Deliverable 4.2

"Procedure for Cross Border Cost Allocation Application"

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"Med-TSO—Mediterranean Project II"

Task 4.2 "Criteria for the allocation of costs and risks"

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List of acronyms

Med-TSO	Mediterranean Transmission System Operators
ACER	Agency for the Cooperation of Energy Regulators
CAPEX	CAPital EXpenditure
CBA	Cost Benefit Analysis
CBCA	Cross Border Cost Allocation
CIGRE	Conseil International des Grands Réseaux Electriques
ENTSO-E	European Network of Transmission System Operators for Electricity
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
ISO	Independent System Operator
ITC	Inter-TSO Compensation
MedReg	Mediterranean Energy Regulators
MoU	Memorandum of Understanding
MPI	Mediterranean Project 1
MPII	Mediterranean Project 2
NPV	Net Present Value
NRA	National Regulatory Authority
NTC	Net Transfer Capacity
O&M	Operation and Maintenance
OHL	Overhead Line
OPEX	OPerational EXpenditure
R&D	Research and Development
RAB	Regulated Asset Base
RES	Renewable Energy Sources
SEW	Social Economic Welfare
TC3	Technical Committee 3 of Med-TSO responsible for International Electricity Exchanges
TPA	Third-Party Access
TSO	Transmission System Operator
TYNDP	Ten-Year Network Development Plan
WACC	Weighted Average Cost of Capital

1 Executive Summary

The objective of Deliverable 4.2 is to establish the main guidelines for the application of a Cross Border Cost Allocation (CBCA) mechanism to the interconnection projects assessed under the framework of Med-TSO's activities. This document does not intend to establish a definite methodology, but rather to propose a set of preliminary criteria and/or guidelines.

The described procedure foresees the application of a preliminary CBCA criterion to the results of the Mediterranean Project I (MPI), i.e., using the results of the MPI Cost-Benefit Analysis (CBA) as an input for the CBCA exercise. This proposed preliminary approach can be used as a basis to collect comments from MedReg, which in turn can potentially lead to a revised CBCA criterion. Depending on the implementation timeline of the Mediterranean Project II (MPII) and on the available timeframe at the end of the project's implementation, the revised CBCA criterion can ultimately be applied to the results of the Mediterranean Project II Cost-Benefit Analysis.

The CBCA represents a subsequent step to the CBA, aiming to assign the costs and risks of the projects under appraisal. The main issues identified, *a priori*, for consideration in the CBCA analysis include: i) the location of hosting TSOs in the Mediterranean Region and the implications resulting from different regulatory frameworks; ii) the identification of participating countries/TSOs, i.e., identifying if only hosting countries are participating or if there are also other beneficiary countries/TSOs that should participate; iii) the level of participation, and the associated rules for sharing costs, benefits and risks; iv) the perimeter of the interconnection projects' costs to be shared, i.e., if and which internal reinforcements are to be included; v) the allocation of interconnection capacity, namely whether it is based on market rules or not; and finally vi) identifying additional transmission costs, including transmission losses and hosting flows.

For the preliminary implementation of a CBCA mechanism, the following pre-selected case-study clusters have been indicated: a) Morocco - Portugal; b) Algeria - Spain; c) Tunisia – Italy 1; d) Egypt – Jordan; and e) Greece – Turkey – Bulgaria. For the purpose of this exercise, two methods are considered and applied to the referred case-study clusters. Both of these methods are in accordance to ACER's (Agency for the Cooperation of Energy Regulators) recommendations.

Method 1 uses the net impact of a project, calculated as a project's Social Economic Welfare (SEW) minus its associated losses. This method defines a threshold of 10% of the sum of all the national net impacts and identifies the participating (contributing) countries by filtering those with a net impact above such threshold.

Method 2 defines the net impact of a project as the Net Present Value (NPV) at the national perimeter, i.e. the NPV of the cash flows associated with SEW, losses, CAPEX and OPEX. The need for contribution is quantified based on the sum of the negative net impacts of the hosting countries. According to this method, the threshold for participation (contribution) is 10% of the sum of positive net impact and the level of participation is calculated proportionally to each country's excess of net impact over the defined threshold for participation.

The application of these two methods to the case-study projects of MPI leads to conclude that generally both methods produce compatible results in terms of identifying participants and quantifying their level of participation, while Method 2 brings in additional information for quantifying compensation in the cases where such is required. Finally, it should also be noted that in most of the analysed cases, non-hosting TSOs also qualify as participants, and in such cases these are majorly neighbouring non-hosting TSOs.

2 Introduction and Context

The objective of this document is to briefly describe the procedure for performing activity 4.2 about the "Criteria for allocation of costs and risks" and to establish the main guidelines in order to apply the criteria.

As main references the following documents are considered:

- Med-TSO Mediterranean Project I Deliverable 2.3 "INTRODUCTORY GUIDELINES OF INTERCONNECTIONS COST ALLOCATION FOR THE INTEGRATION OF THE MEDITERRANEAN ELECTRICITY SYSTEMS" [**2**]
- Med-TSO Mediterranean Project I Deliverable 3.3 "RESULTS OF COMPLETE CBA METHODOLOGY"[**3**]
- ACER Recommendation Number 5/2015 on (18thDecember 2015) [**4**]
- ENTSO-E Recommendations on CBCA implementation [**5**]

3 Procedure

The following figure presents the general procedure, starting from the results of Med-TSO Mediterranean Project I and ending with an optional final application with Med-TSO Mediterranean Project II results.

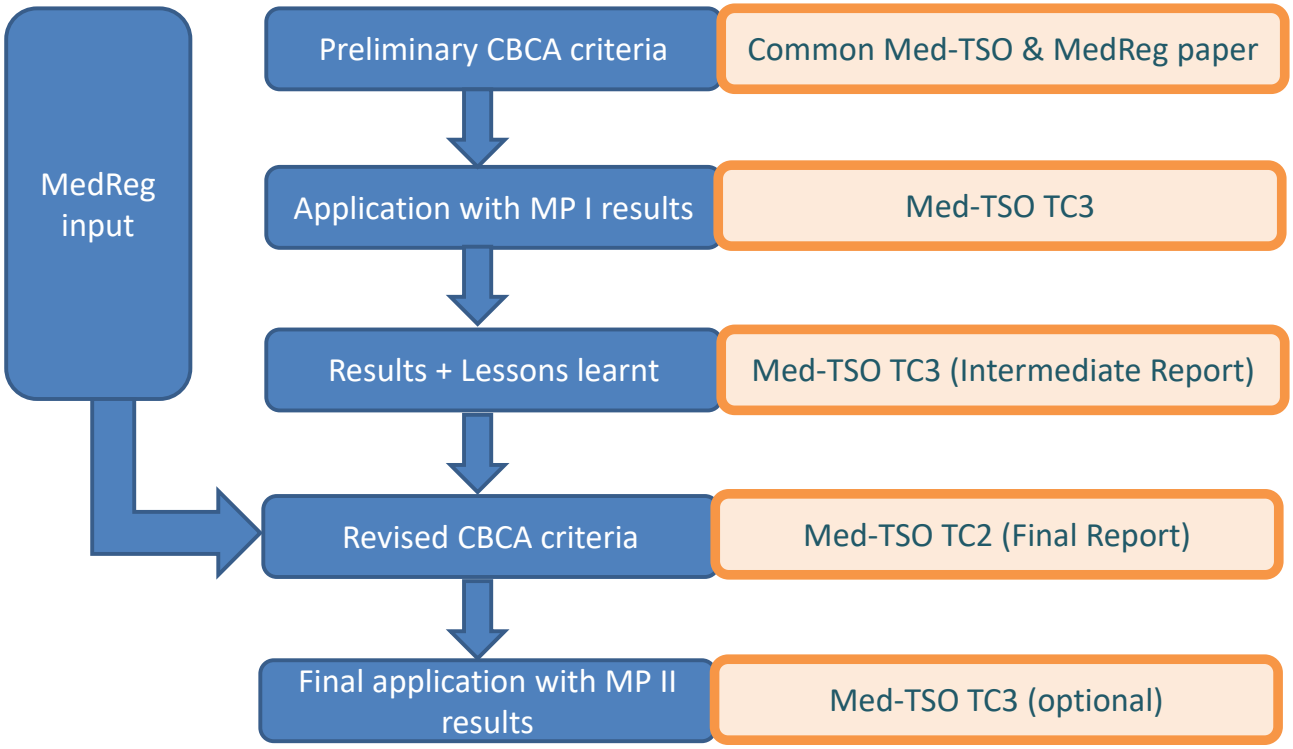

Figure 1: Procedure for Cross Border Cost Allocation Application

1. **Preliminary CBCA criteria.** The first step has already been achieved with the common paper between Med-TSO and MedReg. The main objective of this procedure will be to revise these criteria and, if possible, apply the revised criteria with the results of the new studies to be performed by Med-TSO within the Mediterranean Project II.

2. **Application with MP I results.** Med-TSO TC3 will apply the "Preliminary CBCA criteria" to a selection of the clusters already analyzed in the Mediterranean Project I using the results of these studies and following the guidelines described in chapter 3.

Selected clusters should be chosen so that different possibilities could be analyzed (interconnections between 2 countries or with more than 2 countries involved; AC or DC interconnections; interconnection with flow in the same direction or balanced).

3. **Results and lessons learnt.** Med-TSO TC3 will prepare an intermediate report with the results of the previous point including the lessons learnt that could be used in the updated version of the CBCA criteria.

4. **Revised CBCA criteria.** Med-TSO TC2 will update "Preliminary CBCA criteria" considering the internal discussion, the intermediate report prepared by TC3 and also the input received from MedReg.

5. **Final application with MP II results.** Med-TSO TC3 will apply, when results are available, the "Revised CBCA criteria" to some of the clusters that will be analyzed by Med-TSO within the Mediterranean Project II.

4 From CBA to CBCA

4.1 Consolidated CBA principles

As a basic reference in the assessment of the cost allocation issue, the Cost Benefit Analysis (CBA) is the primary tool for defining and identifying the pros and cons associated to the implementation of a new interconnection transmission facility and then assessing and - if possible - quantifying the resulting positive trade-off for the involved set of systems. A conceptual simplified classification of the pros and cons associated to the implementation of a new interconnection project is presented below:

- The PROS: In general, the benefits of international interconnections development may be recognized in terms of the consequences of an increase or an improvement of both the social welfare (optimised dispatching) and of system security, which can be classified along several general categories:
  - Economic efficiency, associated to the optimised resulting energy production mix and increase in the competition due to a higher interchange capacity: the benefits derive from the possibility to increase the utilization of cheaper/more competitive plants replacing more expensive ones, regardless of their location in the two interconnected areas, until the interconnection capacity is fully used (congestion limit).
  - Economic savings from the possibility of pooling the needed generation as system reserve, sharing ancillary resources and also using cross-border resources of different/complementary nature.
  - Better technical performance and quality of service in terms of increase in the security of supply and reliability for the affected power systems, in contingency/fault conditions; this aspect is always present when a new interconnection is realized, and its impact is very dependent on its operational features[1].
  - Higher sustainability, mainly coming from the possibility of a more environmental-friendly energy production.
  - Specific hurdles overcome or strategic results achieved through the new interconnections, such as: end of electric isolation, connecting to a much stronger system, closing a power loop, regional debottleneck, allowing regional multi-party exchanges, etc.; the morphology of South and East shore provides several occurrences of this cases.

[1] There are different kinds of operating modes of interconnections according to the specific situations of the interconnected systems: flow levels in both directions relatively similar, asymmetric flow (a direction is dominant), single flow direction when a system depends on another one for its supplies; and also depending on the usage rules in each interconnection (auctions, bilateral contracts, market-based).

- The CONS: On the other hand, capturing the potential benefits within the preceding categories has to be confronted against the direct and indirect costs and risks associated to the development of the interconnections.

To address the complex issue of performing CBA, a specific methodology has been developed within Med-TSO for the assessment of the interconnection projects considered in the context of the Mediterranean Project I, based on the ENTSO-E proposal and described in the Deliverable 2.2.3 of MP I [1], presented in the next figure:

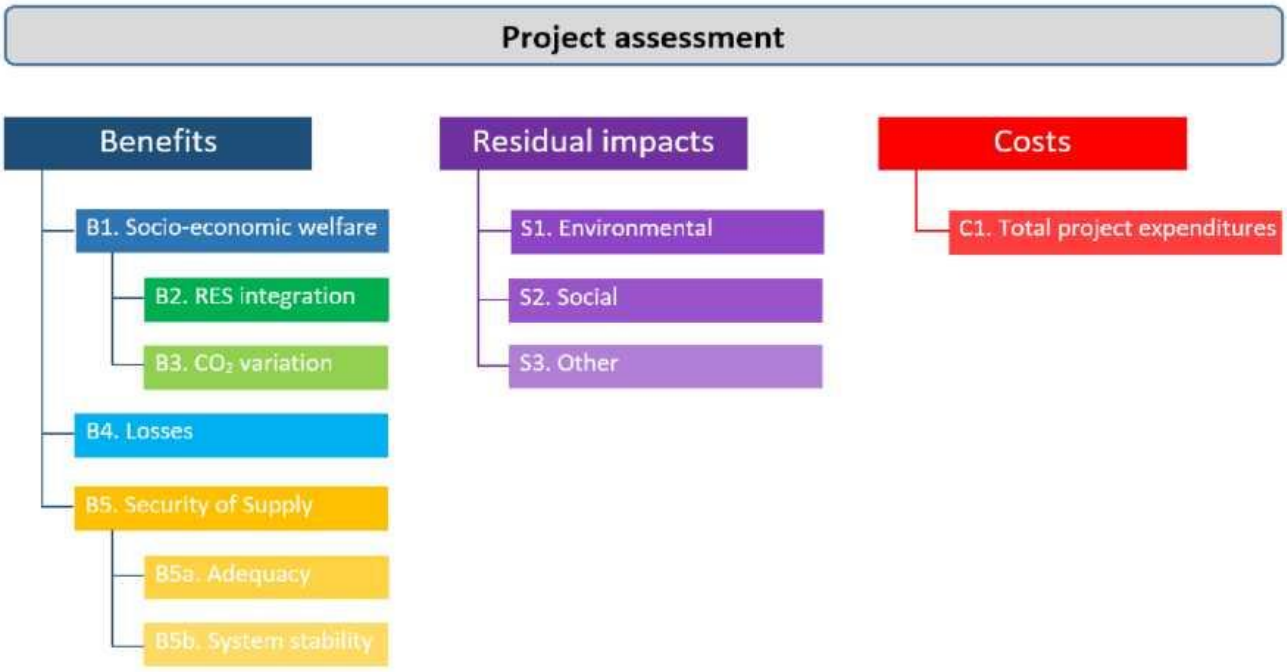

Figure 2: Main indicators of CBA methodology (source: ENTSO-E methodology)

4.1.1 CBA Application challenges: assumptions

This assessment scheme is straightforward for a structured and replicable approach (among different projects or among different implementation options of the same proposed project), while it is much less objective when it comes to perform the actual calculations, since it implies a large set of assumptions; for the sake of transparency and comparability, such assumptions have to be clearly stated and motivated, and some of them (underlying the general framework and/or boundary conditions) also require to be explicitly stated, rather than given for granted.

4.1.2 CBA Application challenges: calculation modalities

For the Costs evaluation, Capex is usually the main item, but also running costs (like O&M) should be considered, implying another set of assumptions on lifetime, interest rate, financial factoring.

For Capex, the perimeter of assets must be fixed, to include or exclude extra investments in and beyond the terminal points of the interconnection (on top of internal reinforcements, if any, already accounted for in the global design of the project), as well as the perimeter of ancillary costs: to include or exclude project origination, negotiations with counterparts, financial costs depending on type of funding, authorisation & permitting, compensations to the territories involved and/or local communities, land acquisition/eviction/right-of-use, etc. At the pre-feasibility stage, these kind of costs could be neglected, while at the feasibility stage, they could be represented with an overall contingency item, or separate contingency items if different uncertainties arise.

The Benefits evaluation is per se a controversial exercise, requiring several standards to be set: the mentioned CBA methodology (Figure 2) is a good reference, if totally accepted by all involved Parties, but still requires a uniform metric with an intrinsic degree of discretionality when transforming qualitative

judgments into quantitative metric; this applies particularly to system operation benefits (security of supply, system stability, adequacy, etc.) and ecosystem issues (social acceptance, environmental impact, side-effects).

4.2 Investment schemes & business models

There is one paramount question to be solved before even starting the CBA exercise as per Fig. 2, which impacts directly the set of assumptions and calculation modalities: the costs and even more the benefits assessment differs very much according to the subject under scrutiny and its perspective:

- a Regulator in charge of transmission tariffs, when approving the investments will check its net positive impact on global tariffs;
- a public decision-maker (Ministry) will assess the benefits for the electric system as whole, including positive/negative impacts on other political targets;
- an ISO will mostly appreciate project robustness (eventually with prudential redundancies) and operational benefits leading to improved system performances, which is its main duty;
- an investing TSO reimbursed through the tariff will combine the ISO approach with the financial aim to maximise the return through the technicalities of the tariff: inclusion of the new assets in the RAB (Regulated Asset Base), immaterial assets (like R&D inherent to the project), recognition of works-in-progress, minimisation of Opex and maximisation of Capex (for a given project), financial conditions (negotiation on WACC and its components, as well as smart project management in the realisation phase (design, engineering, procurement, construction);
- an investing company will search economic profitability (return on own capital invested), so the benefit is the net income on its balance sheets; this is valid for private investors (merchant lines) but also for public-private partnerships, for vehicle companies being sometimes used for the realisation of multi-party projects;
- energy consumers will be looking for energy price reductions, and tariff limitation if they are also the main transmission tariff payers.
- Society at large will mostly appreciate a positive balance between impact on resources (territory, natural endowments, environmental parameters, etc.) and improvement in service rendered (i.e. sustainability).

So, in general, the assessment of PROS and CONS depends on the subject on whom the evaluation is performed; in practical terms, the very first question to investigate is who is taking the benefits and who is supporting the costs.

The simplest case is when these two subjects coincide, for example in unbundled systems market-based, for which the CBA exercise as set forth in Fig. 2 has been developed; indeed, here the energy consumers are both supporting the costs (through the transmission tariff) and taking the benefits (through reduced energy wholesale price formation mechanism and limitation of dispatching tariff); the underlying business model encompasses:

- on the cost side:
  - the investment is carried out by a TSO,
  - the TSO is a state-owned or private company, but whose Capex investments are reimbursed by a regulated transmission tariff,
  - the tariff is calculated at cost-plus (incurred costs+ allowed return on capital invested) on Capex,
  - the calculation is made on ex-ante Capex and forecasted benefits (input-based regulation),
  - the tariff is paid by end-users of the power system (consumers only), independently on the apportionment on consumers' categories;
- on the benefit side:
  - the new interconnection capacity is allocated by market rules, in particular explicit auctions, market splitting or market coupling,

- the overall energy supply cost reduction tends to be automatically transformed into end-users' prices, through wholesale energy market or other equivalent means (Social Economic Welfare calculation),
- the same applies to savings on dispatching costs, for example if they are charged on the same tariff paid by all end-users (consumers only),
- quality of service and security of supply can be expressed and quantified in terms of end-users' benefit,
- environmental benefits (for example CO2 reduction) impact directly and only the consumers, for example when green certificates or tariff-paid subsidies are in place (instead if a carbon tax is in place, this impacts directly the producers).

In electric systems not totally unbundled and not fully market-based (which is the typical case in the Med-TSO area), a preliminary analysis should be made to establish how the CBA exercise of Fig. 2 can be deployed; since the basic principles are the same (investing in interconnection capacity to the benefit of end-users), the approach will remain valid with possibly some adaptation or some modification in the assumptions or calculation modalities.

For example, the role of producers may be worth a reflection, since a part of them will be net losers after the interconnection: those located in the importing area shall lose production share (and the associated income) substituted by energy import through the new interconnection; this is due also to the fact that the SEW rewards only the consumers, and the Regulator's mission is indeed to protect the consumers.

This asymmetry is a direct consequence of the structure of transmission tariff, which is in most countries levied only or mainly on consumers and paid to the TSO; therefore the engagement of one TSO is justified only if the benefit goes to his consumers, which is the case for import-oriented interconnections. If the tariff was levied also on generators, the situation would change accordingly; indeed generators, traders and in general all electricity selling operators - who are definitely part of the national electric system - of an exporting country shall also benefit from the new interconnector.

The same approach, i.e. starting by mapping the type of investment scheme/business model, has to be applied when coming to the CBCA, in order to identify specific issues to be given special consideration when applying the methodology.

4.3 How to get to CBCA

The next step consists in distributing and assigning costs and risks of these projects, which is the scope of the Cross-Border Cost Allocation (CBCA).The CBCA may be an even more challenging task than CBA, this is the reason why the present document does not aspire to establish a definite methodology, but to attempt to define a set of preliminary criteria or guidelines both as a basic stage for future evolution and, if applicable, potential basic rules or mechanisms when tackling the issue in absence of a consolidated practice.

5 General Context of CBCA

5.1 General overview of previous documents – Open questions

The Deliverable 2.3 of MP I [2], considering as relevant references the current recommendations from ACER [4] and ENTSO-E [5], has concluded in specific and concrete questions that should be addressed regarding the CBCA, as follows:

- Should only the (two or more) hosting countries pay the new interconnection, or also the neighbouring/impacted countries?
- Even if normally each country pays 50% of the interconnection cost, or its share of assets under its own territory, may both countries agree some other way of sharing costs?
- How to allocate the capacity of the interconnections North - South? Through competitive market mechanisms, in particular explicit or implicit auctions?

- How to allocate congestion rents collected in such market mechanisms? 50% to each hosting country or according to the share of costs that was agreed?
- If it is not possible to implement competitive market mechanisms for the allocation of the capacity the interconnections North - South, how should congestion rents be calculated? From the users of the interconnection?

With the aim to provide answer to above questions, the main objective of this document is to:

- define an initial list of aspects/issues to be considered as relevant to CBCA
- define certain principles to be considered and criteria to be implemented for the allocation of costs and risks
- propose preliminary guidelines and practical mechanisms for the implementation of above criteria to tackle each issue for specific interconnection projects of MP I, in absence of a consolidated CBCA methodology
- revise the approach, based on the results of the implementation, with the aim to define guidelines for the allocation of costs and risks of interconnection projects, to be used as a basis for the development of a consolidated CBCA methodology

Identifying the main aspects/issues related to CBCA is the first step to be considered, focusing on the different elements to be taken into account as relevant to CBCA. For each one of these aspects, a set of principles, preliminary criteria and rules shall be considered for the allocation of costs and risks. The criteria defined shall serve as the basis for setting up preliminary guidelines and practical mechanisms to be implemented as "Preliminary CBCA criteria" to a selection of clusters already analyzed in Mediterranean Project I. Using as a basis the results of this analysis, above mentioned criteria and guidelines shall be further evaluated and enriched for the definition of a consolidated CBCA methodology to be used to assess the development of interconnection projects in the Mediterranean area.

5.1.1 General considerations on issues/aspects impacting the CBCA

A remarkable peculiarity of transmission investments is that the main drivers for costs and drivers for benefits are different and mostly independent of one another: costs primarily depend on morphology, line's length and on technology (e.g. HVAC vs. HVDC and HVDC converters' technology), while the drivers for benefits are price gap between the interconnected areas and capacity allocation mechanisms, both totally independent on line's length and technology. For example, the length of the new interconnector has a determinant effect on costs (Capex and O&M) and none on benefits.

Except for line capacity and some technological options, there is no proportional relation between costs and benefits, on the other hand, in meshed networks a "stamp" fee is charged to every user for the utilisation of the whole network, independently on his location and on the effective utilization of a particular line.

In general, the key characteristics which act as drivers in raising allocation issues can be listed as:

a) Type of prevailing envisaged energy flows, i.e. mostly unidirectional or in both directions; this impacts directly and heavily the calculation of benefits; in the extreme case, it is justifiable that an import-only interconnection be paid fully by the importing country (this happened in the Malta-Italy link).

b) Routing and geographical distribution of the assets: since typically the asset ownership goes with territorial/jurisdictional footprint, asymmetric asset splitting should call for the same asymmetrical benefit splitting; the opposite may apply, if foreign ownership of transmission assets is practicable by law: asset ownership can mirror the benefit splitting, allowing one TSO to own assets (and receive the relevant remuneration) on foreign territory; when a submarine part in international waters is involved, the asset border can be decided conventionally allowing flexible solutions (this happened in Italy-Greece link).

c) Technology: HVDC system and/or submarine cables, differently from OHL, necessarily imply a unitary approach for the whole link regarding design, engineering, procurement and laying/construction; this may affect a TSO consolidated standards and costs (this happened in Italy- Corsica-Sardinia link).

d) For each country involved, who are the stakeholders: investors and benefitting Parties in order to detect differences in the evaluation criteria to be applied in the two countries and so to be more precise in the assessment of costs and benefits?

e) Other legislation constraints, stemming from national, supra-national, local jurisdictions: such constraints may affect the calculation of costs/benefits and even more of the risks: normally, higher risks should translate into higher rewards, or at least in asymmetrical mitigation measures (way-out clause, reciprocal liabilities, reimbursement of incurred expenses, etc.).

f) Regulatory constraints: differences between the involved jurisdictions and in particular specific obligations/prohibitions may affect the cost benefits and even more of the risks (see previous point).

g) Status of the investing entity company/state body, public/private/state controlled, transmission monopolist/merchant; for Med-TSO feasibility stage studies, this can be disregarded as the association focus on public TSO projects.

h) Business model: pay-back mechanism: public tariff, remuneration scheme, wheeling fee, merchant use of capacity, trading profit on price-gap: see previous point.

i) Financial constraints: different profitability expectations, capital intensity, funding schemes, etc. This would come at a later stage than feasibility study.

j) Risk analysis: perception, aversion, risk management policy (partner un-compliance, regulatory change, cost overrun, resilience to scenario, etc.): same as previous point.

From a pragmatic standpoint, capital intensity is a trigger for allocation issues: the higher it is, the more attention deserves the cost-benefit allocation.

5.2 Main aspects/issues related to CBCA

5.2.1 Location of hosting TSOs in the Mediterranean Region

In what concerns the location of the hosting TSOs/countries in the Mediterranean Region, for the existing and planned interconnection projects it is possible to encounter the following situations:

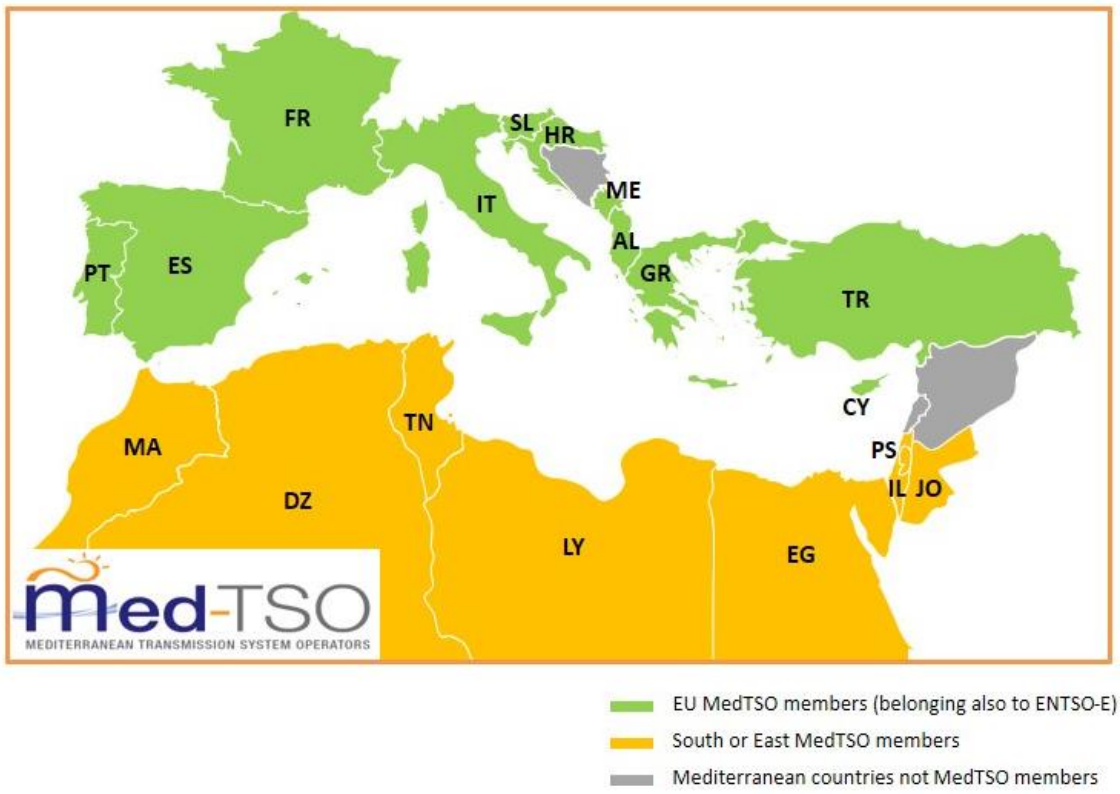

Figure 3: TSOs/countries belonging to the Mediterranean Region[2]

- **ENTSO-E TSOs/countries**

  This is the case of interconnections between TSOs/countries belonging to the ENTSO-E region. Such TSOs/countries are subject to the rules/agreements which are in place in the ENTSO-E region.

  Several cases of existing interconnections belong to this category, such as the ones between PT-ES, ES-FR, IT-GR, AL-GR etc., while among planned interconnection projects analyzed in MP I, there is no case involving only ENTSO-E TSOs/countries.

- **ENTSO-E↔ South or East Med TSOs/countries**

  This is the case of interconnections between one TSO/country belonging to the ENTSO-E region and another belonging to a South or East Mediterranean region.

  Two cases of existing interconnections belong to this category, namely between MA-ES and GR-TR, as well as many of the planned interconnection projects analyzed in MP I, such as between MA-ES, MA-PT, TN-IT, GR-BG-TR, GR-CY-IS, etc.

- **South or East Med TSOs/countries**

  This is the case of interconnections between two TSOs/countries belonging to the South or East Mediterranean region.

  Several cases of existing interconnections belong to this category, such as the ones between DZ-MA, DZ-TN, EG-JO, as well as many of the planned interconnection projects analyzed in MP I, such as between DZ-TN, TN-LY-EG, EG-JO, JO-SY-TR, TR-IS, TR-EG etc.).

As a general guideline for the CBCA, the location of hosting TSOs in the Mediterranean Region should be considered as a parameter possibly affecting the allocation of costs and risks, not from the geographical

[2] Turkey is an ENTSO-E observer country

point of view, but regarding the regulations context.

For example, ENTSO-E TSOs/countries are subject to the rules/agreements which are in place in the ENTSO-E region and thus are already contributing to the Inter-TSO Compensation (ITC) mechanism (see paragraph 5.2.6). This mechanism is based on a multilateral agreement concluded between ENTSO-E and ENTSO-E member countries and is designed to compensate parties for costs associated with losses resulting from hosting transits flows on networks and for the costs of hosting those flows.

Another example to be considered are the members of the 8-countries interconnection (Libya, Egypt, Jordan, Syria, Iraq, Lebanon, Palestine, Turkey). The existing interconnection projects are subject to the rules/agreements of this 8-countries interconnection project. This situation could be considered as a parameter possibly affecting the allocation of cost and risks for the upcoming projects.

Regarding the investment costs, location of the TSOs shouldn't have an important impact because investments are implemented following mutual agreement of the parties involved.
Taking into account above considerations 3 different cases/situations can be identified in the Mediterranean Region in what concerns the location of the hosting TSOs/countries:

- ENTSO-E TSOs/countries: this is the case of interconnections between TSOs/countries belonging to the ENTSO-E region.
- ENTSO-E↔ South or East Med TSOs/countries: this is the case of interconnections between one TSO/country belonging to the ENTSO-E region and another belonging to a South or East Mediterranean region.
- South or East Med TSOs/countries: this is the case of interconnections between two TSOs/countries belonging to the South or East Mediterranean region.

Thus, the selection of clusters of MP I to be considered for the implementation of the "Preliminary CBCA criteria", should include all above cases, with the aim to identify the particularities of each case in reference to CBCA and make the connection between location of hosting TSOs in the Mediterranean Region and CBCA.

5.2.2 Participating TSOs

In what concerns the TSOs/countries participating in sharing costs and risks related to the interconnection project, it is possible to identify the following cases:

- Only hosting TSOs/countries participate
- More TSOs/countries participate

As a general practice for the CBCA, only hosting TSOs/countries should share relevant costs and risks. Nevertheless, on a case-by-case approach, more participants could be included on request of the proponents (hosting TSOs). This could entail participation in the decision making process and sharing of risks, but does not necessarily mean participation in the ownership of the project.

The following issues/aspects should be defined:

1. What are the principles based on which more participating TSOs should be considered?
   The following principles are proposed:
   - Only TSOs/Countries neighboring to hosting TSOs/Countries (N+1)
   - Participation in sharing of costs only in case of the positive impact to neighboring systems
2. What are the criteria based on which more participating TSOs should be considered?
   In general, more participating TSOs should be considered only in case of positive impact of the interconnection project to their systems. This impact could be defined as:
   - Quantitative: a minimum economic benefit should be considered (for example ACER's recommendation of 10% net benefit threshold) to decide to include or not other impacted non hosting TSOs/countries
   - Qualitative: improvement of security of supply, system stability, reliability etc. in neighboring

5.2.3 Level of participation - Rule for sharing

In what concerns the level of participation of each TSO/country in sharing costs and revenues related to the interconnection project, it is possible to identify the following cases:

- Split of costs 50%-50% to the participating TSOs/countries; this stems from the concept that an interconnection is a single investment box, requiring the co-decision of more than one partner, in other words, each partner, notwithstanding its level in the project is fundamental to the global decision; in this view, investments are split on an equality basis, and so it should be also for the benefits, at least in terms of capacity allocation (in a non-integrated market model).
- Split of costs according to the jurisdiction where the assets are located: this is consistent with the regulatory regime that provides remuneration of assets owned by the grid operator, and with the realisation schemes, which typically see each grid operator to design, procure build and operate on his own jurisdiction, where it is normally acing as a legal monopoly.
- Split of revenue (congestion rents, etc.) and in general all benefits should follow the same rule of cost splitting.
- Different way of sharing costs and revenues, provided that justified reasons exist, based on a bilateral agreement asymmetric sharing

In general, the traditional rule of 50-50 sharing of benefits (= capacity entitlements) can be modified to the circumstances, by negotiating an asymmetric capacity sharing, for example equal to overall Capex sharing, especially when the length (and therefore the investment costs) of the new interconnector are very different on the two sides of the border. Of course abandoning the traditional equal (albeit in general economically unjustified) sharing implies opening negotiations on the degree of asymmetry, with few precedent cases for reference; the agreed arrangements will then require proper contractual form.

Asymmetric investment sharing arises also in traditional business model for links encompassing submarine portions spanning into international waters, where no effective border crossing point exists; the cost splitting can then be flexibly tailored to the underlying financial/commercial targets.

The unilateral realisation case can be considered as the extreme case of asymmetry, with 100% of burden & entitlement on one TSO and 0% on the other. This business model is applied for links with presumed mostly unidirectional flows, where the investment is carried out in full by the TSO of the importing country, whose final consumers shall benefit from such imports at lower prices.

If no reinforcements are needed on the sending side, the relevant TSO will act only on the connection issue to one of its stations; this is the case of Malta-Italy HVAC land and submarine cable in operation since 2015. Otherwise the sending side TSO shall make such reinforcements, under a collaboration agreement, and shall be consistently entitled to a portion of the interconnection capacity; this is the case of Italy-Montenegro cable, under final realisation phase.

Table 1 below summarise the possible cases. The analysis can be extended to interconnections spanning more than 2 countries and/or involving more than 2 TSOs.

Table 1: Principles of sharing for interconnection projects

	Traditional	Asymmetric	Unilateral
Cost sharing	Geography- and grid topology- dependent	Real costs-reflective	Born only by interested party (= importing country)
Benefit sharing	50-50 due to mutual “indispensability”	Consistent with costs	Capacity 100% to investing party, but other TSO enjoys windfall benefits

Risk sharing	Unrelated to benefits; partner risk unbalanced	Consistent with benefits; partner risk balanced	No investment partner risk, but country risk (asset abroad)
Agreements	MoU non-binding	Binding contracts	Connection contract
Remarks	In general, not rational	Flexible, can be case-tailored	Can create implementation problems

As a general guideline for the CBCA, costs and revenues should be split among the participating TSOs/countries according to the results of market studies establishing the variation of benefits for each country involved.

An alternative way to split costs which could be considered is according to distances to the border on each side of the interconnection. On a case-by-case approach and based on bilateral or multilateral agreements, different ways of sharing costs could also be implemented.

The following issues/aspects should be defined:

1. What are the criteria to be considered in order to justify an alternative way of splitting the costs?
   - significantly different distribution of economic factors for example: NPV, benefit by country, investment cost for internal reinforcements
   - difference resulting from considerable different distances (assuming similar effect on the cost) to the border in each side
2. What are the principles for splitting the cost?
   - based on the distances to the border in each side, or more in general, on the different overall cost on each side of the border
   - based on the size of the participating TSOs/countries (km of lines or installed capacity)

5.2.4 Perimeter of the interconnection project whose cost is to be shared

In what concerns the perimeter of the interconnection project whose cost is to be shared, it is possible to identify the following cases:

- Only direct interconnection facilities should be included (cross border and terminal stations assets)
- Internal reinforcements related to the interconnection project should also be included

As a general guideline for the CBCA, the perimeter of the interconnection project whose cost is to be shared should include internal reinforcements directly and necessarily related to the interconnection, in case they are considered as critical components contributing to the interconnection development, following the CBA Guidelines.

In that case the following issues/aspects should be defined:

1. What should be the criterion for consideration of internal reinforcements?
   - positive impact of the internal reinforcement on NTC of the interconnection (differential increase of NTC with/without internal reinforcements with respect to the size of the project)
   - positive impact of the internal reinforcement to the overall system stability
2. What proportion of the cost of internal reinforcements should be considered?

In case internal reinforcements are included in the perimeter of the interconnection project, it should be defined, based on technical studies, if they are fully related to the interconnection project or contribute also to internal needs of the System. In such case, the proportion of their cost to be included should be defined accordingly.

5.2.5 Allocation of Interconnection capacity

In what concerns the allocation of interconnection capacity of the interconnection project to the participating TSOs/countries, it is possible to identify the following cases:

- Allocation based on market rules
- Allocation not based on market rules

The benefits expected from developing interconnection within the Mediterranean Region are to:

- improve the security of supply;
- optimize the generation costs;
- increase social welfare by facilitating cross-border trade;
- allow the better integration of renewable energy;
- create a coupled regional energy market.

As a general guideline for the CBCA, in a context of growing market volatility and opportunities for short term optimization, the allocation of interconnection capacity should be based on market rules as far as possible, with the implementation of the most efficient mechanisms (market coupling, flow based NTC identification, etc.). Therefore, depending on the location of hosting TSOs in the Mediterranean Region, the allocation of interconnection capacity is possible to be based on market rules or not.

In general, 3 main categories can be identified:

- interconnections between ENTSO-E TSOs/countries: allocation of interconnection capacity should be based on market rules.
- interconnections between South or East Med-TSOs/countries: allocation can be based on other criteria taking into account qualitative aspects. In this case, congestion rents shall be estimated based on a proposed methodology and then allocated to each participating TSO based on the principle adopted for the level of participation.
- interconnections between ENTSO-E↔ South or East Med-TSOs/countries: allocation can be based on a mix of the criteria mentioned above for the other 2 categories

In case the allocation is not based on market rules, a methodology for calculation of produced congestion rents should be defined.

5.2.6 Additional transmission costs

In general, it is possible to identify the following cases:

- For interconnections between ENTSO-E TSOs/countries, no additional transmission costs should be included.
- For interconnections between South or East Med TSOs/countries, no additional transmission costs should be included. In case of wheeling power, cost of transmission losses and cost of hosting those flows can be considered.
- For interconnections between ENTSO-E↔ South or East Med TSOs/countries, additional costs (cost of transmission losses and cost of hosting those flows) could be included. ENTSO-E TSOs costs are related to the contribution of the ENTSO-E TSO/country to the ITC mechanism regarding the exchanges in the interconnection. ENTSO-E TSOs costs could be considered only in case of negative participation (charge) of the hosting ENTSO-E TSO/country to the ITC mechanism.

For the cases where additional transmission costs should be included, a set of criteria should be defined for the definition of the level of these costs and also for their split among participating TSOs/countries.

The following issues/aspects should be defined:

1. What are the criteria for definition of the level of additional transmission costs?

2. What are the criteria for splitting of additional transmission costs among participating TSOs/countries?

5.2.7 Other issues/aspects related to CBCA

Going beyond the CBCA, a consequence of asymmetric splitting of costs/benefits, as well as assets ownership/regulatory constraints is that one TSO shall find itself owner of public assets located on the territory of another State, and under the electrical jurisdiction of the partner TSO; this happens indeed in both the mentioned cases and had already occurred also for the Italy-Greece interconnector, where the electric assets' border has been located inside Greek territory in order to be proportional to the different funding contributions.

In each single case, peculiar problems may arise, which call for innovative solutions; this is due to a mix of legislative vacuum, regulatory gaps, lack of procedures, conflicting jurisdictions; just to mention some examples:

- the Maltese link portion on Italian territory does not fit in any existing category for authorisation purposes, so in the first place the Maltese public operator (still vertically integrated and monopolistic), was instructed to apply as a merchant, which is clearly a non-sense and also inapplicable; the issue has been resolved with an ad-hoc TPA derogation allowed by Italian authorities;
- the laying of Italian link portion in Montenegrin territory needs expropriation rights which, in principle, cannot be granted to a foreign Company;
- the Albanian energy law prescribes for merchant lines that a percentage of the capacity be left to public- managed TPA, but this conflicts with neighbouring countries rules.

6 CBCA implementation for case-study projects of MP I

For the first two CBCA criteria analysed above, namely the participating TSOs and the level of their participation, a preliminarily implementation has been performed with the results of the CBA analysis of selected case-study projects of MP I.

6.1 Case studies of the MPI

The clusters of the MP I which have been selected as case studies are the following:

- Morocco – Portugal
- Algeria – Spain
- Tunisia – Italy
- Egypt – Jordan
- Greece – Turkey – Bulgaria

6.2 Methodological approach

The methodological approach implemented follows ACER's recommendations to NRAs, as presented in Figure 4. According to which an asymmetric rule should be implemented for the identification of participating TSOs and the calculation of the level of their participation. This rule considers the allocation of cost to the countries presenting a net positive impact which exceeds a significance threshold, equal to 10% of the sum of net impacts of all beneficiary countries. Moreover, in order to request such allocation to third countries, it is also necessary that at least a proponent country presents a negative net impact in at least one scenario.

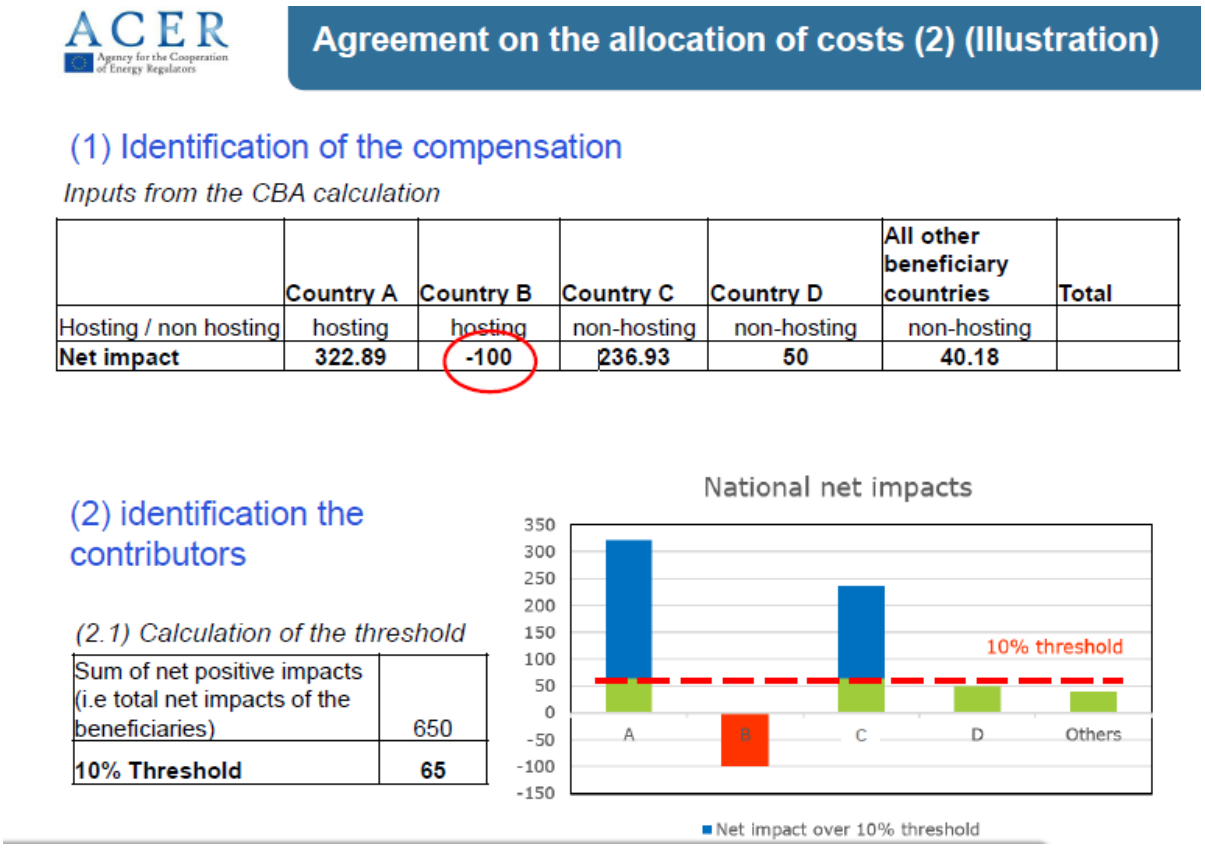

Figure 4: ACER's recommendations to NRAs for allocation of costs

Based on the above, two different approaches (rules) have been implemented for the selection of the participating TSOs and the identification of the level of their participation to the cost of the project, which are presented below:

Method 1:

- The Net impact is calculated considering the SEW and losses at national perimeter;
- Participation = % of the sum of net impacts (=SEW-losses) of all countries ;
- Considers as threshold for identification of the contributors a percentage of 10% of the sum of all the national Net Impact (SEW-Losses > 10%).

Method 2:

- The Net impact is calculated as the Net Present Value at the national perimeter (national NPV).
- The need for Contribution is equal to the sum of negative Net impact of the hosting countries.
- Consider the Threshold for participation at 10% of the sum of positive Net impact.
- The participation to the contribution is proportional to the part of positive Net impact excessing the Threshold for participation.

The parameters used for calculation of the Net Present value are:

- Discount rate = 5%
- Discount duration period = 20 years (remaining value not considered)
- First year of benefits = Year n°2
- OPEX rate = 2% of investment each year
- Electric losses: included
- CAPEX allocation: internal reinforcements cost is allocated to the respective countries and cost of common interconnection assets is equally (50% - 50%) allocated among the bordering countries

6.3 Conclusions

The main conclusions of the CBCA implementation for case studies projects of MP I can be summarized as follows:

- In general both methods produce compatible results in terms of identifying the potential participating countries and the level of participation.
- The second method (NPV method) provide an additional information that is the need or not of compensation and its quantification.
- In general both methods produce rather consistent results (for at least 3 scenarios) concerning the identification of participants.
- In general, concerning the level of participation, both methods are very scenario dependent.
- Application of the NPV method figures out cases where the net impact could be negative or positive for one hosting country depending on the scenario.
- In most cases, non-hosting TSOs are also selected as participating.
- In most cases non-hosting TSOs identified as participating are neighboring countries.

7 References

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[4] RECOMMENDATION No 5/215 OF THE AGENCY OF THE COOPERATION OF ENERGY REGULATORS of 18 December 2015 ON GOOD PRACTICES FOR THE TREATMENT OF THE INVESTMENT REQUESTS, INCLUDING CROSS BORDER COST ALLOCATION REQUESTS, FOR ELECTRICITY AND GAS PROJECTS OF COMMON INTEREST
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[6] CIGRE General session 2012, Paper C1-205: "Business models for new interconnections: allocation of costs, benefits and risks"; Antonio Iliceto, Zoran Vujasinović

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