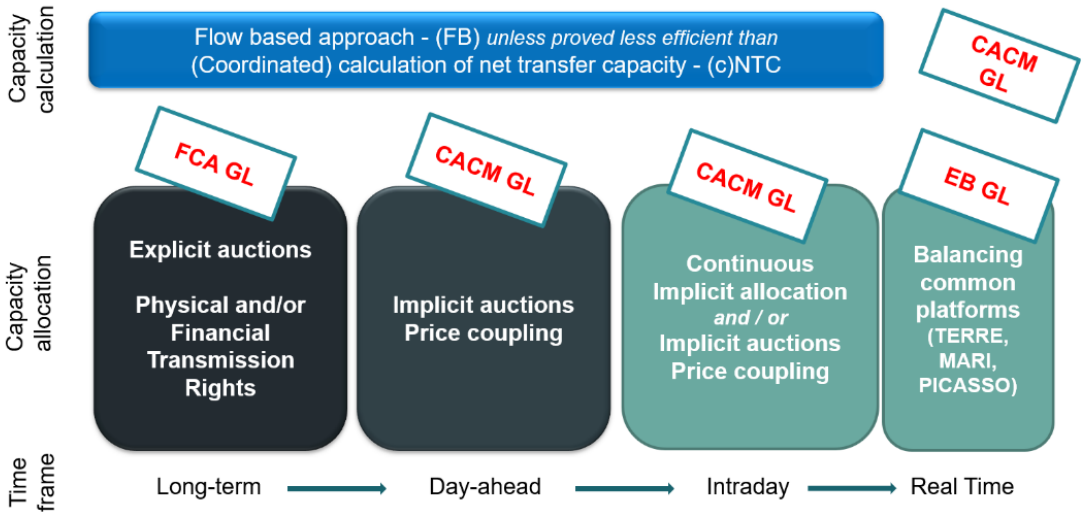


Figure 47 - Summary of Capacity Calculation and Allocation target methodologies in EU.

9.2.2 Flow-based Capacity Calculation

The flow-based approach will typically be used for meshed neighbouring networks. Indeed, this approach is much better to capture the actual impact of the physical flows and constraints, which becomes more difficult with NTC methodology in situations with multiple borders in parallel. The reason is that the FB principle consists in directly formulating the constraints in the market allocation algorithm which reflect the physical limits on the grid, instead of supplying fixed predetermined commercial capacities per border (NTC). To this end, a simplified network model is built and provided into the market allocation algorithm: critical branches (with relevant parameters) are defined by TSOs among the lines close to their country borders, and grid models are provided to perform FB domain computation.

By giving the grid constraints directly to the market algorithms, FB enables to enhance the interconnections efficiency and the market global social welfare compared to NTC method (see illustration below). It also gives clear signals of the grid weakness locations.

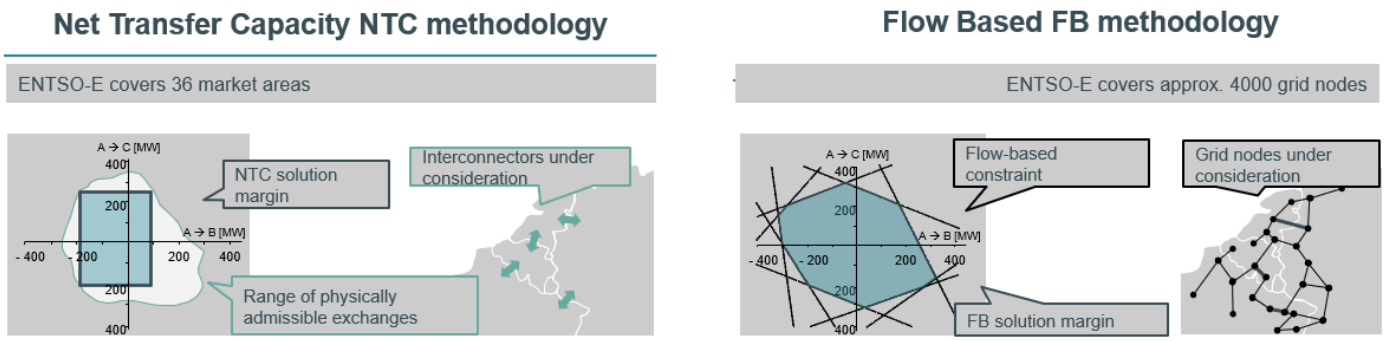


Figure 48 - Illustrative example of improvements enabled by using FB instead of NTC in a meshed grid situation.

In the situation of the future Maghreb regional market, it is likely that Flow-Based approach does not bring major advantages at first step compared to NTC methodology, due to the radial topology and limited parallel borders. Furthermore, FB methodology increases significantly the operational TSOs process complexity and requires a quite mature regional coordination process (entity, IT platform). It should therefore be implemented only if this approach brings significant benefits. The situation could be compared with less meshed areas in Europe like SWE area (South-Western Europe = France – Spain – Portugal). As illustrated in the figure below, coordinated NTC approach is implemented in other less meshed areas in Europe:

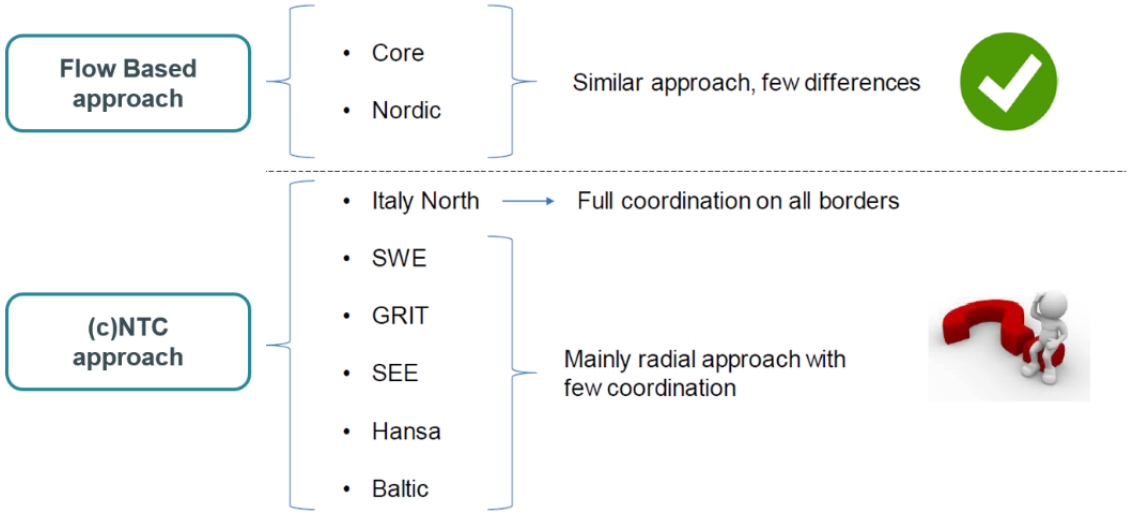


Figure 49 - Overview of the Implementation approaches in Europe.

9.2.3 NTC Capacity Calculation

The NTC approach is based on historic data, considering several factors including seasonal impact and security margin. The NTC is calculated for each border (rather than each line, as with the flow-based approach) and in each direction, for a certain timeframe and granularity (e.g. for each hour for the day-ahead timeframe). The NTC is the maximum allowable trade before a network branch reaches its limit. The Available Transfer Capacity (ATC), which is the parameter used in the market trading platform in-fine, is the NTC decreased by any Already Allocated Capacities (AAC) in the previous timeframes (e.g. any long-term nominations for the day-ahead timeframe). The NTC is calculated as:

NTC (Net Transfer Capability) = TTC (Total Transfer Capacity) – TRM (Transmission Reliability Margin)

The TTC should reflect the maximum physical exchanges possible on the border, without consideration of any margin. This capacity is computed using load flow computation by "pushing" cross-border exchanges until a physical limit is reached. This limit reflects any grid constraints according to the TSOs national security rules such as:

- Thermal limits: the electrical current causes a heating of the conductors of the transmission overhead lines and cables. Depending on the design of lines and cables there is a maximum permissible current.
- Voltage limits: the components of a transmission system are designed for specific voltage ranges according to international standards. The voltages must be kept within these ranges to prevent flashover, to maintain an adequate quality supply and to avoid fast dynamic phenomena known as "voltage collapses" which may cause major blackouts.
- Stability limits: on large interconnected electric power systems there are many electrical, mechanical, and magnetic interactions due to the dynamic behaviour of the generation plants, the characteristics of the loads and the physical properties of the components of the transmission system. As a result, significant power, voltage, and frequency oscillations can occur within the electric power systems. Because of the danger of partial or total system collapses (black outs) these oscillations must strictly be avoided or managed within an acceptable range, and they may induce limitations on operating conditions of transmission interconnections.

In the Maghreb area, the current cross-border exchanges are limited by Watt metric protection thresholds lower than lines thermal limits. According to our understanding, these low threshold values reflect stability limits of the regional grid. Since this threshold cannot be updated on a regular basis (e.g. every hour), they must remain low to protect the grid operations from the worst situations (likely happening when the inertia in the grid is the lowest). **Regarding this context, it is crucial that any future NTC computation process considers such stability constraints: one can expect**

that, once a regular and robust NTC process is implemented, these thresholds could be increased (see more explanations below).

The TRM is the margin required to maintain system security. The methodology to determine the reliability margin in CACM consists of two steps. First, the relevant TSOs shall estimate the probability distribution of deviations between the expected power flows at the time of the capacity calculation and realized power flows in real time. Second, the reliability margin shall be calculated by deriving a value from the probability distribution.

The concept of NTC computation is eventually depicted in the following picture

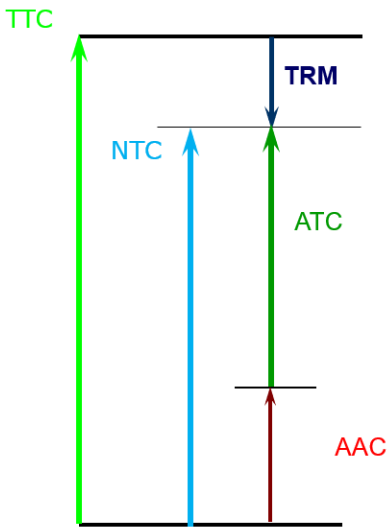


Figure 50 - ATC computation concept.

The operational main challenge for the TSOs is to be able to compute secured NTC over different timeframes. In the end, this is always a trade-off between taking more conservative assumptions to cover any later uncertainties and more risk to provide enough capacity volume. The more the NTC computation is done closer to real-time, the less important are the uncertainties and the grid situation is well known. Therefore, the NTC values tend to increase over time in general. This concept is illustrated in the example below: for a yearly NTC computation, considering specific hypothesis for each month of the year (in red), a monthly capacity (NTC) can be computed for each month. But since one value must be provided for all year (yearly timeframe), the most conservative monthly NTC must be considered at this step (in blue). If NTC must be provided later for a monthly timeframe, it is highly likely that higher NTC can be provided (red assumptions, to be updated at the time of monthly computation).

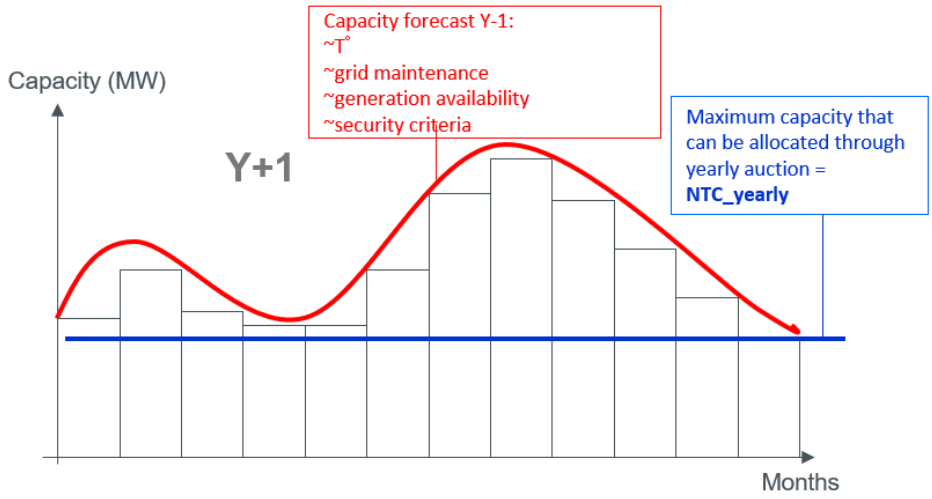


Figure 51 - Concept of NTC computation over the yearly and monthly timeframes.

9.3 Lessons learned

Considering both the target to implement an efficient regional electricity market and the type of operational constraints experienced by the TSOs in Maghreb, **there is no doubt that the implementation of a more frequent (e.g. daily) and robust operational NTC process brings major benefits for economic market efficiency and system operations safety**.

Having a secured and robust NTC computation process would concretely enable:

- **Better consideration of the grid security constraints, such as the stability limits managed by the Watt metric protections.** With an hourly NTC computation, the grid stability situation can be assessed each hour and the NTC limited accordingly. That way, for hours with strong stability risk, the NTC could be limited with lower values which would be comparable to the current exchanges allowed by the Watt metric protection thresholds. But for other hours with less stability risk, the NTC could be increased and limited by other constraints such as thermal limits for example.
- **To give a clear signal of the grid situation to the regional market**, through lower or higher NTC values. **That way economic efficiency could be also enhanced while the operational risk is managed**.

Implementing a daily robust operational process implies **some evolutions in the TSOs System Operations processes**. In particular, the effort should be focused in:

- **Implementing a partially automated and robust process for creation and update of grid model (hourly granularity)**,
- **Implementing a local process to compute NTC** using the previously mentioned grid models and specific inputs such as selection of critical grid elements, generation unit and load dispatch (GLSK) etc.
- **Increasing the cooperation with neighbour TSOs** to optimize the NTC calculation processes on both sides.

9.4 Recommendations

General

The first step for TSOs willing to implement a capacity calculation process should be to answer the following key questions:

1. What are the **main types of grid constraints** that would currently impede any increase in cross-border exchanges? (thermal overloads, voltage limitations, stability constraints etc.)
2. **For each constraint listed above, which volatility do you estimate?**
   How often would you need to assess it to enable increasing the cross-border exchanges without jeopardizing grid security? (e.g. one TSO could estimate to have a general high limit for stability purpose assessed on ad-hoc base once a year, and different level of overloads to be assessed on daily basis)
3. **Regarding the previous risks, how is it currently managed in your operational processes?** Do you estimate that more up to date data would increase the cross-border capacities?
4. **How much effort** do you estimate to update the operational process so it can handle a daily capacity calculation process?

Phase 1 : Fixed ATCs as agreed in the bilateral contracts (maximum values)

Current process can remain as it is with the maximum cross-border capacities bilaterally agreed between the neighbouring TSOs. Some studies are today already done on a regional scale within the framework of COMELEC.

Phase 2 & 3: Formalized Trilateral ATC calculation Process coordinated on a regional level

Nominations and updating of the used interconnection capacity becomes important in a trilateral market. The available cross-border capacity should be coordinated centrally for the region, as the market is a coupled regional implicit auction for which the ATCs serve as input.

10. Wheeling Charges

Introduction

Electricity transmission pricing refers to the cost of transmitting electricity from one location to another, typically through a network of high-voltage power lines and transformers. Among the various pricing mechanisms used in the electricity sector, wheeling charges are an essential component of transmission pricing, as these are the fees charged for using a transmission network to transport electricity. These fees are typically based on the distance the electricity needs to be transmitted over, the capacity of the transmission network, and the demand for electricity in the receiving location.

In this section, the principle of wheeling charges in the context of a regional trading platform is described in more detail, including how these are determined. In a regional market, there will be the situation where a third-party transmission grid will function as a pure transit grid and will offer wheeling services (transport of electricity) between a buyer and a seller, which are both not located in its own grid. This third-party transmission grid owner should be compensated in a fair way for offering wheeling services as there are costs linked to making its infrastructure available to host cross-border flows of electricity. In general, the pricing of cross-border electricity transmission is determined through negotiations between the countries involved, and international agreements and national laws typically regulate it.

Several different pricing methodologies can be used to determine wheeling charges. These pricing methodologies can include historic cost pricing, where the wheeling charges are based on the historical costs incurred by the transmission or distribution company; future cost pricing, where the charges are determined based on short/long-term marginal or incremental cost. In general, the specific pricing methodology used for wheeling charges will depend on the particular circumstances of the transmission network and the market conditions in which the scheme is implemented.

10.1 Principles of wheeling charges

To create a fair and competitive framework, the development of wheeling charges should be informed by certain core principles. These principles include:

- **Promoting efficiency** by providing appropriate price signals, promoting competition, and considering the link between transmission pricing and electricity trading arrangements. The methodology should also aim to recover costs, ensure transparency, fairness, and predictability, and promote non-discriminatory behaviour

- **Cost recovery** - different methodologies, such as historic or forward-looking costs, can be applied to determine the costs to be recovered. Historic cost approach always ensures that investment costs are recovered by a market participant, while the forward cost methodology only guarantees partial recovery. Therefore, this principle is essential since it lowers the risk of investment, which impacts the cost of capital.
- **Ensuring transparency, fairness and predictability**: This requires a governance regime that inspires confidence in regulatory framework and encourages new market participants. Ideally the methodology should be easy to explain and should be stable in the long-term, avoiding "price shocks".
- **Promoting non-discriminatory behaviour:** This means the equal treatment of network users who have the same impact. Consequently, this involves ensuring that the recovery of any residual costs (where price signals do not recover the full costs required) is allocated in a fair way.

10.2 Main components to be covered by wheeling charges

Wheeling charges can recover a variety of costs, including capital costs of network plant and equipment, operation and maintenance costs.

CAPEX

Historical cost approaches rely on calculating the annualized cost of network assets accurately. This must be based on an accurate assessment of the existing network's cost based on asset valuation. The asset costs can be adjusted to include the costs of system operation and maintenance. These approaches are generally effective at recovering actual system costs, though there are trade-offs in the degree to which historical costs are deemed economically efficient.

OPEX

The best way to recover operation and maintenance costs is to allow a predetermined margin on the capital costs of equipment to cover an appropriate amount on an annual basis to cover the O&M costs of each asset. Annual allowances vary by utility, but typical figures in the range of 2% to 8% of the capital cost per year are used to cover O&M costs for the entire system. This must be sufficient to cover the costs of running the centralised control functions within the transmission operator business, as well as the individual asset maintenance requirements.

10.3 Wheeling Charges Methodologies

In general, different pricing methodologies can be used for transmission pricing based on the maturity level of the markets. Transmission pricing methodologies are grouped into the following main categories:

- Historic cost approach
- Future cost approach
- Nodal pricing

Figure 52 illustrates different groups of pricing methodologies for cross-border transmission.

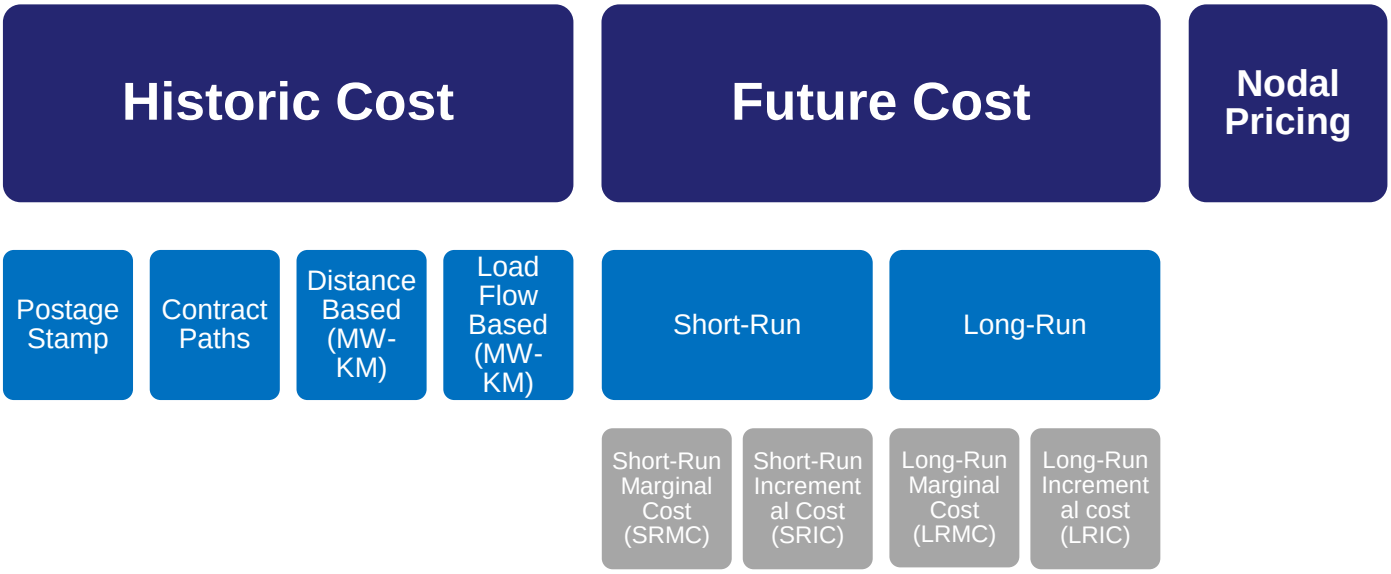


Figure 52 - Transmission pricing methodologies.

10.3.1 Historic Cost Approach

The historic cost approach covers four main pricing methodologies, and all of them are focused on recovering the costs incurred for developing the transmission infrastructure.

10.3.1.1 Postage Stamp Methodology

The postage stamp approach is a simple methodology for allocating transmission costs among users. This method assigns costs based on each user's share of the total peak load on the system, resulting in a flat transmission charge per unit of demand. This approach is often supported because, in power transactions, electrons do not physically travel from the seller to the buyer, and the system is operated as a whole.

There are several clear **advantages** of such a transmission charge methodology:

- Full historic cost recovery is ensured. As this allows investors to recover their investment costs, it solves the problem of under-investment.
- The system results in a clear, simple and stable transmission charge as each consumer pays the same charge, regardless of location. Also as the peak load is likely to increase at a relatively moderate pace in most cases, the charge is largely stable over time.
- Postage stamp pricing is most justified in systems in which there are few constraints and load and generators are fairly equally spaced. In such systems bulk power transmission costs do not significantly increase with the distance between buyers and sellers.

However, a couple of **disadvantages** can be observed:

- As the methodology does not consider the actual utilisation of the system, it does not create the correct incentives for system users. As a result, this approach to determining transmission costs can be unfair and may not promote the efficient use of the transmission system.
- Because all users face the same transmission tariff, the postage stamp methodology favours higher-cost transmission users over low-cost users. In effect, those parties engaging in high-cost transmission deals are subsidized by those who, for example, create a smaller fraction of the transmission costs because they use only a small portion of the network. This incentivizes low-cost users to avoid the existing transmission network.

10.3.1.2 Contract Path Methodology

A specific path is agreed upon for an individual wheeling transaction between two points using the contract path methodology. This 'contract path' ignores the actual path of the power flow that would occur. The wheeling customer receives a proportionate share of the asset costs, including new investment costs, along the contract path. The contract path methodology has a number of advantages. The most notable are analogous to the postage stamp method:

- Full cost recovery is possible because all asset costs along the contract path are considered, including the costs of new assets if they are required. This will allow investors to reap the full benefits of their actions, encouraging efficient investment.
- The system is simple to implement and creates a simple and stable pricing regime.

- In comparison to the postage stamp methodology, the contract path approach provides a better ability to signal the costs of individual user decisions.

However, the methodology, like the postage stamp, ignores actual system operation and any congestion issues. An energy transaction affects all transmission system assets, not just those along the contract path. This may necessitate investments in areas of the system that are not on the contract path at all. As a result, using a contract path approach is inefficient economically and may discriminate between users.

10.3.1.3 Distance Based (MW-km) Methodology

This methodology builds on the idea behind the postage stamp and contract path approaches. The distance travelled by the energy transmitted under a single transaction is either determined on a 'straight-line' basis between the network's points of entry and exit, or on a contract path approach. The transaction's MW-km is then calculated, and the ratio of this to the overall system MW-km is calculated. This ratio is then used to calculate the transaction cost.

This method, as an improvement on the postage stamp method, enjoys most of the former's advantages. The total cost of all transmission activities comprises both fixed and variable expenses, allowing investors to completely recoup their expenditures and, as a result, provide optimal investment incentives. Furthermore, the relatively basic and obvious structure of the technique makes it simple for users to grasp both the transmission price scheme and the way to be executed.

However, as with previous methodologies, the actual system operation and costs are not fully considered. Although the distance between delivery and receipt provides some indication of actual system use, it ignores the impact of Kirchhoff's Law, which states that electricity will take the path of least resistance. As a result, the distance-based approach does not provide users with the correct economic signals, resulting in reduced allocative and dynamic efficiency as well as user discrimination.

10.3.1.4 Flow-Based (MW-km) Methodology

To some extent, the load flow-based MW-km methodology reflects actual power system usage. Transmission prices are based on the percentage of the transmission system used by individual transactions, as determined by load-flow studies. To calculate the flow caused by the transaction on each circuit of the transmission system, a power flow model is used. The ratio of transactional power flow to circuit capacity is then calculated. This ratio is multiplied by the circuit cost to obtain a cost for each circuit transaction. The transaction's share of total system costs is the sum of the costs for each circuit.

The relatively simple and straightforward calculation of transmission charges using this method improves transparency. Furthermore, one of the major issues with the distance-based methodology is mitigated by forcing users to pay prices that are more closely related to their network usage and thus the costs they impose on the network, resulting in less discrimination between users and increased allocative efficiency. However, because it is based on the recovery of historic costs, this approach still fails to signal the costs of future investment caused by individual user decisions. Furthermore, it is expected that total power flows will be less than circuit capacity, implying that not all transmission system capital costs will be recovered.

This methodology has the following **advantages**:

- Considers each transaction separately and is unaffected by the order of wheeling transactions;
- Provides the correct price signal to both short-distance and long-distance entities; and
- Is intuitively logical and conceptually straightforward.

The following are some of the **drawbacks** of this methodology:

- A DC power flow approximation is used to estimate power flows, which may inaccurately estimate the extent of network use by a particular transaction (actual AC power flows in multiple transactions are non-linear)
- Attributes no merit to the transactions that generate counter flows, thereby reducing system loading.

10.3.2 Future Cost Approach

The future cost approach methodology groups four different methods that are sub-grouped in short and long-run based pricing.

10.3.2.1 Short Run Pricing Methodology

Pricing methodologies for short-run include short-run incremental cost (SRIC) pricing and short-run marginal cost (SRMC) pricing. All operating costs associated with a new transmission transaction are allocated to that transaction under the SRIC methodology. This differs from the marginal cost methodology in that the SRMC method includes the operating cost of extra transmission system use caused by a new transaction (the increase in losses and congestion costs).

The SRIC approach calculates costs using an optimal power flow model, whereas the SRMC is estimated by calculating the marginal operating cost of an extra MW of power at all points of delivery and receipt. This is then multiplied by the transaction size to generate SRMCs.

Despite the differences in calculation methods, the analysis of the benefits and drawbacks of the two methods is very similar.

A number of common **concerns** must be addressed when using the pricing methods:

- When multiple transactions occur simultaneously, it is difficult to accurately evaluate the operating costs of a single transaction, and an assessment must be made about which investment cost relates to which individual transaction.
- The application of SRIC methodology necessitates the forecasting of future operating costs. As the time horizon lengthens, such forecasts become increasingly inaccurate.
- The short-term nature of the pricing methodology causes two issues: transmission prices based on the methods are likely to be volatile, and the use of SRMC/SRIC approaches may result in underinvestment.

Furthermore, there are some **disadvantages** to using the SRMC process.

- If the individual transaction is very large in comparison to the transmission system load, the SRMC price may not be an accurate estimate of the actual extra costs imposed by the transaction because it fails to capture additional system reinforcement costs.
- Once an investment is made, future SRMC prices will fall, reducing the network owner's ability to fully recover these costs.

However, under these transmission pricing methodologies, the transmission price for a transaction is roughly equal to the actual cost imposed on the network as a result of the transaction, promoting efficiency in the recovery of transmission system costs.

10.3.2.2 Long Run Pricing Methodology

Pricing methodologies for long-run include long-run incremental cost (LRIC) pricing and long-run marginal cost (LRMC) pricing. The LRIC methodology is similar to that of the SRIC, but it takes into account both operating and investment costs. The investment costs are calculated based on the change in long-term investment plans caused by the individual transaction.

The LRMC method differs from the SRMC methodology only in that it uses marginal investment and marginal operating costs to calculate transmission costs. Future transmission expansion projects are costed to calculate the additional investment costs. The marginal investment cost is calculated by dividing this cost by the size of new planned transmission transactions.

The benefits and drawbacks of LRIC and LRMC pricing are nearly identical. It can be difficult to estimate investment costs and evaluate the costs incurred by individual transactions. Multiple transactions occurring at the same time complicate determining which investment cost is related to which individual transaction, and thus the extent to which users should contribute to new investments. This is especially true when new beneficiaries join the system later. Because future investment programs are sensitive to assumptions about future system use, transmission prices can be volatile. Concerns may also be raised about double counting of investment requirements, as these are driven by congestion costs, which are also reflected in LRMC pricing via the inclusion of operating costs.

Despite these issues, there are benefits to long-run methodologies that are not apparent with short-run methods.

- Users are responsible for the total long-term costs of their actions, including the costs of new investments.
- Prices are more stable in the long run than in the short run, allowing users to enter into long-term contracts with greater ease.

10.3.3 Nodal Pricing

The nodal pricing methodology, in which a node can be any point in the network, is the economically 'ideal' transmission pricing system because prices are calculated to accurately reflect the costs imposed on the system by the transaction. The difference in charges at each system node (which equals the transmission charge between these nodes) is determined by the marginal cost of losses and congestion at that node, i.e. the cost of injecting one additional unit of energy at that node. By not defining the path taken by flows between nodes, nodal prices eliminate the issue of which assets are used for wheeling. Prices are instead set based on the marginal impact on the system as a whole.

The nodal methodology provides a pricing signal relative to any other node on the network for any busbar or node on the network. There will be a relatively high cost for adding additional generation for nodes located in areas with surplus generation, and a high cost for adding additional load for nodes located in areas with a deficit of generation. Parties interested in trading electricity can obtain an estimate of the cost of power transfers between network nodes. Similarly, potential transmission line investors can get an idea of the potential returns on their investments in various parts of the network.

In its most basic form, the optimal dispatch problem is to:

- minimise, at each node, the cost of supply; while
- limiting line flows to their capacity limits; and
- ensuring that total demand equals total supply.

The nodal pricing system in this simple model solves the dispatch problem in a decentralized market by ensuring that the marginal cost at all supplying nodes equals the marginal benefit at all consuming nodes. As a result, users consume electricity until their marginal value of power equals the marginal cost of supply, known as the nodal price, ensuring that both allocative and dynamic efficiency are maximized.

In a more complex model that includes transmission losses and congestion costs, nodal pricing can continue to lead to optimal dispatch. Each nodal price equals the cost of providing an additional unit of electricity to the node, including losses and congestion costs. Thus, within the more complex model, efficiency is still maximized. As a result of the methodology, transmission charges vary depending on time and location. Individual nodal prices can change instantly to account for changes in supply and demand, as well as being affected by distance from the source.

Although nodal pricing methodology provides maximum efficiency benefits, a number of issues have led to the system being rarely used in practice:

- Because pricing is a function of marginal costs, nodal pricing is likely to result in under-recovery of fixed costs. This does not allow for the recovery of transmission networks' significant existing fixed costs, which result in average total costs exceeding short-run marginal costs. To recover these costs more fully, a 'second-best' pricing system must be implemented, in which economic efficiency is sacrificed for prices that allow network operators to recover all costs, including variable and fixed costs.
- The transmission system operator would need constant real-time information about all loads, generators, bids, and the condition of all equipment to set the prices. Prices would vary not only across nodes, but also over time as supply, demand, and transmission constraints changed. This causes significant instability and complexity in implementation, necessitating advanced information technology and communications, and frequently leads to countries adopting different pricing systems or simplifying full nodal pricing.

10.4 Arrangements of wheeling charges

This section illustrates different scenarios of applying wheeling charges when energy is exchanged

Scenario 1:

Scenario 1 depicts the situation when energy exchange takes place between two countries (countries A and B).

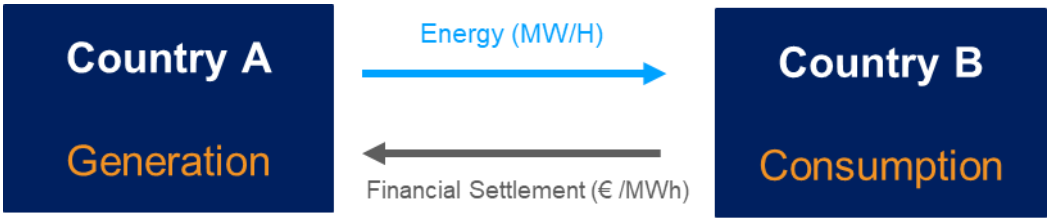


Figure 53 - Arrangement of wheeling charges - Scenario 1.

This arrangement can be described with the following characteristics:

- Bilateral trade/agreement without wheeling charges, however, a bilateral agreement can define the separate fee for using the system on top of the electricity price (€/MWh).
- Country A sends energy to Country B as per the bilateral agreement.
- Country B pays Country A for the energy delivered.

Scenario 2:

Scenario 2 illustrates cross-border trade between 3 countries.

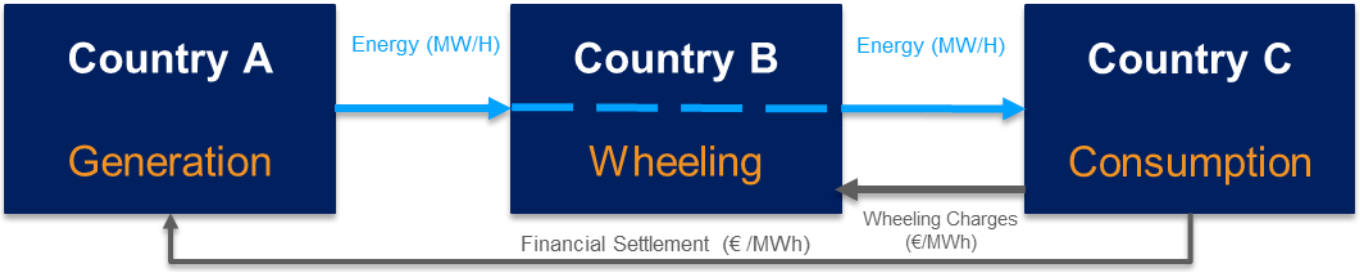


Figure 54 - Arrangement of wheeling charges - Scenario 2.

- The trilateral agreement defines wheeling charges for the transit system (Country B) per unit (€/MWh).
- Country A sends energy to Country C using the transmission infrastructure of country B as a wheeler (MWh)
- Country C pays Country B wheeling charges for using its system (€/MWh);
- Country C pays Country A for the energy delivered (€/MWH).

Scenario 3:

Scenario 3 illustrates trade arrangement between two regions using 2 or more country infrastructures (> 3 countries).

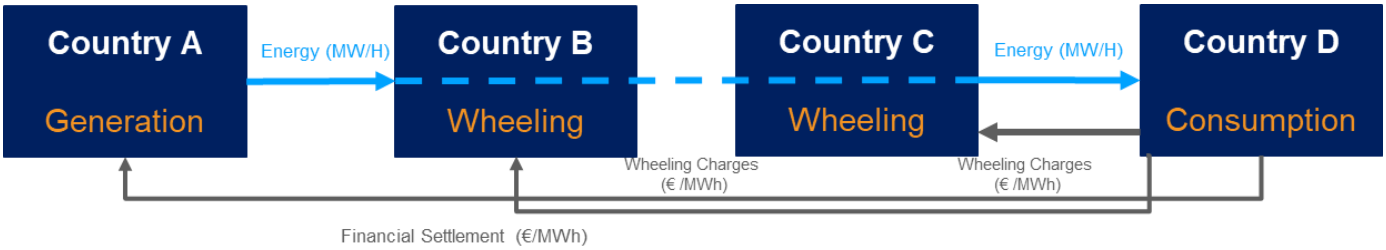


Figure 55 - Arrangement of wheeling charges - Scenario 3.

- The multilateral agreement defines wheeling charges for the transit systems (Country B and C) per unit (€/MWh), according to the pre-agreed methodology;
- Wheeling charges for B and C can be different, depending on the pricing methodology (considering the scale of each system);
- All the arrangements stated in scenario 2 will apply to scenario 3, with the main difference of D paying separate wheeling charges (€/MWh) to each country in between;

10.5 International Practice Examples

10.5.1 SAPP Transmission Pricing

The original South African Power Pool (SAPP) wheeling charge was based on the postage stamp principle. This applied a 7.5 per cent scaling factor to the value of energy wheeled through one country, or a 15 per cent scaling factor if the energy was wheeled through two or more countries, split between the two. The buyer paid for the increase (or decrease) in losses supplied by the energy seller.

In 2003, this method was changed to a flow-based MW-km methodology in which the charges are determined by the proportion of assets used for wheeling. The use of assets for wheeling purposes is determined using load flow studies to calculate the proportion of total available capacity on each contract path accounted for by a wheeling transaction. The proportion of the total value of the assets affected by the wheeling transaction is then used to calculate wheeling charges. This method works well in situations where the counterparties to each bilateral trade are identifiable, i.e. where the "start" and "end" points of each transaction are known. With the evolution of SAPP's trading platforms to include markets other than long-term physical bilateral trades, an alternative methodology was recognized as being

required to allow transmission charges to be applied to trading parties who did not have a defined counterparty to a given trade.

10.5.2 Scandinavian transmission pricing

The transmission pricing methodology used in Scandinavia is based on a point or stamp tariff system, in which producers and consumers pay a fee for the kWh injected or drawn from the system. The transmission price is unaffected by the distance or transmission path between the seller and buyer. The actual transmission price is determined by where (what point in the grid) and how much power is injected or consumed. Individual TSOs determine the charges, which are paid to the TSO to which the connection is made. Each member country has a transmission tariff that must be paid within the country. In Norway, for example, the transmission tariff is divided into three parts: a fixed component, a load component, and an energy component.

- The load or capacity component takes into account congestion and compares prices between an unconstrained and a constrained pricing model.
- The energy charge takes into account transmission losses; if the transaction lowers losses, the energy charge is negative. This provides long-term locational signals for tying generation and demand together.
- The fixed component takes into account customer-specific costs as well as a portion of the network's other fixed costs, such as operation and maintenance.

The allocation of internal transmission charges between generation and demand differs across the countries: Sweden 25:75; Norway 35:65; Finland 12:88; Denmark 2 - 5:95.

Congestion costs are recovered in addition to transmission tariff costs through congestion rents, which are the income or costs resulting from price differences between areas. A separate agreement divides the congestion rent from the interconnectors among the four TSOs.

10.5.3 ENTSO-E

National energy regulators in each European Union member state implement the regulatory arrangements that apply across Continental Europe. Regulations must adhere to policy criteria established by the European Parliament and implemented through European Directives and Regulations. A number of bodies representing regulators and transmission system operators have been established to help with this process in relation to electricity networks.

The mechanism for cross-border trading is called Inter Transmission System Operator Compensation (ITC).

ENTSO-E operates the ITC mechanism, through the ITC Agreement, and the Agency for the Cooperation of Energy Regulators (ACER) oversees and reports on the implementation. The Regulation (838/2010) established an ITC fund to compensate TSOs for the costs incurred hosting cross-border flows. The fund aims to cover the costs of making infrastructure available, for cross-border flows and the losses as well.

TSOs participating in the mechanism either contribute to the fund, or are compensated, according to their net imports / exports. Note that this method is significantly different from previous iterations of the ITC, which made use of a Transit Key and Transit Horizontal Network.

The steps for determining the revenue requirements, levels of compensation and payment (contribution), and the values of these components in 2011, are as follows:

1. **Determine costs to recover (Compensation Fund) associated with c**ross-border infrastructure – the assessment of costs should be based on forward looking Long Run Average Incremental Costs (LRAIC). This method and assessment is currently under review; in the meantime a figure of EUR 100 million per year is used. (EUR 100 million)
   - Losses – based on a With and Without Transits (WWT) model and the value of losses allowed by national regulators. (EUR 125 million).
2. **Determine the compensation owed to each party from the Compensation Fund according to:**
   - Cross-border infrastructure – the use of two factors; Transit Factor and Load Factor. (EUR 100 million)
   - Losses – WWT model and national loss values. (EUR 125 million)
3. **Determine the contribution to the Compensation Fund from each party based on:**
   - Net flows (the absolute value of net flows onto and from national systems as a share of the sum of the absolute value of net flows onto and from all systems) (EUR 205 million); and
   - Perimeter fees – a transmission use of system fee levied on all scheduled imports and exports from perimeter countries, in EUR/MWh. The fee is calculated by ENSTO-E each year in advance. (EUR 20 million)
4. **Calculate the net financial result for each party (i.e., compensation – contribution).**

The Regulation (838/2010) specifies that the method used to determine the cross-border infrastructure fund should be based on forward-looking Long Run Average Incremental Costs (LRAIC).

- "Long-run" implies that future investment costs should be included; and
- "Forward-looking" implies that replacement costs, rather than historic costs, should be used.

Rather than recovering historic costs, the method will signal future investment costs. Long-run pricing methods have the advantage of exposing users to the full long-term costs. Disadvantages can include the difficulties associated with estimating future investment costs, as well as the price volatility that can be caused by future investment scenarios.

10.6 Process of setting regional transmission tariffs

The following process describes the main steps of setting regional transmission tariffs, which include, but are not limited to the following:

1. Determine regional transmission assets and assets value.
2. Calculate annual revenue requirements for each Transmission System Operator (TSO) asset used for regional bilateral trading.
3. Calculate the transmission tariff for the consumer of each regional bilateral trade.

A similar process has been applied to determine the transmission tariff for the West African Power Pool (WEPP), as well as for the South African Power Pool (SAPP).

10.6.1 Determine regional transmission assets and asset value

The Regional Transmission Network is all interconnected assets greater than a certain kV voltage level, as agreed by Med-TSO members, in the region.

Interconnected assets include all regionally interconnected assets, even if two or more synchronous areas exist. All transmission elements greater than a predefined kV level, whether used for regional trading or not, are interconnected assets in each TSO. The asset database will include physical data for each network branch, such as line lengths, circuit counts, line types, tower types, voltages, switchgear type and voltage, transformer rating and voltage, and so on. The TSO must provide the commercial operating date of each asset. The Med-TSO transmission planning unit must agree on a replacement value for each element in the regional transmission asset database. Every five years, the replacement values are updated.

The method for calculating annual asset value is the Depreciated Replacement Cost. This method recognizes that the replacement of specific parts of the transmission line (transformer, switch gear) will be at the current asset value.

Typical values used for asset values are:

- Transmission lines - 50 years

- Substation equipment - 25 years;
- Substation civil works - 50 years; and
- Transformers - 25 years.

A single asset value of 30 years can be chosen for simplicity. Future, approved investments are frequently included in addition to the above methods to allow the transmission network to build equity for investment plans over the next 5 or so years. Loan repayments are included in the revenue base, so future investments are also bankable.

10.6.2 Calculate annual revenue requirements for each TSO asset used for regional, bilateral trading

There are two main cost components to be recovered, i.e., CAPEX and OPEX. To define the annual revenue requirements, the following formula can be applied.

$$\boldsymbol{RR_t = C + D + Tax + P,}$$

Where,

- RR_t – required revenue for the period t,
- C – annual OPEX,
- D – depreciation,
- Tax – taxes,
- P – return on assets, where

$$\boldsymbol{P = I * WACC,}$$

Where,

- I – annuitized transmission asset value,
- WACC – the weighted average cost of capital.

$$\boldsymbol{WACC = \left(\frac{E}{V} \times Re\right) + \left(\frac{D}{V} \times Rd \times (1 - Tc)\right)}$$

Where,

- E - market value of equity,
- D - market value of debt,
- V - E+D,
- Re - cost of equity,

- Rd - cost of debt,
- Tc - corporate tax rate,

Ideally, all countries should use the same WACC values for regional interconnector asset value calculation.

Re, which is the cost of capital, can be calculated using Capital Asset Pricing Model (CAPM).

$$\boldsymbol{CAPM = r_f + \beta\,(r_m - r_f)}$$

Where,

- rf - risk-free rate,
- β – Beta,
- r_m - return on the market,
- $(r_m - r_f)$ - market risk premium

OPEX are to be recovered by allowing a predetermined margin on the capital costs of equipment to cover an appropriate amount on an annual basis to cover the O&M costs of each asset. Annual allowances vary internationally and are typically in the range of 2%-8% of the capital cost per annum to cover O&M costs for the system as a whole.

10.6.3 Calculate the transmission tariff for the purchaser of each regional bilateral trade

The sum of the individual asset costs for each bilateral charge is paid by the consumer of the regional bilateral trade. The formula below represents the Postage Stamp pricing:

$$Rt = TC * \frac{P_t}{P_{peak}}$$

Where**,**

- R_t - transmission price for transaction t,
- TC - total annuitized transmission charges (including CAPEX, OPEX),
- P_t – the power of transaction,
- P_{peak} - system peak power,

The costs are charged at a rate per kWh based.

10.7 Recommendations

Phase 1

Phase 1 does not require any changes related to wheeling charges compared to the current situation. The exchanges in this phase will still be bilateral between neighbours, with electricity handed over at the borders. There are no regional wheeling services offered by a third-party TSO and therefore no compensation for the use of its grid. So as there is no transit country, there is also no need for the implementation of regional wheeling charges.

Phase 2

Wheeling charges become a critical element in phase 2 of the market design, as an implicit trilateral day-ahead auction will be created. As all three TSOs of the respective countries participate to the auction, the transmission grid of Algeria will be used for wheeling power, in case there are commercial exchanges between Morocco and Tunisia. An adequate and fair wheeling arrangement to compensate the Algerian TSO for the use of its grid for this transit, is therefore required.

Based on the nature of the Med-TSO regional electricity market, it is essential that in the implementation of the wheeling framework in Phase 2, a balance is found between economic efficiency, methodological simplicity, and transparency in the rate structure, while ensuring full cost recovery. **It is therefore recommend to use in this stage the Postage Stamp methodology in Phase 2 of the development of the regional trading platform.**

Methodology: Introduce Postage Stamp pricing in tariff-setting methodology

- Define the exhaustive list of existing transmission infrastructure (including transmission lines and substations with different voltages)
- Define the value of transmission infrastructure
- Determine the annual OPEX
- Define the peak and off-peak load
- Pre-define the volume of cross-border energy flow considering the historical data
- Determine the system losses volume and apply the average electricity price to define the value of system losses

Payment

It is advised that the consumer (the buyer) will pay for wheeling charges (as well as for losses (subject to bilateral contract) on top of the bought electricity.

Agreement

Developing a multilateral agreement (Inter-TSO Agreement) of regional trading is essential to enable three interconnected systems to exchange energy using cross-border interconnections. The agreement should be the framework document stipulating the main terms and conditions and setting the adequate pricing methodology.

Phase 3

As the market evolves and also other players will participate in the cross-border regional market, the wheeling charge arrangement must stay compatible. The postage stamp methodology can still be used in Phase 3, but to have a more fair compensation mechanism, a more advanced methodology like the Distance Based Methodology would be recommended. In the end it is the cooperation between the three different TSOs that will determine how advanced the wheeling charge calculation methodology can be. It is always a trade-off between complexity and effort of implementation and fair compensation of the use of the grid.

11. Treatment of transmission losses in cross-border transactions

11.1 Introduction

As losses arise when electricity flows through a transmission grid, the amount of electricity that is injected into the grid by the producer (seller) will not arrive completely at the node of the consumer. In a regional trading arrangement, it is specifically important to compensate the losses in the grid of the third-party TSO, that is wheeling the power between different zones. In the case of the Maghreb region, it would be the losses that arise in the Algerian grid, when there is a commercial exchange between Tunisia and Morocco. A clear framework on how these losses are taken into account and compensated, should be included in the trading scheme.

Two aspects need to be considered:

1. **Estimation of the size of the additional losses caused by the inter-regional trade**
2. **Method of compensation** (in-kind or financially)

Estimation of the losses

The losses arising from generation and demand associated with specific wheeling transactions should be calculated. These transmission losses can be estimated by performing load flow studies and would result in the establishment of

'Loss Factors'. These could be calculated for different operating conditions of the transmission grid (seasonal, peak, off-peak, …). If the load flow pattern would change as a result of changes in the network topology, the losses would need to be recalculated. These loss factors should be calculated and published ahead of time so they can be used in the settlement process..

Method of compensation

Mainly two options can be considered to compensate the network losses.

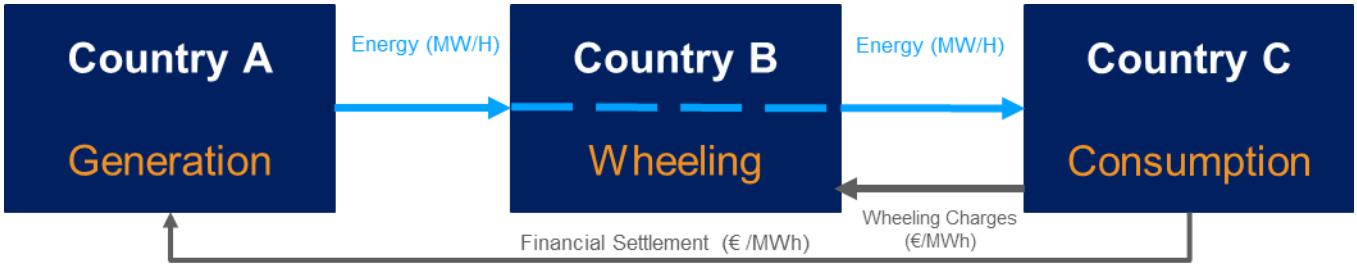


Figure 56 - Concept a wheeling through a transit country B.

I. **In-kind compensation:** Country A injects additional energy to cover the loss of Country B considering the loss factor of the wheeling country. E.g.
   - Contracted energy volume between A and C = 100 MWh;
   - Loss factor of B = 5%;
   - A injects 105 MWh to deliver the contracted volume to C;
   - C pays for 105 MWh to A, while compensating the losses to B.

II. **Cash settlement:** Using an ex-post approach to losses based on the meter volumes on the borders of A-B and B-C. Parties agree that after each settlement period (e.g. month) C pays B for the losses that occur during the energy transaction. E.g.
   - Contracted energy volume between A and C = 100 MWh;
   - Injection = Withdrawal = 100MWh on the borders of A-B and B-C;
   - After the settlement period, based on the meter readings on the borders, losses = 5MWh;
   - C pays B for losses (MWh) by applying charges ($/MWh).

11.2 International Practice Examples

11.2.1 SAPP Treatment of Network Losses

The energy purchaser is responsible for the repayment of energy losses that occur in the transmission networks of SAPP member utilities as a result of wheeling services provided to sellers and buyers of energy. SAPP initially used an "in-kind" arrangement for loss repayment, in which the energy buyer purchased more energy from the seller to compensate the wheeling utility for the energy lost in its network. As part of the scheduling process, the time for repayment of this energy was agreed upon. The possibility of cash settlement of losses is also permitted under the SAPP Operating Members' Agreement, and a method for calculating the financial compensation for losses was developed in 2015. The SAPP Coordination Centre computes the incremental transmission losses caused by wheeling trades. SAPP continues to use transaction-based loss factors calculated from load flow studies performed with and without each wheeling transaction. According to the currently approved methodology, losses are repaid based on the SAPP Market Clearing Prices for the previous year, which are allocated by season (winter, summer) and time of use (differentiated between peak, off-peak and standard periods).

11.2.2 ENTSO-E

As already indicated in the previous section, within the framework of ENTSO-E the Inter-TSO Compensation mechanism also foresees to compensate for transmission losses resulting from hosting transits.

1. **Determine costs to recover (Compensation Fund) associated with Losses –** based on a With and Without Transits (WWT) model and the value of losses allowed by national regulators.
2. **Determine the compensation owed to each party from the Compensation Fund.**
3. **Determine the contribution to the Compensation Fund from each party.**
4. **Calculate the net financial result for each party (i.e. compensation – contribution).**

11.3 Recommendations

It is recommended that network losses be recovered outside the transmission charging methodology, using loss factors that would be applied to volumes traded in the electricity market at the settlement stage. This is because transmission charges are primarily intended to recover the investments and fixed operating and maintenance costs of network

assets. In contrast, loss charges are variable and depend on the amount of power generated and consumed on the network in various operating scenarios.

For energy purchases made on the market platform, a loss factor should be applied at the point of connection of the demand or generation that is contributing to the trade. These loss factors should be calculated and published ahead of time so they can be used in the settlement process. The loss factors must be published ahead of time so that network users can understand the impact of their buying and selling decisions on the transmission networks.

Phase 1

As for the wheeling charges, there is no need in Phase 1 to introduce a framework for compensation of losses, as all trades are done bilaterally.

Phase 2 & 3

As of Phase 2, an agreement has to be reached on the method for the compensation of the losses (in-kind or financially) caused by the transit of additional flows as a result of commercial exchanges.

Each transit country needs to have a loss factor (%) for transmission system that will be applied to each bilateral transaction that transits this country. Therefore, every contractual agreement on cross-border trade will have predefined loss factor.

Line Loss Factors are multipliers which are used to scale energy consumed or generated to account for losses on the transmission network. Therefore, for each system loss factor can be calculated annually, ex-post to use it for the following year's transactions.

Transmission losses are paid as the TSO loss factor multiplied by the regional bilateral trade times the price for the energy lost

$$TSO\ transmission\ losses\ revenue\ (k) = \sum_{i=1}^{m} Transmission\ flow\ for\ bilateral\ trade\ (j) * \alpha\ (j) * energy\ price$$

Where,

α (j) is the loss factor for bilateral trade j

12. Compensation of involuntary flows

12.1 Introduction and general description

Electricity moves freely around the interconnected grid, taking no account of borders between countries. Under normal operating conditions there will be unintentional flows of energy between the grids of the three respective countries. This is related to the fact that all installed interconnections are AC interconnections , which makes it difficult to control precisely the cross-border flows and align them with the programmed exchange schedule (compared to DC interconnections). Moreover, these involuntary flows can also be caused by instrument and control errors, improper control settings, inadequate generator response time, fluctuations in demand, etc. The involuntary flows need therefore to be monitored and accounted for properly, certainly within the framework of a regional trading platform. It is normally the responsibility of the TSOs to try to align the programmed exchange schedule and the real physical flows on the border as much as possible. The difference that still occurs are the involuntary flows.

Today the involuntary flows are compensated “in-kind” with a compensation program that is set up in a bilateral way between Algeria and Morocco and Tunisia and Algeria, respectively. Involuntary flows are measured and then a compensation schedule is agreed during which electricity will be scheduled to flow in the opposite direction to cancel out the occurred involuntary exchanges.

Table 10 - Definition of a compensation program.

COMPENSATION PROGRAM
Compensation of inadvertent deviation is performed by exporting to/ importing from the interconnected system during the compensation period by means of constant power within the same tariff periods as when they occurred.

In order to have a well-function regional trading platform, the coordination of this involuntary flow compensation mechanism should also be aligned with the different phases of the market platform development.

it is still advised to perform the compensation of involuntary flows “in-kind”. Certainly, in the early stages of the market development when liquidity is still low and clear and transparent price formation is not yet reached. It is however

important that the compensation of involuntary flows is done during the same hour (or period) as they occurred. Specifically, because with the implementation of a market that has specific prices on an hourly basis.

- It is clear that the price of a electricity will be higher during peak hours than off-peak hours.
- It is therefore advised that the involuntary flow compensation schedule has the same granularity then the products Methodology that are priced on the market, namely hourly granularity.

To encourage grid operators to follow the commercial exchange schedule as much as possible, it could also be possible to evolve to a financial compensation of involuntary flows. This can also be done gradually, where involuntary flows under a certain threshold are still compensated in-kind, but that the flows above this threshold must be paid for. This can initially be a fixed at a regulated price to penalize extreme high involuntary exchanges. This approach is currently used in the GCCIA region. Future evolutions could include the development of a regional imbalance market.

12.2 Recommendations

Phase 1

Involuntary flow compensation can remain as it exists today using the “In-kind” bilateral compensation scheduling mechanism. However, it is recommended to have the same ‘granularity’ in the compensation schedule as in the contracts for bilateral electricity exchange (24 hours in a day). Concretely, this means in that an involuntary flow volume that occurred during a certain hour, should be compensated during the same hour of a similar day (weekday vs. weekend for example). As the commercial exchanges remain bilateral in this phase, the compensation schedule planning also remains bilateral.

Phase 2

As the market evolves and the volume of commercial exchanges increases, it could be imaged to move from an ‘in-kind’ compensation mechanism to a financial compensation scheme, where the involuntary flows are paid for financially. A combination of ‘in-kind’ compensation for volumes under a certain threshold value and a financial compensation for the volume above a certain threshold value (penalty scheme) could also be envisioned. Such a hybrid system is for example used in the GCCIA area and would ensure that TSOs try to follow the scheduled exchange program as much as possible, otherwise they would need to be penalized with this financial penalty scheme.

Phase 3

In Phase 3, independent power producers and consumers will be able to participate in cross-border transactions. They will keep their balancing obligation towards the national TSOs and imbalance settlement for these independent entities continues to fall under the respective national rules. However, the regional imbalance (imbalances between the three countries) remains the responsibility of the TSOs and can be similar as in Phase 2.

13. Electricity Market Monitoring, Integrity and Transparency

13.1 Introduction

Transparency is one of the most important aspects to ensure good market behaviour and operation. Transparency means equal access to market critical data, sharing of market-critical information The main objective is to prevent market abuse, limit market power and provide a trusted level playing field for all. This also includes sufficient market monitoring / surveillance of the market. Market monitoring is critical to ensure good market behaviour and operation in a competitive electricity market environment. This will in turn increase liquidity and build trust in the system.

The market monitoring function can be performed by a market regulatory body that has access to the database of the Market Operator, or by the Market Operator under the potential supervision of the regional regulatory entity. Market surveillance activities result in reports covering at least the following three main issues:

- Evaluation of the market pricing,
- Evaluation of the individual participants' behaviour, and
- Global market status/trend through fundamental figures with a potential influence on pricing.

Through these reports, non-compliance with the regulations will be detected, as well as market abuses and/or abnormal behaviours.

Transparency is usually coupled with the principle of non-discrimination between all market participants whatever their categories. This latter one is imposing an non-discriminatory access to the power system, equal market rules between all market participants, equal wheeling charges and market fees, same procedures, etc. These elements are used in the design of the regional trading at all its stages.

13.2 Examples of regional market monitoring

13.2.1 The European Regulation on Wholesale Energy Market Integrity and Transparency

One of the most known and comprehensive market monitoring regimes is REMIT, the European regulation to guide market monitoring (the Regulation on Wholesale Energy Market Integrity and Transparency). Its goal is to increase integrity and transparency of wholesale energy markets to foster open and fair competition for the benefit of final consumers of energy. REMIT aims to ensure on European level:

1. Confidence in the market integrity
2. Prices that represent a fair and competitive interplay between supply and demand
3. No profits are drawn from market abuse
4. Provides for monitoring of the wholesale energy markets by the authorities
5. Require that all relevant stakeholders cooperate

In the EU, ACER is at the cornerstone of REMIT implementation and market monitoring activities at regional level. ACER collects all orders and transaction in EU and perform market monitoring to detect market abuse. In addition, ACER ensures that REMIT is applied in the same manner across the Union by coordinating and assisting the actions of NRAs' Market Monitoring section/department.

ACER has also role to issue non-binding guidance in order to ensure that National Regulatory Authorities (NRAs) carry out their tasks under this regulation in a coordinated and consistent way. In order to make compliance with REMIT as smooth as possible, ACER is publishing and updating all relevant documentation on the REMIT Portal.

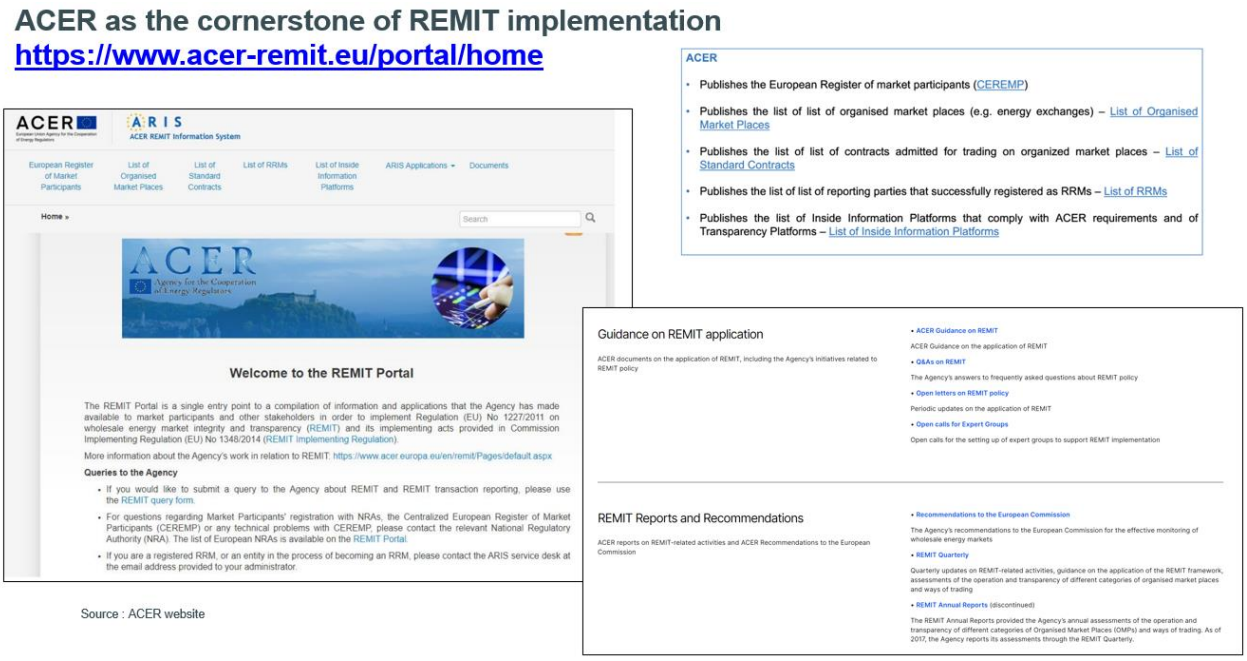


Figure 57 - Relevant documentation of REMIT is published by ACER on the REMIT Portal.

Standard data have also to be reported to NRAs and ACER :

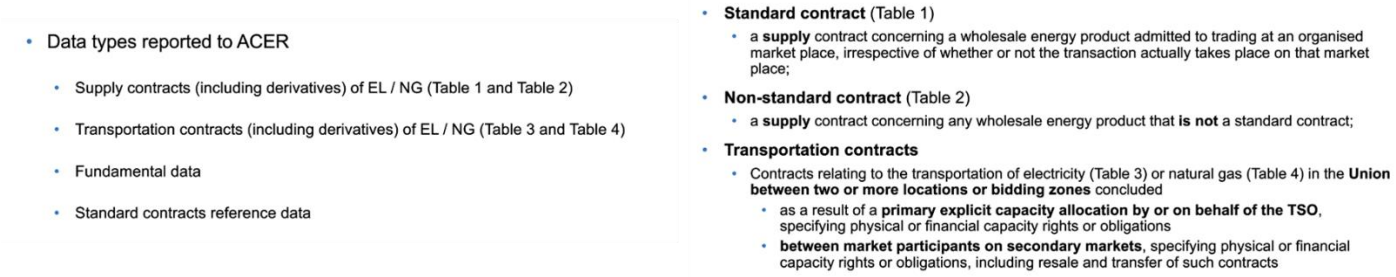


Figure 58 - Standard data to be reported to ACER and NRAs.

Each power exchange has requirements for performing market surveillance as prescribed in REMIT, marketplace license and other regulations. The REMIT regulation gives them the task of performing market surveillance and reporting cases to NRA(s) of the country where the case is taking place, to start the potential sanctioning procedure. All European power exchanges have market surveillance units/departments that monitor the organised wholesale markets, investigate suspicious behaviour, make decisions on whether a specific case shall be sent to the relevant regulator according to REMIT and make the decisions on whether a specific case as a significant breach of another law. The two main market abuses prohibited by REMIT are the use of insider information and market manipulation:

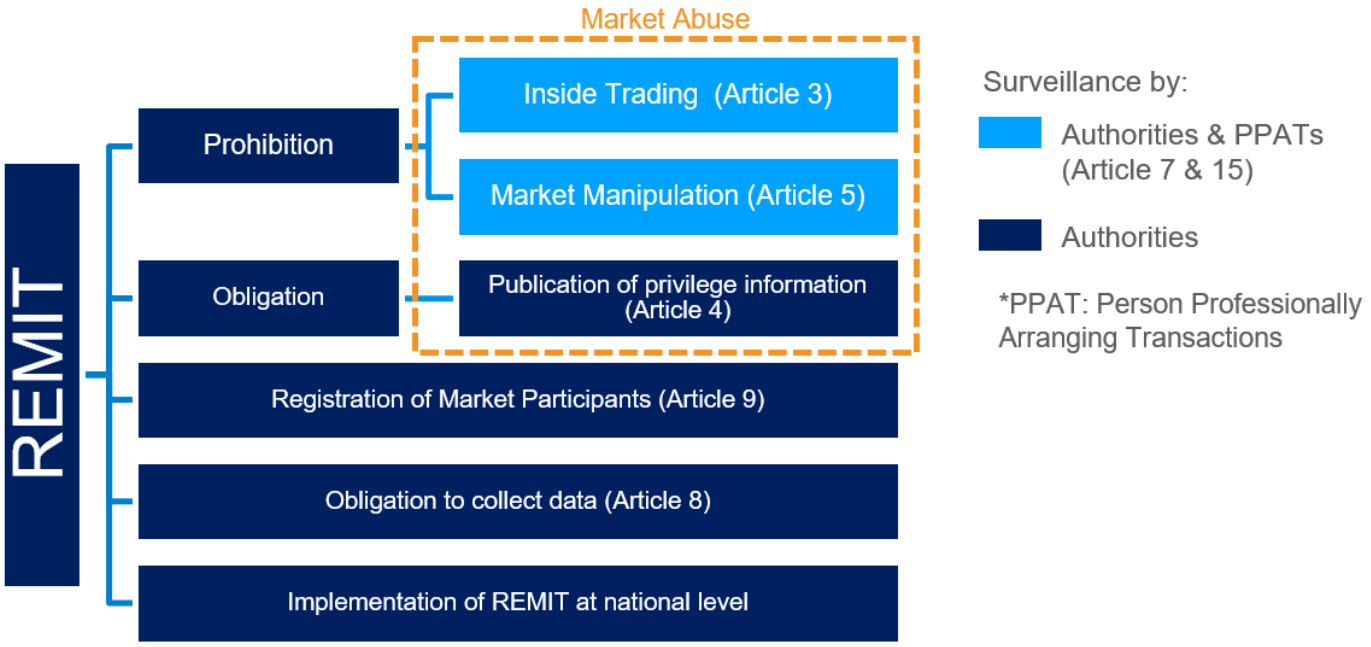


Figure 59 - Overview of Market Abuse regulation included in REMIT.

Privilege information is information of a precise nature which has not been made public, which relates, directly or indirectly, to one or more wholesale electricity market products and which, if it were made public, would be likely to significantly affect the prices of those wholesale electricity market products. Whether or not information can be regarded as inside information must be assessed on a case-by-case basis. As a starting point, if a normal rational trader would assess that it would be possible to profit from trading on the information, that is a good indication that the information could be considered as being significant, and therefore may constitute inside information.

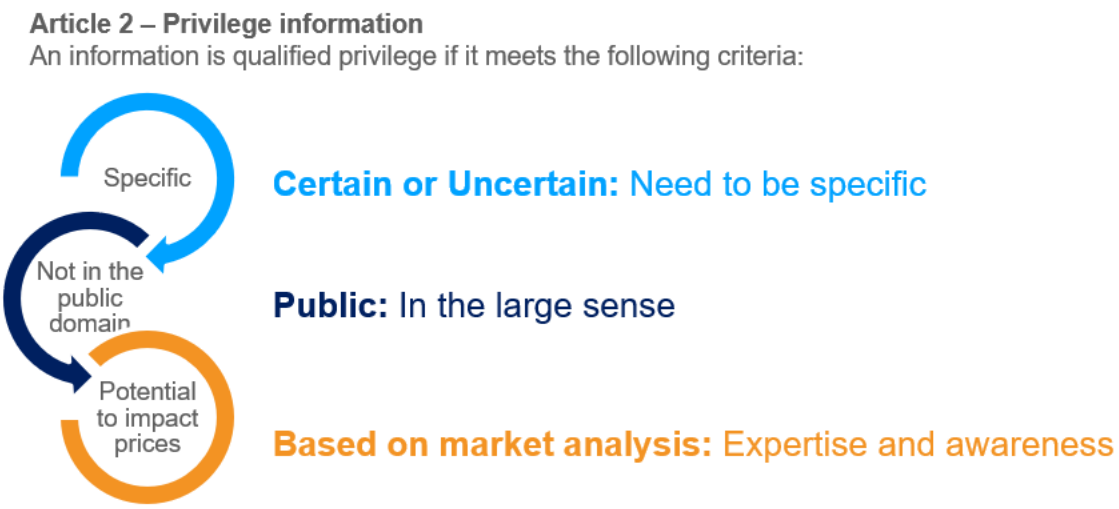


Figure 60 - Summary of Article 2 and 3 (REMIT).

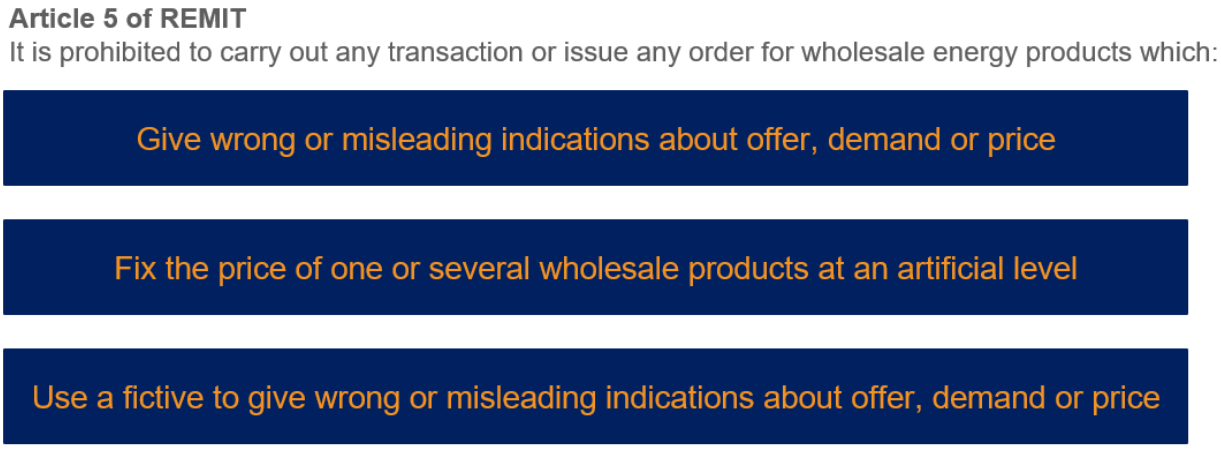


Figure 61 - Overview of Article 5 (REMIT).

13.2.2 The market surveillance at SAPP

The trading volumes on the SAPP markets have been growing since 2009 with the introduction of the Day Ahead Market. The SAPP market design, similar to other markets, has an inherent risk of market manipulation and abuse. With increasing volumes comes an increasing need for market surveillance and monitoring. SAPP has established a Markets Monitoring & Surveillance Team (MMST) within the SAPP Co-ordination Centre[3]. This unit monitors and surveys the SAPP markets with the main purpose of detecting incorrect behaviour of market participants leading to market abuse.

The main tasks of the SAPP Markets Monitoring & Surveillance Team are to:

1. Conduct investigations of possible breaches on laws and regulations governing the SAPP market operations
2. Ensure that all participants within the market benefit from the same level of protection, regardless of type of participant, country and size
3. Continuously monitor the SAPP trades and price development, and ensure that the members adhere to the rules as set in the SAPP Market Book of Rules and the Participation Agreement
4. Keep track, check and report anomalies on bidding behaviour by participants in the SAPP trading market based on available information.
5. Collect information and monitor that the participants keep the Markets trading rules for submission of information e.g., bilateral schedules, transmission capacities etc.
6. Monitor and ensure that participants do not get and misuse inside information that is not publicly available or publicly known in the market but can influence the prices in the market.
7. Monitor that participants do not disclose information to persons not concerned before submission of such information to the market.
8. Monitor that participants do not on purpose contribute to move prices beyond real market value.
9. Ensure good market behaviour by monitoring and controlling of the key market components highlighted in Section 2 of these Terms of Reference.
10. Issue regular reports on market performance to SAPP MANCO, RERA and the MSC.

[3] https://sapp.co.zw/market-surveillance

11. Any other task as assigned by the SAPP from time to time.

13.2.3 Lessons learned and main recommendations

International examples show that full transparency is very important and necessary for market credibility, but full transparency at initial stage of regional market is less critical when third parties have not yet access to the regional exchanges. Monitoring principles should be established as from the opening of the regional trading platform to gain in experience and trust into the market design, even it becomes more complex as the number of participants and number of transactions increase. Participation being crucial for the existence of an emerging market, the surveillance rules should not discourage participation but ensure trust into the market procedures and way of functioning.

Procedures need to be put in place to govern the data that the market monitoring unit is allowed to request from market participants, including protection measures for confidential information. Tip-offs from market participants need to be facilitated (i.e. a whistle-blower function).

When developing market monitoring, integrity and transparency processes, the following guiding principles should be used : ease of implementation ; targeting the most efficient system and not overshooting the Maghreb needs ; allowing national control from the designated regulatory entities even in a context of increasing regional cooperation ; flexibility of the market monitoring, integrity and transparency processes to allow required changes of the time, in parallel to the changes of the trading design.

The market monitoring processes must be able to supervise, evaluate and analyse the conduct of the market participants, in order to detect behaviours or activities that indicate:

a. Non-compliance with the regulatory framework, agreements and market rules
b. Potential market abuse
c. Issues and inefficiencies of the regulatory framework, agreements and market rules
d. Issues and inefficiencies in the design and structure of the trading platform and trading operations, including undue influence over the local systems' operations by any TSO or group of TSOs.,

In conclusion, we recommend a stepwise approach involving all key national and regional stakeholders on market monitoring, integrity and transparency topics, to allow them to progressively absorb the information and best practices for efficient trading.

14. References

[1] Med-TSO, "Deliverable 3.1.C - Part 2: Governance, Regulatory, Market and Transmission Network Concepts," 2023.

[2] Med-TSO, "Deliverable 3.1.B - Part 1: Benchmark Analysis," 2022.

[3] EFET, "Individual Power Purchase Agreement for Corporates and Utilities," June 2019. [Online]. Available: https://www.efet.org//files/documents/EFET%20Power%20Purchase%20Agreement%20Full%20Version%202019%20-%2004.11.2021.pdf.

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