

# **Deliverable 2.2.A**

## **“Candidates for Pilot Projects”**



**EC DGNEAR - GRANT CONTRACT: ENI/2018/397-494**

**“Med-TSO—Mediterranean Project II”**

**Task 2.2: “Elaboration of zonal target regulatory framework  
and tentative roadmap ”**



Med-TSO is supported by the European Union.

This publication was produced with the financial support of the European Union. Its contents are the sole responsibility of Med-TSO and do not necessarily reflect the views of the European Union.



## *Table of contents:*

1	Executive Summary .....	3
2	Background and Methodology .....	4
3	Analysis of potential zones.....	5
4	Maghreb Region (TUNISIA, ALGERIA and MOROCCO) .....	8
4.1	Historical partnership and Memorandum.....	8
4.2	Description of the electricity systems .....	9
4.3	General regulatory electricity sector.....	10
4.4	Schemes of the electricity sector .....	10
4.5	Description of High Voltage interconnections and infrastructures .....	11
5	Initial perspective of TSOs within Pilot Zone.....	15
5.1	STEG perspective .....	15
5.2	SONELGAZ perspective.....	16
5.2.1	Economic aspects:.....	17
5.2.2	Technical aspects:.....	17
5.3	ONEE perspective .....	18
6	Joint proposal:.....	20
7	Appendices: detailed proposals by Company .....	22
7.1	STEG.....	22
7.2	Sonelgaz.....	23
7.3	Common presentation of commercial and economic aspects:.....	25



## 1 Executive Summary

One of the main result expected by the Mediterranean Project II (MPII) is the establishment of a complete set of Rules for progressing in the harmonization of regulation in the Mediterranean region for power system rules ( activity 2.1 “Technical rules”) and a proposal for a fast track implementation project (Pilot Project) through a “zonal approach” considering a subset of rules in selected zones of the Mediterranean (activity 2.2 “Elaboration of zonal target regulatory framework and tentative roadmap”).

The activity 2.1 completes and complements the work already accomplished in Mediterranean Project I, progressing with further identification and proposal for technical rules necessary for developing and operating the power systems, in the perimeter of the network codes, efficient management of the system services and common process for the connection procedure (Deliverables 2.1A Med Grid Code Chapter on System Services and 2.1B Connection Procedures).

The activity 2.2 focus on the implementation of a sub-regional or zonal approach proposing a practical application of harmonization for a sub-set of technical rules in selected priority sub-regions where the harmonization process could go faster.

The objective of the present deliverable 2.2A Potential Candidate Pilot Zone Definition is to define the Pilot Project scope while the subsequent Deliverable 2.2B Road Map for Pilot Zone implementation will define the structure and the development activities of the related project.

An initial list of potential zones where Pilot Projects may be launched has been developed according to a two-dimensional analysis (geographical and regulatory-based).

The identification of pilot zones is based on two dimensions: a geographical aspect, (limited zone in the Mediterranean region where a set of issues are selected and developed for tentative roadmap for practical implementation) and regulatory (considering the current legislative framework in each region). In this context, the real existence of interconnections between countries is necessary for the proposal zone in the short-term.

Through a participative approach among its members, the present deliverable identifies several proposals of significant zones, which have been discussed in detail in chapter 2.

Considering the geographical dimension, four zones (set of power systems) within Med-TSO perimeter were considered as potential candidates to be analyzed and object of developing a pilot project for practical implementation of a harmonized initiative.

For those four potential zones, those aspects, which could be most likely to be tackled in terms of regulatory advance and harmonization, have been preliminarily identified for the corresponding power systems.

After a discussion on technical and practical aspects and considering the short-term horizon for the project implementation, Maghreb area (i.e. Morocco, Algeria and Tunisia - zone 1A reduced) was selected as the first pilot zone.



In the meanwhile, it was considered that future work should assess the incorporation of Libya (zone 1A complete, depending on the studies about the power system integration) and consider, as further scenario, a set of systems including interconnections with European countries (zone 1B).

Chapter 3 describes the selected area in detail (Historical partnership among the Three Countries, Features of the electricity systems, General regulatory framework of the electricity sector, Schemes of the electricity sector for the three Maghreb countries, High Voltage interconnections and infrastructures, Type of energy exchanges and Consistency of interconnections).

Chapter 4 of this report identifies the possible common set of regulatory issues on which apply the harmonization project, based on a mini survey that was distributed with the members of TSO concerned by this activity (STEG, SONELGAZ/OS and ONEE). The survey presents the TSO point of view related to the different aspect and technical issues that could be implemented.

The selection of the priority project to be realized in the Pilot zone is in the final phase after harmonization of the different priorities expressed by the Maghreb zone TSOs.

In Deliverable 2.2.B (Proposal of tentative Road Map for a practical implementation of harmonized rules in Pilot Project(s)) an agreement between the concerned TSOs should be obtained in order to develop proposal of tentative roadmap for practical implementation.

## **2 Background and Methodology**

The identification of zonal pilot projects is a subtask related to activity 2.2 “Elaboration of zonal target regulatory framework and tentative roadmap” defined in Mediterranean Project II (2018-2020) and assigned to the Technical Committee “Regulation and Institutions” (TC2). This deliverable responds to the deliverable 2.2.A namely “Study of potential candidature and proposal of pilot projects (Zonal rule)”.

This activity is considered as the zonal approach of the Mediterranean Common Target Regulatory Framework, which started in fact with Mediterranean Project I (2015-2018) and the proposal of Mediterranean Grid Codes in Connection and Operation issues and continued with activity 2.1 of Mediterranean Project II and the proposal of Grid Code in System Services Markets. The collaboration between Med-TSO and MEDREG is essential for this activity both for the quality of work derived from the complementarity of the both Associations and due to collaboration committed in the context of the Union for the Mediterranean (UfM) Regional Electricity Market (REM) platform.

The identification of pilot zones is based on two dimensions:

- 1) a geographical aspect: limited zone in the Mediterranean region where an ample set of issues are selected and developed for tentative roadmap for practical implementation, and
- 2) regulatory: considering the current legislative framework in each region.
- 3) In this context, the real existence of interconnections among countries is necessary in the short-term for the proposal zone.



The methodology adopted for this activity is a participative approach among members of TC2. It is explained by the exhibition of several proposals significant zones which have been discussed in detail as is explained in chapter 2. After the discussion, the Maghreb area was selected as the first pilot zone. In chapter 3 the area is described in detail. A mini survey was distributed with the members of TSO concerned by this activity (STEG, SONELGAZ/OS and ONEE) in order to explain the TSO point of view related to the different aspect and technical issues that could be implemented, as can be shown in chapter 4.

In Deliverable 2.2.B (Proposal of tentative Road Map for a practical implementation of harmonized rules in Pilot Project(s)) an agreement among the concerned TSOs should be achieved in order to develop a proposal of tentative roadmap for practical implementation.

### 3 Analysis of potential zones

As explained in chapter 1, an analysis of potential pilot zones was developed considering two complementary dimensions:

- Geographical.
- Regulatory.

Considering the geographical dimension, four zones (set of power systems) within Med-TSO perimeter were considered as potential candidates to be analyzed and object of developing a pilot project for practical implementation of a harmonized initiative.

For those four potential zones, those aspects which could be most likely to be tackled in terms of regulatory advance and harmonization have been preliminarily identified for the corresponding power systems.

A summarized explanation of those four zones and the potential regulatory aspects to deal with is presented next:



- i. Zone 1A.- Current “Western Zone” (Morocco, Algeria, Tunisia and Libya<sup>1</sup>) with focus in

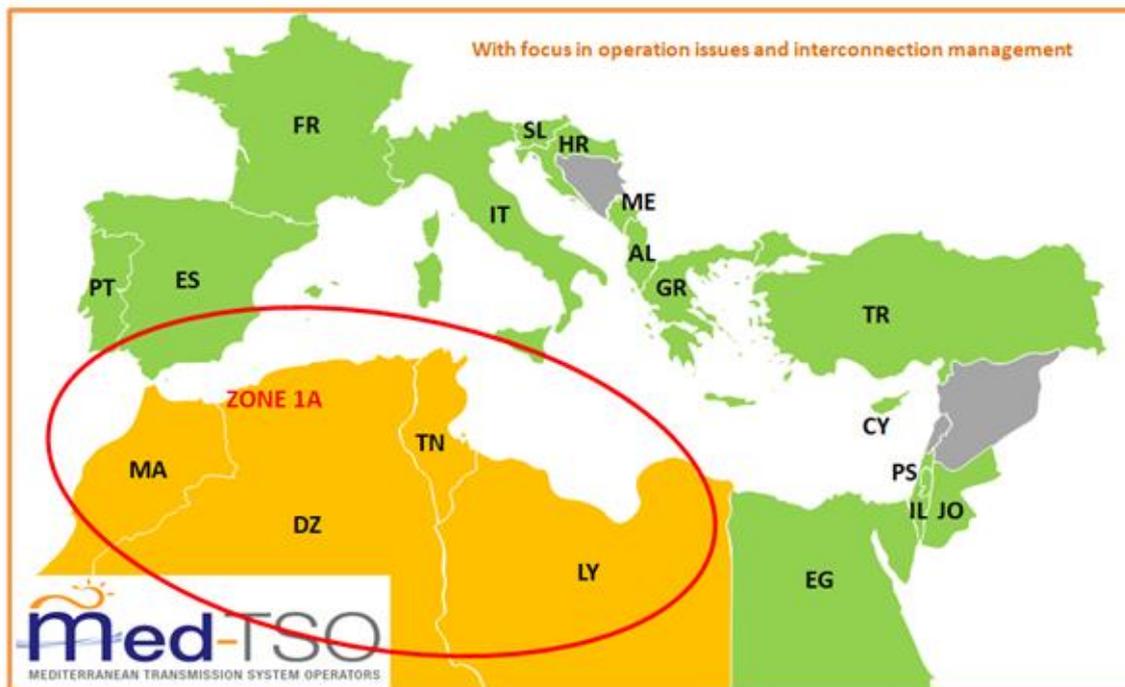


Figure 1.- Analysis of potential zones: zone 1A.- Current “Western Zone” (Morocco, Algeria, Tunisia and Libya. operation issues , interconnection management and commercial exchanges (Figure 1) .

- ii. Zone 1B.- Future “Western Zone” (Morocco, Algeria, Tunisia, Libya, Spain, Portugal, France

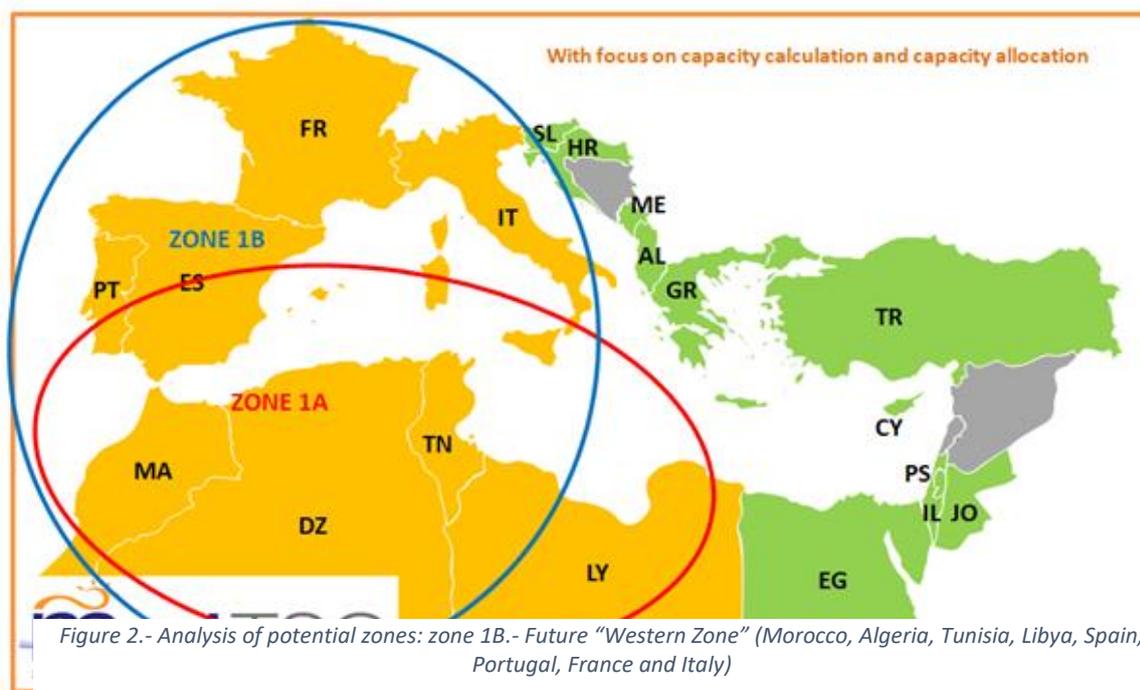


Figure 2.- Analysis of potential zones: zone 1B.- Future “Western Zone” (Morocco, Algeria, Tunisia, Libya, Spain, Portugal, France and Italy)

and Italy) with focus on capacity calculation and allocation (.Figure 2)

<sup>1</sup> The convenience to consider Libya within the pilot Project of this zone is discussed later.



- iii. Zone 2A.- Current “Eastern Zone” (Libya, Egypt and Jordan) with focus in operation issues and



Figure 3.- Analysis of potential zones: Zone 2A.- Current “Eastern Zone” (Libya, Egypt and Jordan).

interconnection management (Figure 3).

- iv. Zone 2B.- Future “Eastern Zone” (Libya, Egypt, Jordan, Israel, Palestine, Cyprus, Turkey and Greece) with focus on HVDC interconnections (Figure 4).

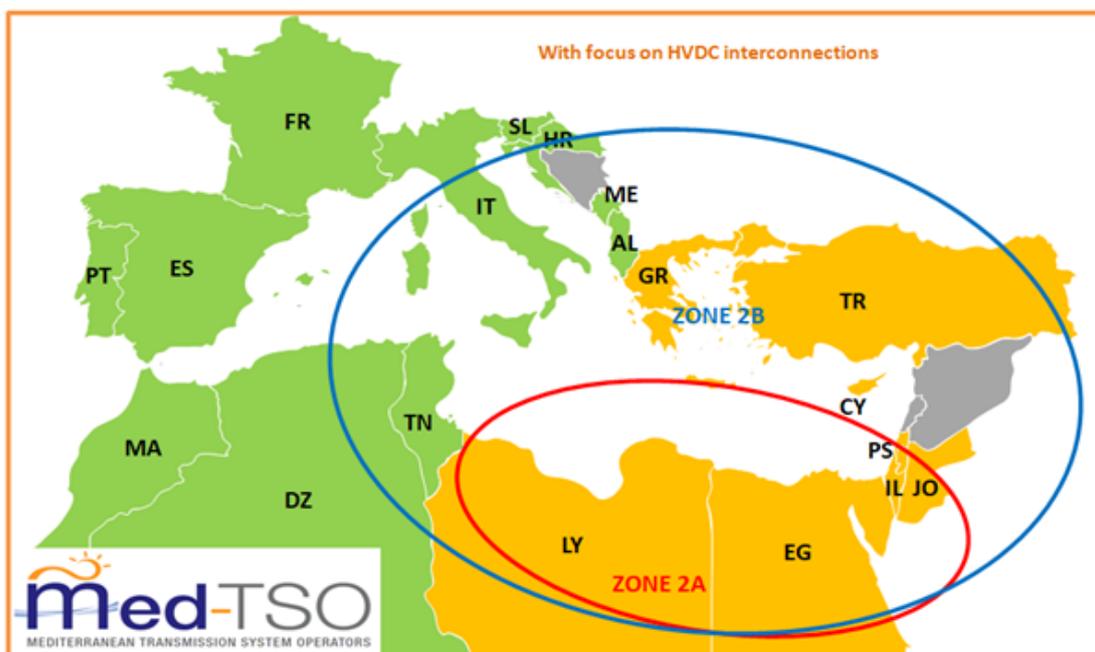


Figure 4.- Analysis of potential zones: Zone 2B.- Future “Eastern Zone” (Libya, Egypt, Jordan, Israel, Palestine, Cyprus, Turkey and Greece).

In a first proposal Italy and Tunisia were considered also part of “Eastern” zones but it was decided to exclude them in a first stage due to the low level of interconnections with the other countries.



A deep analysis considering the current regulatory framework and the current level of interconnection concluded that the Eastern Mediterranean zone is not possible to be developed as a short-term pilot project, as it is required for having practical results within the time scope of the Mediterranean Project II. However, it is considered of high interest for a later stage, when a more active participation of the Egyptian TSO in this work will enable to consider a pilot project within this zone.

Consequently, after a discussion on technical and practical aspects, **it has been concluded that the pilot project should focus on the Current Western Zone**, and precisely due to the short-term purpose of the work, it was concluded that the first pilot project should focus on the zone corresponding the Maghreb area **including Tunisia, Algeria and Morocco power systems** (zone 1A reduced).

Besides, it was considered that future work should assess the incorporation of Libya (zone 1A complete, depending on the studies about the back to back solution for the interconnection with Egypt) as well as in a further scenario to consider a set of systems including interconnections with European countries (zone 1B).

## 4 Maghreb Region (TUNISIA, ALGERIA and MOROCCO)

### 4.1 Historical partnership and Memorandum

We recall that, since several years there is an important region of the southern Mediterranean where the TSO's countries has begun the mutual coordination in operation of interconnection systems and the connection to the grid, it is The region of Maghreb. In 1972, this mutual coordination was translated to ground by the creation of COMELEC (Maghreb Committee of Electricity). COMELEC was created bringing together companies responsible for production, transportation and the distribution of electrical energy of the five Maghreb countries: SONELGAZ (Algeria), ONEE (Morocco), STEG (Tunisia), GECOL (Libya) and SOMELEC (Mauritania). COMELEC is interested in all issues related to the electricity industry. His concerns are the development of the whole electrical activities at the Maghreb scale. The action of COMELEC is particularly regular exchange of information between its members, the coordination of equipment and vocational training, monitoring the interconnection of networks and the promotion of industrial integration in the Maghreb countries. The work entrusted to COMELEC is distributed over 4 committees (Planning & Engineering, Management & Human Resources, and Technical & Maghreb Interconnections Commission (CIM) created in 1999). The CIM operational organization is the representative of COMELEC with the other organizations for all technical issues related to electrical interconnections and he has the role of coordination in the operation interconnection, implementation of rules and operating instructions and ensure their application, ensure the conformity of future Maghreb interconnections with the rules in force and participate in promoting inter-Maghreb trade with a view to a Maghreb electricity market.



In December 2003 the three countries (Tunisia, Algeria and Morocco) signed a Memorandum of Understanding with the European Commission for the creation of a regional electricity market Maghreb (Figure 5) with the object to integrate it into the internal market.

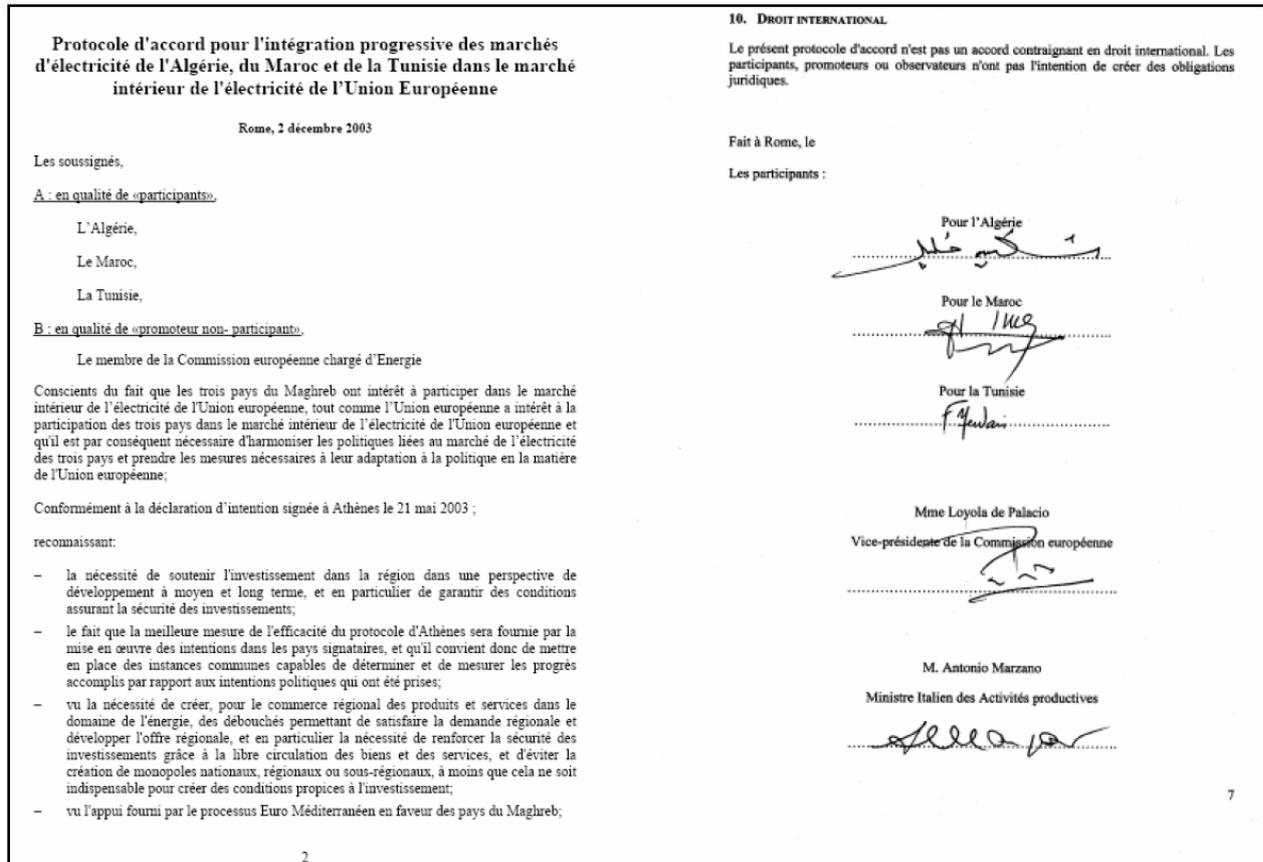


Figure 5.- First and last page of the Memorandum of understanding for the progressive integration of the electricity markets of Algeria, Morocco and Tunisia into the internal electricity market of the European union.

## 4.2 Description of the electricity systems

The following table shows the main figures of the electric power systems within Maghreb countries:

**For 2018:**

Country	Country Code	Energy demand (TWh 2018)	Installed capacity (GW in 2018)	Peak load (GW in 2018)
TUNISIA	TN	19,209	5,076	3,916
ALGERIA	DZ	66,461	16,846	13,676
MOROCCO	MA	37,446	10,937	6,310

**For 2019:**

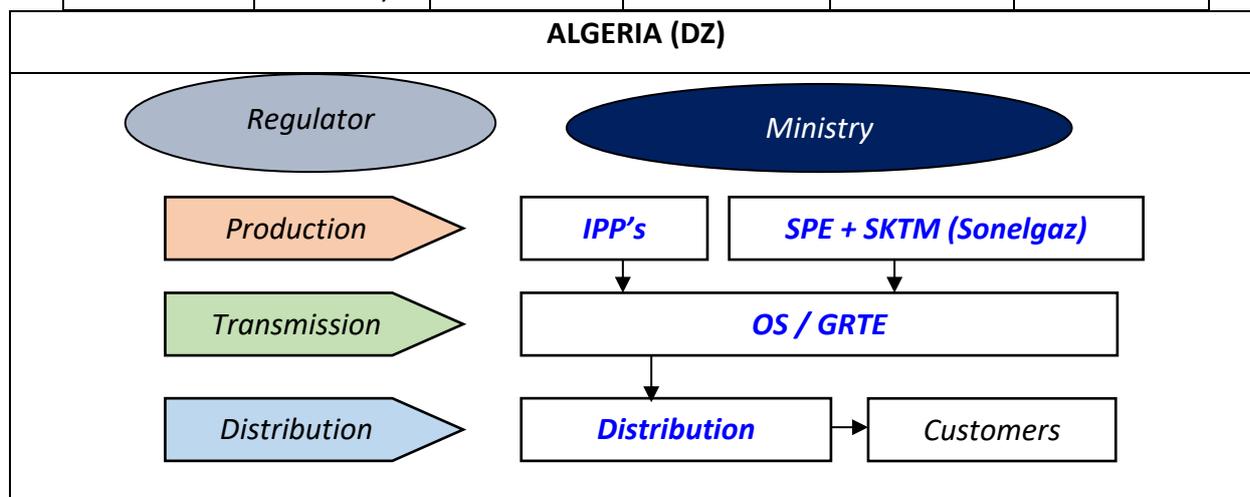
Country	Country Code	Energy demand (TWh 2019)	Installed capacity (GW in 2019)	Peak load (GW in 2019)
TUNISIA	TN			
ALGERIA	DZ	73,830	20	15,656
MOROCCO	MA	38,870	10,675	6,54



### 4.3 General regulatory electricity sector

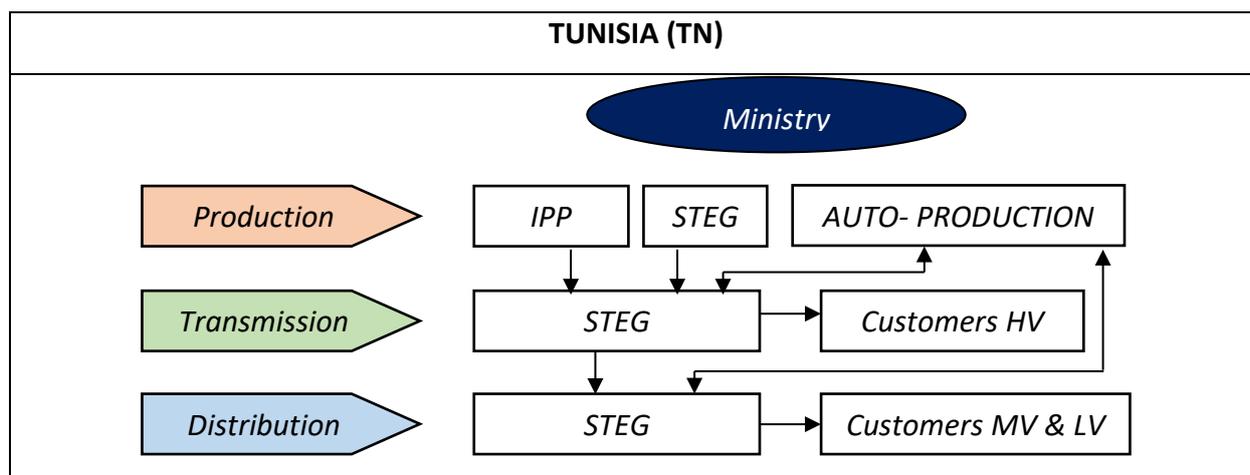
The following table gives an overview for the responsibility authority in the Maghreb countries. The summary is extracted from the result of Del 1.1 Starting Regulatory Framework SRF in Mediterranean Project I

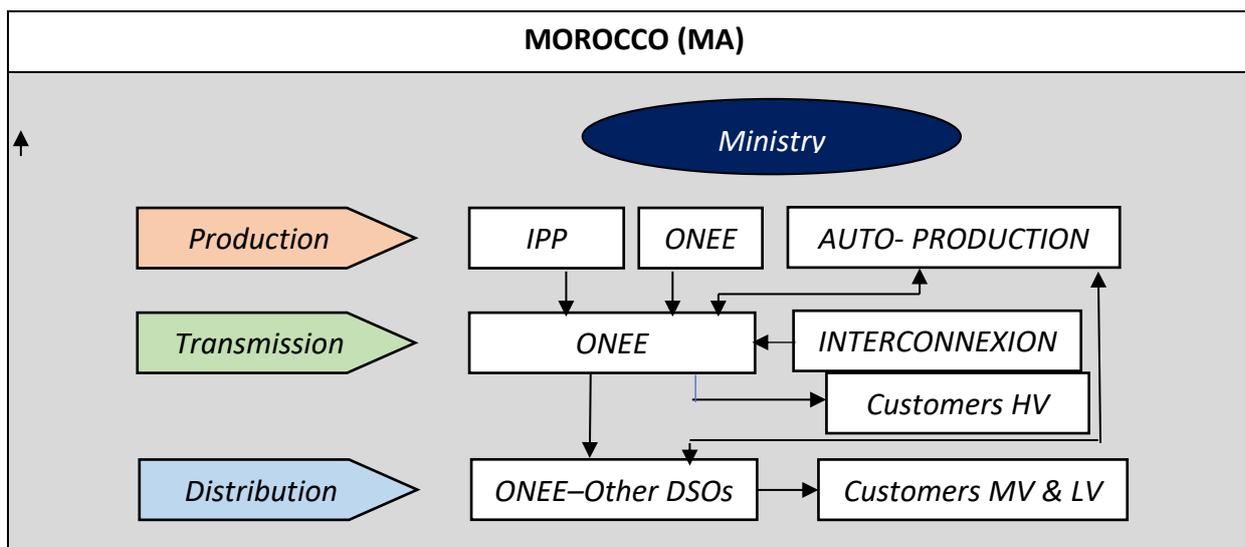
Country	Responsible Authority	TSO	Unbundling	Private	
				Production	Distribution
TUNISIA	Ministry	STEG	No	Yes	No
ALGERIA	NRA	OS/GRTE	Yes	Yes	No
MOROCCO	Ministry	ONEE	No	Yes	Yes



### 4.4 Schemes of the electricity sector

The diagram of the organizational structures adopted in the electricity industry in the three Maghrebi countries is presented in the following tables:





Legend:

- DSO: Distribution System Operator
- GRTE: Le Gestionnaire du Réseau de Transport de l'Electricité
- HV: High Voltage
- IPP: Independent Power Producer
- LV: Low Voltage
- MV: Medium Voltage
- ONEE: L'Office National de l'Électricité et de l'Eau potable
- OS: L'Opérateur du Système Electrique
- SKTM: Shariket Kahraba wa Taket Moutadjadida (subsidiary of Sonelgaz for operating isolated electrical energy networks in the south (conventional electricity production) and renewable energies)
- SPE: Société Algérienne de Production de l'Electricité (subsidiary of Sonelgaz for conventional electricity production)
- STEG: Société Tunisienne de l'Electricité et du Gaz

#### 4.5 Description of High Voltage interconnections and infrastructures

Actually the Cross-border exchanges of electricity between the national operators of the Maghreb countries have existed since several years (Figure 6). In practice, these exchanges have been based on the self-sufficiency of each country to face their own demand for energy and on the emergency function. These exchanges are bounded at the simple transfer of energy from one country to other in the different events like the disturbed situation, cyclical situation and bilateral programmed exchanges and with the criterion to have monthly zero-balance of exchanges. The Cross-border exchange is limited to bilateral contracts between national operators for limited periods or mutual assistance in the case of technical incidents. Consistency of existing interconnections and energy exchanges:

The interconnected countries of the Maghreb (Tunisia, Algeria and Morocco) benefit from three types of exchanges, namely: mutual assistance exchanges in the event of incidents, zero-balance compensation exchanges and contractual exchanges (bilateral trade contracts).

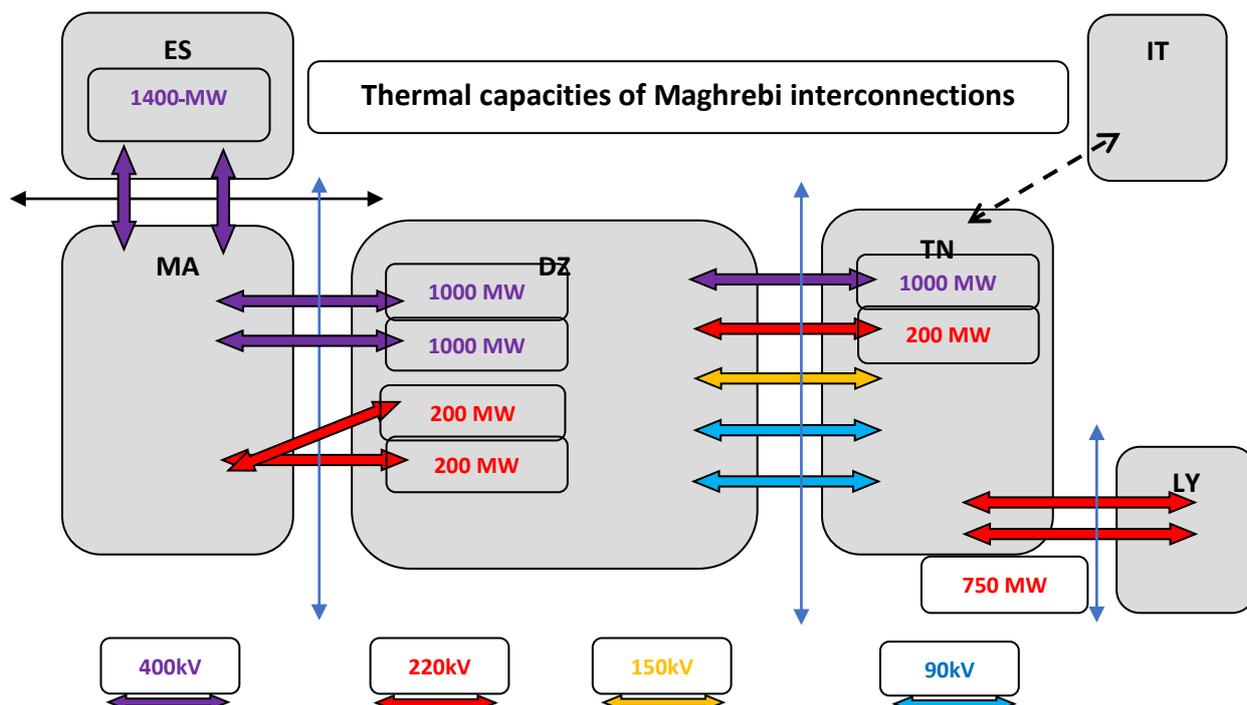


Figure 6.- Current interconnections and thermal capacities.

In the context of the electricity ring around the Mediterranean, the interconnection infrastructure for the three countries of Maghreb is reinforced by transmission facilities since several years. The commissioning of a 400 kV dorsal is one of the most favorable factors to increase the exchanges between the three countries, the exchange between the Maghreb zone and the European Union zone has developed well, through two submarine circuits with a total thermal capacity of 1400 MW between Morocco and Spain. The commercial capacity amounts from 400 to 900 MW (**Errore. L'origine riferimento non è stata trovata.**) as it is published in several horizons in the following websites:

- <https://www.ree.es/en/activities/operation-of-the-electricity-system/international-interconnections>
- <https://www.esios.ree.es/en>



- <https://www.iesoe.eu/iesoe/> (also in Arabic) Figure 7

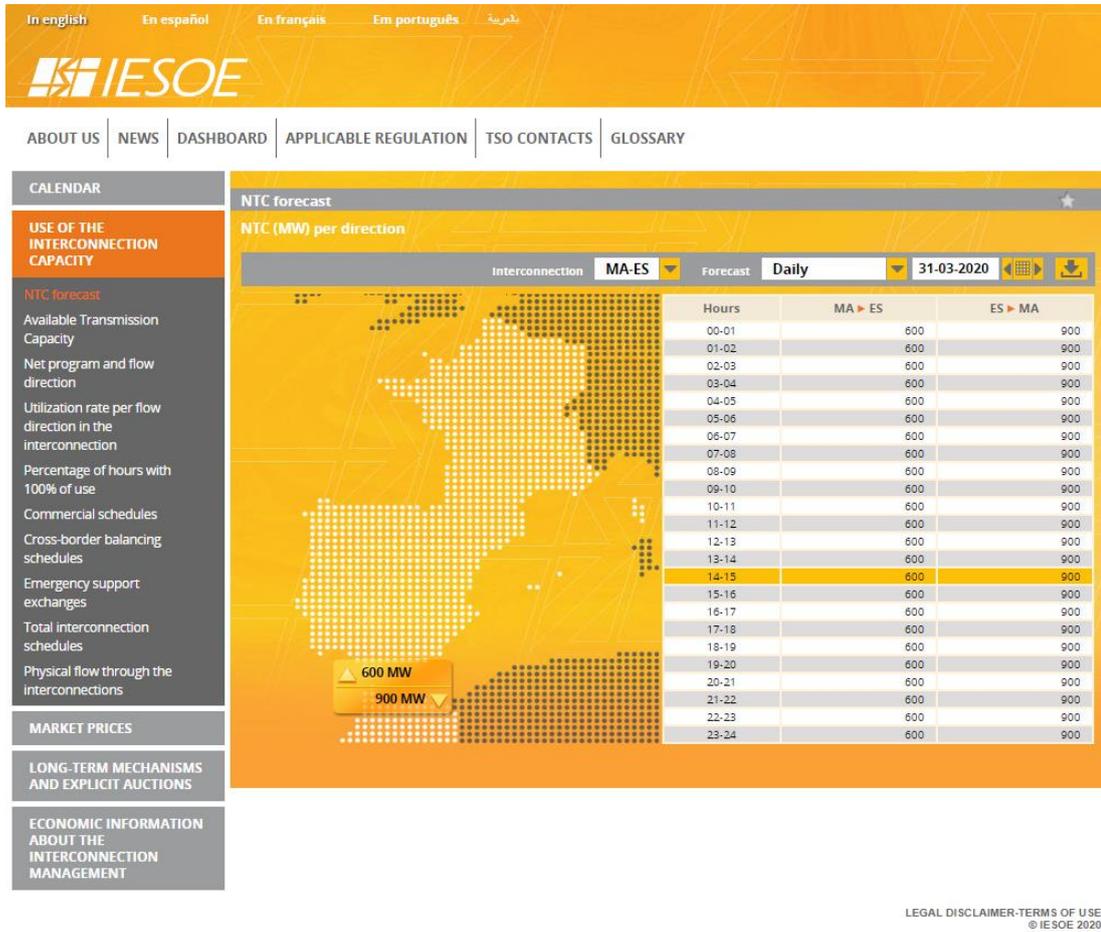


Figure 7. The commercial Net Available Capacity forecasts between Morocco and Spain.

This South – North connection will be expanded in the future by the Tunisia-Italy interconnection project with a capacity of 600 MW that will play an important role in the reinforcement of the system in this Maghreb zone.

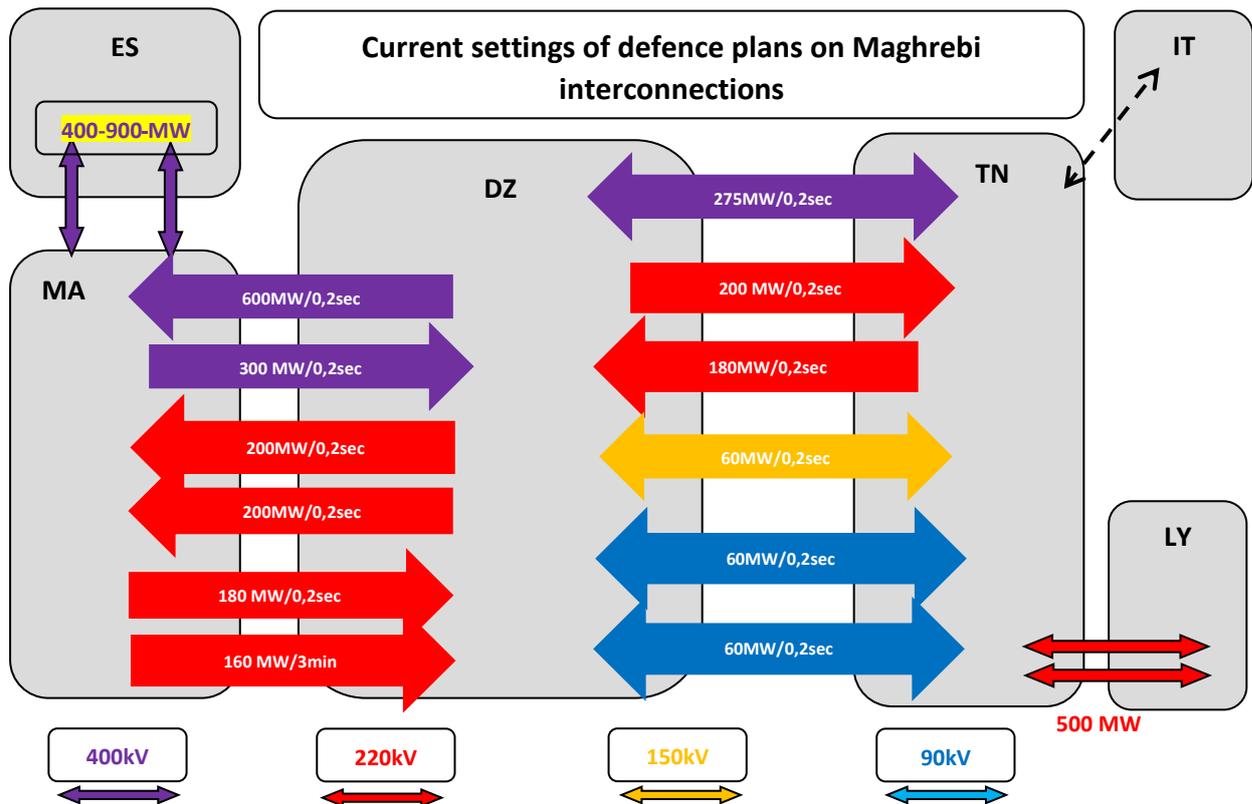


Figure 8.- Maghrebi interconnections and current setting of defence plans.

A study has been carried out in 2019 to review the technical limits of the interconnection and the watt-metric protection settings on the IMA (Morocco – Algeria interconnection) and ITA (Tunisia – Algeria interconnection) and new settings have been agreed at the last CIM (Maghrebi Interconnection Committee of COMELEC) meeting held in Casablanca in January 6<sup>th</sup> 2020. The new settings will be implemented starting from March 31<sup>th</sup> 2020 and with the following adjustments (Figure 8):

- 1- Watt-metric settings on the IMA (Morocco to Algeria):
  - 1<sup>st</sup> stage: 400 MW, 0.5s
  - 2<sup>nd</sup> stage: 300 MW, 5 min
- 2- Watt-metric settings on the ITA (Algeria to Tunisia ):
  - 1st stage: 350 MW, 200 ms with new special protection system (SPS) associated with ITA
    - **1<sup>st</sup> stage:** : 350 MW (0ms) load shedding at the Tunisia electrical system
    - **2<sup>nd</sup> stage:** 320 MW, 200 ms load shedding at the Tunisia electrical system.

Other potential interconnections in the zone are:

- Third AC interconnection between Morocco and Spain;
- New HVDC interconnection between Morocco and Portugal.
- New interconnection between Morocco and Mauritania.
- New interconnection between Algeria and Spain;
- New interconnection between Algeria and Italy;
- New interconnection between Tunisia and Italy;
- The reinforcement of interconnection between Algeria – Tunisia – Libya



## 5 Initial perspective of TSOs within Pilot Zone

In this chapter, the initial perspective of the concerned TSOs about the different aspects to be developed in the practical implementation of the Pilot Project is presented.

### 5.1 STEG perspective

The proposal zone is (TN+DZ+MA) in which the conditions for coordinated operation of the Maghreb zonal interconnected are in place. It remains to define a framework within which the Maghreb operators can respect the common rules, preserving the liberty choices for the development of their own system, allowing each TSO to optimize their regional planning and set up and makes operational markets regional electricity. The main goal to be achieved is to establish a Maghreb electricity market. For this some proposed actions to be take into consideration like (i) engage in a progressive way cross-border stakeholder (producers and consumers of electricity) to contract future trade and (ii) to accelerate the discussions to create an appropriate institutional framework that will have a dedicated budget for the coordinated management of the development of Maghreb region

Actually, the Maghrebi countries interconnections (TN+DZ+MA) do not caused a problem with most technical and operational issues. Only a passive island of the Libyan Power System is interconnected with Maghreb countries through Tunisia but currently, due to the current situation it's difficult to considerate Libya in this proposal zone (may be at a later stage).

In the future, the interconnection TN-IT will play an important part by the reinforcement of the system in this zone.

Among the difficulties encountered for the interconnected Maghreb system (TU + DZ + MA) are the Watt-metric protection measures and the contribution at the level of reserves, these aspects are the main factors, which limit the interconnection in this zone.

The main proposed technical aspects that the Maghreb countries have to implement in the future pilot zone project are the flowing:

- **The participation in the Load Frequency Control:** At every moment, the current produced must therefore correspond exactly to the current consumed. This balance ensures the safe operation of the power grid at a constant frequency of 50 Hz (hertz). To compensate for unplanned fluctuations between the injection and the withdrawal of electrical energy on the grid, the responsible of the "reserve of adjustment" temporarily adjust the power needed. From a technical point of view, a two-level adjustment procedure (primary and secondary) is used in this Maghrebi region interconnected, from where it is necessary to update operating instructions for the Maghrebi network taking into account the interconnection capacities.
- **The participation in different kinds of reserves:** the participation in the three reserve levels that have been defined must be required during a disturbance or incident found in the synchronous Maghreb area.
- **The participation with mutual security commitment:** The development of coordinated procedures and multilateral corrective measures is to achieve a high level of operational security for the synchronous Maghreb region. In this context, the following activities should be mentioned:
  - ✓ Exchange of experiences on inter-GRT corrective actions



- ✓ Share knowledge and expertise acquired through system monitor
- ✓ development and implementation of new multilateral procedures and remedial actions to maintain high system security levels
- **The compensation for voluntary exchanges:** concerning the involuntary exchanges managed by the bilateral agreements between the TSOs which mentioned that the exchange will be in zero balance, a compensation planning will be established between the two parties concerned which defines both the quantity and the time of exchange
- **Transparency with mutual exchanges information:** a continuous monitoring of the system state based on the real-time measured values of operational parameters are required, as well as, the permanent mutual information for the three TSOs about the system state are necessary, while taking into account a common set definition agreed for the system states.

Every incident or disturbance in a grid of any country can also affect the neighbor's network. In a first phase and during the first stages to identify the zonal pilot projects, the different TSOs were invited to describe only the technical aspects necessary to accelerate the creation of the synchronous area, but after fruitful discussions among concerned members of TSOs (Maghreb countries), it was decided to include the commercial aspects in order to collect all the notifications by the different TSOs. In this case, there is two commercial (economic) aspects to be considerate:

- **A Trading Platform for Electricity** (legal issue): This trading platform allows swift and flexible exchange of electricity between Maghreb countries and it will ensure that the supply of energy will continue to be secure, affordable, and sustainable. These, aim to improve the exchange of electricity and derive additional benefits by using lower costs to satisfy the local electricity demand. In order to take knowledge and follow best practices, it will be necessary to acquire ideas about alike project experiences.
- **A market grid services** (regulatory issue): This grid service is an interface associated with a grid resource. It is implemented by using a regulatory framework. This market services must be available on any time for the needs of the zonal network.

But for the **involuntary exchanges**, we consider them as related to the technical issues and not as commercial or economic aspects because the experience at the operational level has shown that frequency tuning related to the involuntary exchanges is frequently caused by adjusting the supply to the demand. In practical and real cases, during some times of day when the price in the European zone increases (the adjustment supply to demand raises a small frequency deviation), in this case, we are obliged to receive some megawatts, in which, our system doesn't need from where, the involuntary exchanges are due to technical aspects.

In summary, the diagrams in Appendices (chapter 7) give an overview of the different technical and economic aspects to harmonize in this region of the Maghreb with a desired order of priority.

## 5.2 SONELGAZ perspective

As part of the progress in harmonizing technical rules in the Mediterranean region, the regional or zonal approach should make it possible to identify proposals for rules to be harmonized between TSOs in the Maghreb area to improve regional and cross-border energy cooperation in order to develop a regulatory framework for the potential area (task 2.2 Elaboration of zonal target regulatory framework and tentative roadmap).



The objective of this zonal approach is the definition and proposal of a synchronous zone in the Maghreb region between the three TSOs, as a pilot zone to develop a proposal for a provisional roadmap in order to implement harmonised rules in the Mediterranean project II of Med-TSO. For this, the Maghrebi area (MA+DZ+TN) was selected as a potential area that could be considered as a candidate to develop a common regulatory framework and to propose aspects to be included in the list of this area, as operational issues and interconnection management.

To this end, Maghreb region TSOs will develop a draft conceptual note including a proposal of issues to be considered of common interest and further development during the implementation phase.

It is reminded that now that existing international interconnection in this area are used with several limitations as follows:

- Limited use of cross-border trade imposed by interconnection adjustments;
- Reduction in the principle of reserve sharing;
- Incompatibility of exchange capabilities with physical capabilities.

As a proposal to improve exchange on cross-border interconnection in order to integrate all electrical systems, it's proposed below the main aspects to be taken into consideration. In addition, those issues are split into two parts: technical issues and commercial/economic aspects as presented below:

#### 5.2.1 Economic aspects:

- a) **Establishing a platform for Electricity Trading:** to perform and improve electricity exchange with trading mechanisms and take advantage of the complementarities of Maghreb electrical systems namely in generation. This proposal had to deal with different aspects, namely:
  - A presentation on similar existing projects in order to learn lessons and take good practices
  - Learn about methodologies for calculating electricity costs and prices.
  - The specifications for setting up the platform;
  - The mode of its use and management.
- b) Improve the commercial transactions and reduce involuntary exchanges, which are currently managed by clearing on the basis of a zero balance approach.

Create a market for grid services: in order to optimize systems costs for the three countries;

#### 5.2.2 Technical aspects:

▪ **Upward revision of the adjustment thresholds for Maghreb interconnections;**

The transit on the IMA reaches the triggering threshold (set point at 300MW in the direction of ONEE-Sonelgaz) following a loss of a production of more than 250 MW at Sonelgaz or STEG, whereas the thermal capacity of interconnections exceeds 2400MW, IMA rated and 1200 MW, ITA side (incompatibility of setting thresholds with physical capabilities). In addition, the three TSOs have generation power plants with units at over 400 MW as biggest unit.

▪ **Participation of Maghreb TSOs in different types of reserves (sharing of reserves);**

Incidents on production units at Sonelgaz and STEG affect the quality of exchange at the IME interconnections and especially the IMA, where the consequences are detrimental in most cases. The limitation of the impact of such incidents depends essentially on the transient behavior or the power system, the sharing of primary and secondary reserves in all electrical systems in the Maghreb zone (ONEE, Sonelgaz and STEG).



- **Participation in load frequency control;**

The frequency of the electrical system is the indicator of the balance between electricity production and consumption. Essentially, the production units that provide the power needed to adjust the frequency.

Each Maghreb country must maintain, for the primary adjustment, a reserve of adjustment of at least 2.5% of the power developed in its network.

As the Maghreb network is considered as a single zone with respect to the European network, the secondary reserve set provided by all TSOs (ONEE - Sonelgaz - STEG) corresponds at all times to the size of the largest group operating on the interconnected Maghreb network.

- **Participation in mutual security commitments (mutual assistance in case of incidents);**

In the event of incidents on the production units at the level of one of the networks of the Maghreb countries, the other networks must assist, for 15 minutes, the disturbed network by putting at its disposal their available reserves. This allows the disturbed network to couple the production units necessary for the restoration of the normal operating situation.

- **Compensation for unintentional exchanges (Compensation program for unintentional exchanges between TSOs);**

In the case of involuntary exchanges related to the setting of the network and which are assumed to have zero balance, the programming of the compensation of the deviations is carried out according to a compensation schedule established between the TSOs to reduce the recorded differences.

- **Exchange of information relating to electricity grids among TSOs in the Maghreb synchronous zone (network consistency, Means of generation, etc.) for the purposes of operating studies of different grids and for optimizing the operation of electricity interconnections in the Maghreb region.**

The improvement of the information exchanges between the network operators makes it possible to improve the quality of the studies and the operational safety of the interconnections. In fact, any incident that occurs on one of the networks has consequences for other neighboring networks. The best way to guard against this is to maintain a very good level of communication and information exchange between the companies in charge of managing the transmission networks.

In summary, the diagrams in annexes (chapter 7) give an overview of the different economic and technical aspects to be harmonized in order to achieve the main goal in the region of the Maghreb.

### 5.3 ONEE perspective

The Maghreb zone including (MA + DZ + TN) already exists and is operational.

From the analysis of the operational data and the management of the interconnections of the Maghreb zone, it is obvious to note the constraints and limitations below:

1. The number of incidents affecting IMA and ITA is very high in every year and it had reach 120 incident and about 11h55 min;
2. The exchanges made among the different countries of the Maghreb zone are limited compared to the capacity of IMA and ITA interconnections;



3. The quality of the exchanges at the level of these interconnections is very low and disturbs the operation of the three electrical systems and mainly the Moroccan system;
4. The involuntary exchanges are very high since the commissioning of those interconnections;
5. The compensation mechanism adopted for IMA and ITA is unfair and does not reflect the economic aspect. Indeed, in the majority of cases, the energy exchanged involuntarily or following an incident during peak hours by one of the electrical system is returned during the off-peak hours of another day.

Conscious of the constraints and limitations mentioned above, and in order to improve the performances and achieve the objectives for which the IMA and ITA interconnections were realized, ONEEE agree to work together to achieve those objectives.

Therefore, from ONEE's point of view, we believe that trade in the Maghreb areas between the three electrical systems is limited for **economic reasons rather than technical issues**, indeed we are convinced that any improvement in trade in the Maghreb zone cannot be limited to technical proposals and should consider an economic approach.

ONEE considers the following proposals that can be undertaken as part of this study to allow better technical and economical use of interconnections:

### **I Commercial and Economic proposal:**

1. **Create framework for commercial exchanges:** the purpose is to create a legal framework that allow commercial exchanges between countries in order to improve, use efficiency the power capacity available in the Maghreb regions , and optimize generation cost
2. **Establish a platform for Electricity Trade:** to improve and increase energy trade and take advantage of available generation in the Maghreb area, particularly with the development of renewable energies, by setting up a platform for the exchange of electricity.
3. **Identify and remove barriers regarding legal and technical, which block energy exchanges.**
4. **Establish a compensation system based on a commercial approach** to address the problem of unintended exchanges between the three systems and which considers the energy exchanges made during the three hourly periods of the day (peak, full and off –peak load );
5. Set and define competitive prices for the energy exchange between the three electrical systems based in a competitive terms with the European electricity market.
6. **Carry out an economic study CBA** to improve trade between the three Maghreb countries including the compensation system
7. **Create a grid services market:** to provide the services that the network needs on due time and optimize the cost of electricity for the three countries;

### **II- Technical proposal:**

- a. **Revision of the power thresholds at the level of the interconnections** taking into account the IME power thresholds: a study was finalized by ONEE and a proposal was presented for the CIM at the last meeting held in Casablanca the last 6<sup>th</sup> January 2020 and the new settings will be settled on the 31<sup>th</sup> March 2020 at the IAM and ITA.
- b. **Improve the quality of trade and reduce involuntary trade:** currently, involuntary trade is managed by the compensation of energy during each month based on a zero balance



- approach, but it seems unfair and difficult to achieve and generates considerable economic losses for the three organizations.
- c. **To revise and carry out of a study for the AGC system**, the operating modes and the adjustments to be made on the synchronous machine control bands in order to minimize the fluctuations and divergences observed at the IME, IMA and ITA interconnections.
  - d. **Carry out a study to identify the root cause and origin for these involuntary exchanges in order to propose relevant technical and economic solutions.**
  - e. **Harmonize grids codes between Maghreb countries in order to prepare for the electricity regional market.**
  - f. **Sharing of the reserve between the three electrical systems** by providing the operators of the power system in each country with the necessary means.
  - g. **Establishment of a procedure for the capacity allocation and calculate of capacity for IMA and ITA.**

The proposals given above have been done in order of priorities.

## 6 Joint proposal:

With a view to regional integration of a Maghreb electricity market, it is necessary to harmonize certain aspects within the pilot zone. To this end, and on the basis of the analysis of the different visions of the three TSOs (TN, DZ and MA), several prerequisites and aspects to be addressed and discussed. However, these aspects are strongly linked, which requires them to be ranked in order of priorities in order to facilitate their gradual implementation according to a roadmap to be put in place.

At the end of the description of the vision of each of the three TSOs, the following grouping appears according to each category:

### **Commercial / economic aspects:**

The three TSOs share the same vision and priority for the establishment of a platform to promote exchanges of electricity as a first stage of an integrated electricity market. This initiative is expected to provide support from Med-TSO for the provision of common approaches and methodologies relating to the calculation of electricity prices for different slots time and period as well as lessons learned from other similar examples.

This project was to be accompanied by studies to assess short-term exchange opportunities according to the provisional schedules (generation plan, PPT maintenance, unavailability of generation units, etc.) of each TSO.

For the implementation of such project, a roadmap with detailed specifications will be established and developed in the framework of the next project.

### **Regulatory aspects:**

For the implementation of such a project to integrate a Maghreb electricity market, it is necessary to prepare certain prerequisites in terms of regulations and procedures. For this purpose, it is necessary to analyse the state of place in each Maghreb country, then on the basis of previous experiences, it will determine the minimum required for the functioning of such market and thus determine a roadmap for each TSO in order to reach this minimum required.

Also, as a first step, it would be interesting to develop the existing bilateral contracts for international trade (set up to date for a single price of electricity) between the three countries to an adapted contract according the future platform for several price of electricity.

### **Operational aspects of operations:**

From what is presented below it appears that there are certain constraints in the functioning and current operation of Maghrebi interconnections which consist in (i) limitations of transits on the lines through



protections, (ii) sharing of reserves and defence plan, (iii) synchronism with Libya, (iv) treatment of involuntary exchanges, etc.

These constraints are still the subject of discussions and examination by the TSOs within the COMELEC Committees. Nevertheless, some of them go beyond the limits of the work of these Committees, for example the synchronization of Libya with the zone (ENTSO-E + MA-DZ-TN) which requires more detailed studies.

**Aspects related to transparency and information exchange:**

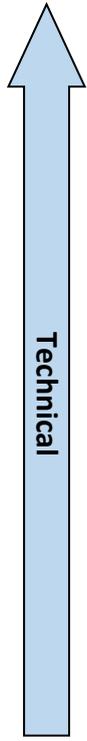
Although these aspects have been dealt with as part of the deliverable "Transparency" established by TC2. For this pilot zone project, it is necessary to include the data and information to be processed and shared in the context of this initiative, while distinguishing commercial data from technical data.

The following table in annexes gives a summary of the different aspects to be treated (commercial & economic, technical, regulatory aspects...etc.)



## 7 Appendices: detailed proposals by Company

### 7.1 STEG

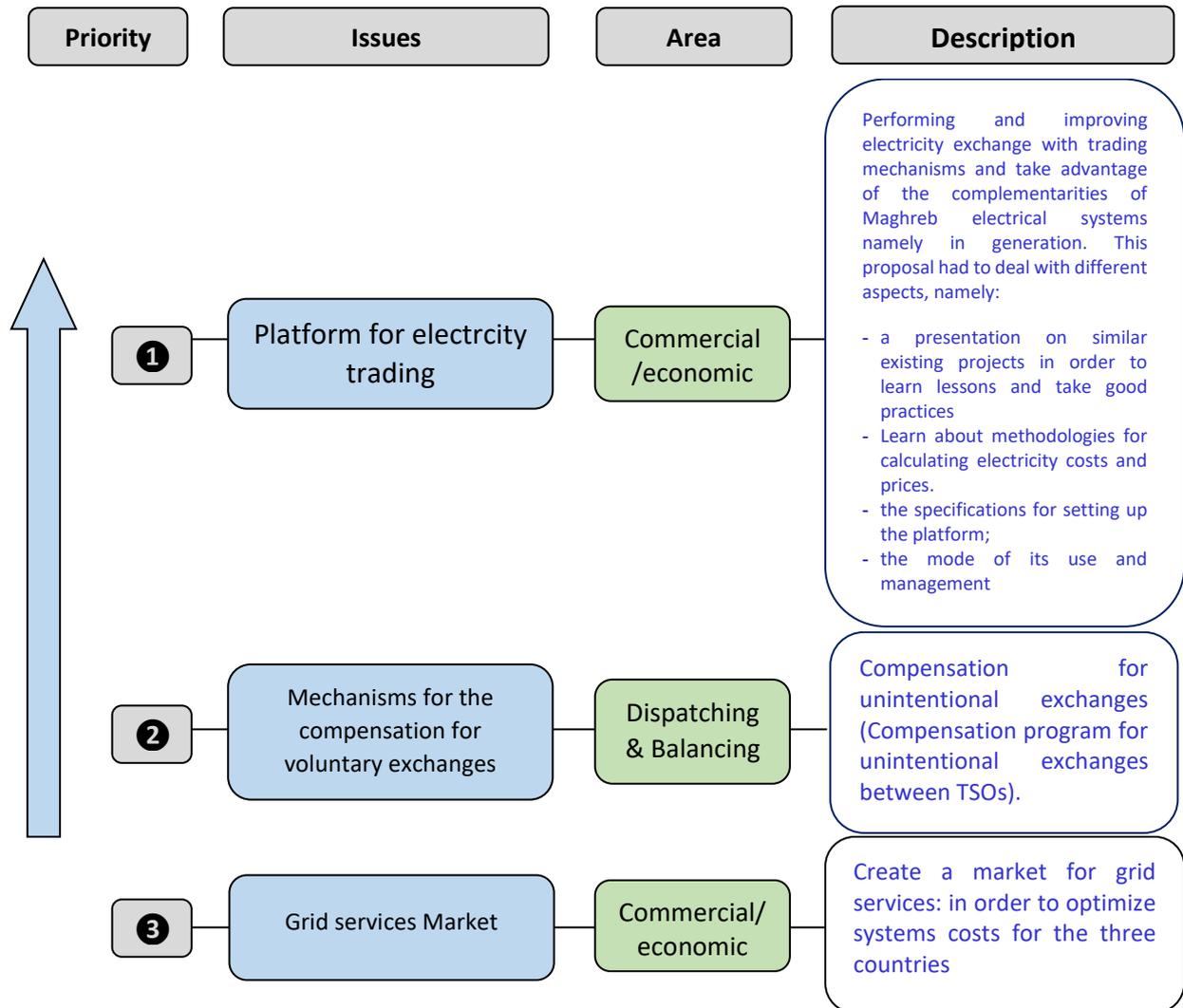
Priority STEG	Issues	Area	Description	
 Technical	1	Defence Plan	OPERATION	Adjustment thresholds for Maghreb interconnections
	2	Reserve management	OPERATION	The participation in different kinds of reserves
	3	Load control Frequency	OPERATION	The participation in the LFC
	4	System States	OPERATION	Participation and Assistance with mutual security
	5	Dispatching & Balancing	SYSTEM SERVICE	The compensation for involuntary exchanges
	6	Transparency	SYSTEM SERVICE	Transparency with mutual exchanges information

Priority STEG	Issues	Area	Description	
 Economic	1	A Trading Platform for Electricity	SYSTEM SERVICE	Create a Trading Platform for Electricity
	2	A market grid services	SYSTEM SERVICE	Create a market for grid services



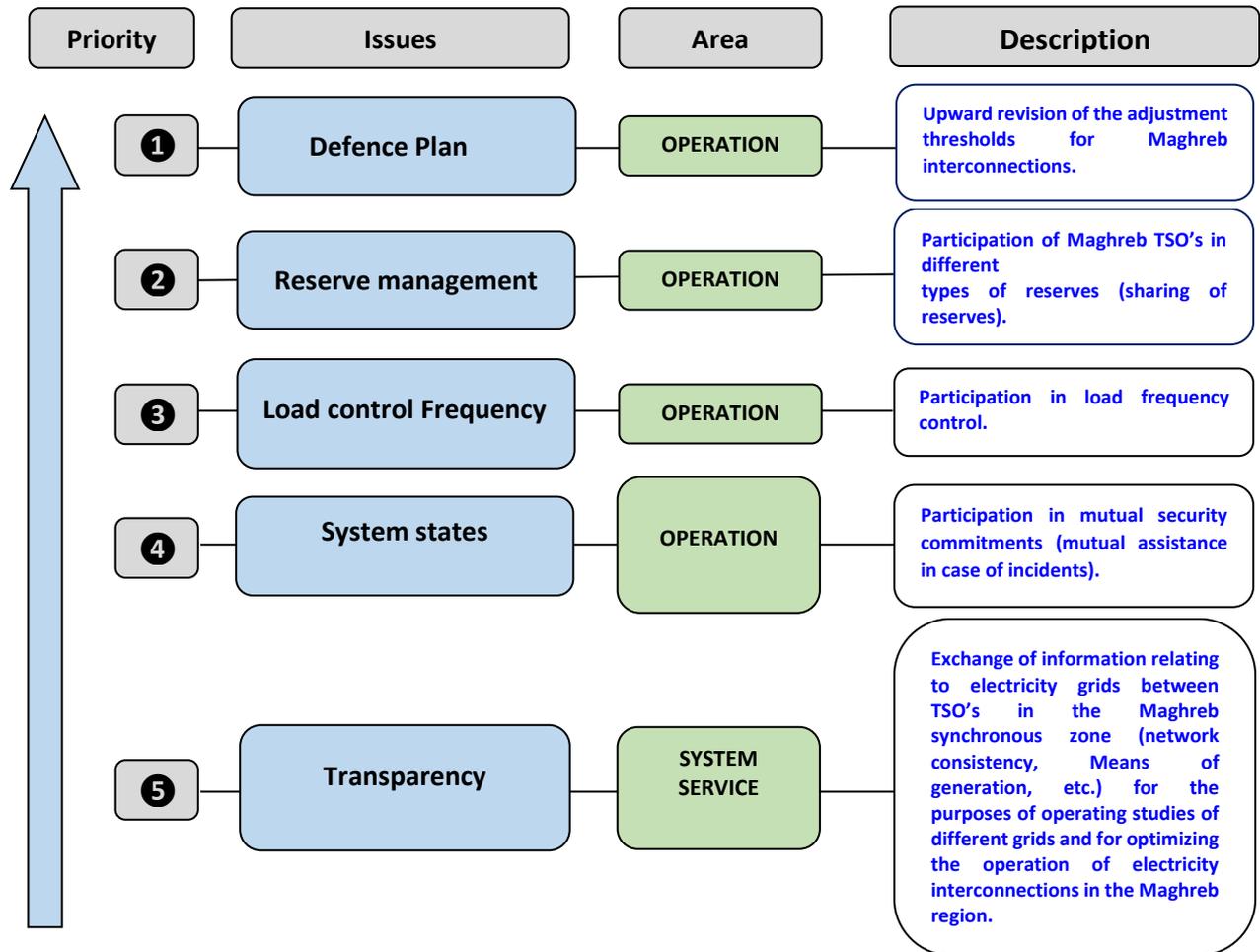
## 7.2 Sonelgaz

### a) Commercial/economic aspects:





**b) Technical aspects:**





### 7.3 Common presentation of commercial and economic aspects:

Issues	Description	Priority		
		STEG	SONELGAZ /OS	ONEE
Commercial/economic	Platforme Trade	1	1	1
Dispatching & Balancing	The compensation for voluntary exchanges	N	2	3
Regulatory	Grid services Market	2	3	2
Capacity Allocation & Calculation	Capacity Allocation Capacity Calculation	N	N	7
Profitability & Efficiency	CBA Study	N	N	8



Issues not disclosed By TSO's



Issues disclosed with desired priority by TSO's



#### 7.4 Common presentation of Technical aspects:

Issues	Description	Priority		
		STEG	SONELGAZ /OS	ONEE
Defence Plan	Adjustment thresholds for Maghreb interconnections	1	1	6
Reserve mangement	The participation in different kinds of reserves	2	2	5
Load control Frequency	The participation in the LFC	3	3	4
System States	Participation and Assistance with mutual security	4	4	N
Dispatching & Balancing	The compensation for voluntary exchanges	5	N	N
Transparency	Transparency with mutual exchanges information	6	5	N



Issues not disclosed By TSOs



Issues disclosed with desired priority by TSOs

## **DISCLAIMER**

*This document contains information, data, references and images prepared by the Members of the Technical Committees “Planning”, “Regulations and Institutions”; “International Electricity Exchanges” and Working Group “Economic Studies and Scenarios”, for and on behalf of the Med-TSO association. Whilst the information contained in this document and the ones recalled and issued by Med-TSO have been presented with all due care, the Med-TSO Members do not warrant or represent that the information is free from errors or omission.*

*The information are made available on the understanding that the Med-TSO Members and their employees and consultants shall have no liability (including liability by reason of negligence) to the users for any loss, damage, cost or expense incurred or arising by reason of any person using or relying on the information and whether caused by reason of any error, negligent act, omission or misrepresentation in the information or otherwise.*

*Whilst the information is considered to be true and correct at the date of publication, changes in circumstances after the time of publication may impact on the accuracy of the information. The information may change without notice and the Med-TSOs Members are not in any way liable for the accuracy of any information printed and stored or in any way interpreted and used by a user.*

*The information of this document and the ones recalled and issued by Med-TSO include information derived from various third parties. Med-TSOs Members take no responsibility for the accuracy, currency, reliability and correctness of any information included in the information provided by third parties nor for the accuracy, currency, reliability and correctness of links or references to information sources (including Internet Sites).*