

ENTSO-E Guideline for Cost Benefit Analysis of Grid Development Projects

Key issues and questions

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1 INTRODUCTION

On 15 May 2013, the European Regulation on guidelines for the implementation of European energy infrastructure priorities (EU) No 347/2013 entered into force. It aims at ensuring that strategic energy networks¹ are completed by 2020. To this end, the Regulation proposes a regime of "common interest" for Trans-European transmission grid projects contributing to implementing these priority projects (projects of common interest; PCIs), and entrusts ENTSO-E with the responsibility of establishing a cost benefit methodology².

The **main goals** of this methodology, as stated in the Regulation, are the following:

- a) System wide cost benefit analysis (CBA), allowing an assessment of all TYNDP projects in a homogenous way;
- b) Assessment of candidate PCIs which contribute to market integration, sustainability and security of supply; when approving cost allocation, and for PCIs, the results of CBA could be considered if at least one project promoter requests the relevant national authorities to apply cross border cost allocation.

2 KEY ISSUES

This paper will deal with the following high level issues:

1. Why use cost benefit analysis for transmission projects?
2. What is ENTSO-E's approach to CBA methodology?
3. Why doesn't ENTSO-E rank projects?
4. What are the costs and benefits of transmission projects?
5. How to ensure that benefits outweigh costs?
6. How to assess the environmental and social impact of transmission projects at different stages of development?

The issues will be detailed below, with ENTSO-E's questions to stakeholders listed at the end of each chapter. Any comments from stakeholders to the detailed methodology presented in the CBA guidelines will of course also be welcomed. In addition, a FAQ document deals with more detailed questions on methodology and its use.

2.1 WHY USE COST BENEFIT ANALYSIS FOR TRANSMISSION PROJECTS?

The energy sector in Europe is currently undergoing major changes. The prospect of climate change combined with other factors such as closing down of plants due to age or environmental issues, leads to a major shift in the generation mix (1/3 of present generation capacity needs to be replaced in the coming decade). As the share of intermittent generation

¹ Recital 20, Regulation (EU) 347/2013 : <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ.L.2013:115:0039:0075:EN:PDF>

² Article 11, Regulation (EU) 347/2013

grows, and with higher market integration in Europe coupled with the development of offshore generation long distance electricity flows will become a feature of the network.

Simultaneously, the evolution of Demand Side Participation (DSP), smart grids and development of electric mobility lead to changes in load patterns. Current concerns regarding security of supply (dependency on certain energy sources) will remain a driver for diversified generation portfolios in future years.

All these evolutions trigger grid development, and the growing investment needs are currently reflected both in European TSOs' investment plans³ and in the ENTSO-E Ten Years Network Development Plan (TYNDP). However, the lack of social acceptance is a main hurdle for timely delivery of transmission investments.

In this uncertain environment, with huge needs for transmission investment, Cost Benefit Analysis, combined with multi-criteria assessment, is essential to identify transmission projects that significantly contribute to European energy policies. This identification will assist in demonstrating the benefit for society, focusing and easing public acceptance.

Moreover, such an assessment may help identify projects that are robust enough to provide value for society in a large range of possible future energy projections, while at the same time being efficient in order to minimise costs for consumers. The results of project assessment would also highlight projects which have a particular value in achieving certain targets, such as RES integration or completing the Internal Market.

Cost Benefit Analysis is a well-known tool for project appraisal⁴, and is often performed in combination with multi-criteria analysis. The challenge is to apply this tool in the European electricity transmission sector as a whole in a consistent way, while giving due consideration to resources and practical possibilities of both ENTSO-E's 42 TSOs and other project promoters.

2.2 WHAT IS ENTSO-E'S APPROACH TO CBA METHODOLOGY?

ENTSO-E already developed a multi-criteria assessment methodology in 2011. The methodology was applied for the TYNDP 2012 and detailed in Annex 3 of the TYNDP. The "guidelines for CBA" consist of an update of this methodology, with a number of improvements taking into account the results of both the TYNDP consultation and ACER's opinion on the TYNDP and on CBA, as well as the requirements of the Regulation, notably:

- Use of a wider span of scenarios and sensitivity analysis: projects have to be assessed against at least two scenarios, and specific guidance is given to sensitivity analysis;
- Specification of the nature, level of coherence and source of legitimacy of data and economic parameters to be used when building scenarios and carrying out analysis;
- Guidance on project clustering, discount rate and calculation of residual value;

³ See Annex 1

⁴ See for instance DG Regio: Guide to Cost Benefit Analysis of Investment projects, 2008: http://ec.europa.eu/regional_policy/sources/docgener/guides/cost/guide2008_en.pdf

- Greater transparency on calculation methodologies for each indicator and requirement of quantification of each indicator;
- Guidance on quantification and possible monetization of additional indicators (losses, security of supply);
- Guidance on surplus analysis.

Following the CBA- Workshop organised on 19th of November 2012, ENTSO-E again updated the methodology to take into account the results of the workshop⁵. The current version also takes into account ACER's opinion on the CBA⁶, and the report on target CBA methodology prepared by the THINK consortium⁷

Moreover, the CBA methodology gives simple and functional requirements; hence it does not impose any values to parameters, in order to facilitate regular updates.

2.3 COSTS AND BENEFITS OF TYNDP PROJECTS

Transmission projects are by their nature multi-purpose. Originally, the main goal of cross-border electricity interconnections was to contribute to security of supply. Interconnectors were built to allow for mutual support in case of supply disruptions, thereby ensuring the reliability of electricity supply⁸. Their role in improving social welfare has received growing attention over the last 20 years. More recently, and given the ambitious renewable-energy and CO2 targets of the EU, the integration of electricity from RES and CO2 mitigation appear as new motives for transmission projects. The majority of TYNDP projects contribute to all indicators, proving this multi-purpose characteristic of transmission projects.

The Regulation (Annex IV) establishes the main categories of transmission benefits:

- Market integration, competition and system flexibility, measured through GTC increase and evolution of system costs;
- Transmission of RES;
- Interoperability and secure system operation, which are assessed via the impact of the project on the loss of load expectation for the area of analysis.

These benefits were already included in ENTSO-E's multi-criteria methodology used for the TYNDP 2012, but only published through colour codes. The current CBA methodology requires publication of all numbers.

In addition, Annex V suggests a list of other indicators that could "notably be taken into account". It includes the following benefits:

⁵ Minutes of the CBA workshop 19 November 2012:

https://www.entsoe.eu/fileadmin/user_upload/library/events/Workshops/CBA/121119_CBA_workshop_minutes.pdf

⁶ ACER opinion on ENTSO-E CBA – 30 January 2013: <http://www.eui.eu/Projects/THINK/Documents/ACERPositionENTSOECBA.pdf>

⁷ "Cost-benefit analysis in the context of the energy infrastructure package", published 20 January 2013:

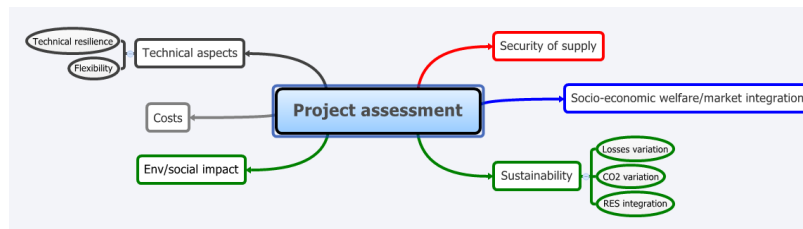
<http://fsr.eui.eu/Publications/RESEARCHREPORT/Energy/2013/THINK10.aspx>

⁸ Including insurance against high-cost outcomes under extreme conditions, and increased flexibility of grid operations

- Greenhouse gas emissions and transmission losses over the technical lifecycle of the project;
- Future costs for new generation and transmission investment over the technical lifecycle of the project;
- Operational flexibility, including optimisation of regulating power and ancillary services;
- System resilience, including disaster and climate resilience, and system security, notably for European critical infrastructures as defined in Directive 2008/114/EC.

One of the main questions related to cost benefit analysis of projects which could achieve such a large variety of benefits, is how to quantify and monetise all of them in a reliable way, while avoiding double accounting.

ENTSO-E's approach is to adopt a combined cost-benefit and multi-criteria framework, allowing for the best available information both for the public (TYNDP) and PCI decision-makers, on the full range of indicators required by the Regulation, while monetising as far as possible.



Thus, socio-economic welfare and losses are monetised using common international reference values (e.g. IEA). Costs are of course also monetised, and ENTSO-E will use reference values published by National Regulatory Authorities as soon as they will be published.

It should be noted that some benefits (e.g. CO₂, RES) are already internalised in socio-economic welfare, and should not be accounted for twice. Externalities such as disaster and climate resilience⁹ »(add Footnote Annex 5 of Regulation) are on the other hand very difficult to monetise (multiplying low probabilities and very high consequences have little meaning), and are better treated through a KPI approach¹⁰. Moreover, for externalities that are of a more national or regional nature, such as value of lost load, opposable values only exist in a few European countries¹¹. Therefore, ENTSO-E proposes to use multi-criteria assessment whenever the uncertainty associated with monetisation is too high to provide reliable and consistent results throughout Europe.

ENTSO-E displays externalities in the following way:

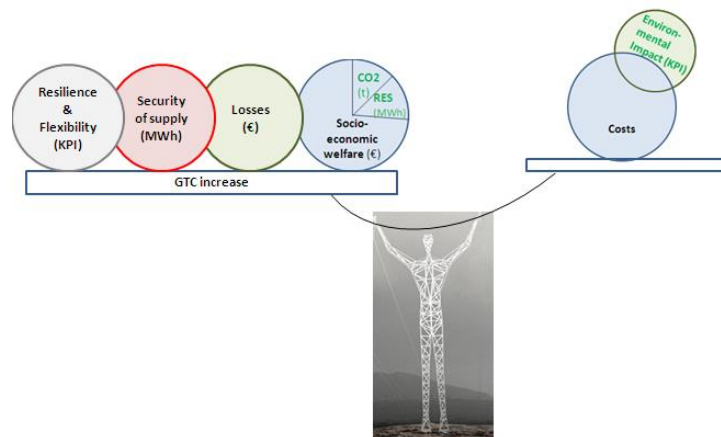
- RES and CO₂ are fully internalised via socio-economic welfare, but also quantified through their reference units (tons, MWh) in order to provide full information.

9 See Annex V , Regulation (EU) 347/2013

10 Following DG Regio's Guide to Cost Benefit Analysis of Investment projects, ENTSO-E consider that "In contrast to CBA, which focuses on a unique criterion (the maximisation of social welfare), Multi Criteria Analysis is a tool for dealing with a set of different objectives that cannot be aggregated through shadow prices and welfare weights, as in standard CBA ".

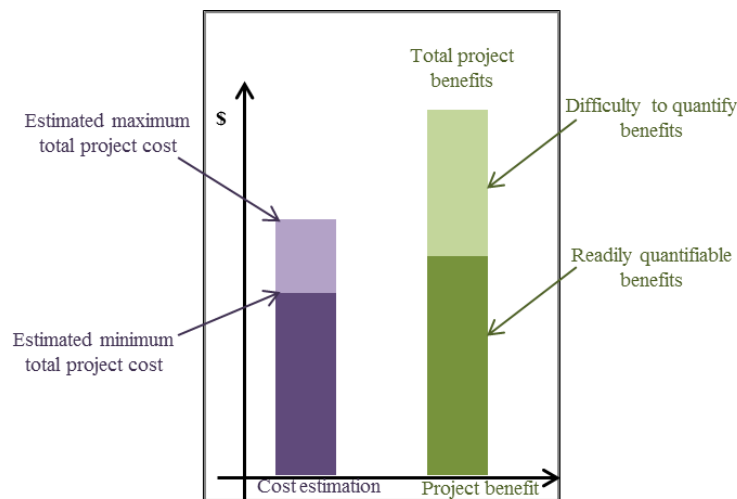
11 Value of lost load indeed depends on the structure of consumption in each country (tertiary sector versus industry, importance of electricity in the economy etc...).

- Security of supply, resilience and flexibility are not internalised and do not overlap (security of supply relates to grid reliability under normal contingencies, whereas resilience concerns exceptional contingencies);
- Environmental impact is partially internalised via project costs (avoidance costs, compensation costs...). The residual impact is qualified through the environmental and social impact indicators.



2.4 HOW TO ENSURE THAT BENEFITS OUTWEIGH COSTS?

There are several methods to ensure that benefits outweigh costs. The first method is to calculate a net benefit using a single monetary unit, using reduced lists of benefits (only monetisable benefits). The risk of this approach is that important benefits for society are neglected, thus underestimating its value for society, as has been shown by CAISO (2004)¹² and Brattle (2012)¹³. The advantage is that it provides an “objective” ranking.

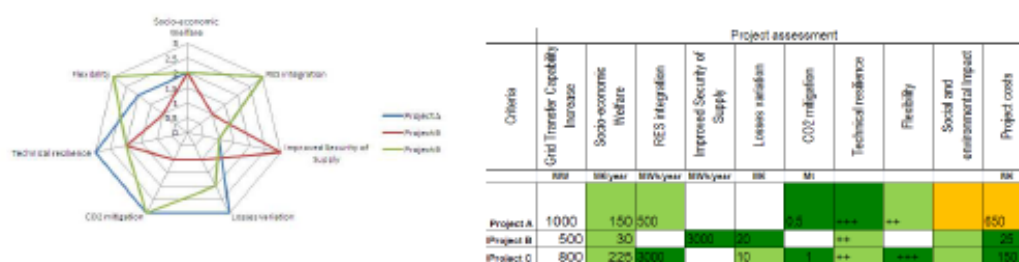


¹² California ISO, Transmission Economic Assessment Methodology (TEAM), Folsom, CA, June 2004, www.caiso.com/docs/2003/03/18/2003031815303519270.html

¹³ Brattle, Transmission Investment Trends and Planning Challenges, Madison, WI, August 2012. http://www.brattle.com/_documents/UploadLibrary/Upload1073.pdf

The second method is to attach a weight to each of the benefits, typically using expert assessments or votes. The full range of benefits will be included, but the weighting process needs to be carefully thought through in order to minimise subjectivity and avoid double accounting. Similarly to the uncertainties of benefits, uncertainties in costs shall also be taken into account, by means of estimating minimum/maximum total project costs.

ENTSO-E's role is to provide information to decision-makers (Regional Groups) allowing them to “choose their assessment method” as required by the Regulation. ENTSO-E will provide information on the impact of each indicator using the most reliable indicator available, and monetising when reliable values are available. Different kinds of decision-making tools are provided, such as sensitivity analysis and colour codes according to threshold values (colour codes) agreed through consultation.



ENTSO-E believes that the proposed set of common European-wide indicators will form a solid basis, both for project evaluation within the TYNDP, and coherent project portfolio development for the PCI selection process.

2.5 HOW TO ASSESS ENVIRONMENTAL AND SOCIAL IMPACT OF TRANSMISSION PROJECTS AT DIFFERENT STAGES OF DEVELOPMENT?

Assessing the local and regional environmental impact of projects at different stages of development in a consistent way (some TYNDP projects are only conceptual studies, while others are in an advanced permitting stage) is a difficult task. For some projects, only general GIS information will be available, and neither the technology nor the routing will yet be defined. For others, environmental impact assessment (EIA) will already have been carried out.

Moreover, ENTSO-E's first approach (TYNDP 2012) was to establish a risk indicator, taking into account analysis based on expert assessments. The current approach, developed in cooperation with NGOs, considers only residual environmental and social impact, i.e. impact not already internalised in costs, and includes description of the assessment method (Annex 7).

