
Guideline on the declaration of “Missing benefits” and “declared values of CBA indicators” in the TYNDP 2018

From: ENTSO-E

Date: 1st August 2018

Part of the effort to continuously improve the quality of the TYNDP, ENTSO-E will put in place new rules and a new process to:

- ensure a consistent and relevant approach to the definition and declaration of missing benefits in the TYNDP 2018 (see definition in Section 1.1 of this document), and
- allow for project promoters to declare values, if possible monetised, for some specific indicators already described in the 2nd CBA guideline (referred in this document as ‘declared value of CBA indicators’, see definition in Section 1.2 of this document)

This document provides guidance on how these elements should be declared by project promoters in the TYNDP 2018. The elements presented in this document all apply to transmission and storage projects and to missing benefits and declared values of CBA indicators unless specified otherwise.

Why the TYNDP needs project promoters to declare missing benefits or their own values for some CBA indicators?

Whilst each new iteration of the TYNDP has seen significant progress in the factors that are included in the TYNDP and its assessment of the proposed developments, there remains elements which are missed by the models used in the analysis, or for which a consolidated pan-European understanding on how to assess or quantify the value of a benefit or a cost is not yet accessible.

The TYNDP, like any study based on modelling of future systems, will always be limited by the assumptions considered to render an uncertain future. As such, it can be expected that although some of the benefits currently missing should become covered and more of the indicators should become monetised in future editions of the TYNDP, there will always be a need to consider what costs and benefits are missing from the analysis.

The latest evolution of the ENTSO-E Cost Benefit Analysis process recognises these limitations and recommends to further improve the information presented in the TYNDP by collecting missing benefits from projects promoters in a coordinated way.

This stage of the TYNDP is very important in order to allow properly informed public support or investment decisions on infrastructure projects based on the TYNDP. The information collected by ENTSO-E could in particular be used by the EC to determine the full benefits of projects during the 2019 PCI selection process (the PCI process is under the responsibility of the EC, which maintains the right to decide what information presented in the TYDP is relevant for its process).

Furthermore, delivering the input needed to the PCI process, which of course is one of the main objectives of the TYNDP, is not the only aim of the TYNDP. There will always be the need to assess each benefit and cost indicator with respect to its impact on a pan-European, regional or national perimeter. As the TYNDP is seen as source not only for the PCI process but also for giving a solid basis for additional information to national and regional investment decisions, indicators missing in the CBA guideline, that mainly seeks to concentrate on the costs and benefits of pan-European interest, will be additionally implemented in the TYNDP.

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1. What are missing benefits and declared values of CBA indicators?

1.1. Missing benefits

Missing benefits are all benefits of a project (transmission or storage), which may be taken into account in its direct assessment according to the scope of the TYNDP but are not captured by the current 2nd CBA guideline or that are not adequately implemented in TYNDP2018.

Missing benefits thus correspond to elements for which a consolidated pan-European methodology is not yet accessible or for which current implementation of the updated methodology is still not able to adequately capture them. ENTSO-E with stakeholders engaged in the preparation of the next editions of the CBA methodology are considering if and how these benefits could be captured in a revised, future, CBA methodology or in future TYNDPs.

Lists of such benefits have been prepared by ENTSO-E in collaboration with EASE for transmission and storage projects after a consultation with the EC, the ACER and all project promoters. In this edition of the TYNDP, the missing benefits which may be declared by project promoters can be listed in two sub-groups:

- A) **Missing benefits not captured by the current 2nd CBA guideline**
 - A.1 Reductions of costs for ancillary services
 - A.2 Reduction of emissions (non-CO2)
- B) **Missing benefits not covered by the current 2nd CBA guideline applying to transmission projects only**
 - B.1 Synchronisation with Continental Europe (for Baltic States)
 - B.2 Avoidance of the renewal/replacement costs of infrastructure
- C) **Missing benefits not adequately covered by TYNDP 2018 implementation of the current 2nd CBA guideline applying to transmission and/or storage projects**
 - C.1 Reduction of necessary reserve for re-dispatch power plants

1.2. Declared values of CBA indicators

ENTSO-E and stakeholders are working with each iteration of the TYNDP towards methodologies for monetisation, or if not possible the quantification of as many CBA indicators as possible. However, these methodologies can only be included in the TYNDP once they are robust enough to be consistently applied to all projects and provide tangible results.

The 2nd CBA guideline presents the most recently available set of robust indicators. In parallel to implementing them, ENTSO-E has been conducting experimental monetisation studies, notably regarding the Security of Supply indicators. Project promoters may also have conducted their own studies and have access to alternative versions of the indicator.

TYNDP 2018 Project Sheets will include a new box intended for the declaration by project promoters of alternative quantified/monetised values of CBA indicators. This Guidance Document provides a framework for the declaration of this information, by listing which of these indicators are concerned and providing guidance for the monetisation/quantification:

- D.1 Contribution to the removal of infrastructure bottlenecks which are caused by loop flows or transit flows (transmission only)**
- D.2 B6 indicator: Security of Supply - Adequacy to meet demand**
- D.3 Monetisation of B7 indicator: Security of Supply – System Flexibility**

2. Key principles and process for the collection of missing benefits and declared values of CBA indicators

The only missing benefits that can be provided by promoters are the ones included in the list presented in Chapter 1. This list has been drafted considering the following necessary conditions:

- Missing benefits cannot overlap with the benefits already covered by the present CBA and this condition needs to be proved and justified.
- Missing benefits need to comply with the same standards of a benefit that should be covered by the CBA. As such a missing benefit should:
 - be intended as a benefit to the overall European electricity system (countries in the ENTSO-E perimeter)
 - refer to benefits only directly related to the electricity system;
 - not refer to redistribution of income among electricity participants.
- Given that ENTSO-E has set up the process for collecting missing benefit to, inter alia, facilitate the PCI selection process, the missing benefits have been identified considering the criteria presented in Regulation 347/2013 Art. 4, Paragraph 2 as guiding principles:
 - *“i) market integration, inter alia through lifting the isolation of at least one Member State and reducing energy infrastructure bottlenecks; competition and system flexibility;*
 - *ii) sustainability, inter alia through the integration of renewable energy into the grid and the transmission of renewable generation to major consumption centres and storage sites;*
 - *iii) security of supply, inter alia through interoperability, appropriate connections and secure and reliable system operation “*

The missing benefits and declared values of CBA indicators boxes in the TYNDP 2018 project sheets are under the responsibility of project promoters, which means that ENTSO-E will not include any element not explicitly provided by the project promoter. However, ENTSO-E keeps both the final editorial responsibility and the right for acceptance of submitted benefits, based on a plausibility check of the provided justification.

ENTSO-E will coordinate the declaration, review and final approval of missing benefits and declared values of CBA indicators by Project Promoters according to the process described in this Chapter.

All project promoters submitting missing benefits and declared values of CBA indicators should:

- **Respect the guidance for declaration and calculation presented in Chapter 4 (for missing benefits) and Chapter 5 (for declared values of CBA indicators) of this document**
 - Project promoters should declare Missing benefits within the classifications provided in this document and respecting the guidance for monetarisation or quantification. They should select data sources for their analysis based on the indications provided. These classifications have been accepted as Missing benefits by ENTSO-E and EASE and therefore if provided with sufficient justification will be considered applicable. Project promoters should provide due justification if they do not comply with the guidance.
- **Comply with the justification and validation elements detailed in Chapter 3**
- **Monetise values whenever possible**
 - Unless specified otherwise in the lists presented in Chapter 4 (for missing benefits) and Chapter 5 (for declared values of CBA indicators) of this document, when providing the missing benefits and declared values of CBA indicators, the promoter should first provide a

monetarised value then if this is not possible, that being justified, a quantitative indicator should be provided, then only as a last resort a qualitative justification submitted.

- In case a reference for standard costs is needed ENTSO-E recommends using the mean values shown in the tables of the ACER report “*On Unit Investment Cost Indicators and Corresponding Reference Values For Electricity And Gas Infrastructure – Electricity Infrastructure – Version 1.1, August 2015*”¹,

¹ https://acer.europa.eu/Official_documents/Publications/UIC_Electricity_History/UIC%20report%20%20-%20Electricity%20Infrastructure%20corrected.pdf

The process for the collection of missing benefits and declared values of CBA indicators is

1st August: release of the guidance document

ENTSO-E releases the final version of this document to all project promoters. This Guidance Document was submitted to all TYNDP project promoters for consultation. Project promoters had the possibility to request additional “missing benefits” or “declared monetized values” and suggest ways to calculate them.

Project promoters were informed about the process described in this guidance document through specific communications and a series of 3 physical workshops and webinars (May 2018). Specific information and draft guidance for calculations was provided for each of the initially proposed Missing Benefits and Declared Values.

Project promoters were encouraged to start investigating how they could perform calculations of the proposed Missing Benefits and Declared Values during the preparation period (April to July).

1st August to 15 September: project promoters provide input

Project promoters calculate the Missing Benefits and Declared Values based on the guidance of the present document.

Only Missing Benefits and Declared Values presented in this document might be considered by ENTSO-E and the promoters during this process. Other information which the promoter would like to present but does not relate to a Missing Benefits and Declared Values presented in this note may be included by the promoter in the “Additional Information” section of the Project Sheets.

Promoters should respect the instructions of this guidance document both for the justification and calculation of the Missing Benefits and Declared Values.

Promoters should upload before the deadline the requested information for each Missing Benefits and Declared Values, including the calculated value, information on the methodology followed and possible proofs of calculations, and justification for the Missing Benefits and Declared Values (studies).

ENTSO-E staff is available to answer to any question and investigate how project promoters could be supported in this task during this period.

15 September to TYNDP submission to ACER: ENTSO-E review

ENTSO-E reviews the information submitted by promoters, runs a sanity check on the values declared and proofs of methodology followed, checks the justification for each Missing Benefits and Declared Values.

Final Missing Benefits and Declared Values will be included in the TYNDP package to be delivered to ACER. ENTSO-E will be available after the delivery to support any additional check on the Missing Benefits and Declared Values that regulators would like to pursue.

3. Justification, validation and datasets

In order for missing benefits and declared values of CBA indicators to be accepted in the TYNDP project sheets, project promoters should provide the following justification elements:

1. Explanations and justifications on the methodologies and scenarios used in the calculation

- ENTSO-E will not publish this information but will review it and will make it accessible to regulators and ACER, for the purpose of preparation of ACER Opinions on the TYNDP 2018 and on PCI list 2019. The absence of such details should lead to the exclusion of the promoter's proposal from the project sheet. Methodological guidance is provided for each missing benefit and declared values of CBA indicators in Chapter 5. Promoters should prepare a short explanation on the methodology used, including justification for any deviance from the present guideline on methodologies or scenarios. They can include proofs that the methodologies were properly executed.

2. For Missing benefits, explanations on the benefit and an external study

- Missing benefits should be accompanied by the indication whether i) they are already validated by a relevant national body (e.g. a Regulator) or ii) they are still to be validated. Benefits not accompanied by an external study will not be considered in the TYNDP unless a sufficient justification for the absence of study is provided.

3. A quantification of the share of the missing benefits and declared values of CBA indicators applying to non-EU countries.

In case the promoter needs to use data that don't fall in the perimeter of the data provided by ENTSO-E the promoter should seek to select sources that are publicly available from reputable sources (see some examples listed below). Only where this is proven to not be possible, will unpublished data be considered acceptable.

Example reputable public sources:

- EU Law
- National Law
- ENTSO-E published data (notably for system modelling)
- EC/Governmental policy, projections and targets
- European/National Regulatory Policy
- European Associations related to data (i.e. European cost per MW of wind taken from IWEA)
- Manufacturer related to data (published or written response)

All missing benefits and declared values of CBA indicators should be preferably **calculated using the final ENTSOs 2018 scenario** datasets for each scenario considered in the TYNDP2018 process.

ENTSO-E currently provides to project promoters scenario data for the countries they need for their analysis. ENTSO-E will make available, under a Non-Disclosure-Agreement, the full data set (scenario data, market data and network data) upon request from the promoter at the email contact: tyndp2018@entsoe.eu.

4. Guidance on the declaration and calculation of Missing Benefits

This Chapter presents the lists of Missing Benefits for transmission and storage projects which can be considered in the TYNDP 2018. This list has been consolidated with all project promoters and key stakeholders and is therefore considered as complete.

A) Missing benefits not covered by the current 2nd CBA guideline applying to transmission and/or storage projects

A.1 Reductions of costs for ancillary services	System modelling recommended ✓	Applicable to Transmission or storage projects
Explanations on the benefit		
<p>The current CBA does not account for ancillary service needs. The indicators A.1 and D.3 provide different ways of how to deal with sharing reserves. The promoter should choose, which of the indicators A.1 or D.3 if any to apply, not both.</p>		
<p>The benefit in terms of reserve to control frequency, voltage control resources, and black-start ancillary services are not currently included in the CBA. These more specifically would include:</p>		
<ul style="list-style-type: none"> ➤ Synchronous Inertial Response ➤ Fast Frequency Response ➤ Frequency Containment Reserves ➤ Frequency Restoration Reserves ➤ Replacement Reserve – Synchronised ➤ Replacement Reserve – Desynchronised ➤ Ramping Margin ➤ Fast Post Fault Active Power Recovery ➤ Steady State Reactive Power ➤ Dynamic Reactive Response 		
<p>Note: The definition and use of the terms listed above can vary across market structures and countries across Europe, due mainly to system topography and geography.</p>		
<p>Quantification and monetarisation of the projects contribution to solving ancillary services needs can derive from specific statistical analyses and simulations of ancillary services amount and their relative costs.</p>		
Why the benefit does not overlap with current CBA indicators		
<p>The current time resolution of the studies at a pan-European level in the TYNDP does not allow many of the ancillary services contributions to be calculated and therefore reflected in the benefits.</p>		
<p>Also currently the range of ancillary services is being extended in many countries beyond those already in existence.</p>		
<p>The B8 indicator of the CBA (Stability component of the Security of Supply) only partially covers, and</p>		

does not quantify the benefits linked to ancillary service's needs. B.8 only deals with giving a qualitative estimation for the transient/voltage/frequency stability effect of new grid investments. No €'s are captured / quantifiable for such indicator, as it does not link to any minimum requirements of quality. B.7 (Flexibility component of the Security of Supply) only deals with the optimal balancing energy exchange, which can be linked to EU regulation Electricity Balancing Guideline (EBGL), which requires most countries to adopt & implement cross-border platforms for the optimal exchange of balancing energy.

Therefore, this benefit corresponds primarily to a “missing benefit” and partially to a “declared value of CBA indicator”.

Guidance for calculation of the benefit

The following section aims to provide guidance on the key principles to take into account for calculation of the benefit. In case of any doubt related to the validity of the proven and accepted methodologies the promoter would like to apply, it is always possible to request for support at tyndp2018@entsoe.eu.

Examples of current national practices are provided in the Appendix of the guidance.

This “reduction of ancillary services cost” missing benefit should focus mainly on the effects of capacity reservation (i.e. cost for reservation/contracting of the reserves, which means these volumes are blocked for usage in other markets) without looking at energy activation costs of ancillary at first, as this methodology is still to be developed as improvement for the B7 indicator.

Some countries today have market based methodology for procurement of these reserves, whereas other simply impose/oblige its delivery. If the ‘dispatch’ of these necessary reserves happens on the most efficient flexibility (generation unit / consumption / ...), welfare contributions are present which can be quantified in €'s.²

Where ancillary services have been introduced into the market place, they can be modelling in market studies over a year using an appropriate time window i.e. 5 – 15 minutes time steps. By considering the impact with and without a project the net contribution of a project can be monetarised based on what the market has valued this service to be.

For some ancillary services market modelling which typically uses a DC based load flow will be insufficient and an AC based approach will be required. Some specialised modelling tools exist which can perform AC market modelling. Alternatively, the annual range of dispatches can a significantly reduced into a few representative discrete dispatches and evaluated using an AC network modelling tool. These benefits from these dispatches can be aggregated to also provide a net annual benefit for ancillary

² Indeed, based on the System Operation Guideline (SOGL), which is a EU regulation that entered into force in September 2017, each TSO should have a certain amount of such ancillary services (“reserves”- e.g. FCR (frequency containment reserves), FRR (frequency restoration reserves), or blackstart/reactive power reserves) available at each moment in time – based on a dimensioning methodology to be respected. This implies that this category of missing benefit has impacts for all TSOs. If certain quality targets are not respected, more reserves will have to be enforced (either procured or mandatory – depending on the country).

The amount of these minimum necessary reserves (as specified in SOGL) + the optimal possible dispatch itself of these contracted reserves (not the activation) within the country (or cross-border) will be influenced by grid investments, hence a certain benefit in €'s is present, but not quantified today (partly because of not being able to have sufficient time granularity in the models to correct model the reserves). Indeed, when cross-border capacity reserve exchange or sharing is performed (as defined in SOGL), welfare benefits are apparent – which are influenced by available grid elements and hence also investments. A simple example: if due to a project, more efficient assets become available, for participation of delivery of these mandatory reserves; benefits are captured – as opposed to when such efficient assets without the project would be blocked for access to the delivery of these reserves, for instance due being localised in a congestion region.

service[s].

<h2>A.2 Reduction of emissions (CO2 excluded)</h2>	<p>System modelling recommended</p> <p>✓</p>	<p>Applicable to Transmission or storage projects</p>
<p>Explanations on the benefit</p>		
<p>This missing benefit corresponds to the avoidance of externalities due to CO_x reductions (CO₂ excluded), SO_x, NO_x, PM 2, 5 and PM 10. The benefits of these avoided emissions and how they should be considered in infrastructure projects assessment are described in a study by the European Investment Bank: The Economic Appraisal of Investment Projects at the EIB</p>		
<p>Why the benefit does not overlap with current CBA indicators</p>		
<p>Emissions of greenhouse gases, different from CO₂, are not considered in the CBA</p>		
<p>Guidance for calculation of the benefit</p>		
<p>The calculation of the benefit should result from market simulations providing generation by unit's types. Unit is kton of avoided emission per year and the monetarisation is made by using specific prices made available from technical literature. The monetarisation is made using emission factors [ton/MWh] (see the study by the European Investment Bank mentioned in the explanations on the benefit).</p>		

B) Missing benefits not covered by the current 2nd CBA guideline applying to transmission projects only

<h2>B.1 Synchronisation with Continental Europe (for Baltic States)</h2>	<p>System modelling Recommended</p> <p>✓</p>	<p>Applicable to Transmission projects only</p>
<p>Explanations on the benefit</p>		
<p>Projects making a contribution towards the synchronous operation of the Baltic system with one of the European Union networks will contribute to the independent and reliable control of system operation and services.</p>		
<p>This benefit can be considered in terms of the avoided cost of a potential blackout.</p>		
<p>Why the benefit does not overlap with current CBA indicators</p>		
<p>The CBA-calculations cover security of supply by use of traditional methods. However, security of supply considerations from a geo-political point of view, in particular the impact/control of the Baltic system from other non-EU countries (Russia), are not covered in the TYNDP. These considerations are key drivers in the ongoing plan to desynchronize the Baltic system from the Russian one.</p>		
<p>This plan will create new system operations needs in the regions. The contribution of projects to the needs specifically arising from this plan should be covered in this indicator as they are not captured in the TYNDP.</p>		

Guidance for calculation of the benefit

The monetisation may be done related to the ongoing studies between the 4 involved TSOs of the Continental synchronous alternative. For further information please see ‘the Focus on the Nordic and Baltic Sea corridor’ insight report section 6.0.

B.2 Avoidance of the renewal/replacement costs of infrastructure

System modelling recommended
No

Applicable to Transmission or storage projects

Explanations on the benefit

One of the most important task of TSOs is replacing/renewing/upgrading existing transmission infrastructure (assets) in times when such infrastructure is expected to be no longer fit for purpose due to its availability, age or poor condition that has or will have a detrimental effect on the security of supply levels. As a part of life cycle management in the scope of Asset Management a TSO could decide to renew and or upgrade such assets in order to ensure and maintain a proper level of security of supply.

However, sometimes, in the transmission grid development process a completely new project is defined, with a primary purpose to increase social economic welfare and deliver multiple benefits to hosting countries as part of a valid CBA methodology (such as market integration, increase of RES integration, establish market and competition of ancillary services, etc).

At the same time, a further project benefit can arise if such a new project also eliminates the need for renewing other (existing) aged infrastructure, thus, avoiding investment costs into the existing transmission grid. This effectively means that if the new project is not commissioned, a TSO would have to invest into existing grid in order to maintain an existing level of grid reliability and security. Investing into the new project thus partially replaces the investment costs needed for renewal of existing/old grid and presents savings in additional capital investment for a TSO.

The benefit is to be modelled as a one-time benefit of the new projects occurring in a designated year rather than a yearly benefit (positive cash flow) and is equal to the cost of the equipment which would be needed to be renewed.

As the TSO decision making process for new investments is similar across European countries, such benefit is relevant at a pan-European scale and can be easily implemented in all countries.

Why the benefit does not overlap with current CBA indicators

The current CBA methodology mentions that new transmission investments can avoid or postpone generation investments needs – however, this is limited to generation sources and regional/cross-border scale. Thus, an additional benefit of avoiding investments into the renewal/upgrading of existing transmission infrastructure is proposed here, which can be implemented following a similar concept as for the avoidance of generation needs.

At the moment, the proposed benefit is not included in any of the ENTSO-E CBA benefit indicator and as such is not taken into consideration in the CBA of projects. Avoided investments also cannot be expressed through the EENS indicator since it is impossible to calculate it. This is because the EENS indicator is generation oriented and that none of the indicators take into consideration the age or condition of equipment (this is not modelled anywhere and cannot be computed).

Guidance for calculation of the benefit

The benefit is calculated as the avoided investment cost of the equipment/infrastructure as part of national

network investment plans, or equivalent, which would be needed to be renewed or upgraded but can be avoided with the new project.

The benefit should be modelled as a one-time benefit of the new projects occurring in a designated year rather than a yearly benefit (positive cash flow) and is equal to the cost of the equipment which would be needed to be renewed or upgraded.

The benefit is evaluated on the basis of TSO's investment renewal cost estimates and is expressed/monetized in EUR.

C) Missing benefits not adequately covered by TYNDP 2018 implementation of the current 2nd CBA guideline applying to transmission and/or storage projects

<h2>C.1 Reduction of necessary reserve for re-dispatch power plants</h2>	<p>System modelling recommended</p> <p>✓</p>	<p>Applicable to Transmission or storage projects</p>
<p>Explanations on the benefit</p>		
<p>This benefit applies especially for projects able to solve internal congestions. This benefit corresponds to the saved use or capacity needs of peaking units in the system due to the reduction of the maximum re-dispatch volume with and without the project.</p>		
<p>Why the benefit does not overlap with current CBA indicators</p>		
<p>The TYNDP CBA only considers the start-up and fuel costs of generation re-dispatch as an alternative measure for determining the change in the generation dispatch for internal projects. Therefore it does not include the full cost of the fixed costs of retention of generation to be available for re-dispatch.</p>		
<p>Guidance for calculation of the benefit</p>		
<p>The re-dispatch changes the cost-optimal dispatch by exchanging cheaper by more expensive units. Therefore the maximum re-dispatch power is a direct indication for the need of reserve power plants and the difference (with and without the project) gives a direct indication of the change in needed reserve power plants.</p>		
<p>Quantification of the benefit is relative to the reduction of the maximum amount of necessary re-dispatch in MW and can be monetarised by statistical analysis of the costs of reserve from power plants i.e. from changing capacity constraint payments.</p>		

5. Guidance on the declaration and calculation of Declared Value

This Chapter presents the lists of Declared Values for transmission and storage projects which can be considered in the TYNDP 2018. This list has been consolidated with all project promoters and key stakeholders and is therefore considered as complete.

D) Declared values of CBA indicators

D.1 Contribution to the removal of infrastructure bottlenecks which are caused by loop flows or transit flows	System modelling Recommended 	Transmission projects
Explanations on the benefit		
<p>This benefit can only apply to projects between the following countries identified in the needs evaluation part of the TYNDP:</p> <ul style="list-style-type: none"> • CZ-DE • DE-PL • DE-NL • BE-LU • FR-DE <p>The loop flows are defined as unscheduled flows stemming from scheduled flows within a neighbouring bidding zone or control area.</p> <p>The transit flows are defined as unscheduled flows stemming from a scheduled flow between two or more bidding zones or control areas. Both of these types of unscheduled flows could significantly jeopardize security of the transmission system operation. Therefore it is worth to analyse possible missing benefits which are not covered by the CBA, which are improving the situation by transmission system infrastructure development</p>		
Why the benefit does not overlap with current CBA indicators		
<p>Several benefits of a projects contribution to the removal of loop or transit flows are already captured in the CBA through the “SEW” indicator – congestion rent and “Variation in losses” indicator – decreasing of losses in the grid.</p> <p>However several other elements are not captured, for example reduced market efficiency, security of supply and missing incentives as shown in the European Commission study³ by the TYNDP 2018 application of the CBA methodology.</p>		
Guidance for calculation of the benefit		
<p>The assessment of a contribution of a project to the removal of loop flows should be done by comparison of market and network flows with and without projects, or by application of generation shift methodologies. Justification is mandatory and quantification welcomed. The monetisation is not foreseen.</p>		

³ Thema, Loop flows, final advice, prepared for the European Commission, September 2013.

D.2 B6 indicator: Security of Supply - Adequacy to meet demand

System
modelling
recommended
✓

Transmission
or storage
projects

Why it is not quantified/monetised in the TYNDP

The current TYNDP approach for the B6 indicator is limited by the modelling capacities of the TYNDP. Because of the number of projects and scenarios to consider, which each require to build specific models, it had been impossible to consider approaches testing a high number of conditions (climate and outage patterns) in the TYNDP 2018.

Guidance for calculation of the benefit

ENTSO-E has tested in parallel to the calculation of CBA results a new approach for the calculation of the B6 indicator, using the TYNDP 2018 scenarios and projects data. The test was conducted on transmission and storage projects of all technologies. Projects were selected on the presumption of their contribution to Security of Supply needs based on previous analysis.

The results of the experiment were considered satisfactory.

The approach tested by ENTSO-E uses the energy not served index computed by means of probabilistic or deterministic network simulations, taking into account several system- and network constraints (only limits in transmission capacity among bidding zones is captured in the TYNDP 2018).

The Energy Not Served is provided in GWh/year and may be monetarised according to the value given to Energy not Served by customers.

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Additional value for storage projects: Avoided investments in peaking capacity

The text in 2nd CBA guideline reads: „The 'Additional adequacy margin' is measured in MW of spare capacity that does not need to be installed as a result of expanding transmission capacity. It can be conservatively monetised on the basis of investment costs of peaking units, although this may not be appropriate if the share of the additional adequacy margin compared to the installed generation base is relatively large. In this case a specific analysis is required for the monetization of the additional adequacy margin“

A storage unit would reduce the need to invest in additional peaking units and possibly required infrastructure within its respective bidding zone. Additionally, it can create benefits to interconnected bidding zones. Monetizing the avoided cost to invest in peaking capacity in the respective zone has not been considered adequately.

The indicator should be computed by means of deterministic or probabilistic simulations, running market model for several climate years and maintenance planning (ideally stochastic optimization). The indicator is monetarized based on the cost new entry

D.3 Monetisation of B7 indicator: Security of Supply – System Flexibility

System
modelling
recommended
✓

Transmission
or storage
projects

Why it is not quantified/monetised in the CBA

A.1 and D.3 provide different ways of how to deal with sharing reserves. The promoter should choose, which of the indicators A.1 or D.3 if any to apply, not both. The CBA indicator B7 cannot be directly monetized as the CBA methodology states “The B7 indicator will be quantified by use of the transmission capacities to indicate the level of cross border assistance to ramping that the existing and the new interconnection can provide. It is thus related to a share in reserves”.

In general, the increase of cross-border capacities between bidding zones through grid development would lead to additional value in terms of balancing energy from frequency restoration reserves and replacement reserves during non-congested time steps.

The deployment of storage reduces the need for regulation capacity by providing fast responding resources and in some cases by providing synchronous inertia. Regulation capacity is remunerated by an availability fee and these costs might not be currently modelled. By reducing the amount of regulation capacity requirements storage can reduce the cost to operate the system.

Guidance for calculation of the benefit

Projects promoters who wish to monetarise the indicator may do so according to the following guidance.

The B7 indicator seeks to capture the capability of an electric system to accommodate fast and deep changes in the net demand (load minus intermittent RES). These changes require more flexible resources to deal with the more frequent and acute ramping-up and ramping-down requirements. Cross-border interconnections support ramping where deviations are balanced over a power system covering a wider area. Transmission or storage capacity thus provides a form of flexibility in the system by increasing the available flexible units that can be shared between different areas (share in reserves).

The residual load and the up/down reserves requirements should be assessed as a first step. The available cross-border capacity, which can be used to exchange balancing energy, will be determined and the contribution of the project. The hourly output from the TYNDP market simulations can be used to quantify it.

- ⇒ **First Step – Common Platform**, assumed that in the future there will be platforms to exchange balancing energy such as IGCC (now “EU imbalance netting”), TERRE, MARIE, PICASSO. The balancing platforms presuppose that the settlement rules will be harmonised to marginal pricing across different markets, as per TERRE design. The platform also presupposes that there will be standard balancing products to be exchanged. While this is already available for TERRE member states, it can be expected common balancing platforms to be rolled out as part of the balancing guidelines implementation.
- ⇒ **Second Step - Balancing Need**: assumed that there is a system imbalance that needs to be resolved. The volume needed varies across member states and assumptions would be made about what this would be over the lifetime of the project being assessed. This need is not easy to forecast as generation and consumption mix are evolving. An option which would be a prudent approach is to use historical balancing needs making the assumption that they will apply in the future, as in the TERRE study. The ENTSO-E transparency website provides historic balancing needs. However, as

the share of RES in the energy mix and the number of interconnectors is increasing, using historical data risks underestimating future balancing needs. It is strongly recommended to study the effects of this type of assumption.

Furthermore, it is acknowledged that a cross-border project could itself increase the balancing needs across to bid areas.

- ⇒ **Third Step – Cross-border Exchange Capacity:** Determine the available cross-border capacity aftermarket closure, which can then be used to exchange balancing energy. This capacity in both directions will be calculated as an output from the TYNDP market simulations. The simulation results will show the remaining cross-border capacity for every hour in the modelled years (including Montecarlo/climatic years).
 - For each platform a dedicated model should be built and updated with spare capacity available with and without the project.
 - Update the spare capacity taking into account what will be left after each platform simulation.

- ⇒ **Fourth Step – Opportunity for Imbalance Netting:** Determine the opportunity for imbalance netting between control areas. The opportunity for imbalance netting in one direction does not require available cross-border capacity and can be achieved even if the link is fully congested for market flows. In situations where imbalance netting requires flows in the same direction as market flows, there is need for available cross-border capacity. The model should calculate the volume of imbalance netting that is possible.

- ⇒ **Fifth step – Balancing Bids and Offers:** Establish the balancing bid price stack for the different balancing markets. There are currently four proposals to determine this with increasing levels of complexity.
 - i) Determine a seasonal average balancing bid price using historical data
 - ii) Determine hourly national balancing bid price curves, i.e. price and volume offered, using historical data
 - iii) Determine historical balancing bid price savings exchanged through TERRE (or other such platform)
 - iv) Determine hourly national balancing bid price curve, i.e. costs and volume offered, using forecast data that reflects changes to generation mix (taking into account the technologies available for participating in the balancing market)

- ⇒ **Sixth Step - Balancing Cost Savings.** For imbalance netting, the cost savings will be calculated as the difference of the balancing costs with and without the project.

6. Appendix

Links to ancillary services calculations and reference material:

- **Ireland**
 - [EirGrid System \(ancillary\) services central site](#)
 - [Contracted volumes of system services in Ireland](#)
 - http://www.eirgridgroup.com/site-files/library/EirGrid/Quarterly_Update_Aug2017.pdf