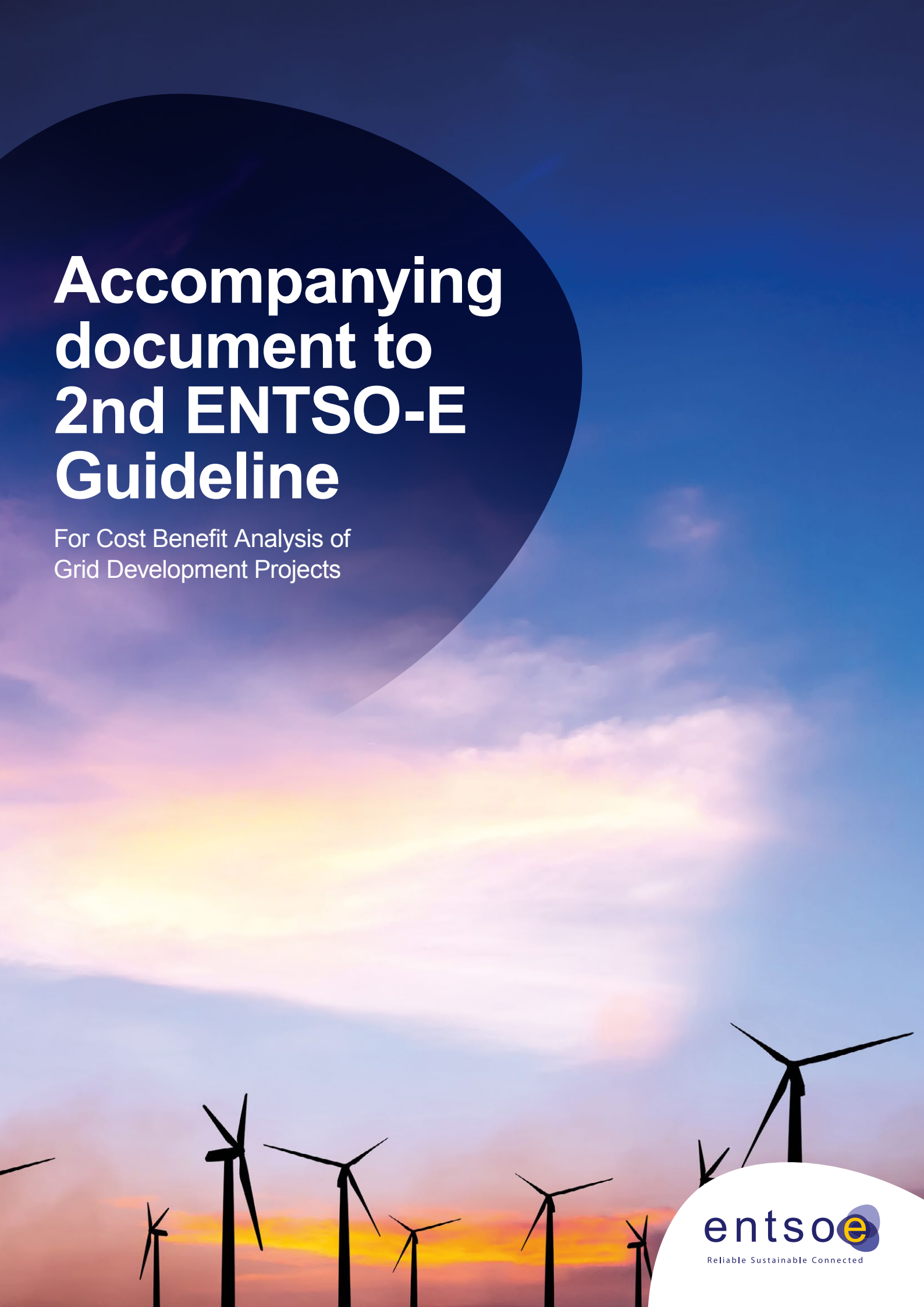
Accompanying document to 2nd ENTSO-E Guideline

For Cost Benefit Analysis of
Grid Development Projects



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Contents

Section 1

Coherence with Regulation (EU) 347/2013

This chapter describes how the 2nd CBA methodology corresponds with the requirements posed by Article 4(2) and Annex IV of Regulation (EU) 347/2013. Stakeholders worked with ENTSO-E experts to define a complete set of robust and replicable indicators, capturing fairly all costs and benefits determined in the Regulation.

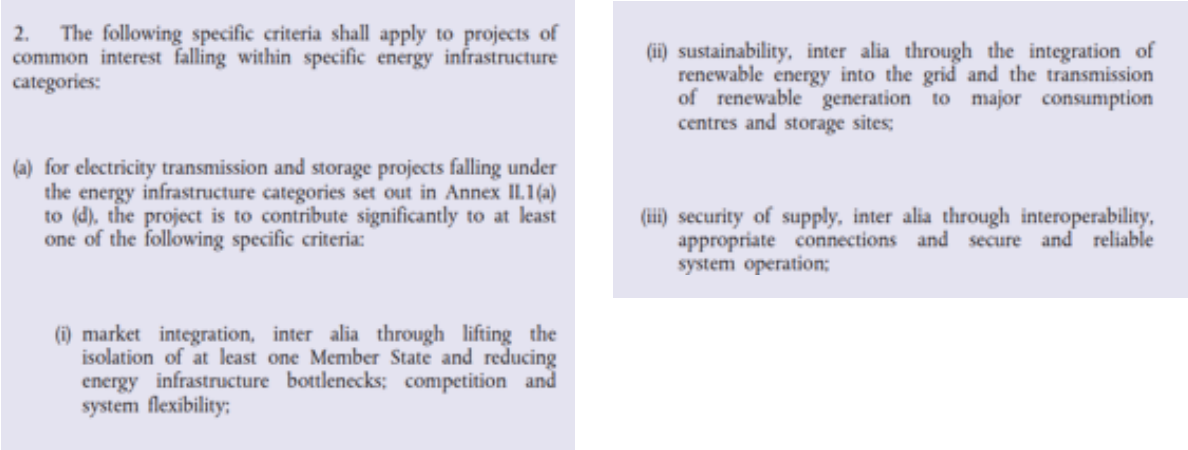
The Regulation is intended to ensure a common framework for multi-criteria cost-benefit analysis (CBA) for TYNDP projects, which are the sole base for candidate projects of common interest (PCI). Moreover the CBA guideline is recommended to be used as the standard guideline for project specific CBA as required by Regulation (EU) 347/2013 Article 12(a) for the CBCA process. In this regard all projects (including storage and transmission projects) and promoters (either TSO or third party) are treated and assessed in the same way.

In some cases, some elements presented in the Regulation are related to the TYNDP or to the PCI selection process rather to the CBA itself (this CBA is not only intended for one TYNDP, but should rather include strong principles that would stand for a longer time). In a few other cases, the elements presented in the Regulation cannot currently be captured through replicable, robust and fair indicators. All these elements are reported in this chapter.

1

Article 4(2): Criteria for projects of common interest

Figure 1: Relevant provision from Article 4



2. The following specific criteria shall apply to projects of common interest falling within specific energy infrastructure categories:

(a) for electricity transmission and storage projects falling under the energy infrastructure categories set out in Annex II.1(a) to (d), the project is to contribute significantly to at least one of the following specific criteria:

(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;

Article 4(2)(a) describes several specific criteria that projects of common interest for electricity and storage must significantly contribute to in order to be eligible to the Project of Common Interest status (in addition to general criteria specified in Article 4(1) which are not addressed in the CBA, but for which the information is available in the TYNDP). The 2nd CBA methodology includes specific indicators to capture these criteria:

Criteria for PCI (article 4(2) Regulation 347/2013)	2nd CBA Methodology Indicator
Market Integration	B1 (Socio-Economic Welfare)
Sustainability	B3 (RES Integration)
Security of Supply	B6 (SoS – System Adequacy to meet demand) B7 (SoS – System Flexibility) B8 (SoS – System Stability)

Article 4(2)(a)(i): Market integration benefits are reported by CBA indicator B1 (socio-economic welfare), which is a measure of the ability of a project to lift constraints that limit the competition (ability to exchange power) between the market zones of a pair of Member States. It is described in section 3.4.1. of the CBA guideline.

In the event of market imperfections, transmission projects may also contribute to reducing market power of one or more players in a specific area and, hence, improve competition. Although impact on market power is recognized as an important benefit, Annex 4 of the Guideline explains in details why this effect is not captured by the set of indicators defined in the Guideline. This is due in particular to the difficulty of currently available market modelling tools to represent imperfect market competition, and to the extreme sensitivity of this indicator to future regulatory and market designs.

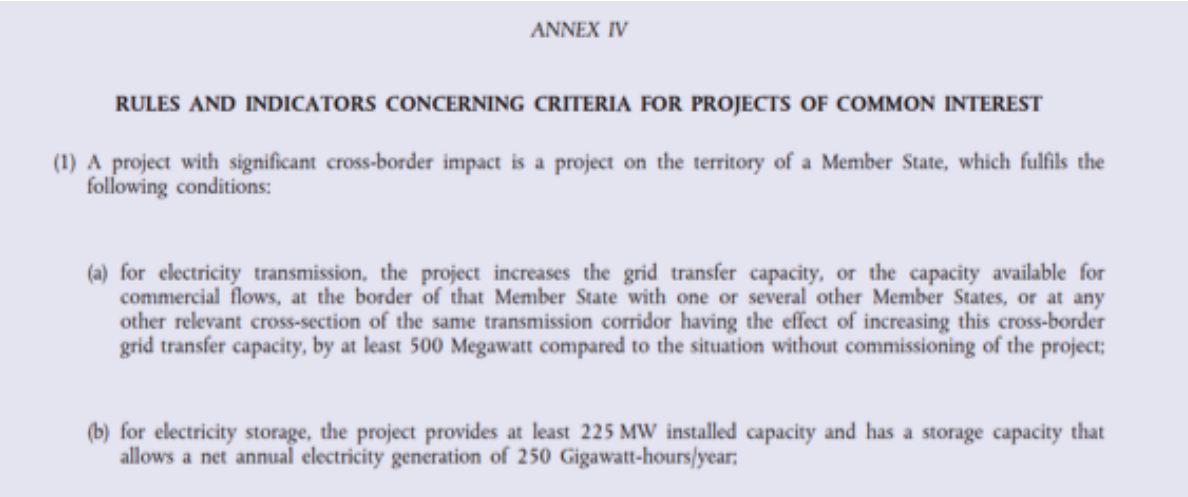
Article 4(2)(a)(ii): Sustainability benefits are reported by CBA indicator B3 (RES integration), which indicates the extent to which a project contributes to integrating RES into the system. It is described in section 3.4.3.

Article 4(2)(a)(iii): Security of supply is reported by three CBA indicators and encompasses different aspects. A suite of indicators (B6 System adequacy, B7 System flexibility and B8 System stability) have been designed to show the contribution of a project to security of supply. These are described in section 3.4.

2

Annex IV(1): Significant cross-border impact

Figure 2: Relevant provisions from Annex IV(1)



ANNEX IV

RULES AND INDICATORS CONCERNING CRITERIA FOR PROJECTS OF COMMON INTEREST

(1) A project with significant cross-border impact is a project on the territory of a Member State, which fulfils the following conditions:

(a) for electricity transmission, the project increases the grid transfer capacity, or the capacity available for commercial flows, at the border of that Member State with one or several other Member States, or at any other relevant cross-section of the same transmission corridor having the effect of increasing this cross-border grid transfer capacity, by at least 500 Megawatt compared to the situation without commissioning of the project;

(b) for electricity storage, the project provides at least 225 MW installed capacity and has a storage capacity that allows a net annual electricity generation of 250 Gigawatt-hours/year;

Annex IV(1)(a) and **(b)** describe that electricity transmission projects and electricity storage projects must, respectively, add at least 500 MW at the border of two Member States (transmission) and 225 MW/250 GWh/year (storage) in order to be considered as having a 'significant cross-border impact'. In order to easily determine whether a project meets the requirements to be considered as a project of common interest, section 3.2.2 of the CBA guideline provides a methodology to determine the transfer capacities of transmission projects and requires that these transfer capacities must be reported.

The methodology refers to the two notions of transfer capability mentioned in the Regulation through two measures: Net Transfer Capacity, which is related to the potential for market exchanges of electricity resulting in a power shift of dispatch from one bidding zone to another; and, Grid Transfer Capacity, which is related to physical power flows that can be accommodated by the grid.

The methodology defines which of these measures must be reported for different types of projects (internal or cross-border), and requires that same method must be applied in a consistent and transparent way for all projects that are under assessment.

3

Annex IV(2): Criteria from Article 4

Figure 3: Provisions from Annex IV(2)

(2) Concerning projects falling under the categories set out in Annex II.1(a) to (d), the criteria listed in Article 4 shall be evaluated as follows:

(a) Market integration, competition and system flexibility shall be measured in line with the analysis made in the latest available Union-wide 10-year network development plan in electricity, notably by:

— calculating, for cross-border projects, the impact on the grid transfer capability in both power flow directions, measured in terms of amount of power (in megawatt), and their contribution to reaching the minimum interconnection capacity of 10 % installed production capacity or, for projects with significant cross-border impact, the impact on grid transfer capability at borders between relevant Member States, between relevant Member States and third countries or within relevant Member States and on demand-supply balancing and network operations in relevant Member States,

— assessing the impact, for the area of analysis as defined in Annex V.10, in terms of energy system-wide generation and transmission costs and evolution and convergence of market prices provided by a project under different planning scenarios, notably taking into account the variations induced on the merit order.

(b) Transmission of renewable energy generation to major consumption centres and storage sites shall be measured in line with the analysis made in the latest available 10-year network development plan in electricity, notably by:

— for electricity transmission, by estimating the amount of generation capacity from renewable energy sources (by technology, in megawatts), which is connected and transmitted due to the project, compared to the amount of planned total generation capacity from these types of renewable energy sources in the concerned Member State in 2020 according to the national renewable energy action plans as defined in Article 4 of Directive 2009/28/EC,

— for electricity storage, by comparing new capacity provided by the project with total existing capacity for the same storage technology in the area of analysis as defined in Annex V.10.

(c) Security of supply, interoperability and secure system operation shall be measured in line with the analysis made in the latest available 10-year network development plan in electricity, notably by assessing the impact of the project on the loss of load expectation for the area of analysis as defined in Annex V.10 in terms of generation and transmission adequacy for a set of characteristic load periods, taking into account expected changes in climate-related extreme weather events and their impact on infrastructure resilience. Where applicable, the impact of the project on independent and reliable control of system operation and services shall be measured.

Annex IV(2) elaborates on how a number of criteria listed in Article 4 of the Regulation should be evaluated.

a Market integration
The impact on grid transfer capability and the contribution to the minimum interconnection targets are addressed in the CBA through the NTC/GTC values mentioned in the previous section of this Chapter. The interconnection targets themselves are not part of the CBA but are presented in the ENTSO-E System Needs package and Regional Investment Plans (parts of the TYNDP).

The B1 (Socio-Economic Welfare) indicator is a direct measurement of the impact of projects both in terms of system-wide costs and evolution of market prices. Because this indicator is calculated for the entire geographic scope, and not separately for each market zone, it also encapsulates the convergence of market prices. The methodology requires that it is calculated within different scenarios including variations in the merit order.

b Transmission of renewable energy generation
The B3 (RES integration) indicator, which measures the spilled energy of renewable generation avoided by the project, directly corresponds to the definition of the Regulation for transmission projects. As the CBA focuses on reporting project benefits and costs at a pan-European level, the geographic scope considered is the entire TYNDP area as for all other indicators. For storage projects, the criteria defined above can be calculated through information reported in the TYNDP.

c Security of supply
The B6 indicator (System Adequacy to meet demand) encapsulates the impact of a project on the loss of load expectations. It can be performed under multiple climate years, which will be the case starting from the TYNDP 2018. The CBA methodology does not however explicitly prescribe the context of the project assessments with regard to extreme weather events. This is due to the fact that it would be very challenging to define an analysis methodology guaranteeing a fair and replicable assessment of all projects in long terms scenarios (a methodology such as the one used in the ENTSO-E Mid-Term Adequacy forecast, which includes stochastic calculations considering extreme weather events is not currently possible for the TYNDP due to the number of projects to consider, and would be very challenging to replicate for external parties).

The impact of one project on the capacity of an electric system to accommodate fast and deep changes in the net demand in the context of high penetration levels of non-dispatchable electricity generation (in order to maintain secure system operation) is characterised by indicator B7 – System flexibility.

Finally, indicator B8 – System Stability characterises the project's impact on the ability of a power system to provide a secure system operation for a given initial operating condition, to regain a state of operating equilibrium after being subjected to a physical disturbance.

(Articles IV(3), IV(4) and IV(5) are not related to electricity transmission or storage and therefore not discussed here).

4

Annex V

Figure 4: Provisions from Annex V

ANNEX V

ENERGY SYSTEM-WIDE COST-BENEFIT ANALYSIS

The methodology for a harmonised energy system-wide cost-benefit analysis for projects of common interest shall satisfy the following principles laid down in this Annex.

(1) The methodology shall be based on a common input data set representing the Union's electricity and gas systems in the years n+5, n+10, n+15, and n+20, where n is the year in which the analysis is performed. This data set shall comprise at least:

(a) in electricity: scenarios for demand, generation capacities by fuel type (biomass, geothermal, hydro, gas, nuclear, oil, solid fuels, wind, solar photovoltaic, concentrated solar, other renewable technologies) and their geographical location, fuel prices (including biomass, coal, gas and oil), carbon dioxide prices, the composition of the transmission and, if relevant, the distribution network, and its evolution, taking into account all new significant generation (including capacity equipped for capturing carbon dioxide), storage and transmission projects for which a final investment decision has been taken and that are due to be commissioned by the end of year n+5;

(b) in gas: scenarios for demand, imports, fuel prices (including coal, gas and oil), carbon dioxide prices, the composition of the transmission network and its evolution, taking into account all new projects for which a final investment decision has been taken and that are due to be commissioned by the end of year n+5.

N.B: Articles V(1)-b, V(7), V(8) and V(12) are not related to electricity transmission or storage and therefore not discussed here

Annex V(1): The CBA 2.0 (and its foreseen application with the ENTSOs scenarios 2018 and the ENTSO-E TYNDP 2018) are fully compliant with Annex V(1).

The methodology prescribes that common electricity system and gas scenarios should be constructed, including the formation of a common input dataset. It prescribes that these scenarios should be used as the basis for all subsequent simulations.

The Regulation provides a detailed list of parameters that should be included in the common input data set. The CBA guideline does not list all of these, but includes the sentence "…take into account several constraints such as flexibility and availability of thermal units, hydro conditions, wind and solar profiles, load profile and outages" which covers the same span of relevant parameters. It has to be noted that the ENTSOs scenarios 2018 specifically provide the data for each parameter listed in Annex V(1).

The common scenarios developed by ENTSO-E and ENTSO-G cover the years 2025, 2030 and 2040 (n+7, n+13, n+23). The choice of round years rather than round time horizons (e.g. n+5 would be 2023) allows comparison of the CBA results with previous and future TYNDPs as well as external studies using the same time horizons.

Concerning the transmission projects to be taken into account in the input data set, i.e., the reference network, section 2.3 prescribes: "The reference network is then built up of including the most mature projects that are: a) in the construction phase or b) in the 'permitting' or 'planned but not yet permitting' phase where their timely realisation is most likely".

Figure 5: Provisions from Annex V

(2) The data set shall reflect Union and national law in force at the date of analysis. The data sets used for electricity and gas respectively shall be compatible, notably with regard to assumptions on prices and volumes in each market. The data set shall be elaborated after formally consulting Member States and the organisations representing all relevant stakeholders. The Commission and the Agency shall ensure access to the required commercial data from third parties when applicable.

Annex V(2): The provisions above are addressed through the construction of relevant and consistent scenarios by ENTSO-E and ENTSO-G, rather than in the CBA 2.0 which focuses on assessment and does not prescribe the content of scenarios.

While constructing the TYNDP scenarios, ENTSO-E and ENTSO-G widely consult stakeholders, including specifically Member States and National Regulators, to define storylines and the main indicators of the scenarios. A formal consultation period also takes place on the final scenarios report. Furthermore, the TYNDP electricity models are built using a joint approach both bottom-up (for the first scenarios: the data is collected at national level) and top-down (for other scenarios: results are derived from the first bottom-up scenario). This allows to ensure that the scenario datasets are consistent with national assumptions.

Figure 6: Provisions from Annex V

(3) The methodology shall give guidance for the development and use of network and market modelling necessary for the cost- benefit analysis.

Annex V(3): The methodology provides guidance on market and network modelling on section 2.2.

Figure 7: Provisions from Annex V

(4) The cost-benefit analysis shall be based on a harmonised evaluation of costs and benefits for the different categories of projects analysed and cover at least the period of time referred to in point (1).

Annex V(4): The core objective of the CBA guideline is to enable a proper comparison of projects, based on standardised and uniform assessment results.

Section 3 introduces a uniform set of indicators for this purpose, with benefit indicators in section 3.4, residual impact indicators in 3.5 and cost indicators in 3.6.

Figure 8: Provisions from Annex V

(5) The cost-benefit analysis shall at least take into account the following costs: capital expenditure, operational and maintenance expenditure over the technical lifecycle of the project and decommissioning and waste management costs, where relevant. The methodology shall give guidance on discount rates to be used for the calculations.

Annex V(5): All cost components that are mentioned in the Regulation are included in section 3.6 of the CBA guideline.

Figure 9: Provisions from Annex V

(6) For electricity transmission and storage, the cost-benefit analysis shall at least take into account the impact and compensations resulting from the application of Article 13 of Regulation (EC) No 714/2009, the impacts on the indicators defined in Annex IV, and the following impacts:

(a) greenhouse gas emissions and transmission losses over the technical lifecycle of the project;

(b) future costs for new generation and transmission investment over the technical lifecycle of the project;

(c) operational flexibility, including optimisation of regulating power and ancillary services;

(d) system resilience, including disaster and climate resilience, and system security, notably for European critical infrastructures as defined in Directive 2008/114/EC.

Annex V(6):

a Reducing greenhouse gases is one of the directly measurable effects of transmission projects. CO_2 emissions are considered as the most important greenhouse gas by the CBA guideline and it therefore mandates the reporting of the variation in CO_2 as a consequence of building a transmission project. This is covered by indicator B2 in section 3.4.2.

Transmission losses must be reported as according to indicator B5 in section 3.4.5.

b The methodology considers generation scenarios as input that is covered by the scenario building process and transmission in the process leading to the construction of a reference network for subsequent simulations.

c In the absence of a full quantitative method to assess regulating power and ancillary services, the methodology includes indicator B7 to serve as a proxy for reporting flexibility. Further work is ongoing to bring this complex but essential part of the valorisation of projects in next editions of the CBA and TYNDP.

d In the absence of a full quantitative method to assess system resilience and system security, the methodology includes indicator B8 to serve as a proxy for reporting the effect of transmission projects on system stability.

Figure 10: Provisions from Annex V

(9) The detailed method used to take into account the indicators referred to in points 6 to 8 shall be elaborated after formally consulting Member States and the organisations representing all relevant stakeholders.

Annex V(9): The 2nd CBA methodology was formally consulted with the general public, ACER, European Commission and the Member States (see further details in Section 3 of this document Main Changes between the 1st CBA and 2nd CBA guideline).

Figure 11: Provisions from Annex V

(10) The methodology shall define the analysis to be carried out, based on the relevant input data set, by determining the impacts with and without each project. The area for the analysis of an individual project shall cover all Member States and third countries, on whose territory the project shall be built, all directly neighbouring Member States and all other Member States significantly impacted by the project.

Annex V(10): Project benefits are calculated by comparing the situations with and without the project, as defined by the Regulation. Section 2.3 of the methodology provides guidance for this. Section 3.2.3 prescribes the geographical scope that should form the basis for these assessments.

Figure 12: Provisions from Annex V

(11) The analysis shall identify the Member States on which the project has net positive impacts (beneficiaries) and those Member States on which the project has a net negative impact (cost bearers). Each cost-benefit analysis shall include sensitivity analyses concerning the input data set, the commissioning date of different projects in the same area of analysis and other relevant parameters.

Annex V(11): Project appraisal is based on analyses of the global (European) increase of welfare. This means that the goal is to bring up the projects which are the best for the European power system. At this stage, the CBA states that all costs and benefits are therefore to be reported at the European level. The methodology does not foresee as mandatory breakdown of costs on different countries.

The CBA guideline provides general guidelines with regard to sensitivity analyses, but does not prescribe the extent to which sensitivity analyses should be performed in general. This is because in principle, each individual model parameter can be used for a sensitivity analysis, but not all might be equally useful to obtain the desired information. The 2nd CBA guideline provides examples of useful sensitivities: Fuel and CO_2 price, climate years, load, technology phase-out and must-runs.

In the TYNDP 2018, each of these sensitivities are considered either as a building parameter of scenarios, or as specific CBA sensitivities within each scenario reported in the TYNDP (climate years).

Figure 13: Provisions from Annex V

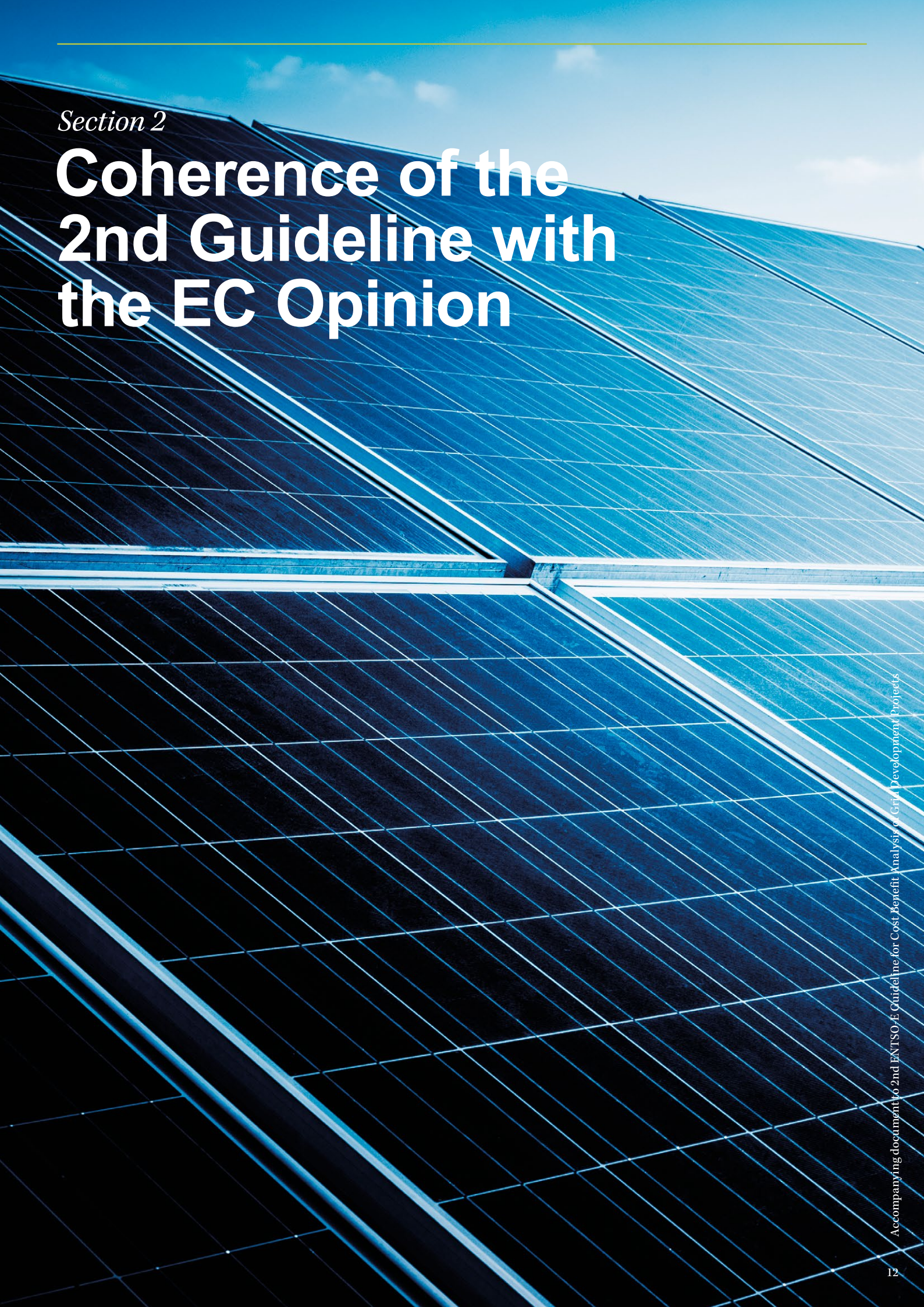
(13) For the common electricity and gas market and network model set out in paragraph 8 of Article 11, the input data set referred to in point (1) shall cover the years n+10, n+20 and n+30 and the model shall allow for a full assessment of economic, social and environmental impacts, notably including external costs such as those related to greenhouse gas and conventional air pollutant emissions or security of supply.

Annex V(13): The construction of a common electricity and gas market and network model was addressed through the construction of a joint set of scenarios by the ENTSOs. The TYNDP 2018 set of scenarios covers the years 2025 to 2040. Stakeholders consulted agreed in majority that scenarios building resources should be affected to the development of 1 scenario for 2020, 1 for 2025, 3 for 2030 and 3 for 2040, avoiding the 2050 time horizon.

The ENTSOs are currently working in parallel to the TYNDPs development to further identify the relevant interlinks between existing or new gas and electricity transmission infrastructure, and are looking forward to possibly enriching future TYNDPs with such elements.

Section 2

Coherence of the 2nd Guideline with the EC Opinion



ENTSO-E welcomes the suggested updates and change requests to the CBA guideline provided by the European Commission in Opinion (2018) 4 (published: 10.01.2018), and has already included some of them in the "2nd ENTSO-E Guideline for Cost Benefit Analysis of Grid Development Projects" (short: 2nd CBA guideline). Some other of these comments will be considered in the context of the development of a 3rd CBA guideline (see Roadmap for further developing the CBA guideline). ENTSO-E has already started the work in preparation of a 3rd CBA Guideline, in which it directly includes opinions from external stakeholders, which are involved in three so-called "work streams" on Socio-Economic Welfare, Security of Supply and storage projects.

This Chapter presents an overview of the changes made to the CBA methodology following the European Commission opinion.

1. General Findings
As requested by the European Commission in their opinion, ENTSO-E has included to the "CBA package" a roadmap with future improvements that go beyond the 2nd CBA guideline, including the proposed improvements, the current planning status, an estimation of the effort it will take and the expected improvements. As recommended by European Commission in their opinion, ENTSO-E has included a detailed overview of the changes from the first CBA guideline to the second CBA guideline in this document, including an argumentation of the changes, i.e. due to comments from ACER, or from the public consultation.

2. Comments on the Proposed Methodology
2.1. Coherence with the Regulation
Following the recommendation from EC of their opinion, ENTSO-E has included an overview which highlights the coherence of the 2nd CBA guideline with the regulation as defined in Article 4(2) and relevant provisions from Annex IV.

2.2. Clustering of investments
ENTSO-E acknowledges the Commission's comments regarding the issue of clustering and agrees that clustering should solely occur in the event that investments are highly interdependent. No additional changes have been included to the clustering rule in the 2nd CBA. However, ENTSO-E also agrees that the clustering of investments has not always been done properly in previous editions of the TYNDP. ENTSO-E will therefore continue to consider this issue in the development of the next CBA guideline as requested in the Opinion, and will also specifically communicate on that matter with project promoters during the TYNDP delivery process.

2.3. Further monetisation of cost-benefit indicators
No additional changes have been included, as the development of the current CBA already considered all that could be currently achieved. ENTSO-E will keep discussing this in the development of the next CBA guideline.

2.4. Assessment methodology for electricity storage projects
Following the recommendation from European Commission of their opinion, ENTSO-E has included to the 2nd CBA guideline an abstract under "1.2 Scope of the Document" and "4 Assessment of Storage" highlighting the specificities of storage projects.

Further improvements will be carried out in the next version of the CBA. A specific work stream on storage for the next CBA has been created with the participation of external stakeholders.

Given that the peculiarities of storage projects could not be completely covered by the current methodology, the TYNDP process will foresee a dedicated space for Additional Benefits in the project sheet. This space will allow the TYNDP to include results obtained by project promoters. Justification (reference studies) and if possible monetisation of these benefits will be required.

2.5. Net present value (NPV)
Following the recommendation from European Commission of their opinion, ENTSO-E has changed in the 2nd CBA the section "3.2.4 Guidelines for Project NPV calculation" and now no longer mentions concrete values to use for the discount rate, the economic lifetime and the residual value in NPV assessments. Instead of providing concrete figures, it now highlights the need for using a common methodology for NPV calculation for all projects.

2.6. Socio-economic welfare
Following the recommendation from EC of their opinion, ENTSO-E has highlighted in the 2nd CBA the importance of the CO_2 indicator by placing it on top of the benefit indicators directly behind SEW (see 3.4.2 in the 2nd CBA guideline).

2.6.1. Total surplus approach
ENTSO-E expanded the explanations regarding the total surplus approach (section 3.4.1). It now clearly mentions that all the different effects that projects may have on consumer, producer and TSO surpluses should be taken into account. If a project has a negative effect on a surplus category (i.e., it decreases the welfare in a category), this is properly accounted for.

2.6.2. Inconsistencies between wording for CO_2 and RES
The CBA Guideline is now consistent with regard to the CO_2 and RES sub-indicators that are provided as additional information under B1. Further improvements will be considered in the context of the "SEW work stream", in which external (non-ENTSO-E) stakeholders participate.

2.6.3. SEW benefits distinction in subcategories: SEW benefits on cross-border boundaries, SEW benefits on internal boundaries and on very local constraints

Annex 2 of the "2nd ENTSO-E Guideline for Cost Benefit Analysis of Grid Development Projects" explains how the assessment of internal projects (with low impact on any NTC) will be based on redispatch simulations in addition to the market simulations. The overall SEW benefit can be achieved by summing up the benefits derived by both methods: while the market simulations are giving access to the benefits resulting from increasing the NTC (Net Transfer Capacity), the redispatch simulations are giving access to the benefit resulting from resolving grid congestions. However, beside its cross-border impact, interconnector projects can also have a significant impact on the internal grid which until now has not been properly taken into account. Therefore, for the next update of the CBA guidelines, ENTSO-E intends to evaluate the introduction of the combination of market and redispatch simulation for cross-border projects (without double counting them).

As for now, SEW benefits are shown on a Pan-European level without distinction between SEW benefits on cross-border boundaries and SEW benefits on internal boundaries and very local constraints. While cross-border projects present SEW benefits calculated at the Pan-European level only, for internal project SEW benefits are calculated at both Pan-European and internal, local level. As for now, SEW benefits are shown anyway on a Pan-European level without distinction between SEW benefits on cross-border boundaries and SEW benefits on internal boundaries and very local constraints. So in case internal SEW benefits are available, they are properly included in the unique, Pan-European SEW benefit indicator. For the future the focus is still on eventually extending the methodology (combining market studies and redispatch simulations) also for cross-border.

The efforts required and the expected development are detailed in the Roadmap for improving the CBA guideline in section 4.4.

2.6.4. Transparently reporting the sub indicators to the SEW indicator: RES integration, avoided CO_2 and avoided redispatch/congestion

The 2nd CBA Guideline requires that the SEW sub-indicators related to reduction of CO_2 (calculated as reduction of CO_2 emission costs) and RES integration (expressed as fuel savings due to integration of RES) are defined as sub components of the overall SEW benefit indicator (B1) and transparently displayed as such. Any increase of SEW is the direct result of a transmission link reducing congestion (cross-border congestion creating economic bottlenecks or internal congestion due to physical bottlenecks), and as such a sub-indicator for 'SEW caused by reduced congestion' would, by definition, be equal to 'total SEW benefits'. Further note that some of the SEW benefits that result from reducing congestion by building the transmission link may be induced by a higher penetration of RES and/or reduced CO_2 emissions (hence, the categories overlap). The CBA Guideline requires that the basis for calculation (cross-border impact, internal bottleneck alleviation, etc.) is reported along with the value (see Table 3 of the 2nd CBA Guideline).

2.6.5. Application of the sensitivity analysis to the SEW indicator for sensitivity to CO_2 prices

A wide range of CO_2 prices, derived from official sources (e.g. the outlooks of the International Energy Agency or scenarios published by the European Commission) is used during the scenario building phase. This enables to visualize the impact of CO_2 prices to the SEW indicator without losing the huge impact of these prices to the definition of the generation portfolio. To assess the impact of a wide range of CO_2 prices within the same scenario is acknowledged as recommendable to better frame the weight of the CO_2 prices in the SEW results of a given project. However, this type of exercise would inevitably affect the merit order, one of the pillars of the market simulations. This implies that a separate market simulation is necessary for each CO_2 sensitivity that is to be addressed, for each project. This aspect is not only not negligible, but also the main concern related to the feasibility of CO_2 price sensitivity to the SEW indicator given the current schedule and resource of the TYNDP process. Differently, ignoring the impact to the merit order (e.g., by doing some sort of post-processing of results) would result in figures that are hardly meaningful.

In short, a proper analysis of CO_2 sensitivities entails an expansion of the scope of a study. Following the interesting suggestion expressed in the Opinion, ENTSO-E will perform internal tests and research to determine if and how such sensitivities could be performed in the next TYNDPs (from 2020 onwards).

The CBA Guideline does not however intend to lay down the scope of any study, but to provide a uniform basis for calculations. Therefore, the extent to which CO_2 sensitivity analyses are to be performed, must be decided in the context of TYNDP and not prescribed by the CBA Guideline.

2.6.6. A better link of the CBA results with the needs assessment part of the PCI selection process

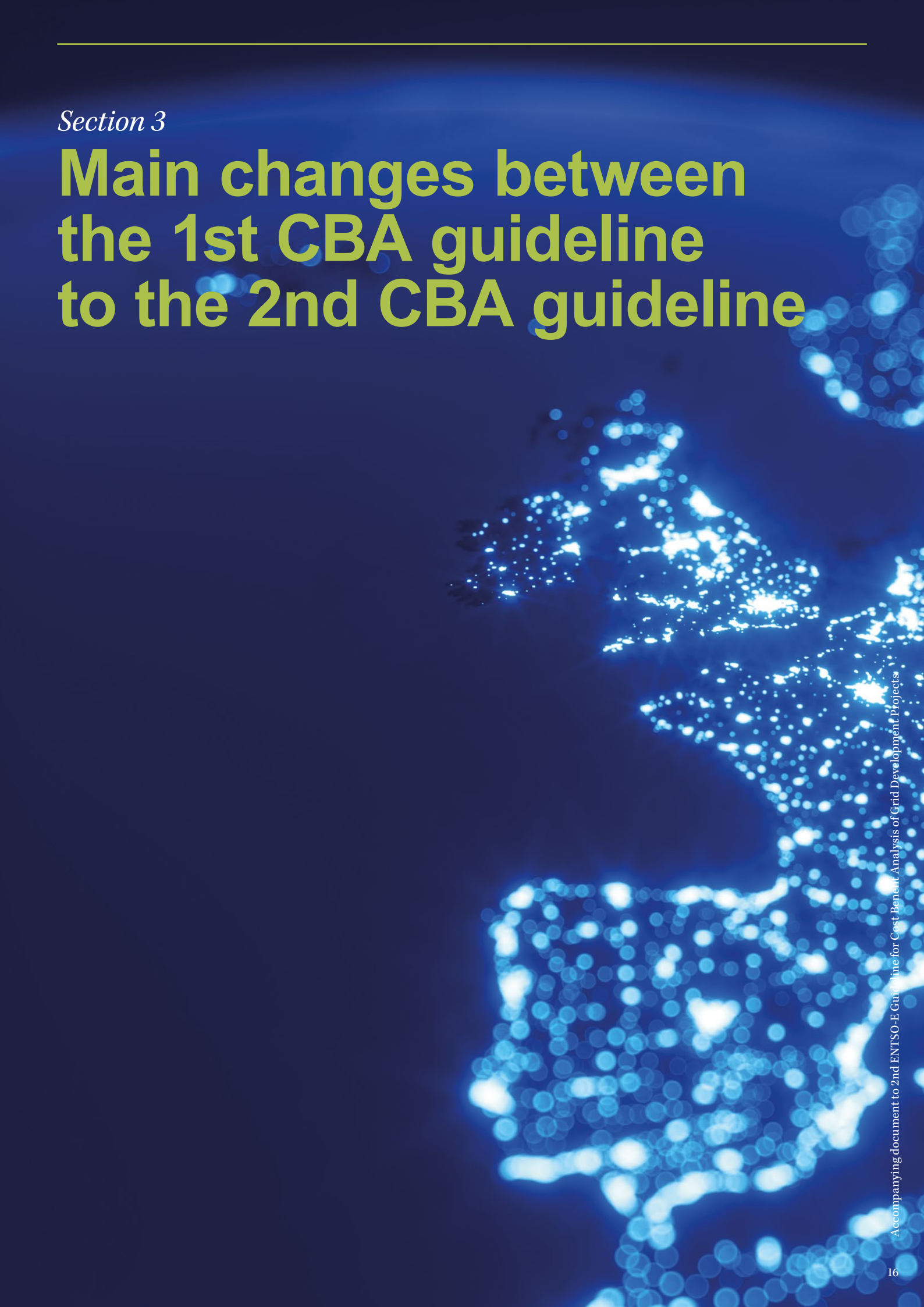
ENTSO-E acknowledges that CBA results could be better linked to the needs assessment part of the PCI selection process. However, this is an improvement that could be better tackled within all the preliminary work planned within the TYNDP process framework to improve the project sheets structure and hence support a smoother PCI selection process.

2.7. Other issues

Following the recommendation from EC of their opinion, ENTSO-E has included the reference to the updated document (Guide to Cost-Benefit Analysis of Investment Projects, Economic appraisal tool for Cohesion Policy 2014-2020; EC, 2014).

Section 3

Main changes between the 1st CBA guideline to the 2nd CBA guideline



Regulation (EC) 347/2013 mandates ENTSO-E to draft the European Cost Benefit Analysis methodology which shall be further used for the assessment of the ENTSO-E Ten-Year Network Development portfolio. ENTSO-E has drafted the first official CBA methodology during 2013 and 2014, which was consequently approved and published by the European Commission on 5 February 2015.

The 1st CBA Guideline was used in TYNDP 2014 (unofficially) and TYNDP 2016 (officially) project assessments. Based on the experience gained from these two applications as well as the feedback received from external stakeholders, including the European Commission and ACER, ENTSO-E worked during 2015 and 2016 on improving the official 1st CBA Guideline.

The draft 2nd CBA Guideline (referred to as 'CBA 2.0') was then presented to the stakeholders during the open workshop on 16 March 2016 and released for public consultation on 25 April 2016 (until 31 May 2016).

During the public consultation, the following stakeholders responded to ENTSO-E's proposed draft 2nd CBA Guideline:
— Europacable
— European Copper Institute
— TIWAG-Tiroler Wasserkraft AG
— DEME
— APG – Austrian Power Grid AG
— EASE
— Climate Action Network (CAN) Europe
— Worldenergy SA
— COMPANY
— EURELECTRIC
— National Grid
— FRIENDS OF THE SUPERGRID
— EURELECTRIC
— EDF
— IFIEC Europe
— Ricerca sul Sistema Energetico – RSE S.p.A.
— Enel S.p.A.
— RTE
— Copperleaf

These stakeholders had the chance to provide their opinion regarding pre-defined aspects of the CBA (purpose of an European CBA methodology, multi-criteria vs. one figure approach considering the variety of users of the CBA, ease of use and understanding of the CBA, ease of understanding indicators computation method and suggestions for improvements, degree of completeness of the set of indicators in covering costs and benefits of a given project, clustering rules, Security of Supply indicator, cost indicator, losses indicator and storage assessment), as well as share with ENTSO-E their broader vision on the draft released for public consultation.

The current document summarizes what ENTSO-E has improved regarding the methodology and the reasons behind the changes. These changes cover also the implemented changes due to the stakeholders' feedback. For a full view on all stakeholders' feedbacks (from the consultation) and the ENTSO-E answer to each of them please read the overview table in the dedicated Appendix Stakeholder Consultation Feedback.

It is to be noticed that the 2nd CBA guideline has a more general approach and assumes that the project selection and definition, along with the scenarios description is within the frame of the TYNDP and therefore not defined in detail in the assessment methodology. ENTSO-E aims with this approach to develop a CBA methodology that can be used not only for one TYNDP but rather to include strong principles that would stand for a longer time.

There have been several comments from the public consultation related to the assessment on storage projects. In a first step ENTSO-E took these into account by harmonizing the assessment of storage and transmission projects, while at the same time giving a more specific guidance related to the flexibility contribution of storage projects. For further improvements ENTSO-E has set up a work stream for storage in which external stakeholder are encouraged to participate.

Furthermore, the section on Security of Supply (SoS)
— System Stability has been commented as being presented without enough detail. ENTSO-E has already further improved the respective indicators and added more explanation. For further improvements ENTSO-E has set up a work stream for the SoS in which external stakeholder are encouraged to participate.

The general main changes can be summarized as follows:
— changed the structure of the document to make it more logic and easier to follow e.g. introduced one section for each indicator category (i.e. 3.4 benefits, 3.5 residual impacts, 3.6 costs) and subsection for each indicator;
— introduced detailed explanations on Grid Transfer Capability (physical flow) and Net Transfer Capacity (market exchange) while finally "just" reporting the delta Net Transfer Capacity;
— further generalized the treatment of storage projects, to align with the evaluation of transmission projects;
— deleted the recommendation to use "one hour" as resolution for the simulations (e.g. changed the recommendation to perform the simulations per hour to per time step);
— aligning the project statuses, definition of investments and project to the TYNDP16 for consistency reasons;
— general review of the Socio-Economic Welfare (RES, CO_2, societal well-being) concept;
— included more details on Security of Supply calculations and divided the Security of Supply indicator in three sub-indicators: first one – System Adequacy (i.e. Adequacy to meet demand) (B6) and other one – System security, i.e. System flexibility (B7) and System stability (B8). All of them has explanation in the methodology.

The table included below provides a comprehensive overview of all the topics that are addressed in the CBA Guideline, indicates the positions in the 1st CBA and the 2nd CBA, and explains the reasons for the changes if applicable.

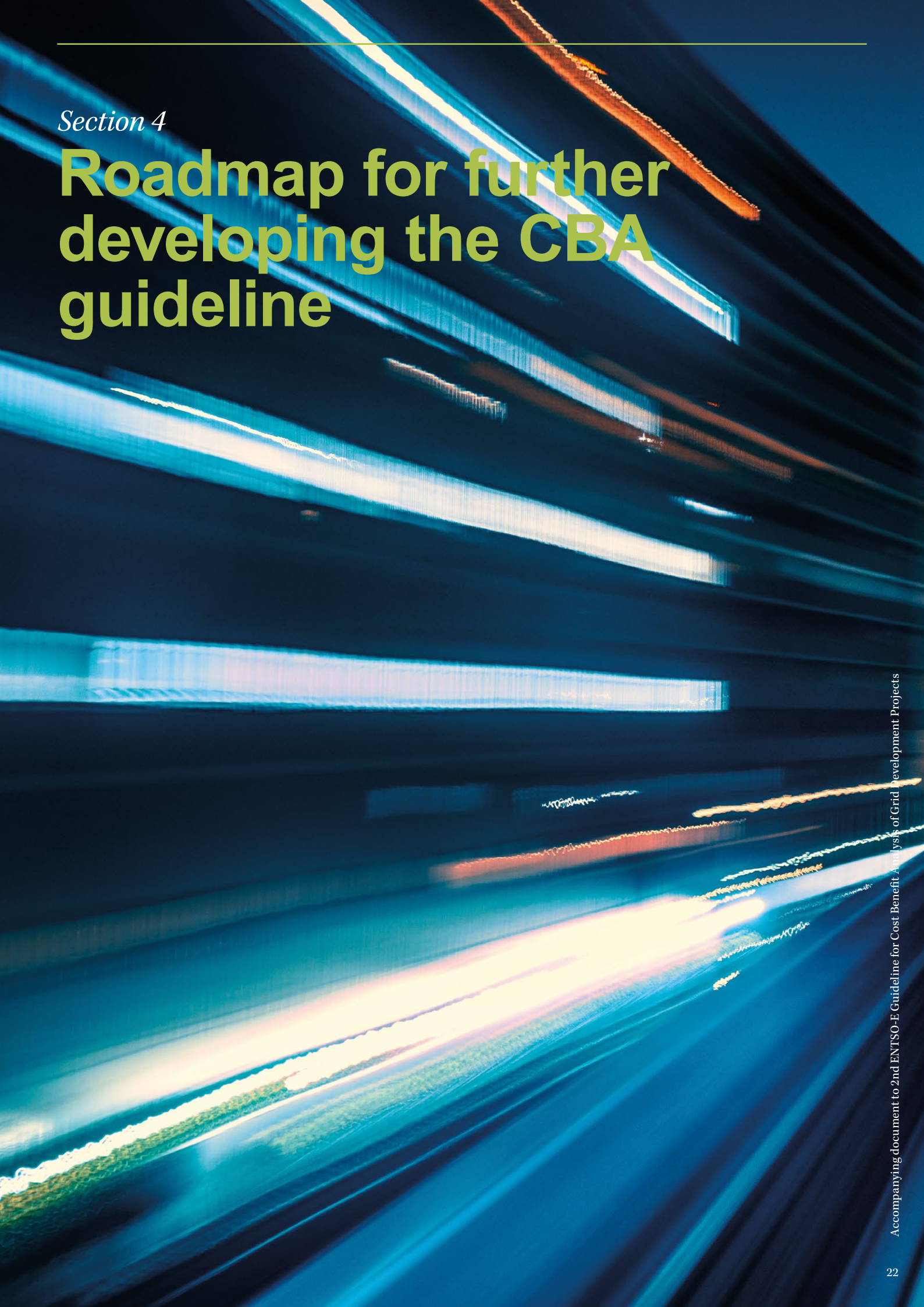
Topic	Section in 1st CBA	Section in 2nd CBA	What/how?	Why?
Definitions and abbreviations	None	Preamble	Inclusion of a general definitions and abbreviations section in the beginning of the document	Offers more clarity and helps to easier understand the guideline, abbreviations and definitions
Introduction	1	1	Shortened and improved; included a figure displaying the role of the CBA in the „whole“ process; included a section on the compliance with Reg. 347	To focus better on the important topics; better explains the role of the CBA inside the process (scenario-TYNDP-CBA-PCI)
Scenarios and planning cases	2	2	Edited in order to streamline the scenario chapter focusing more on the general aspects of scenarios; e.g. introduced the need to have at least two representative scenarios for the “mid-term horizon”; introduced fixed study horizons by rounding to full 5 years (n+5 in TYNDP18 should be 2025)	Scenarios are decided within the TYNDP frame; this chapter only reflects the need of scenarios within the CBA process
Market and Network Studies	2.4.1	2.2	Renamed to “Modelling Framework” and included abstracts for Redispatch and Flow-Based simulations	Gives a better overview of the most common simulation methods. According to a comment from the consultation
Baseline/ Reference Network	–	2.3	Included as separate section on the definition on the baseline/reference network	Gives more guidance on the very basis of the simulations. According to comments from ACER and EC
Project identification	3.1	–	Removed	Starting point of CBA is that projects are already identified
Assessment framework	3.3	3.3/3.5	Introduced a new indicator category and named it “Residual impact” (topic 3.5) and renamed and regrouped the other indicators to “Benefit categories” and “Costs”	To clarify that these indicators are not double counting with other indicators and to break down the indicators to only three categories for simplification. Gives more detail definitions of all indicators
Benefit indicators	3.3/3.7	3.3/3.4	Changed the order of the indicators and grouped the monetary part of CO_2 and RES under SEW; introduced the indicator “Societal well-being” under B4	According to a comment from ACER SEW was named as B1 indicator which already includes the monetary parts of CO_2 and RES; B4 “societal well-being” was introduced to complement the benefits as result from RES integration and CO_2 mitigation
RES integration	3.7.3	3.4.3	Included an explanation of the possible “additional subjective” value of RES; included text concerning double-counting of these costs which may be (partly or wholly) included in indicator B1 (SEW)	RES integration also has a subject component that is not covered by the “hard numbers” coming out of the simulations; avoidance of double-counting is seen very critical so therefore useful to add guidance, even though methodologically there was never a problem

Topic	Section in 1st CBA	Section in 2nd CBA	What/how?	Why?
Variation in CO_2 emissions	3.7.5	3.4.2	Included an explanation of the possible "additional subjective" value of CO_2 emissions (i.e., long-term societal cost different from internalized costs through EU Emissions Trading Scheme (ETS) prices or carbon taxes); included text concerning double-counting of these costs which may be (partly or wholly) included in indicator B1 (SEW)	CO_2 integration also has a subject component that is not covered by the "hard numbers" coming out of the simulations; avoidance of double-counting is seen very critical so therefore useful to add guidance, even though methodologically there was never a problem
Residual impact	–	3.3/3.5	Introduced a new residual impact indicator: S3 Other residual impacts	According to the comment of TIWAG
Clustering	3.2	3.2.1	20% and 5 years rule were replaced by a status-based approach; included clear definitions of the different project status to "under consideration", "planned, but not yet permitting", "permitting", "under construction	We kept the principles but reduced the complexity to come more reasonable results
SoS, robustness, resilience	3.3/3.7.6/ 3.7.7	3.4.6 and 3.4.8	Merged into adequacy meet demand and system stability	Clarity plus further possible development of the security of supply
SoS: System flexibility	3.7.7	3.4.7 and 4 (for storage)	Taken out as it was defined in CBA 1 and introduced an improved flexibility indicator under SoS	In CBA 1.0 flexibility referred to the usefulness of the projects across different visions; in CBA 2.0 it is defined as the ability of a storage project to contribute to smoothen load and generation patterns
Variation in Losses	3.3/3.7.4	3.2/3.4.5	Clearer rules for the perimeter and more detailed explanation; added monetization rules	More consistency in the assessments; needed monetization
Costs	3.5	3.6	Costs reported according to the project status; complexity factor for projects in early stage of development; mandatory explanation of the complexity factor. Costs have to be given per investment. Costs have to be given as OPEX and CAPEX	More consistency; clarification and transparency in case true costs differ from investment to investment. According to several comments from the consultation ACER and EC
Transfer Capability calculation	3.4	3.2.2	Changed the name and concept to a more generalized method. Changed the caption to "Transfer capability calculation"; extended the chapter to fully take account of the "new" described concepts of GTC and NTC, as well as their relation	Ensure consistency and helping better understanding the way NTC, ΔNTC, GTC and ΔGTC are calculated
Time frame	3.6.2	3.2.4	Included the text under discount rate and put it under NPV calculation	Logical position in the text
Discount rate	3.6.3	3.2.4	Renamed it to project NPV calculation; changed to a more general but consistent methodology	Title did not fully cover the content; according to EC opinion on the CBA guideline

Topic	Section in 1st CBA	Section in 2nd CBA	What/how?	Why?
Benefit analysis	3.6.4	2.3	Changed the caption to "Baseline/reference network". Project Promoter may now provide information about the benefits of their projects in relation to a difference reference network	Better explanation TOOT, PINT; in addition to the strict application of TOOT
Overall assessment	3.8	3.1	Changed the caption to "Multi-criteria assessment". Deleted the figure and replaced it by a description	The figure did not give the desired additional information which is now given in text. According to a comment from ACER
Sensitivity analysis	3.8.2	2.5	Changed the caption to "Optionally sensitivities". Changed it to a more detailed description of selected useful sensitivities	According to comments from ACER
Technical criteria for planning	4	Annex 1 (5.1)	Moved to the annex; deleted items related to project identification	Provides background information; CBA methodology deals with project assessment, not identification
Impact on market power	Annex 1 (5)	Annex 4 (5.4)	Changed only annex number	
Multi criteria analysis vs cost benefit analysis	Annex 2 (6)	Annex 5 (5.5)	Changed only annex number	
Total surplus analysis	Annex 3 (7)	Annex 6 (5.6)	Changed only annex number	
Value of lost load (VOLL)	Annex 4 (8)	Annex 7 (5.7)	Included a sample table with an overview of values for VOLL in Europe	According to comments from ACER
Assessment of ancillary services	Annex 5 (9)	Annex 8 (5.8)	Changed only annex number	
Assessment of storage	Annex 6 (10)	4	Added new chapter "Assessment of storage" and included flexibility indicator specific for storage projects; all other indicators to be assessed in line as given under the respective indicator	Outcome based on common work with storage promoters
Environmental and social impact	Annex 7 (11)	Annex 9 (5.8)	Changed title to "Residual environmental and social impact"	
Internal projects	–	Annex 2 (5.2)	Added new chapter "Assessment of Internal Projects"	Additional information for the assessment on internal projects are added

Section 4

Roadmap for further developing the CBA guideline



4.1

Justification for a 3rd CBA

Stakeholder feedback and the ENTSO-E experience with the 1st CBA (CBA 1.0) (used in the TYNDP 2014 and 2016) have clearly shown the need of improving the European project assessment methodology. Based on this, ENTSO-E has drafted the "2nd ENTSO-E Guideline for Cost Benefit Analysis of Grid Development Projects" (CBA 2.1) which will be used for the TYNDP 2018. While it is a good step forward, it does not address all stakeholders' stringent comments (especially with regard to the "Commission Opinion C(2018) 4 on the cost-benefit analysis methodology concerning trans-European electricity infrastructure" (short: EC opinion) and ACER's comments).

ENTSO-E has rather intensively involved ACER and the EC in the development of its 2nd CBA guideline. Both agencies are legally invited to provide an official opinion on ENTSO-E's work, and at the end the European Commission must give its formal approval before the CBA methodology can be used for project assessment. ACER initially voiced a negative opinion on CBA 2.0, an opinion which turned more positive for the updated 2nd CBA guideline in the light of strong cooperation between the two bodies along with strong commitment that ENTSO-E made with regards to the 3rd CBA: start stakeholder interaction very early, be more open-minded and tackle the ACER comments that could not be considered in the 2nd CBA guideline. Together with the EC opinion and experience from the PCI selection process for the 3rd PCI list, a clear need for further improving the CBA guideline is given.

The development of a 3rd CBA provides ENTSO-E with the opportunity to constantly improve its methodology and bring new perspectives to the table by, from the very beginning, developing this methodology in close cooperation with experts in the field and not just with the ENTSO-E core experts.

The improvements presented in this section are expected to be implemented as much as possible in the next CBA 3.0 whose works have already started and are ongoing.

4.2

Recommendations to be developed in the 3rd CBA guideline

According to Reg. (EU) 347/2013, ENTSO-E must develop its CBA guideline to support the European Commission within the process for Projects of Common Interest (PCI). Experience from the last PCI process has shown that the guideline should provide a solid basis for economic profitability and Net Present Value calculations, including the monetisation of the quantifiable benefit indicators. However, as not all indicators can be quantified and monetised in a uniform and objective way, the CBA guideline, in addition to the monetisation, has to give a tool at hand with which project promoters can assess those additional benefits in a consistent and transparent way in order to allow the best comparability as possible.

4.3

General overview

The development of a new CBA 3.0 is presently in a "starting phase" and focuses on gathering the comments and suggestions discovered during the process of improving the 2nd CBA guideline. Furthermore ENTSO-E has already, in the beginning of the process, included ENTSO-E external stakeholders by bringing the non-ENTSO-E experts in the process and to together discuss first ideas on how to improve the respective indicators or concepts. This joint way-of-working has started with the "Public workshop: CBA 3.0 – come and improve with us the transmission and storage assessment methodology" on 07.11.2017 from which it was decided to further work together with all interested stakeholders organised in so-called work streams. These work streams will focus on the improvement of certain fields of indicators that are:

— Socio-economic welfare, in a broad interpretation including RES and CO_2
— Storage projects
— Security of Supply

The outcome of the work-streams will directly be brought to the CBA guideline, the work-streams meetings delivered their outcome in April 2018.

While the remaining improvements as given by the European Commission opinion and ACER comments as well as comments from the public consultation for the 2nd CBA guideline will be done in a first step ENTSO-E internally (with following public consultation).

The recommended approach for project assessment based on the ENTSO-E CBA guideline is a mixture of: monetising as many indicators as reasonable and at the same time delivering additional, not less important, indicators. Only together the full potential and all the benefits of the projects will be captured.

4.4

Roadmap of improvements with regard to the EC opinion

This section describes the current status and expected improvements, as well as an indication of the work load, for a number of CBA topics.

4.4.1 SoS (adequacy to meet demand, system flexibility, system stability)

Current planning status

— joint work with ETNSO-E external stakeholders started on 07.11.017
— organisation of the improvements in an Security of Supply specific work stream together with ENTSO-E external stakeholders
— Adequacy to meet demand: Energy Not Served (ENS) and Additional adequacy margin to meet demand (in case the Energy Not Served is negligible)
— ENTSO-E currently aims to develop, together with external stakeholders, an improved and more sophisticated methodology to display and then monetize the project specific contribution to the Adequacy of the system. Value of Lost Load (VOLL)
— it is planned to develop together with ACER a methodology on how a reference VOLL for use in ENTSO-E evaluations can be determined

Flexibility

— ENTSO-E currently aims to develop, together with external stakeholders, a methodology on displaying and monetising the project specific contribution to flexibility due to ancillary services given by exchanging balancing energybetween different bidding areas

System stability

— taking the ideas generalised approach from the 2nd CBA guideline as starting point, ENTSO-E aims to develop a methodology on quantifying the projects impact on the system wide inerti. Furthermore this is also point of attendance within the work-stream on SoS

The table below gives a synthetic overview of all the roadmaps taken by ENTSO-E to improve the current SoS indicator.

Table 1: Roadmap overview for improvements of the SoS indicator

Topic	Objectives
Adequacy to meet demand[1]	ENTSO-E currently aims to develop, together with external stakeholders, an improved and more sophisticated methodology to display and then monetize the project specific contribution to the Adequacy of the system
Value of Lost Load (VOLL)	Work is envisaged to develop, together with ACER, a methodology on how a reference VOLL for use in ENTSO-E evaluations can be determined. However this would come from the activities carried not only within the CBA methodology
System flexibility	ENTSO-E currently aims to develop, together with external stakeholders, a methodology on displaying and monetising the project specific contribution to flexibility due to ancillary services given by exchanging balancing energy between different bidding areas
System stability	ENTSO-E currently aims to develop, together with external stakeholders, a general approach (using the 2nd CBA guideline as starting point) to quantify the projects impact on the system wide inertia

Effort it will take

— this indicator will be treated within one of the work-streams and therefore a constant communication with ENTSO-E external stakeholders is needed
— in general the effort for improving the SoS indictor is seen as high due to the complex nature of this indicator and the needed organisation and communication within the work streams and directly with ACER
— proposals and outcomes will need to be both previously tested and duly assessed in terms of implementation feasibility

Expected improvements

— getting, together with ACER, a methodology for VOLL determination allowing to consistently monetise the adequacy indicator. However this would come from the activities carried not only within the CBA methodology
— getting a quantified and monetizable indicator for flexibility
— getting a quantified indicator for the system stability
— getting an improved and more sophisticated methodology to display the system adequacy indicators

[1] Energy Not Served (ENS) and Additional adequacy margin to meet demand.

4.4.2 Storage

Current planning status
— joint work with ETNSO-E external stakeholders started on 07.11.2017
— organisation of the improvements in a storage specific work stream together with ENTSO-E external stakeholders
— discussing the applicability of increasing the time resolution of the used simulation tools which could better display the projects contribution to e.g. flexibility which is one main benefit from storage projects
— in general the idea is to not treat storage projects differently from other project types: all indicators developed should be applicable for all projects. However, it has to be ensured that the specificities of storage projects are displayed respectively

Effort it will take
— this indicator will be treated within one of the work-streams and therefore a constant communication with ENTSO-E external stakeholders is needed
— high effort is awaited due to the need to align all CBA indicators with the applicability for storage projects and to define the storage projects specificities

Expected improvements
— developing a methodology for storage projects that is well communicated and finds a broad acceptance (especially from project promoters) as from the beginning on ENTSO-E external stakeholders are included
— more detailed methodology for storage projects covering more of the storage projects specificities

4.4.3 Guiding principles and input for NPV calculation

Current planning status
— the concrete numbers for NPV calculation (discount rate, economic lifetime, residual value) were replaced by general statements referring to actual studies
— guiding principles to follow for selecting the proper discount rate, economic lifetime and residual will be further developed

Effort it will take
— depends on the outcomes of the planned exchanges with relevant stakeholders involved in the process

Expected improvements
— instead of fixed numbers a transparent and consistent methodology to determine the needed numbers will be given

4.4.4
SEW

Current planning status
— joint work with ENTSO-E external stakeholders started on 07.11.2017
— organisation of the improvements in an SEW specific work stream together with ENTSO-E external stakeholders
— Including the quantifiable benefits that fall under the term welfare which in general (will include the monetisation of RES integration and CO_2 mitigation)
— the term 'socio-economic welfare' (in its definition under the 1st and 2nd CBA guidelines) is misunderstood by some stakeholders, which expect the definition to encompass more than merely the change in yearly economic surpluses, and must be renamed
— transparently display how the SEW has been calculated (only cross border impact, only internal impact or both together)
— defining a concept of welfare in general (of which SEW, as it is defined now, is a sub-indicator)
— evaluating the reasonable inclusion, quantification and monetization of potential additional subcomponents of the SEW indicator:
  — Additional environmental aspects (e.g. potential natural disasters avoided, impact on population health)
  — Jobs creation

Effort it will take
— his indicator will be treated within one of the work-streams and therefore a constant communication with ENTSO-E external stakeholders is needed
— as the general concept of this indicator will be improved, by also including benefits going beyond the changes in yearly economic surpluses, the all over effort expected to being high

Expected improvements
— covering more/all aspects that fall welfare (such as CO_2 mitigation and RES integration)delivering a more clear definition and naming of this indicator

4.4.4.1.
Application of the sensitivity analysis to the SEW indicator for sensitivity to CO_2 prices

Current planning status
A wide range of CO_2 prices, derived from official sources (e.g. the outlooks of the International Energy Agency or scenarios published by the European Commission), is foreseen to be taken into account during the scenario building phase. This enables to visualize the impact of CO_2 prices to the SEW indicator without losing the huge impact of these prices to the definition of the generation portfolio. To assess the impact of a wide range of CO_2 prices within the same scenario is acknowledged as recommendable to better frame the weight of the CO_2 prices in the SEW results of a given project. However, this type of exercise would inevitably affect the merit order, one of the pillars of the market simulations. This aspect is not only not negligible, but also the main concern related to the feasibility of CO_2 price sensitivity to the SEW indicator given the current schedule and resource of the TYNDP process. Differently, ignoring the impact to the merit order would lead to figures hardly meaningful for this type of analysis.

A good solution, able to both efficiently implement the sensitivity study and include its impact on the merit order is yet to be found and would anyway need to be tested in terms of significance of the figures obtained and efforts needed.

Any solution on this sense then needs to be defined within the whole TYNDP framework.

4.4.4.2.
Including local constraints in SEW assessment

Current planning status
Annex 2 of the "2nd ENTSO-E Guideline for Cost Benefit Analysis of Grid Development Projects" already explains how the assessment of internal projects (with low impact on any NTC) will be based on redispatch simulations in addition to the market simulations. The overall SEW benefit can be achieved by summing up the benefits derived by both methods: while the market simulations are giving access to the benefits resulting from increasing the NTC (Net Transfer Capacity), the redispatch simulations are giving access to the benefit resulting from resolving grid congestions.

However, besides its cross-border impact, interconnector projects can also have a significant impact on the internal grid which until now has not been properly taken into account. Therefore, for the next update of the CBA guidelines, it is planned to evaluate the introduction of the combination of market and redispatch simulation for cross-border projects while double accounting must be avoided.

While cross-border projects present SEW benefits calculated at the Pan-European level only, for internal project SEW benefits are calculated at both Pan-European and internal, local level. As for now, SEW benefits are shown anyway on a Pan-European level without distinction between SEW benefits on cross-border boundaries and SEW benefits on internal boundaries and very local constraints. So in case internal SEW benefits are available, they are properly included in the unique, Pan-European SEW benefit indicator. For the future the focus is still on eventually extending the methodology (combining market studies and redispatch simulations) also for cross-border projects such that it will be possible to consider both Pan-European and internal SEW benefits for all types of projects.

Effort it will take
A detailed methodology for CBA 3.0, taking into account the redispatch related to specifics of interconnectors, will be discussed and eventually developed together with the experts involved in the CBA assessment of the TYNDP (Ten Year Network Development Plan) process.

Expected improvement
Eventually extending the methodology (combining market studies and redispatch simulations) for all projects. Any solution on this sense then needs to be defined within the whole TYNDP framework.

Section 5

Conclusion

The aim is to provide this accompanying document to better frame the perimeter covered by the 2nd CBA Guideline and at the same time to map the improvements made so far as well as the expected future developments.

The 2nd ENTSO-E guideline for Cost Benefit Analysis of Grid Development Projects is the result of a continuous process of improvement.

Nevertheless, ENTSO-E welcomes the suggested updates and changes to the CBA guideline given by the European Commission in Opinion C(2018) 4 (published: 10.01.2018), and has already included some of them in the 2nd CBA Guideline (e.g., roadmap with future improvements, clustering recommendations) underlying the coherence 2nd CBA Guideline with Art. 4(2).

Some of these comments not yet addressed in the 2nd CBA Guideline, will be considered in the context of the development of a 3rd CBA guideline. To do so, ENTSO-E has already started the work in preparation of a 3rd CBA Guideline, in which it directly includes opinions from external stakeholders, which are involved in three so-called “work streams” on Socio-Economic Welfare, Security of Supply and Storage projects. The work with these workstreams and ENTSO-E external stakeholders started on 07.11.2017 with the following main target:

Regarding the SEW, the effort is:

1 to cover and represent a broad approach for RES and CO_2 indicators;

2 to further qualify (or monetisation if possible) of potential additional environmental aspects and jobs creation implications;

3 to improve the SEW considering the internal boundaries/local constraints.

Regarding the Storage, the assessment of those specific projects should give the peculiarity not covered by the current methodology avoiding to treat storage projects differently from other project types but allow the application of indicators developed for all projects.

Regarding the calculation of Net Present Value, guiding principles and input for calculations (discount rate, economic lifetime and residual value) should be further developed in the 3rd CBA Guideline.

Concerning the general issues of Security of Supply, the effort is identify the following sub-indicators: the system adequacy, the system stability, the system flexibility and the Value of Lost Load.

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