TYNDP 2022

Stakeholders Engagement Report

July 2022 – version for public consultation

entsoe

ENTSO-E Mission Statement

Who we are

ENTSO-E, the European Network of Transmission System Operators for Electricity, is the **association for the cooperation of the European transmission system operators (TSOs)**. The 39 member TSOs, representing 35 countries, are responsible for the **secure and coordinated operation** of Europe's electricity system, the largest interconnected electrical grid in the world. In addition to its core, historical role in technical cooperation, ENTSO-E is also the common voice of TSOs.

ENTSO-E **brings together the unique expertise of TSOs for the benefit of European citizens** by keeping the lights on, enabling the energy transition, and promoting the completion and optimal functioning of the internal electricity market, including via the fulfilment of the mandates given to ENTSO-E based on EU legislation.

Our mission

ENTSO-E and its members, as the European TSO community, fulfil a common mission: Ensuring the **security of the interconnected power system in all time frames at pan-European level** and the **optimal functioning and development of the European interconnected electricity markets**, while enabling the integration of electricity generated from renewable energy sources and of emerging technologies.

Our vision

ENTSO-E plays a central role in enabling Europe to become the first **climate-neutral continent by 2050** by creating a system that is secure, sustainable and affordable, and that integrates the expected amount of renewable energy, thereby offering an essential contribution to the European Green Deal. This endeavour requires **sector integration** and close cooperation among all actors.

Europe is moving towards a sustainable, digitalised, integrated and electrified energy system with a combination of centralised and distributed resources.

ENTSO-E acts to ensure that this energy system **keeps consumers at its centre** and is operated and developed with **climate objectives** and **social welfare** in mind.

ENTSO-E is committed to use its unique expertise and system-wide view – supported by a responsibility to maintain the system's security – to deliver a comprehensive roadmap of how a climate-neutral Europe looks.

Our values

ENTSO-E acts in **solidarity** as a community of TSOs united by a shared **responsibility.**

As the professional association of independent and neutral regulated entities acting under a clear legal mandate, ENTSO-E serves the interests of society by **optimising social welfare** in its dimensions of safety, economy, environment, and performance.

ENTSO-E is committed to working with the highest technical rigour as well as developing sustainable and **innovative responses to prepare for the future** and overcoming the challenges of keeping the power system secure in a climate-neutral Europe. In all its activities, ENTSO-E acts with **transparency** and in a trustworthy dialogue with legislative and regulatory decision makers and stakeholders.

Our contributions

ENTSO-E supports the cooperation among its members at European and regional levels. Over the past decades, TSOs have undertaken initiatives to increase their cooperation in network planning, operation and market integration, thereby successfully contributing to meeting EU climate and energy targets.

To carry out its **legally mandated tasks**, ENTSO-E's key responsibilities include the following:

- Development and implementation of standards, network codes, platforms and tools to ensure secure system and market operation as well as integration of renewable energy;
- Assessment of the adequacy of the system in different timeframes;
- Coordination of the planning and development of infrastructures at the European level (Ten-Year Network Development Plans, TYNDPs);
- Coordination of research, development and innovation activities of TSOs;
- Development of platforms to enable the transparent sharing of data with market participants.

ENTSO-E supports its members in the **implementation and monitoring** of the agreed common rules.

ENTSO-E is the common voice of European TSOs and provides expert contributions and a constructive view to energy debates to support policymakers in making informed decisions.

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Ten-Year Network Development Plan 2022

How to use this interactive document

To help you find the information you need quickly and easily we have made this an interactive document.

Home button
This will take you to the contents page. You can click on the titles to navigate to a chapter.

Arrows
Click on the arrows to move backwards or forwards a page.

Hyperlinks
Hyperlinks are highlighted in bold text and underlined throughout the report. You can click on them to access further information.

ENTSO-E Technopedia
www.entsoe.eu/Technopedia/

Questions?

Contact us as at **tyndp@entsoe.eu**

Contents

Stakeholders' involvement in TYNDP 2022

TYNDP 2022 scenarios

External stakeholders representing the gas and electricity industries, customers and environmental NGOs, regulators, national governments and the European Commission were key in building an ambitious set of scenarios. Two public consultations, on the scenario storylines and draft scenarios, and four workshops and webinars allowed the collection of stakeholders' input. The European Commission and ACER contributed via the TYNDP Cooperation Platform and high-level meetings. The Scenarios will be submitted to ACER in Q4 2022 for a formal opinion alongside the draft TYNDP 2022 package. For a detailed overview of stakeholders' engagement in TYNDP 2022 scenario building, see Chapter 4 of the TYNDP 2022 Scenario Report.

CBA methodology

The '3rd CBA guideline for the cost-benefit analysis of grid development projects' (CBA 3.0 or 3rd CBA guideline) was drafted by ENTSO-E in compliance with the requirements of the EU Regulation (EU) 347/2013. The cost-benefit analysis (CBA) guidelines are the result of an extensive consultation process involving the general public, stakeholder organisations, national authorities, their national regulatory authorities, ACER, and the European Commission.

In December 2017, ENTSO-E invited external stakeholders to participate in three workstreams dealing with specific aspects of the CBA, including security of supply (divided between adequacy, stability and ancillary services), socio-economic welfare (SEW), and storage. The outcome of this work has served as a starting point and as an extended consultation process for drafting the 3rd CBA Guideline. The draft was submitted for public consultation between November and December 2020. For more information on the involvement of stakeholders in the development of the 3rd CBA Guideline, see, Consideration on the inclusion of input from stakeholders in the development of CBA 3.0.

Related documents:

- Comments received during the public consultation and ENTSO-E's assessment of the comments

TYNDP 2022 CBA Implementation Guidelines

ENTSO-E consulted stakeholders on the main proposed improvements to the TYNDP 2022 Implementation Guidelines from 30 November 2021 to 7 January 2022. All questions and answers are available in Appendix 3. Below is an overview of the feedback received and how it impacted the guidelines.

General comments on the concept of the CBA Implementation Guideline:

While the organisation of a public consultation on key topics related to the Implementation Guidelines was positively received, respondents regretted that the full Implementation Guideline itself was not released for early consultation (before its release as part of the full TYNDP package). One stakeholder pointed out that the changes from the 2020 version of the Implementation Guideline should be made clearly visible. ENTSO-E addressed this comment by including in the Implementation Guidelines an overview of the main changes compared to 2020. The TYNDP 2022 Implementation Guidelines were released in draft form in March 2022, much earlier than in previous TYNDPs.

One stakeholder took the view that it should not be the role of an implementation guideline to propose improvements to the methodology. ENTSO-E clarified that the modularity of the CBA Guideline / Implementation Guideline approach is meant to allow for the introduction of minor changes and specific details in the Implementation Guideline, while the CBA Guidelines (CBA GL) set the main concepts. Therefore, the changes introduced in the Implementation Guideline do not go beyond the scope allowed by the CBA GL because the CBA GL explicitly refers to and relies on the study-specific implementation guideline.

On the proposed approach to assessing security of supply:

Stakeholders asked for additional justification for the proposed approach of using 15 randomised yearly availabilities of thermal power plants. To address this comment, the draft Implementation Guideline explains the reasoning behind the choice of Monte-Carlo years, which is based on a trade-off between precision of the results and operational feasibility of the computations.

Stakeholders also noted that climate years in the pan-European climate database (PECD) should reflect climate change. An update of the PECD to cope with the effects of climate change will be investigated in future TYNDPs.

In respect of the value of lost load and cost of new entry, stakeholders pointed out that these should both be sufficiently high to provide a strong investment signal and generally agreed with the default values proposed by ENTSO-E if no value has yet been computed at the country level.

On project-level indicators:

Some stakeholders wondered why some project-level indicators could not be computed by ENTSO-E while they are being addressed in studies by other stakeholders. ENTSO-E clarified that, on the one hand, the framework of the TYNDP, which comes with tight deadlines, does not allow the inclusion of overly complex studies. On the other hand, indicators cannot be overly simplified; they must be sufficiently detailed to support the PCI process. Project-level indicators are an imperfect solution, and whether they can be assessed by ENTSO-E will be investigated in a future edition of the CBA Guidelines.

On the climate years chosen to perform the CBA:

Stakeholders suggested that using more climate years would yield more robust results, to which ENTSO-E replied that the chosen number of three climate years represents a compromise between the quality of results and operational feasibility. Whether the number of climate years could be expanded in future is a matter to be assessed when planning for TYNDP 2024.

Stakeholders also asked for clarification on how the chosen climate years were selected and suggested that each year should be analysed regionally to show sufficient variation in the temperature, solar and wind data across Europe. ENTSO-E clarified that the selection was an application of the bidding zone review (BZR) methodology.

On the time horizons studied:

A majority of respondents called for the assessment of projects to be extended to the 2050 horizon, because meeting the 2050 climate objectives will require significant effort translating into major challenges for the power sector. Time horizons studied in the CBA are determined in part by rules set in the CBA Guideline, there is therefore limited flexibility. In addition, the further into the future the projection, the more scenarios have to be assessed to provide useful results, making a study of the 2050 horizon too resource-intensive.

On the reference grids:

From stakeholders' responses, it appears that the concept of a reference grid and its role in the assessment of projects should be better explained. The same goes for the criteria governing the construction of reference grids, specified in the CBA Guideline, and the provision of projects' commissioning years. To address this issue, the draft Implementation Guideline released after this consultation contains a specific part on the reference grid.

On the use of AC or DC for load-flow calculations:

Few stakeholders expressed views on this very technical question. Two stakeholders expressed their preference for AC modelling, one because AC modelling supposedly allows for a more detailed assessment of network performance, the other because AC requires fewer assumptions than DC-based load-flows. The draft TYNDP 2022 Implementation Guideline allows for the use of either AC or DC for load-flow calculations. Indeed, analysis shows that the DC power flow with customised voltage patterns is as appropriate for long-term studies as the AC power flow approach.

A stakeholder further recommended assessing projects' losses in the long-term, as it can help in deciding between alternative technology solutions. In TYNDP 2022, because of the complexity of computations, losses are computed only for the National Trends 2030 scenario.

On internal redispatch calculations:

A majority of respondents called for ENTSO-E to develop a central analysis and calculation of redispatch. ENTSO-E will investigate possible solutions for calculating redispatch on a centralised level in future editions.

On offshore hybrid projects:

Modelling approach: Some respondents were of the view that both the offshore bidding zone (OBZ) and home market (HM) approaches should be allowed, while other stakeholders called for prioritising the OBZ approach. In TYNDP 2022, we allowed promoters to choose their preferred option.

Should hybrid projects be treated as enablers for the achievement of policy goals: Some stakeholders agree that offshore hybrid projects should be treated as enablers, allowing the installation of RES to the European power system. However, the risk of double counting should be recognised and avoided. Others point out that RES inclusion is already covered by indicator B2, which requires the assessment of projects' contributions to the EU climate or decarbonisation objectives.

On the assessment of hybrid projects, one stakeholder took the view that they should be allowed to assess hybrid projects by adding or removing capacity to/from scenarios. Another stakeholder called for a METIS-type study proving that such projects are part of the optimal energy mix. Both ideas will be considered when further reviewing our methodology to assess hybrid projects.

On interlinkage of gas and electricity:

ENTSO-E proposed a new indicator monetising the amount of hydrogen produced by P2G units. Stakeholders called for caution and further analysis. ENTSO-E recalled that this new methodology is a pilot in TYNDP 2022, which will be included in future CBA Guidelines if its implementation in 2022 is successful.

On other relevant indicators that should be included in the CBA:

Two stakeholders asked for an indicator that captures the use of network optimisation technologies. One stakeholder was not in favour of the creation of many additional indicators, as it creates the risk of double counting and could put out of sight economic efficiency. Stakeholders also proposed improvements to existing indicators, including a SEW indicator calculated with both an energy demand constraint and others reflecting FCR, automatic frequency regulation reserve (aFRR) and manual frequency regulation reserve (mFRR) demand. Another request is to monetise avoided non-CO_2 emissions.

Some stakeholders called for the 'energy efficiency first' principle to be enshrined in the CBA approach. Applying this principle is a requirement in the revised TEN-E regulation and will therefore be implemented in the 4th version of the CBA Guidelines.

On the new methodology to assess commissioning years:

Stakeholders asked for further information on the proposed methodology, which is new in TYNDP 2022. One stakeholder pointed out that national and regional differences may impact the results. As this is a pilot in 2022, ENTSO-E will use this first implementation as a test to further improve the methodology, which may be included in the next version of the CBA Guidelines. When asked whether the length of a project has a major influence on its duration, stakeholders were unanimous in answering that public acceptance, environmental aspects and permitting processes have much more impact.

Methodology for the identification of system needs

On 14 October 2021, ENTSO-E presented the proposed methodology to stakeholders to identify system needs in TYNDP 2022. The webinar brought together 120 stakeholders and generated over 60 questions and comments in a lively discussion. Below is an overview of the main comments received and of our responses where appropriate. The exhaustive list of comments and our responses can be found in Appendix 2.

On the choice of time horizons studied:

ENTSO-E presented its plan to assess needs over the 2030 and 2040 time horizons. Many stakeholders felt ENTSO-E should develop plans for the 2050 horizon and that 2030 is too soon to provide relevant information for project promoters, as infrastructure projects generally require more than eight years to be financed, planned and built. ENTSO-E clarified that the choice of time horizons is justified, first, by the need to align with the horizons studied in the next step of the TYNDP, the CBA of projects. Time horizons studied in the CBA are determined in part by rules set in the CBA Guideline, a methodology approved by the European Commission, and by the requirement to provide data to support the European Projects of Common Interest process, which looks at the 2030 horizon. There is, therefore, limited flexibility. The 2050 horizon has been discarded in TYNDP 2022 because the further into the future the projection, the more scenarios have to be assessed to provide useful results, making the study too resource-intensive.

On scenarios:

Stakeholders asked whether the needs study would be performed in respect of all three TYNDP 2022 scenarios, thus delivering three different optimised power system configurations. Others suggested that the analysis should be repeated for more ambitious scenarios, as the National Trends scenario falls behind targets as countries increase their climate ambitions. ENTSO-E replied that the 2022 system needs study is performed only on the National Trends scenario, which is more ambitious than the same scenario assessed in TYNDP 2020. We expect that the same study in TYNDP 2024 would look at a yet more ambitious scenario.

On the system needs study within the TYNDP process and its interrelation with the CBA:

In response to a question seeking clarification about the process, ENTSO-E explained that the assessment of system needs and the CBA are two distinct, complementary steps that help policymakers identify the most relevant projects at a given time. Additionally, one person asked why the market analysis is based only on SEW. Considerations of system resilience or other societal and environmental benefits are not included in the system needs analysis, but are considered in the next step, the CBA.

One comment requested a second window for submitting projects to the TYNDP process after the system needs study. This has been done in TYNDP 2020 but is not planned in TYNDP 2022 because promoters are expected to propose any project addressing needs identified in 2022 in TYNDP 2024.

On the consideration of storage and peaking units in 2040:

In response to a question about the flexibility of the power system analysis in the system needs study, it was explained that ENTSO-E will include flexibility solutions for the first time in its analysis in the system needs study of TYNDP 2022. A participant asked why only hydro pumps and battery storage technologies are being considered and proposed thermal storage with synchronous machines, which can provide inertia in both operation modes. If the 2022 study is successful, ENTSO-E may consider including additional flexibilities in future studies. However, integrating flexibilities renders the modelling extremely complex. A further comment on flexibility beyond storage and generation technologies was that smart transmission is essential and must be taken into account.

On the 70% rule:

A questioner asked why the 70 % rule on cross-zonal capacity will not be taken into account and suggested that it may potentially result in an overestimation of identified system needs. ENTSO-E considers that currently, there is not sufficient maturity or alignment of views on implementing this rule in current models. There are ongoing workstreams with regulators and other actors to address this issue.

On offshore needs:

Stakeholders were asked about capturing offshore benefits in future studies. Indeed, the current system-needs methodology does not allow for the identification of needs for hybrid offshore infrastructure. ENTSO-E explained that it has been developing a methodology to capture the benefits of such infrastructure, which will be released with TYNDP 2022 but only implemented in TYNDP 2024.

On transparency and availability of datasets

One commenter asked for ENTSO-E to publish all data, including costs estimates for candidates. Another asked for the zonal clustered model to be published to allow complementary research, and a third asked for the choice of climate years to be made available. All this information has been or will be published. Not all information may be published on ENTSO_E's website, but stakeholders are welcome to contact ENTSO-E if they are interested in obtaining particular information. All data used in the system needs study will be submitted for public consultation alongside the TYNDP 2022 package between July and September 2022.

Public consultation on the draft TYNDP 2022 package

The draft TYNDP 2022 is to be submitted to public consultation from 25 July to 16 September 2022. A webinar will also take place in early September. An overview of the feedback received and how it is taken into account, as well as the detailed list of responses, will be inserted into the next version of this report to be released in Q4 2022.

Project promoters in TYNDP 2022

Project promoters are key stakeholders in the TYNDP process, and ENTSO-E has put in place dedicated communication activities to ensure a smooth sharing of information, both from ENTSO-E to promoters and from promoters to ENTSO-E.

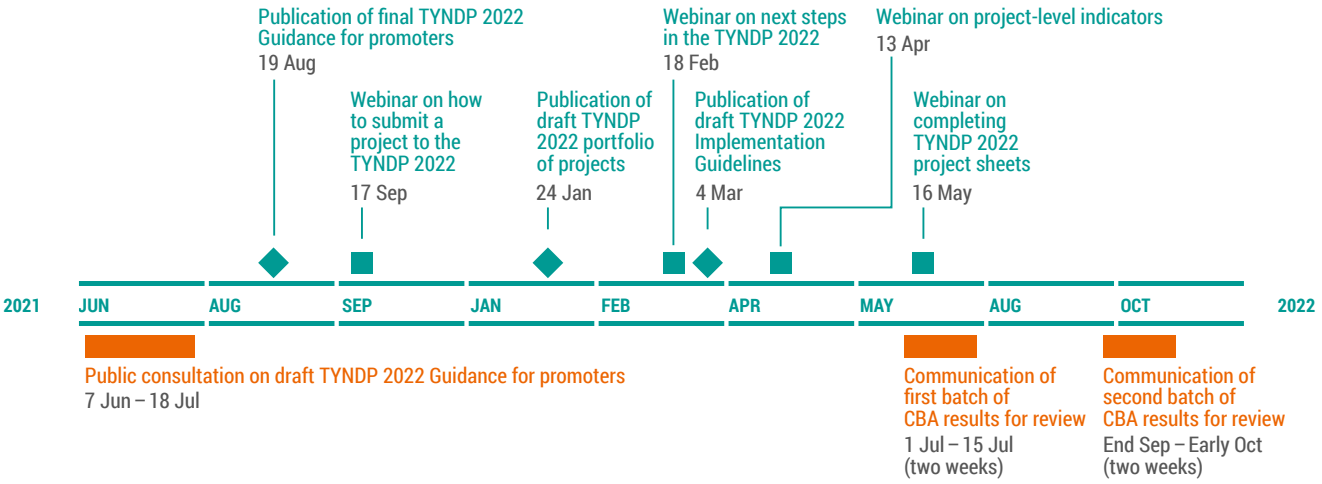

Figure 1 – Communication to promoters: release of key documents and webinar

Figure 2 – Collection of data from TYNDP 2022 promoters

Selection of TYNDP 2022 projects

The eligibility of projects for assessment in the TYNDP 2022 is determined according to the rules and criteria specified in the TYNDP 2022 Guidance for applicants – Transmission and storage projects promoters – Criteria for applications and their treatment. Requirements related to the project promoter's seriousness, demonstrated by documents relating to the company's legal existence, financial information and technical expertise, and the project's characteristics (its status, whether featured in the most recent PCI list or in a national development plan or confirmed in feasibility studies). A draft version of the guidance was first submitted for public consultation in June and July 2021 before being edited based on the comments received and published in its final version in August 2021.

Project promoters were then asked to propose projects during a one-month window between 15 September and 15 October 2021.

Among the projects for which applications were received for inclusion in TYNDP 2022, seven were not in compliance with the mandatory administrative criteria and were therefore not accepted in the TYNDP 2022. The list of non-accepted projects and the specific reasons for non-compliance are included in the TYNDP 2022 project portfolio.

TYNDP projects online platform

The collection of project data is managed via an online platform, accessible at https://tyndp2022-project-platform.azurewebsites.net/. The platform is also used to share CBA results with promoters. Credentials to access the platform are available to promoters' single point of contact upon request to ENTSO-E.

Promoters' corner

A webpage, or 'promoters' corner' is available at https://tyndp.entsoe.eu and aims to keep project promoters informed of key steps of the TYNDP 2022 process. The page centralises all information, documents, and frequently asked questions of interest to promoters. The page is regularly updated with the latest information on project status, the most recent data collected, and webinar materials. New promoters can also subscribe to the mailing list of project promoters via the promoters' corner. Promoters who contemplate submitting a project to the TYNDP 2024 are encouraged to subscribe to that list to stay up to date.

Documents made available to promoters in the TYNDP 2022 process

On submitting a project to the TYNDP 2022

- Guidance for applicants: Transmission and storage project promoters criteria for applications and their treatment in the TYNDP 2022
- Webinar: 'Submitting a project to TYNDP 2022 – recording and slides
- Webinar: 'Next steps for project promoters in the TYNDP 2022 process' – recording and slides
- Frequently asked questions for project promoters of TYNDP 2022 projects

On completing the project sheets

- Webinar: 'Completing TYNDP 2022 project sheets' – recording and slides

On submitting Project-level indicators

- Webinar: 'Project-level indicators' – recording and slides

Appendix 1 – Comments received in the public consultation on the TYNDP 2022 Guidance for promoters and ENTSO-E's responses

Q1. General comments

Anonymous

Page 8, Section 2.1 Eligibility criteria for all projects: The last section, "Project promoters of storage projects", is in bold; we think there is an error, and this should be option c) for the eligibility criteria and we would like to ask for correction. Could you define PHES in your document?

ENTSO-E's answer: In Section 2.1. the last section is corrected by being designated as Option C; thank you very much for your remarks.
For the definition of PHES (Pumped Heat Electrical Storage), please see the following quote from Energy Storage Association (ESA)[1].Please note that PHES is removed from the document to avoid any confusion, as the technologies are not limited to PHES.
"In Pumped Heat Electrical Storage (PHES), electricity is used to drive a storage engine connected to two large thermal stores. To store electricity, the electrical energy drives a heat pump, which pumps heat from the "cold store" to the "hot store" (similar to the operation of a refrigerator). To recover the energy, the heat pump is reversed to become a heat engine. The engine takes heat from the hot store, delivers waste heat to the cold store, and produces mechanical work. When recovering electricity, the heat engine drives a generator.
PHES requires the following elements: two low-cost (usually steel) tanks filled with mineral particulate (gravel-sized particles of crushed rock) and a means of efficiently compressing and expanding gas. A closed circuit filled with the working gas connects the two stores, the compressor and the expander. A monatomic gas such as argon is ideal as the working gas as it heats/cools much more than air for the same pressure increase/drop – this, in turn, significantly reduces the storage cost.
The process proceeds as follows: the argon, at ambient pressure and temperature (top left limb of the circuit on the diagram), enters the compressor (diagram shows a rotating compressor symbol – all equipment is in fact reciprocating). The compressor is driven by a motor/generator (top) using the electricity that needs to be stored (yellow arrows at top). The argon is compressed to 12 bar, +500°C. It enters the top of the hot storage vessel and flows slowly (typically less than 0.3 m/s) through the particulate, heating the particulate and cooling the gas. As the particulate heats up, a hot front moves down the tank (at approximately 1m/hour). At the bottom of the tank, the argon exits, still at nearly 12 bar but now at ambient temperature. It then enters the expander (bottom) and is expanded back to ambient pressure, cooling to minus –160°C. The argon then enters the bottom of the cold vessel and flows slowly up, cooling the particulate and itself being warmed. It leaves the top of the tank back at ambient pressure and temperature.
To recover the power (i.e. discharge), the gas flow (and all arrows on the diagram) is simply reversed. Argon at ambient temperature and pressure enters the cold tank and flows slowly down through it, warming the particulate and itself becoming cold. It leaves the bottom of the tank at -160°C and enters the compressor. It is compressed to 12 bar, heating back up to ambient temperature. It then enters the bottom of the hot tank. It flows up, cooling the particulate and itself being warmed to +500°C. The hot pressurised gas then enters the expander, where it gives up its energy-producing work, which drives the motor/generator. The expected AC to AC round trip efficiency is 75–80 %.
PHES can address markets that require response times in the region of minutes upwards. The system uses gravel as the storage medium, so it offers a very low-cost storage solution. There are no potential supply constraints on any of the materials used in this system. Plant size is expected to be in the range of 2–5 MW per unit. Grouping of units can provide GW-sized installations. This covers all markets currently addressed by pumped hydro and a number of others that are suitable for local distribution, for example, voltage support. Technology is in development stage and commercial systems are due in 2014".

1 ESA, Retrieved on 2 August 2021, https://energystorage.org/why-energy-storage/technologies/pumped-heat-electrical-storage-phes/

Q2. Please share here any comment or question on the Guidance – Specific comments on technical criteria (and related documentation)

Anonymous

Page 17 sets out the requirement that the project shall provide at least 225 MW installed capacity. We ask you to consider a reduction of the requirement to 100MW. There are storage systems that could still provide the net annual electricity generation of 250 GWh/year with a 100 MW installed capacity.

Page 19 states, "the promoter indicates whether the project presents a natural inflow (for PHES)". We do not know what that means. We would like to ask for clarification. Natural inflow is the storage inflow that comes separately from the main source (river where there is pump storage). An example of the pump storage could be melting snow.

ENTSO-E's answer: As the required installed capacity is linked to the current TEN-E regulation, we cannot change this requirement. TEN-E regulation[2] Annex IV (1) (b) reads: "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". For the second part of the question (regarding PHES), please see our response to the previous question.

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1 We suggest adding "digitalisation projects" as a third category, recognising that new transmission capacity, more storage, and enhanced utilisation through digitalisation are the three elements of the infrastructure transition.

In Section 2.2.2, in the estimation of an increase in NTC, we suggest adding the requirement that the effects of grid-enhancing technologies be considered as a supplement or alternative to building new grids. This change aims to ensure compliance with the efficiency first principle.

Many grid-enhancing technologies and innovative solutions have medium to high TRLs and are ready for wide-scale implementation but have not been included in TYNDP projects in past years. The TYNDP 2022 process should support the inclusion of such technologies and solutions, in addition to conventional infrastructure. The ENTSO-E Technopedia is a useful reference to the wide range of technologies available.

ENTSO-E's answer: In the current TYNDP, there are several technologies that apply to digitalisation that can be part and are already part of the project and process (For example, HighT[a] conductors, DLR, FACTs, and SSSC).
Regarding smart grid projects, as the current TEN-E regulation does not require their inclusion, we have not included them in the TYNDP thus far. We do recognise the importance of smart grid projects and their role in the infrastructure transition; however, with the current TYNDP design (methodology and calculation method) and timeframe, the inclusion of these projects is not possible for this TYNDP 2022.

Q3. Please share here any comment or question on the guidance – Specific comments on project assessment, review procedure and data handling

3d-Hydro Engineering GmbH

2 With regard to CBA:

1. The experience from past CBA shows that the methodology for calculation of the various indicators is available very (or too) late in the process. We propose communicating the methodologies as early as possible to give promoters sufficient time to calculate the required figures.

2. Please try to monetise as many indicators as possible. In particular, avoided cost of non-greenhouse-gas emissions, based on EEA data, shows beneficial effects to the projects.

ENTSO-E's answer: The indicators for the CBA assessment and their underlying approach are included in the CBA Guideline. This is not part of the consultation but is a separate guideline that is referenced in the Project Promoters Guideline. The 3rd ENTSO-E Guideline for the CBA has been submitted to the European Commission for approval. Please find, for your information, the following clarification regarding the CBA:
1. The Implementation guidance for TYNDP 2022 will be completed and published before the initiation of the CBA process.
2. A monetisation of the non-CO_2 indicator is currently not proposed in this methodology. This is because it is unlikely that future improvements

2 Regulation (EU) No 347/2013, guidelines for trans-European energy infrastructure and repealing Decision No 1364/2006/EC and amending Regulations (EC) No 713/2009, (EC) No 714/2009 and (EC) No 715/2009, Annex IV (1) (b)., https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013R0347&from=en

in emission reductions due to filters or increases in efficiency will have a comparable effect at lower costs. When monetising the non-CO_2 indicator, a project might become beneficial, or even non-beneficial, simply because of this impact. Therefore, it can be strongly impacted by future technologies. However, at the moment, no such technologies are in place, and the non-CO_2 indicator has to be shown on a quantified basis in order to complement the CBA assessment.

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3 **Project Assessment:**

Project Promoters must have the flexibility to adapt, change or propose new solutions if a better solution becomes available or is identified. Given that innovation can be commercialised or proven at scale in a very short amount of time, innovative or new technologies will continue to become viable solutions for Europe during the time between projects being proposed to the TYNDP and their implementation on the grid (often three years or more). To ensure that the best solutions for society are ultimately delivered, the TYNDP process must provide flexibility to promoters to easily adapt, change, or propose new solutions at any point if they become available or a superior solution that meets the same system needs more efficiently.

The "cost of delay" must be reflected in the assessment of TYNDP projects, and flexible solutions must be fairly valued. currENT advocates for the optimisation and reinforcement of grids as a first step in grid development. While new grids are essential to meet certain long-term system needs, there is often scope to also utilise available capacity on the existing grid using flexible grid-enhancing solutions. This can deliver earlier benefits to consumers while new infrastructure is "in permitting" or under construction (e.g., by reducing constraint costs) and may, in some cases, even defer or eliminate the need for the new infrastructure. The value of reducing carbon emissions in the near term and making progress towards a high-RES grid now is far greater than reducing the same carbon emissions in 10 years' time. This "cost of delay" associated with large infrastructure projects must be taken into account when considering which project should be taken forward to meet an identified system need.

Review Procedure/Assessment of existing projects:

Project Promoters must have the flexibility to adapt, change or propose new solutions if a better solution becomes available or is identified. Given that innovation can be commercialised or proven at scale in a very short amount of time, innovative or new technologies will continue to become viable solutions for Europe between the time when projects are proposed to the TYNDP and their implementation on the grid (often 3yrs+). To ensure that the best solutions for society are ultimately delivered, the TYNDP process must provide flexibility to promoters to easily adapt, change or propose new solutions at any point if new solutions become available or they identify a superior solution that meets the same system need more efficiently.

We propose that there should be greater recognition of the full range of cost-effective solutions that can provide additional capacity and that support optimising the use of the existing grid.

ENTSO-E's answer: The TYNDP project has a defined timeline and scope, which are set by the regulation. Considering its stringent requirements within the given timeline, it is not possible to take a flexible approach to project adaptation. Such an approach would cause inconsistencies in the following process of the TYNDP project (CBA calculation etc.) and would not allow timely delivery of the results. Any further modifications that might occur on the projects after the project data collection period can always be submitted to the TYNDP for the next cycle.
For the second part of your question, the indicators for the CBA assessment and the approach behind them are included in the CBA Guideline. This is not part of the consultation but a separate guideline that is referenced in the Project Promoters Guideline. The 3rd ENTSO-E Guideline for the CBA has been submitted to the European Commission for approval.
However, since the efficient use of the system is a pillar of ENTSO-E's approach to the energy transition, our CBA team will be informed about your comments in considering the next CBA Guidelines.

Appendix 2 – Comments received in the webinar on the system needs study methodology of 14 October 2021 and ENTSO-E's responses

How do you intend to capture offshore benefits in future studies?

ENTSO-E's answer: In the TYNDP 2020 and TYNDP 2022 System needs study, the wind and solar capacities are part of the scenarios, meaning that connection costs are treated as an externality, which, in the case of offshore wind, may represent an even higher deviation from overall system costs optimality. The study does not focus on the optimal connection of generation for all types. For that reason, so-called 'hybrid solutions', that is, the combination of interconnections and offshore generation units, are not identified in the needs assessment.
However, throughout 2021 and 2022, ENTSO-E has been developing a methodology to capture the benefits of offshore hybrid infrastructure. The methodology and early results are released with the 2022 system-needs methodology report, and the new methodology implemented in TYNDP 2024.
In addition, the revised TEN-E regulation foresees the development of an Offshore Network Development Plan. ENTSO-E is currently working on the first such plan to be released around mid-2023.

Are there any constraints applied to the model, for example, taking into account maximum build rates of infrastructure?

ENTSO-E's answer: The costs of the investment candidates consider all factors. For capacity increases, candidates located on borders where the topology makes it difficult to build infrastructure will have costs that reflect that reality. As a result, it will be more difficult for these projects to be selected by the model.

I hope you learn from the fast-deteriorating British grid:
https://www.storelectric.com/where-grid-regulation-went-wrong/

ENTSO-E's answer: Thank you for your comment.

What will the reference scenario be? Specifically, will the process be the same as in the rest of the TYNDP process?

ENTSO-E's answer: The National Trends scenario will be used both for the system needs study and to perform the CBA of projects, in both 2030 and 2040. The CBA is also planned to be performed on the Distributed Energy scenario.

Will the second window for providing the projects in the TYNDP process be opened after the system needs study?

ENTSO-E's answer: No, it will not. In TYNDP 2020, ENTSO-E organised a second submission window after the release of the system needs study, reserved for future projects (post-2035) and addressing needs identified in the study. The lesson learned from this process is that, while it allowed the identification of a few projects, it tended to create confusion for project promoters. In addition, the system needs study is to be released every two years, and ENTSO-E is of the view that promoters can identify projects and submit them to the next TYNDP; for example, they can develop a project for submission in TYNDP 2024 based on results of the 2022 system needs Study.

Regulations make the best project impossible; for example, connecting large renewables to grids through large-scale, long-duration inertial storage: contracts impossible

ENTSO-E's answer: Thank you for your comment.

How will the flexibility of the power system analysis in the system needs study be improved?

ENTSO-E's answer: For the first time, the system needs study of TYNDP 2022 ENTSO-E will include flexibility solutions in its analysis. Concretely, this is done by proposing optimiser storage and peaking units (with a set capacity and cost) in each country, together with cross-border solutions to increase transmission capacity. Solutions to increase flexibility and capacity will complete each other, and it is expected that the optimum identified will reflect needs in respect of both flexibility and capacity increases.
The timeline shows the CBA assessment starting in Q1 2022, so before the end of the System needs study.
Indeed, the CBA and the system needs study are parallel processes. Because the TYNDP must be released every two years, it follows a very tightly constrained process. For that reason, promoters who would like to propose solutions to the needs identified in a TYNDP are invited to do so for the next TYNDP. For example, promoters willing to propose transmission or storage solutions to some needs identified in TYNDP 2022 will be able to do so in TYNDP 2024. These projects will then be assessed in the 2024 process.

What is the expected impact of the system needs study process on the CBA assessment?

ENTSO-E's answer: The assessment of system needs and the CBA of projects are two distinct steps in the TYNDP process that complete each other to help policymakers identify the most relevant projects at a given time.

The system needs study looks at where the flow of electricity could be improved across Europe to reach decarbonisation targets and keep security and costs under control. It does not look into solutions to address the identified needs but only at where actions are needed. Identified needs can be addressed by any solution, including non-wire solutions.

ENTSO-E's answer: Identifying solutions to the needs is up to project promoters, who may propose their projects for assessment in the TYNDP's CBA of projects. ENTSO-E looks at how individual projects perform on a series of indicators. When selecting European Projects of Common Interest, policymakers consider both projects' CBA results and whether the project addresses a need identified in the system needs study.

Is there any News on the Issue of Inertia?

ENTSO-E's answer: Inertia is assessed in a separate study, which will be released together with the system needs study. The last edition of this study is available here.

How do you deal with the opportunities of system integration/ sector coupling in the study?

ENTSO-E's answer: This is taken into account in the scenario via Power-to-Gas and vehicle-to-grid. For scenario data, please refer to the TYNDP 2022 scenarios data visualisation platform.

What are the parameters being tested, amps only or voltage, frequency and the like as well?

ENTSO-E's answer: The methodology used in the system needs study focuses on SEW and security of supply. The optimal set of capacity and flexibility increases is based on the contributions of the proposed increases to SEW and to ensure the security of supply. All investment candidates are defined only by their cost and capacities.

What can ENTSO-E do about regulations which, throughout Europe, make new large-scale long-duration inertial storage impossible to fund/contract?

ENTSO-E's answer: To discuss the effectiveness of European and national regulation, we advise you to address your comments to the European Commission and governments of EU Member States.

Will there be an option to de-select the CBA for a project as was possible last time for projects under construction?

ENTSO-E's answer: No, this possibility will not be available in TYNDP 2022.
A cost is required to see if the need is justified. Is this based on only lines, or are stations, cables, and PFC being used to determine if a need is justified.
Regarding increases in cross-border capacity, ENTSO-E collected data (capacity and costs) from project promoters of TYNDP 2022 projects in the fall of 2021. On borders where there were no or few existing planned investments, the collected data was completed using conceptual projects proposed by TSOs. The ultimate objective is to propose to the optimiser a list of investment candidates with realistic capacities and costs.
Cost assumptions include the CAPEX of the investment and the cost of any needed reinforcement of the internal transmission network.
As regards flexibility investments, the assumptions are based on data collected and consultations with TSOs within the scenario-building process. It is not broken down into distinct investments but takes the form of capacity in MW per market with associated costs.

What will be the improvement in the system needs study methodology to capture the full benefits of a connection between European and non-European countries (Tunisia–Italy).

ENTSO-E's answer: The list of capacity increases proposed to the optimiser includes all existing EU to non-EU country projects, provided they have PCI status. These investment candidates from EU to non-EU countries are included in the study, just like internal EU projects. ENTSO-E has a workstream with MedTSO to improve the modelling of North African countries in our studies.

The system needs definition, omits stability (based on real, not synthetic inertia), and skates over worst-case scenarios like kalte Dunkelflaute.

ENTSO-E's answer: Kalte dunkelflaute is taken into account by using multiple climate years chosen on a statistical basis in order to represent all types of years, including very cold years with low wind. ENTSO-E runs a separate study looking at inertia that will be published together with the system needs study.

There is inadequate calculation of trade-offs, for example, the need to triple grid sizes for renewables unless sufficient well-located large-scale long-duration inertial storage.

ENTSO-E's answer: Thank you for sharing your views. Could you please also share a source substantiating your statement.

Do you intend to implement flow-based market coupling into your model in the future?

ENTSO-E's answer: There is no such plan at the moment because we do not know how to do it or even if it is doable. The system needs study for the 2030 horizon uses a zonal model, which is another way to consider grid constraints in a market study.

How do you choose the zones for each country?

ENTSO-E's answer: There is no perfect zonal model. The perfect clustering would have one node per zone, which is not realistic. It is, therefore, necessary to cluster zones to form one node.
In the previous TYNDP, the zonal clustering was based on administrative boundaries, which led to suboptimal results in some countries.
In TYNDP 2022, the zonal clustering (used in the 2030 horizon only) seeks to represent grid contingencies. It represents a compromise between the level of detail (the more zones within a country, the more accurate the model) and the total number of zones (the more zones there are, the more difficult it is to run the model). Several criteria were considered, including which lines to put on equivalent links, the limiting elements, the number of zones for model convergence, and the capacities obtained after clustering.

Planning grid needs must not only be statistical but also (separately) designed for worst-case scenarios, for example, kalte dunkelflaute, when nearly all countries import by 2040

ENTSO-E's answer: Kalte dunkelflaute is taken into account by using multiple climate years chosen on a statistical basis in order to represent all types of years, including very cold years with low wind.

How are the benefits of each investment (of one interconnection, for example) evaluated if they are all operating at the same time with a co-optimisation?

ENTSO-E's answer: The benefits of specific investments are assessed in a second step, the CBA of individual projects, which is separate from the assessment of system needs. To know the impact of one single element in the system, interested stakeholders should turn to the TYNDP project sheets where ENTSO-E publishes results for a series of indicators, from the impact of a project in terms of increased SEW to CO_2 emissions reduction.
The system needs study does not look at the specific impact of each element. Instead, it seeks to prove that there exists a world in which investing in the energy system will deliver benefits. Doing so reveals the areas most likely to see these benefits. The system needs study is not an assessment of transmission or flexibility solutions. Identified needs can be addressed by any solution, including non-wire solutions.

The 2030 horizon is too short-term: grid-connected projects often take this long just to be financed, planned and built. The focus should be on the longer term of 30+ years.

ENTSO-E's answer: ENTSO-E understands there is an interest in the 2050 horizon among project promoters, industry, policymakers and investors. The system needs study looks at two horizons: 2030 and 2040.
_ 2030, because it is the horizon currently being investigated in the PCI process run by the European Commission, into which the TYNDP feeds.
_ 2040, because it is a relevant time horizon to identify needs that should be addressed by new projects that will be conceptualised and developed over the coming years. It is also a time horizon sufficiently close to today to allow the development of a set of technically sound scenarios.
ENTSO-E has considered the possibility of studying time horizons beyond 2040. The farther into the future the projections, the more uncertain the models become. The level of uncertainty that we would face in respect of 2050 and beyond renders the study too expensive in terms of work required for a properly representative projection.

In your modelling, the simple yet powerful way of calculating the need for storage should not be ignored: https://www.storelectric.com/calculating-the-need-for-storage/

ENTSO-E's answer: Thank you for sharing this link.

Smart technologies can increase transmission capacity and can be deployed faster than new-build transmission. How do studies take their benefits into account?

ENTSO-E's answer: The system needs study looks at cross-border capacity increases without considering whether the increase in capacity comes from a new line or from the increased efficiency of an existing line(s) with smart technology. The identified need for cross-border capacity increases may be addressed by a wide range of solutions, including smart technologies. Solutions to the needs are proposed by project promoters and may be assessed in the next phase of the TYNDP, project CBA.

Why are only hydro pump and battery storage considered? What about thermal storage with synchronous machines that can provide inertia in both operation modes?

ENTSO-E's answer: The inclusion of flexibilities in the 2022 system needs study is a pilot and represents a significant challenge for ENTSO-E's modelling experts and tools. That is why it was decided, as a first step, to limit the inclusion of flexibilities to storage and peaking. If the 2022 study is successful, we might consider the inclusion of additional flexibilities in future editions. However, it is important to understand that integrating flexibilities in the study (together with other improvements introduced in this edition, such as multiple climate years) renders the modelling extremely complex in the case of very long simulation times, to the extent that it might not be possible to integrate any additional element in the methodology.

Is it planned to use projected 2040 climate years (which could be significantly different given climate change at such time horizons)?

ENTSO-E's answer: Climate years are historical years. The methodology used to choose climate years is the one developed in the context of ENTSO-E's bidding zone study.

Are the climate years now probabilistic or still based on historical data?

ENTSO-E's answer: Climate years are historical years. The methodology used to choose climate years is the one developed in the context of ENTSO-E's bidding zone study.

To what degree do you seek national regulatory authority "buy in" to your methodology such that they accept this significant piece of work?

ENTSO-E's answer: ENTSO-E had regular exchanges with ACER in developing the system needs methodology for TYNDP 2022. The system needs study, results and methodology will be submitted to ACER for opinion alongside the rest of the TYNDP 2022 package.

Will you assess the impact of more interconnections on generator profitability?

ENTSO-E's answer: The system needs study looks at benefits for the entire European society, not at benefits for individual actors.

We would like both Swiss zones to be merged; how should we proceed?

ENTSO-E's answer: A study is currently underway to improve zonal clustering. In TYNDP 2022, the zonal clustering seeks to represent grid contingencies. Several criteria were considered, including which lines to put on equivalent links, the limiting elements, the number of zones for model convergence, and the capacities obtained after clustering.

Flexibility is not just storage and generation. Smart transmission tech is also essential. How is this taken into account?

ENTSO-E's answer: The system needs study looks at cross-border capacity increases without consideration for whether the increase in capacity comes from a new line or from the increased efficiency of an existing line(s) with smart technology. The identified need may be addressed by a wide range of solutions, including smart technologies. Solutions to identified needs are proposed by project promoters and may be assessed in the next phase of the TYNDP, project CBA.

Hybrid offshore networks will show value but fail in times of system stress.
See https://www.storelectric.com/offshore-energy-networks/

ENTSO-E's answer: Thank you for your opinion.

As a next step, is it possible to review the current capacity threshold of 225MW for PCIs? This will allow access to different storage technologies.

ENTSO-E's answer: The capacity threshold for a storage project to be eligible for PCI status is set in the TEN-E Regulation, which was revised in 2021. We suggest you address any comment to the responsible staff in the European Commission.

ENTSO-E: "We are not the body setting the agenda nor leading the review of Regulations". Regulations prevent the solutions the grids need, so they are 100% relevant.

ENTSO-E's answer: Regulation is definitely relevant, but any comments on EU regulation are better addressed to European lawmakers.

How is the investment candidate list developed and set?

ENTSO-E's answer: In respect of increases in cross-border capacity, ENTSO-E collected data (regarding capacity and costs) from project promoters of TYNDP 2020 projects in the fall of 2021. On borders where there were no or few existing planned investments, the collected data was completed using conceptual projects proposed by TSOs. The ultimate objective is to propose to the optimiser a list of investment candidates with realistic capacities and costs.
Cost assumptions include the CAPEX of the investment and the cost of any needed reinforcement of the internal transmission network.
As regards flexibility investments, the assumptions are based on data collected and consultation with TSOs within the scenario-building process. It is not broken down into distinct investments but takes the form of capacity in MW per market with associated costs.

Flexibility of Storage (Pump Hydro and Batteries): Is the long-term flexibility taken into account (daily, weekly and longer)?

ENTSO-E's answer: This is specified in the system-needs methodology report; please refer to pages 40–43.

How will isolated systems be treated in the model? And how is the value assigned to address the energy isolation of a country?

ENTSO-E's answer: The need to connect isolated systems is assessed like any other need. There is no special value assignment to the first capacity increase connecting an isolated country.
However, it is natural that the SEW achievable by any capacity increase is greater than that associated with subsequent increases (the SEW of a new project decreases with the already installed capacity). Consequently, there is indeed a greater value for the first capacity increase than for those that follow. This makes it more likely that investment candidates that would end the isolation of a previously isolated system would be selected for the optimal solution.

Why is flexibility only for peaking and storage, and where are other sources considered given the EC requirement to maximise the existing grid first?

ENTSO-E's answer: The inclusion of flexibilities in the 2022 system needs study is a pilot and represents a significant challenge for ENTSO-E's modelling experts and tools. That is why it was decided to limit the flexibilities to storage and peaking as a first step. If the 2022 study is successful, we will consider the inclusion of additional flexibilities in future editions of the study.

What if one interconnection candidate is selected by the optimiser in 2030 but not in 2040?

ENTSO-E's answer: It is normal that when looking at two different scenarios, two different optimal configurations are identified. The list of needs identified by the study constitutes an example of an optimal configuration, and changing the scenario or the investment candidates would likely generate different optimal configurations. The value of the system needs study is not to find one optimal solution but to show that there are margins for improvement.
The situation where investment candidates were part of the optimal solution in 2030 but not in 2040 happened in TYNDP 2020 on two borders, where the investment candidates did not show sufficient benefits in relation to costs to be selected for 2040. A deeper analysis revealed that the needs were selected in an "upper-bound" solution: the optimum was very flat, and, when broadening it to include needs that delivered just slightly lower overall benefits, these investments were included. This "upper-bound" solution can be found in Figures 1.4 and 1.5 of the 2020 system needs report, which shows that these investments were still valuable in 2040.

Will the 70% rule of the Clean Energy Package will be taken into account in determining maximum cross-border exchanges?

ENTSO-E's answer: The 2022 edition of the system needs study does not take into account the 70 % rule because ENTSO-E considers that there is currently insufficient maturity and alignment of views on how to implement the rule in our models. There are ongoing workstreams that include regulators and other actors, but no consensus has emerged so far.

Will the system needs study for 2022 TYNDP take all three scenarios into account? (NT, DE and GA) If so, will we see three different optimised power system configurations?

ENTSO-E's answer: The 2022 system needs study will be based on the National Trends scenario only.
Unlike National Trends, which is a scenario generated using TSO data, the Distributed Energy and Global Ambition scenarios are designed to meet the objective of climate neutrality in 2050. To build these, we run optimisation engines that model the scenarios based on this objective. Therefore, the Distributed Energy and Global Ambition scenarios can, in a way, be seen as system needs. This is the main reason why the system needs study is performed only for the National Trends scenario.
In the reports accompanying the release of the system needs study, we can consider how the identified system needs compare to the capacity increases in Distributed Energy and Global Ambition scenarios.

The National Trends scenario will quickly become redundant as countries expand their climate ambitions. Should the analysis be repeated for more ambitious scenarios?

ENTSO-E's answer: As countries increase their ambitions, the National Trends scenario in each successive TYNDP becomes more ambitious in turn. The National Trends scenario that will be assessed in the TYNDP 2022 system needs study is more ambitious than the same scenario in the TYNDP 2020 system needs study. We expect that, if repeated in TYNDP 2024, the needs study will consider a yet more ambitious scenario.

Will you publish the methodology for the selection of climate years?

ENTSO-E's answer: Yes, it will be published. It was developed as part of the locational marginal pricing study conducted as part of the second BZR. We expect that the methodology will be released by July 2022, but the exact timing requires ACER confirmation.

Are you also going to use the NTC model (as well as the zonal model) for 2030 to assess the impact of different weather years?

ENTSO-E's answer: Because of time constraints, it is not possible to run the 2030 study on an NTC model. However, we are investigating the operational feasibility of running the 2030 study for three climate years.

The answer to Zeid's questions was not clear. If the Italy-Tunisia project is not a PCI, is it ignored from the system needs calculation?

ENTSO-E's answer: Yes, the list of capacity increases proposed to the optimiser includes all existing projects from EU to non-EU countries, provided they have PCI status.

Do you consider SSSCs for digital power flow control as part of the flexibility solutions?

ENTSO-E's answer: The inclusion of flexibilities in the 2022 system needs study is a pilot and represents a significant challenge for ENTSO-E's modelling experts and tools. That is why it was decided to limit the flexibilities to storage and peaking as a first step. We might consider the inclusion of additional flexibilities in future editions of the study.

In TYNDP 2018, Tunisia was an endogenous zone, but this was not maintained in TYNDP 2020. Algeria and Morocco should also be an endogenous zone in the 2030 and 2040 studies, and Ukraine and Moldova should be included as an endogenous zone, considering the synchronisation pattern.

ENTSO-E's answer: Thank you for your comment.

Why will the 70% rule on cross-zonal capacity not be taken into account? Identified system needs may be overestimated as a result.

ENTSO-E's answer: The 2022 edition of the system needs study does not take into account the 70 % rule because ENTSO-E is of the view that currently, there is not sufficient maturity or alignment of views on how to implement this rule in our models. There are ongoing workstreams that include regulators and other actors, but no consensus has emerged so far.

It could be significant that ENTSO-E publishes all the data, including costs for candidates used for the planning option application of ANTARES.

ENTSO-E's answer: The list of investment candidates, including related capacities and cost assumptions, will be published.

Will the zonal clustering model be published in opendata to allow complementary research?

ENTSO-E's answer: Yes, it will. The clustering used in TYNDP 2020 is already published; the TYNDP 2022 zonal clustering will be released with the study in Q3 2022.
I disagree that the 2050 horizon is too difficult; 2050 is the date by which we need to decarbonise and 2030 (in just eight years) is an extrapolation of current plans. This is a totally different approach.
Thank you for your views. We agree that developing scenarios for 2050 is very different from doing so for 2030. As explained, ENTSO-E has considered the possibility of studying time horizons beyond 2040. The farther into the future the projection, the more uncertain the models become. The level of uncertainty in considering the 2050 horizon and beyond renders this study too expensive in terms of work to generate a proper representation of 2050.

RES and Hydro time series have a significant impact on this study. Will you consult them? 2040 RES time series were not published nor consulted in the previous system needs study.

ENTSO-E's answer: All main datasets will be published. Because of the mass of data, we do not systematically publish everything, but stakeholders are welcome to contact us if they are interested in obtaining data that is not published on our website.
It may happen that we cannot release data because either:
_ it is private data that we paid for, such as climate data;
_ the regulation prevents us from releasing some data, such as network models.

The market analysis is only SEW-based? Why?

ENTSO-E's answer: To analyse system needs for 2030 and 2040, ENTSO-E determined the combination of potential increases in cross-border network capacity and flexibilities that minimises the total system costs, composed of total investment (including costs of related necessary internal network reinforcements) and generation costs. A panel of possible network increases and flexibility solutions is proposed to an optimiser, who identifies the most cost-efficient combination. In TYNDP 2022, the identified system needs in 2040 also consider the contribution of potential capacity increases to alleviating security of supply issues.
The mutual influence of different investment opportunities is taken into account by performing the analysis simultaneously for all investments (transmission and flexibilities).
The identified needs are a depiction of the effective cross-border transfer capacity increases necessary for a cost-optimised and secure operation of the 2030 and 2040 systems.
It is important to note that considerations in terms of system resilience or other societal and environmental benefits are not included in the system needs analysis. They are, however, considered in the next step of the TYNDP, the CBA of projects, which considers a series of indicators, including the impact of each project on CO_2 and non-CO_2 emissions (nitrogen oxides, particulate matter) and reductions in energy not served.

How is the Location of possible flex solutions identified?

ENTSO-E's answer: The localisation of flexibility needs is identified based on the localisation of investment candidates proposed to the optimiser. For storage, those were based on the TYNDP 2022 list of storage projects.
However, the system needs study does not identify solutions. The methodology can only identify where, for example, market integration could be further improved. However, it does not identify which technology would be best to address the identified need. ENTSO-E believes that needs will be addressed by a combination of solutions to be proposed by project promoters. The solution(s) to a flexibility need may include increasing storage capacity, but also generation and a capacity increase on a neighbouring border.

Will future models consider the impact of rising temperatures on line capacity? More capacity may be needed just to overcome this limitation.

ENTSO-E's answer: ENTSO-E is now starting to work on the methodology for the 2024 system needs study. We will keep this idea in mind.

Thank you so much for this very meaningful interactive webinar. Well done!

ENTSO-E's answer: Thank you, we appreciate your feedback.

No-regret decisions can only be taken in the context of 2050 (not 2040) plans/scenarios; otherwise, solutions may become obsolete by decarbonisation.

ENTSO-E's answer: Thank you for your comment. The system needs study looks at 2040 and at 2030 because these are the time horizons currently being investigated in the PCI process run by the European Commission, which the TYNDP feeds into. ENTSO-E has considered the possibility of studying time horizons beyond 2040. The farther into the future the projection, the more uncertain the models become. The level of uncertainty which we would face for 2050 and beyond renders this study too expensive in terms of work to have a proper representation of 2050.

The general public should be consulted on all data and methodologies to ensure fair treatment (e.g. regarding storage), improve transparency, and avoid arbitrariness

ENTSO-E's answer: All data used in the system needs study, as well as its methodology, will be submitted alongside the TYNDP 2022 package for public consultation from July until September 2022.

Appendix 3 – Comments received in the public consultation on key improvements to the TYNDP 2022 Implementation Guideline and ENTSO-E's responses

Q1. The TNYDP 2022 specific Implementation Guidelines aim to complement the guidance given within the 3rd CBA Guideline by delivering the methodologies used to assess projects in the TNYDP 2022. It, therefore, gives additional information on models, tools, data, and examples, as well as additional case-specific explanations and clarifications. The aim is to deliver all the information needed to perform the project assessment.

Is this approach sufficient, and, if not, what do you think was missing in the previous edition of the Implementation Guidelines or needed additional explanation or clarification?

Anonymous

It would be great to
1) have the draft document; For now, I only have the following version:
https://eepublicdownloads.entsoe.eu/clean-documents/tyndp-documents/Cost%20Benefit%20Analysis/200128_3rd_CBA_Guideline_Draft.pdf
2) first, have a general introduction to the CBA methodology. This would be very useful for people new to the topic, in the form of a webinar.
3) subsequently, summarise the differences or improvements from the previous version in the form of a webinar.

ENTSO-E's answer:
1) ENTSO-E will consider publishing the whole guideline document for early consultation for the next TYNDP.
2) A short introduction and a link to the 3rd CBA Guideline are already given at the beginning of the Implementation Guidelines
3) A short overview of the main changes since the Implementation Guidelines for the TYNDP 2020 has been introduced in the document. For the next TYNDP, ENTSO-E will continue to work on improving the transparency of the process.

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currENT Europe

1 This incremental approach is safe and regulatorily sound but insufficient if the goal is to enable EU-wide decarbonisation of the energy system. There is a need to establish what is necessary to achieve economy-wide carbon neutrality in 2050 and work back from there, planning and designing a transition to a fit-for-purpose grid infrastructure.

Therefore, the CBA needs to be based on scenarios that ensure the net-zero scenarios are reached.
We have not seen the 2022 Implementation Guidelines; however, the 2020 guidelines failed to address the following issues: flexibility, the complementarity of solutions, redeployability, scalability, fast deployment, and modularity.

ENTSO-E's answer: This question was intended to address the process and the link between the CBA Guideline and its application in the TYNDP. However, we appreciate this feedback on the missing parts, which are more related to the overall TNYDP and scenario building, especially the listed issues, and which ENTSO-E is always working to improve.

SuperNode Ltd

2 This incremental approach is safe and regulatorily sound but insufficient if the goal is to enable EU-wide decarbonisation of Europe's energy system.

There is a strong need to establish what is necessary for economy-wide carbon neutrality in 2050 and work back from there, planning and designing a transition to a fit-for-purpose grid infrastructure. Therefore the CBA needs to be based on scenarios that ensure the net-zero scenarios are reached.

The 2020 Implementation Guidelines failed to address the following issues which should be included in the new guidelines: flexibility, the complementarity of solutions, redeployability, scalability, fast deployment, and modularity.

ENTSO-E's answer: This question was intended to address the process and the link between the CBA Guideline and its application in the TYNDP. However, we appreciate this feedback on the missing parts, which are more related to the overall TYNDP and scenario building, especially the listed issues, and which ENTSO-E is always working to improve.

Smart Wires

3 The CBA needs to be based on scenarios that ensure that net-zero scenarios are reached.

We have not seen the 2022 Implementation Guidelines; however, the 2020 guidelines failed to address the following issues: flexibility, redeployability, scalability, fast deployment, modularity, and complementarity of solutions in a toolbox.

ENTSO-E's answer: This question was intended to address the process and the link between the CBA Guideline and its application in the TYNDP. However, we appreciate this feedback on the missing parts, which are more related to the overall TNYDP and scenario building, especially the listed issues, and which ENTSO-E is always working to improve.

EDF SA

4 EDF welcomes these Implementation Guidelines as a valuable and helpful tool to help project promoters implement the CBA methodology developed by ENTSO-E to assess their infrastructure projects or help understand how ENTSO-E proceeds. However, in principle, it is not the role of implementation guidelines to further enrich or propose additional indicators to the methodology. The Implementation Guidelines can indeed help identify necessary improvements but should be limited to their primary role. EDF is of the view that a separate process for the evolution of the methodology should be favoured.

ENTSO-E's answer: The structure of the 3rd CBA Guideline follows a general and modular approach. It explicitly refers to and relies on the study-specific implementation guideline:

a. It is modular as each individual indicator or aspect within the 3rd CBA Guideline is presented as an individual module. This approach would allow ENTSO-E to include small changes or revise/add/revoke single indicators in a clearer manner without changing the entire document.
b. It is more general since very specific details or assumptions needed for applying the CBA Guidelines are dealt with in the Implementation Guidelines, while the CBA relies on the main concepts.

Anonymous

Yes.

Given that there is no space for general comments:

_ ENTSO-E should run public consultations on the data of third countries. So far, this data has not been considered, which means that ENTSO-E does not comply with article 11 (Annex V) of the regulation (EU) 347/2013. Data consulted should include installed capacities, interconnection capacities, hydro inflows, fuel prices, demand, RES profiles and technologies.

_ Market and network data should be published with an hourly resolution, with the base case and the cases with or without the project being assessed for all scenarios.

ENTSO-E's answer: ENTSO-E appreciates this positive feedback.

The consultation and publication of detailed modelling data are out of the scope of the Implementation Guidelines. Only the most fundamental information needed to perform the indicator-based CBA assessment is included.

Q2. Indicator B6 – SoS – Adequacy: In order to assess the Security of Supply (which is associated with very scarce phenomena) with sufficient accuracy, ENTSO-E currently uses all the PECD climate years of the database combined with 15 randomised yearly availabilities of thermal power plants resulting in 510 Monte-Carlo Years.

Do you consider this approach sufficient to represent the variety of offer and supply balance situations?

Anonymous

I do not have the expertise necessary to challenge this methodology; it seems like a great approach.

ENTSO-E's answer: ENTSO-E appreciates this positive feedback.

currENT Europe

1 This is appropriate.

ENTSO-E's answer: ENTSO-E appreciates this positive feedback.

SuperNode Ltd

2 Yes.

ENTSO-E's answer: ENTSO-E appreciates this positive feedback.

EDF

3 When assessing adequacy, it seems important to have a sufficient number of climate years to properly represent the climate events and assess the thermal capacities needed. As it stands, ENTSO-E fails to justify the reason for choosing 15 randomised yearly availabilities of thermal power plants, making it difficult for market participants to express an informed view on the accuracy of this approach. EDF calls on TSOs to provide evidence of the fact that such a number of randomised yearly availabilities of thermal power plants consists in a better trade-off between precision and computational complexity.

Considering fewer Monte-Carlo years can lead to an underestimation of the high variability of the climatic conditions (renewable production, thermal sensitivity) and their impact.

EDF also wonders whether, and to what extent, climate change is modelled in the PECD climate years.

ENTSO-E's answer: Additional information on the creation of the Monte-Carlo years has been introduced to the Implementation Guidelines. For future TYNDPs, we will consider to what extent the PECD can be updated in order to cope with the effects of climate change.

Anonymous

It is not clear if the power plant granularity should be per unit or aggregated (average size). The number of outages needed to have a consistent CBA depends on this detail. The number of Monte-Carlo years could be fine, but so far seems arbitrary.

ENTSO-E's answer: Additional information on the creation of the Monte-Carlo years has been introduced to the Implementation Guidelines.

Q3. Indicator B6 – SoS – Adequacy: In order to monetise the Energy not Supply avoided, thanks to a new project, for each country, ENTSO-E is going to use the value of lost load each has developed in compliance with the Clean Energy Package (article 11.1). For those countries where the value of lost load has not been computed yet, ENTSO-E intends to use 10 k€/MWh, a value in the order of magnitude of what is currently taken into account and that has been used by ENTSO-E in previous TYNDP.

Do you agree with this choice?

Anonymous

This choice is great; no remarks.

ENTSO-E's answer: ENTSO-E appreciates this positive feedback.

1 **currENT Europe**

This is appropriate and needs to be reasonably high to provide adequate investment signals.

ENTSO-E's answer: ENTSO-E appreciates this positive feedback.

2 **SuperNode Ltd**

Yes. A high price is needed to provide a strong investment signal.

ENTSO-E's answer: ENTSO-E appreciates this positive feedback.

Smart Wires

3 Yes, this is adequate as it provides sufficient incentive to invest.

ENTSO-E's answer: ENTSO-E appreciates this positive feedback.

EDF

4 EDF understands that, for practical reasons, ENTSO-E proposes some values for the VoLL for those countries where it has not been computed yet but calls for caution in the use of an absolute value.

ENTSO-E's answer: In future, Member States shall compute these values according to regulation (EU) 2019/943 article 25 nº 1) when applying capacity mechanisms, Member States shall have a reliability standard in place. A reliability standard shall indicate the necessary level of security of supply of the Member State in a transparent manner and in nº 3). The reliability standard shall be calculated using at least the value of lost load and the cost of new entry over a given timeframe and shall be expressed as "expected energy not served" and "loss of load expectation".

Anonymous

Yes.

ENTSO-E's answer: ENTSO-E appreciates this positive feedback.

Q4 Indicator B6 – SoS – Adequacy: In order to monetise avoided investment for peaking power plant avoided thanks to a new project, ENTSO-E intends to use, for each country, the cost of new entry assessed by each country through the ENTSO-E methodology (link here). For those countries where the cost of new entry has not yet been computed, ENTSO-E intends to use 42k€/MW/year, a value in the order of magnitude of what is currently taken into account, and that has been used by ENTSO-E in previous TYNDP and in the scenario-building phase.

Do you agree with this choice?

Anonymous

The link does not seem to work – I would be very interested in the methodology and assumptions used to compute this number. I would guess that this parameter would be about 20 % higher based on the projects my company is looking at.

ENTSO-E's answer: Acknowledged.

currENT Europe

1 This is appropriate and needs to be reasonably high to provide adequate investment signals.
We also believe that it needs to be recognised that interconnectors can also contribute to the provision of adequacy and should be included in the analysis.

ENTSO-E's answer: ENTSO-E appreciates this positive feedback.
The contribution of interconnectors to adequacy provision should also already be considered in the CBA phase, in the B6 indicator.

SuperNode Ltd

2 Yes. A high price is needed to provide a strong investment signal. In addition, it should be recognised that interconnectors can also contribute to ensuring adequacy and should be included in the analysis.

ENTSO-E's answer: ENTSO-E appreciates this positive feedback.
The contribution of interconnectors to adequacy provision should also already be considered in the CBA phase, in the B6 indicator.

Smart Wires

3 Yes, agreed, but it needs to be recognised that interconnectors can also contribute to the provision of adequacy and should be included in the analysis.

ENTSO-E's answer: ENTSO-E appreciates this positive feedback. The contribution of interconnectors to adequacy provision should already be considered in the CBA phase, in the B6 indicator.

EDF

4 EDF understands that, for practical reasons, ENTSO-E proposes some values for the cost of new entry for those countries where it has not been computed yet but calls for caution in the use of an absolute value.

ENTSO-E's answer: In future, Member States will compute this value according to regulation (EU) 2019/943 article 25 nº 1: when applying capacity mechanisms, Member States shall have a reliability standard in place. A reliability standard shall indicate the necessary level of security of supply of the Member State in a transparent manner, and, in nº 3: the reliability standard shall be calculated using at least the value of lost load and the cost of new entry over a given timeframe and shall be expressed as "expected energy not served" and "loss of load expectation".

Anonymous

The value used should correspond to the minimum value between an OCGT and an oil power plant.

ENTSO-E's answer: In cases where no country-specific data is available, the current assumption is that the price-determining power plants are OCGT.

Q5. Project-Level Indicators: in relation to the "non-mature" indicators (B7, B8) and the redispatch calculations and based on the content of the previous editions of the Implementation Guidelines (where those were addressed as "project-level indicators"), **where do you think that additional clarity should be delivered in terms of calculation?**

Anonymous

I would be very interested in the reasons why these indicators cannot be monetised, at least partially. This is really not clear to me. It seems to me that there are published studies that took these elements into account in various ways. I would need an additional explanation on this point. A document and a webinar on this topic would be great.

ENTSO-E's answer: ENTSO-E has already organised a meeting in the past, and for the development of the 3rd CBA Guideline, the public was also invited to directly work with ENTSO-E on these indicators. It turned out that currently, there seems to be no methodology applicable to the TYNDP process. Of course, there are detailed studies published, but for the CBA and within the framework of the TYNDP, we need to consider resources and a tight deadline. Complex and detailed studies in SoS cannot be incorporated into this process. On the other side, simplified indicators seem not to be applicable either, as they are lacking in important details.
However, ENTSO-E is always working to improve this shortcoming of the CBA Guideline, and welcomes any constructive suggestions.

currENT Europe

1 B7 – Flexibility characterises the impact of the project on the ability to exchange balancing energy in the context of high penetration levels of non-dispatchable electricity generation. Balancing energy refers to products such as Replacement Reserve (RR), mFRR, and aFRR. Exchanging/sharing balancing capacity (i.e., RR, mFRR and aFRR) that requires guaranteed or reserved cross-zonal capacity is also taken into account.

B 8 – Stability characterises the project's impact on the ability of a power system to provide a secure supply of electricity. B8.0 Qualitative stability indicator; B8.1 Frequency stability; B8.2 Blackstart services; and B8.3 Voltage/reactive power services.

ENTSO-E's answer: ENTSO-E appreciates this feedback and will consider this for the next update.

SmartWires

2 The additional clarity in terms of their calculation could be provided as a guidance note from ENTSO-E with ACER/EC support. However, the ability of the TYNDP to calculate this is limited until a dynamic model of the synchronous systems is available. Therefore, the calculation, at least for cross-border or transmission-to-distribution interfaces, should be calculated on the basis of the increased capacity, the latency in this capacity for energy trade, that is, the spare capacity not being used at a point in time to trade energy and that can be reused to provide reserves. Note the reserves being shared between jurisdictions would, of course, need to exist at that time in country B to support country A.

For the B8 indicator, the ability to improve the stability margin on a circuit network should be recognised since technology with this ability can support stability, frequency B8.1 (increasing transient stability margin), voltage 8.3 (directly providing reactive voltage injection), and 8.2 (by reducing the need for black start units and/or making existing units reach further across the network).

ENTSO-E's answer: ENTSO-E appreciates this feedback and will consider this for the next update.

Anonymous

Due to its complexity, it should not be a project-level indicator, but an indicator computed in a transparent way by ENTSO-E.

ENTSO-E's answer: ENTSO-E, in principle, agrees on that statement, but within the frame of the TYNDP, this is currently not possible.

Q6. Scenarios: Three climate years, 1995, 2008, and 2009 have been selected using a methodology based on the year's representativeness of the climate years within the Pan-European Climate Database. The results from market simulations are then considered based on the weighted average from these three climate years. The weighting is as follows: 0.233 for 1995, 0.367 for 2008 and 0.4 for 2009.

Do you see this approach and the number and choice of the climate years as sufficient? If not, which climate years should be used and why?

Anonymous

I do not have sufficient expertise to challenge this choice; it seems OK to me.

ENTSO-E's answer: ENTSO-E appreciates this positive feedback.

TIWAG-Tiroler Wasserkraft AG

1 The selection of three weather years seems to be too few as a proxy for the representation of the weather situation of 35 years (at least 10 weather years).
A comprehensive and transparent description of the selection process is needed.
If only a few weather years are used, tend to use "more recent" years (the weather of the last decade is not appropriately taken into account; moreover, the climate has changed significantly since 1995 (temperature, precipitation, extreme events); in 2012, for example, there was a pronounced cold spell)

ENTSO-E's answer: ENTSO-E believes that three years is a good compromise between robust results and computation time. The choice of the three climate years is based on BZR methodology: the most recent climate years are not better than the oldest, but ENTSO-E will further investigate improving this process for subsequent TYNDPs.

currENT Europe

2 Using a larger number of years seems likely to deliver more robust results, and the most recent available climate years should be considered.

ENTSO-E's answer: ETNSO-E believes that three years is a good compromise between robust results and computation time. The choice of the three climate years is based on BZR methodology: the most recent climate years are not better than the oldest, but ENTSO-E will further investigate improving this process for subsequent TNYDPs.

SuperNode Ltd

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ENTSO-E's answer: ENTSO-E believes that three years is a good compromise between robust results and computation time. The choice of the three climate years is based on BZR methodology: the most recent climate years are not better than the oldest, but ENTSO-E will further investigate improving this process for the following TNYDPs.

Smart Wires

3 The climate years do not show enough variation in the temperature, solar and wind variance across the grid.
This method does not account for increasing more likely extreme weather events in future years, nor does it give the full range of weather variations to be endured. A long drought, for example, would drive a major cost in one year for certain regions that would need to be paid and should be included in a CBA for a project. This regional situation is at risk and most likely will be lost by trying to find a representative year for Europe.

In addition to the method proposed, each individual full year should be analysed regionally, looking for these hidden trends and then using the outcome of the analysis to make adjustments for these with weighted factors, but still enable the TYNDP to be run at a Pan-European scale.

ENTSO-E's answer: ENTSO-E believes that three years is a good compromise between robust results and computation time. The choice of the three climate years is based on BZR methodology: the most recent climate years are not better than the oldest, but ENTSO-E will further investigate improving this process for the following TNYDPs.

EDF

4 Although selecting climate years according to their representativeness out of the climate years within the Pan-European Climate Database seems to be the optimal way for the optimisation, EDF deeply regrets the lack of transparency (i) on the methodology used for both the selection and the weighting and (ii) on the number of selected years.

Besides, EDF wonders whether ENTSO-E is already planning to consider an increased number of climate years in the next CBA.

ENTSO-E's answer: The choice of the three climate years is based on the BZR methodology.
Within the TYNDP 2022, ENTSO-E will not change the number of climate years. But for the TYNDP 2024, ENTSO-E will assess the realisation of increasing the number.

Anonymous

ENTSO-E has not published the assumptions behind PECD, so it is not possible to say if these are the right years.

ENTSO-E's answer: Information about the PECD can be found in Section 6.3 in the ERAA report, found under the link here. Further information and assumptions on how the climate years are chosen for the TYNDP can be found in Section 4.1 and appendix VII in the Scenario Building Guidelines, found here.

Q7. Scenarios: In the TYNDP 2022, the plan is to perform the CBA assessment for each of the three climate years for the time horizons 2030 and 2040 and with each applied to different scenarios.

Do you consider these time horizons relevant for the TYNDP 2022 CBA assessment, and do they provide a sufficient overview of the benefits of the projects? If not, which ones should be considered?

Anonymous

Yes, they are relevant and sufficient.

ENTSO-E's answer: ENTSO-E appreciates this positive feedback.

TIWAG-Tiroler Wasserkraft AG

1 Regarding the selection of reference years, see our response to question No. 9.

currENT Europe

2 The 2050 horizon should be considered. Meeting the 2050 goals will require significant additional effort. Given that transmission investments are typically long-term in nature, it makes sense to evaluate projects in terms of their contributions to longer-term goals as well as with reference to the 2030 and 2040 time horizons.

ENTSO-E's answer: ENTSO-E appreciates this constructive feedback and will take this proposal under consideration for the next TNYDPs. However, in terms of economic evaluation (calculation of the net present value), 30 years of distance will have little impact on results.

SuperNode Ltd

3 2050 should be considered. Meeting the 2050 goals will require significant additional effort. Given that transmission investments are typically long-term in nature, it makes sense to evaluate projects in terms of their contributions to longer-term goals as well as with reference to the 2030 and 2040 time horizons.

ENTSO-E's answer: ENTSO-E appreciates this constructive feedback and will take this proposal under consideration for the next TNYDPs. However, in terms of economic evaluation (calculation of the net present value), a 30-year distance will have little impact on results.

Smart Wires

4 They are relevant, but near-term time horizons should also be considered, such as 2023 and 2025.

ENTSO-E's answer: This is not the aim of the TYNDP, which is more related to mid-term and long-term effects than the very short-term aspects. Please also consider the investigation in the adequacy studies (e.g., ERAA)

EDF SA

5 Keeping consistent time horizons between the TYNDP and the CBA assessment makes sense. While acknowledging that a distant time horizon comes with a high level of uncertainty, EDF wonders whether the CBA assessment could also be performed for 2050 – since the power sector may meet major challenges in this time frame, especially when it comes to the decarbonisation goals.

ENTSO-E's answer: ENTSO-E appreciates this constructive feedback and will take this proposal under consideration for the next TYNDPs. However, in terms of economic evaluation (calculation of the net present value), 30 years of distance will have little impact on results.

Anonymous

2050 is also relevant due to the Paris agreement.

ENTSO-E's answer: ENTSO-E appreciates this constructive feedback and will take this proposal under consideration for the next TNYDPs. However, in terms of economic evaluation (calculation of the net present value), 30 years of distance will have little impact on results.

Q8. Reference Grid: Based on the guidance given within the 3rd CBA Guidelines, for the TYNDP 2022, two different reference grids are defined for the corresponding horizons, 2030 and 2040. The reference grids for the 2030 and 2040 horizons are based on the maturity criteria as set out in the 3rd CBA Guideline.

Additionally, in respect of the above maturity criteria, a cut-off for the commissioning years has been set. This choice deals with uncertainties in the planning and construction, ensuring that only projects having a strong chance of being commissioned at the dates of the respective scenarios are part of the reference grid. The cut-off has been set to 31 December 2027 for the mid-term horizon (2030) and 31 December 2035 for the long-term horizon (2040), excluding all projects with planned commissioning dates later than these cut-offs.

Do you agree with defining distinct cut-off years to take due account of possible uncertainty?

Anonymous

Yes, I have no reasons to challenge this choice.

ENTSO-E's answer: ENTSO-E appreciates this positive feedback.

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currENT Europe

1 The 2050, 2040 and 2030 target reference grids should be included in the assessment of benefits for new projects to close the gap between what already exists and what we need. This will allow hybrid projects to be more fully assessed. The risk of stranded assets is less than the risk of failing to decarbonise.

If the reference grid is based on today's grids plus those additional projects that we feel will make it through current planning processes, the result will be a small, inefficient grid that will not meet the 2050 decarbonisation pathway.

The reference grid for 2040 must reflect what is needed to reach European economy-wide decarbonisation in 2050. For the electricity sector, that would require full decarbonisation well before 2040. In addition, the infrastructure must be able to support the decarbonisation through electrification of the heating, transport, and industrial sectors.

Grid-enhancing technologies that are mature and available today, and other technologies that are expected to mature in near years, can significantly improve the efficiency of grids, affecting both the willingness to invest in new grids and the questions of when and where to invest in what kind of grid components. The future reference grid must assume the use of existing and expected technologies when it is socio-economically beneficial to do so.

ENTSO-E's answer: ENTSO-E appreciates this constructive feedback, although it exceeds the frame of this question. To be noted: the choice of the reference grid for modelling purposes, as in the TYNDP, does not, in any event, impact the realisation of future projects.

SuperNode Ltd

2 The 2050, 2040, and 2030 target reference grids should be included in the assessment of benefits for new projects to close the GAP between what already exists and what we need. This will allow hybrid projects to be more fully assessed. The risk of stranded assets is less than the risk of failing to decarbonise.

If the reference grid is based on today's grids plus those additional projects that we feel will make it through current planning processes, the result will be a small, inefficient grid that will not meet the 2050 decarbonisation pathway.

The reference grid for 2040 must reflect what is needed to reach European economy-wide decarbonisation in 2050. For the electricity sector, that would require full decarbonisation well before 2040. In addition, the infrastructure must be able to support the decarbonisation through electrification of the heating, transport and industrial sectors.

Grid-enhancing technologies that are mature and available today, and other technologies that are expected to mature in the coming years, such as transmission technology based on superconductors, can significantly improve the efficiency of grids, affecting both the willingness to invest in new grids and the questions of when and where to invest in what kind of grid components. The future reference grid must assume the use of existing and emerging technologies within the 2050 timeframe when it is socio-economically beneficial to do so.

ENTSO-E's answer: ENTSO-E appreciates this constructive feedback, although it exceeds the frame of this question. To be noted: the choice of the reference grid for modelling purposes, as in the TYNDP, does not, in any event, impact the realisation of future projects.

Smart Wires

3 We believe that an approach focusing only on PCIs that are in construction or in permitting or planning stages is too narrow. Such an approach does not consider any optimisation projects whose lead time can be from 1–5 years.

Taking optimisation into account helps as it gives lead times to new projects to be delivered.

We suggest having an average/typical development to commissioning time for each category/type of technology. This should be consulted with stakeholders. These would allow the TYNDP process to assess whether to use the existing 3rd CBA Guideline, which is based on whether there is sufficient certainty in the timelines to consider whether a new project could be built and therefore make it into the reference case. For long-lead-time technologies like circuits, this seems reasonable, but for shorter lead-time technologies like optimisation technologies, it may only take a couple of years to move from analysis to construction. A stakeholder-consulted lead time for optimisation and capital projects based on European lead-time example projects would provide sufficient evidence to make this distinction.

ENTSO-E's answer: The reference grid is not composed of PCI projects only but also includes projects submitted to the TYNDP that fulfil the reference grid criteria. ENTSO-E appreciates this constructive feedback, although it exceeds the frame of this question. To be noted: the choice of the reference grid for modelling purposes – as in the TYNDP – does not, in any event, impact the realisation of future projects.

EDF SA

4 EDF is of the view that it makes sense to have in the reference grids, at longer time horizons only, those projects having a strong chance of being commissioned and welcomes the idea of improving the CBA by also taking into account this commissioning horizon dimension, especially considering the delays that can be observed and that ACER notably points out in its PCI annual report.

Yet, EDF regrets the lack of transparency in the way those dates have been calculated, and wonders whether the methodology used could be shared with market participants so they can replicate the calculations.

ENTSO-E's answer: No calculations have been performed to establish these cut-off dates. They were chosen to take into account the possible delays of projects.

Anonymous

Yes, but the question is how a project substantiates that it will be commissioned before a given cut-off date. So far, CBA Guidelines leave the door open for TSOs to take arbitrary decisions. Entities like regulators without conflicts of interest should be in charge of assessing the commissioning dates of projects.

ENTSO-E's answer: The CBA Guideline, on which the Implementation Guidelines are based, explicitly mentions that the commissioning years need to be in line with the information given in the respective national development plans, or they need to be agreed with the respective regulator.

Q9. Modelling: Within the TYNDP CBA Implementation Guidelines, two options are allowed for the load-flow calculations. These are AC and DC-based load-flow calculations. Internal tests have shown that the line loadings and resulting losses – as needed to determine the B5 indicator - are well aligned between both approaches. Therefore, this comparison of AC and DC does not suggest any reasons to reject one modelling approach for another.

ENTSO-E believes that both the AC and the DC calculations are well suited for the CBA assessment. Do you agree?

Anonymous

I do not have sufficient expertise to challenge this choice; it seems OK to me.

ENTSO-E's answer: ENTSO-E appreciates this positive feedback.

currENT Europe

1 Yes.

ENTSO-E's answer: ENTSO-E appreciates this positive feedback.

SuperNode Ltd

2 Yes.

ENTSO-E's answer: ENTSO-E appreciates this positive feedback.

Smart Wires

3 AC modelling allows for a more detailed assessment of network performance. It is important to assess long-term losses, which can help arbitrate between alternative technology solutions. The eco-design and energy efficiency directives focus precisely on the need to reduce losses in networks over time to reach the decarbonisation target.

ENTSO-E's answer: ENTSO-E appreciates this feedback.

EDF SA

4 EDF welcomes the ENTSO-E approach to finding the best way to approximate network losses by analysing various load-flow calculations. In our understanding, DC-based load-flow calculations require more assumptions than AC calculations to estimate the network losses. Consequently, EDF would recommend opting for AC modelling.

ENTSO-E's answer: ENTSO-E appreciates this feedback.

Anonymous

Yes.

ENTSO-E's answer: ENTSO-E appreciates this positive feedback.

Q10. Modelling: The redispatch calculations, as in the TNYDP 2020, will again be treated as project-level indicators (indicators delivered by the project promoters). Do you see this as a reasonable approach also for future editions of the TNYDP, or **do you think ENTSO-E should invest additional resources, if needed, even on the cost of other processes, to make ENTSO-E centralised redispatch calculations available?**

Anonymous

I do not think that having project-level indicators is a good choice.
Based on my understanding of the methodology, I think that the methodology is great for evaluating investments in transmission lines but not well suited to evaluating investments in storage or other technologies that are capable of providing ancillary services.
I am firmly convinced that SEW calculations should be performed in a way that the demand for both energy and ancillary services (FRC, aFRR, mFRR) is satisfied. I would appreciate a detailed methodological explanation of why this is not the case already (I am convinced that this is technically feasible).

ENTSO-E's answer: ENTSO-E acknowledges that PLIs are not seen as a perfect solution and will further investigate possible solutions to make them general indicators as well. The second part seems to be out of the scope of this question.

currENT Europe

1 We believe that ENTSO-E needs to come up with a centralised analysis and calculation of redispatch. As a prime component of the SEW benefit indicator, the required redispatch is a very important indicator of the performance of power systems and should therefore be established centrally and independently.

ENTSO-E's answer: ENTSO-E acknowledges that redispatch calculations are seen as important and will further investigate possible solutions for calculating redispatch on a centralised level.

SuperNode Ltd

2 ENTSO-E should, in consultation with relevant stakeholders, develop a centralised analysis and calculation of redispatch. As a prime component of the SEW benefit indicator, the required redispatch is a very important indicator of the performance of power systems and should, therefore, be established centrally and independently.

ENTSO-E's answer: ENTSO-E acknowledges that redispatch calculations are seen as important and will further investigate possible solutions for calculating redispatch on a centralised level.

Smart Wires

3 We believe that ENTSO-E needs to come up with a centralised calculation of redispatch: the needed RD is a very important indicator for the performance of power systems and should therefore be established centrally.
Redispatch should first, systematically, and as a matter of principle, be addressed through optimisation of existing grids, and only then more lines-applying what is called in Germany, for instance, the NOVA principle (optimisation ahead of reinforcement ahead of more lines), and that project promoters are at risk of double counting the savings between projects. This is because the promoter models will not take into account other PCI applications that are expected to be commissioned earlier and that have the potential to reduce or eliminate the redispatch costs now.

ENTSO-E's answer: ENTSO-E acknowledges that redispatch calculations are seen as important and will further investigate possible solutions for calculating redispatch on a centralised level. We further appreciate this constructive feedback and will assess the proposal for the next TYNDP.

EDF SA

4 Project promoters are best placed to assess their dispatch costs but using their hypotheses may generate – in our view – two major risks.
First, project promoters may use various calculation methodologies, leading to potentially biased comparisons between projects. Second, their calculations may be based on too optimistic hypotheses, especially when it comes to the commissioning date of the projects.
EDF wonders whether ENTSO-E is willing to put in place some safeguards to mitigate these risks.

ENTSO-E's answer: During the TYNDP 2020 process, when project promoters submitted redispatch calculations, they had to prove their compliance with a dedicated simplified test case. Further, within the Implementation Guidelines, detailed instructions on data and parameters were introduced. For this, TYNDP ENTSO-E is following the same approach, which should mitigate the risk of inconsistencies.

Anonymous

No. ENTSO-E should calculate them.

ENTSO-E's answer: ENTSO-E will further investigate possible solutions for calculating redispatch on a centralised level.

Q11. Hybrid project: As regards the assessment of projects aimed at both interconnection between countries/bidding zones and integration of generation (projects often called hybrid projects and mainly used for offshore hybrid projects), – **do you agree on restricting the modelling on the application of OBZ only, or do you think that HMs should also be allowed?**

Anonymous

It would be great to include also HMs.

ENTSO-E's answer: Acknowledged.

currENT Europe

1 The HM concept is today commonly used for radial connections of Offshore Wind Farms (OWFs) and offshore wind hubs to shore. The market design solution for offshore interconnectors is also well established and does not distinguish market-wise if they are built on land or subsea. The discussion of whether to apply the HM or OBZ concept applies to hybrid projects and multi-terminal configurations, where OWFs are connected to infrastructure that connects two or more bidding zones. Both concepts have pros and cons and require further analysis in several respects.

Based on current insights, the OBZ concept appears to be the prominent solution when considering the efficiency of markets and system operations, mainly as the OBZ concept provides a market solution that better reflects physical congestions and physical flows. The OBZ concept does, however, provide less market revenue to OWFs compared to the HM concept. Thus, the OBZ concept may affect price-setting in the offshore renewable energy tenders to realise investments in socio-economic efficient hybrid projects.

currENT strongly supports an approach to modelling the OBZs as a priority.

ENTSO-E's answer: ENTSO-E appreciates this comment and background information.

SuperNode Ltd

2 An approach to modelling the OBZs is a priority. The HM concept is today commonly used for radial connections of OWFs and offshore wind hubs to shore. The market design solution for offshore interconnectors is also well established and does not distinguish market-wise if they are built on land or subsea.

The discussion of whether to apply the HM or OBZ concept applies to hybrid projects and multi-terminal configurations, where OWFs are connected to infrastructure that connects two or more bidding zones. Both concepts have pros and cons and require further analysis in several respects.

Based on current insights, the OBZ concept appears to be the prominent solution when considering the efficiency of markets and system operations, mainly as the OBZ concept provides a market solution that better reflects physical congestions and physical flows. The OBZ concept does, however, provide less market revenue to OWFs compared to the HM concept. Thus, the OBZ concept may affect price-setting in the offshore renewable energy tenders to realise investments in socio-economic efficient hybrid projects.

ENTSO-E's answer: ENTSO-E appreciates this comment and background information.

Smart Wires

3 The OBZ price should not be determined by the best HM market price, and the transfer flows from one HM to another or from the generation itself – that is, a higher market price? Also, how are ancillary services being accounted for; can OBZ provide benefits in all HMs at the same time?

ENTSO-E's answer: This seems to be a misunderstanding; the question was whether to allow – just for modelling purposes – that the hybrid projects be modelled within an own newly defined OBZ or within the HM of one of the participating countries.

EDF SA

4 Hybrid projects are one of the issues addressed with a view to improving the CBA methodology and should, therefore, not be dealt with in an implementation guideline. Beyond this question, EDF considers that no decision has yet been made on the status of hybrid projects at the EU level. Therefore, modelling should remain open to both approaches (OBZ or HMs).

ENTSO-E's answer: The idea is to include such new methodologies within the Implementation Guidelines as test cases. After positive application in the TYNDP, such new methodologies could be transferred into the CBA Guideline.

Anonymous

HMs should also be allowed.

ENTSO-E's answer: Acknowledged.

Q12. Hybrid projects: **Should projects aimed at both interconnection between countries/bidding zones and integration of generation (projects often called hybrid projects and mainly used for offshore hybrid projects) be assessed as "enablers" for the achievement of specific goals, such as a distinct amount of RES installed within the EU?**

Anonymous

This should be the case only if there is some indication from a reputable study that hybrid projects contribute significantly to an optimal European energy mix. I am not aware of such a study; I would appreciate a reference.

ENTSO-E's answer: Acknowledged and the comment will be considered when further updating the methodology.

currENT Europe

1 Yes, and assessed in the context of a plan for the Pan-European grid infrastructure needed to move remotely based solar and wind to the centres of demand. This needs to be in line with the Renewables Directive update (article 7) on cooperation mechanisms.

ENTSO-E's answer: Acknowledged and the comment will be considered when further updating the methodology. We thank you for the additional information.

SuperNode Ltd

2 Yes, and assessed in the context of a plan for the Pan-European grid infrastructure needed to move remotely based solar and wind to the centres of demand.

ENTSO-E's answer: Acknowledged and the comment will be considered when further updating the methodology. We thank you for the additional information.

Smart Wires

3 Projects should be looking to deliver the maximum benefits to the end consumer and not focus on solving a single issue.

Agreed. They should be treated as enablers if the risk of double counting is recognised and avoided. For example, you cannot use a project to hit the 70 % target exporting energy at any time while being fully utilised for the import of renewables in the TYNDP network modelling. We also believe that the following question requires further thought: Does the 15 % interconnection target for any country with its neighbours include the offshore network? If so, how is this offshore network apportioned?

We believe that this could only be effective at an indisputable point, for example, the shoreline with each jurisdiction and not an arbitrary point offshore, and its capacity must also be limited to the weakest link in the interconnection pathway, like onshore NTC calculations.

ENTSO-E's answer: Acknowledged and the comment will be considered when further updating the methodology. We thank you for the additional information.

EDF SA

4 Here again, hybrid projects are one of the issues addressed with a view to improving the CBA methodology and should therefore not be dealt with in an implementation guideline.
Besides, the proposal here looks like introducing an additional indicator that is not technologically neutral to favour the RES objective. There is already indicator B2 in the methodology to assess the contribution of the projects to the EU climate or decarbonisation objectives.

ENTSO-E's answer: The idea is to include such new methodologies within the Implementation Guidelines as test cases. After positive application in the TYNDP, such new methodologies could be transferred into the CBA Guideline.
The B2 indicator only assesses the impact of the project on CO_2 emissions. The question here was if such hybrid projects should be treated as "enablers" for additional RES installation - on top of the scenario numbers

Anonymous

Both numbers should be computed. With generation and without the additional generation. Then decision-makers can see what to do and how to compare projects.

ENTSO-E's answer: Acknowledged and the comment will be considered when further updating the methodology.

Q13. Hybrid projects: considering the point raised in the previous question (and the answer given), **should it be permitted to assess those projects by adding RES capacity to the scenario numbers (PINT) or by reducing the scenario numbers because of the project (TOOT)?**

Anonymous

Same answer as for the previous question. I would like to see a METIS-type study that proves that this type of project is part of the optimal energy mix. This is a general remark – it would be good to consider only projects that fall within the optimal energy mix that has been identified in a public METIS-type study.

ENTSO-E's answer: Acknowledged and the comment will be considered when further updating the methodology.

currENT Europe

1 Adopting the TOOT (take one out at a time) approach implies a stronger network; thus, it tends to underestimate the impact of a project on the system. The PINT (put in one at a time) approach implies a weaker network and thus tends to overestimate the impacts.

ENTSO-E's answer: The question was if the scenario numbers should be adjusted based on the project's RES capacities (additional RES for PINT or reduced RES for TOOT)?

Smart Wires

2 PINT should be considered for radial or an early delivered project, for example, pre-2025 (it is an all or nothing installation), and TOOT for longer-term projects as they are often built to make use of existing planned developments and would fail to give a strong CBA without these as a result.

ENTSO-E's answer: The question was if the scenario numbers should be adjusted based on the project's RES capacities (additional RES for PINT or reduced RES for TOOT)?

EDF SA

3 This methodological issue is not in the scope of implementation guidelines. EDF supports the use of both the TOOT approach (removing one project at a time) and the incremental approach (PINT – adding one project at a time) in order to provide confidence in the robustness of the indicators for all projects.

ENTSO-E's answer: The question was if the scenario numbers should be adjusted based on the project's RES capacities (additional RES for PINT or reduced RES for TOOT)?

Anonymous

None of them. The capacity should be reallocated accordingly. Scenarios are an equilibrium between supply and demand. Hybrid projects should just affect the location of the supply.

ENTSO-E's answer: Acknowledged and the comment will be considered when further updating the methodology.

Q14. Interlinkage of gas and electricity on top of the scenario building: within the TNYDP 2022, ENTSO-E plans to introduce an indicator monetising the amount of hydrogen produced by P2G units. The variation of with and without the project to be assessed can then be considered as an addition to the general SEW.
The overall SEW benefit can then be calculated by SEW = SEW_el + SEW_H2

Do you consider this addition as the valid first step in further linking both sectors together?

Anonymous

Yes, this is a good idea.

ENTSO-E's answer: ENTSO-E appreciates this positive feedback

currENT Europe

1 We believe technology neutrality is relevant here: P2G bears consideration as a method for sector coupling, but ENTSO-E should not advocate for higher P2G as part of the modelling through an indicator monetising the amount of hydrogen unless the EU has a defined hydrogen target that is a defined input to the TYNDP.

ENTSO-E's answer: This can be seen as a first step to meeting the requirements of the upcoming revised TEN-E regulation. With this indicator, ENTSO-E is monetising the additional benefit from the change in H_2 output from P2G with and without the project. It is not assessing P2G projects, nor will it change the installed P2G capacity in the scenarios.

Smart Wires

2 We believe technology neutrality is relevant here: P2G is one option; ENTSO-E should not advocate for higher P2G as part of the modelling through an indicator monetising the amount of hydrogen unless the EU has a hydrogen target that the TYNDP has to properly reflect.
The important thing here is how the P2G is calculated. IF P2G is proposed, it should be calculated like any other PCI either as:
1. A standalone project with the benefits of gas production and associated redispatch costs, including its CAPEX, losses, operations and maintenance and carbon costs of its final use.
2. As part of the network reinforcement with the CAPEX, OPEX and reduced capacity costs (both in market and payments)

ENTSO-E's answer: This can be seen as a first step to meeting the requirements of the upcoming revised TEN-E regulation. With this indicator, ENTSO-E is monetising the additional benefit from the change in H_2 output from P2G with and without the project. It is not assessing P2G projects, nor will it change the installed P2G capacity of the scenarios.

EDF SA

3 This issue is beyond the scope of the Implementation Guidelines and should be addressed separately with a view to improving the CBA methodology.
EDF considers direct electrification (except for those hard-to-abate sectors) to be the most cost-efficient way to achieve the EU decarbonisation objectives. The social welfare assessment of indirect solutions requires being cautious and has to be analysed further.

ENTSO-E's answer: The idea is to include such new methodologies within the Implementation Guidelines as test cases. After positive application in the TYNDP, such new methodologies could be transferred into the CBA Guideline.

Anonymous

Yes, but gas prices should better reflect the reality of gas prices in Europe in terms of magnitude, volatility, and location.

ENTSO-E's answer: Acknowledged and the comment will be considered when further updating the methodology.

Q15. B7 indicators - Security of Supply - Flexibility: What, in your opinion, is the relevance of the "non-mature" B7 indicators (B7.1 and B7.2), as described within the 3rd CBA Guidelines in the overall CBA assessment of a project? **Do you think ENTSO-E should push to develop a methodology for all projects on a central ENTSO-E level, or should its assessment be kept at the project level and delivered by the project promoter?**

Anonymous

The answer is the same as for question 13. I do not think that having project-level indicators is a good choice.
Based on my understanding of the methodology, I think that the methodology is great for evaluating investments in transmission lines but not well suited to evaluating investments in storage or other technologies that are capable of providing ancillary services.
I am firmly convinced that SEW calculations should be performed in a way where the demand for both energy and ancillary services (FRC, aFRR, mFRR) are satisfied. I would appreciate a detailed methodological explanation as to why this is not the case already (I am convinced that this is technically feasible).

ENTSO-E's answer: ENTSO-E acknowledges that PLIs are not seen as a perfect solution and will further investigate the possibility of making them general indicators. Currently, it is not practically possible to assess the impact of a project on the ancillary services within the framework of the TYNDP due to the complexity of such studies.

Smart Wires

1 Guidance is always good as it allows for the avoidance of gamesman ship by promoters. However, to do this and be fair, given that many of these assessments will be done using dynamic modelling, the SOs should make available dynamic modelling data (black-boxed for commercial reasons) to allow this type of assessment, and these models should be used by all promoters, not just 3rd party promoters but TSO/DSO as well.

ENTSO-E's answer: It is currently not practically possible to assess the impact of a project on the ancillary services within the framework of the TYNDP for all projects; given the complexity of such studies, this indicator needs to be treated as a PLI. As soon as such a methodology is available, it will be applied to all projects within the TYNDP.
The treatment of data availability and publication is not part of the Implementation Guidelines.

EDF SA

2 This question is also far beyond the scope of the Implementation Guidelines and should be addressed when discussing improvements to the methodology.

ENTSO-E's answer: The idea is to include such new methodologies within the Implementation Guidelines as test cases. After positive application in the TYNDP, such new methodologies could be transferred into the CBA Guideline.

Q16. Besides the benefit indicators given within the 3rd CBA Guideline, **should any other relevant indicator be included in the CBA assessment?**

Anonymous

The SEW indicator calculation should better reflect the way power production portfolios actually operate and TSOs actually run power systems with sufficient margins. Therefore it needs to be calculated not only with an energy demand constraints but also with constraints reflecting FCR, aFRR and mFRR demand (the exact modelling of these constraints is up for discussion)

ENTSO-E's answer: Acknowledged and the comment will be considered when further updating the CBA Guidelines.

TIWAG-Tiroler Wasserkraft AG

1 A monetised benefit should be shown not only for avoided CO2 costs (ETS market value as well as avoided environmental costs) but also for avoided costs of non-CO_2 emissions.

ENTSO-E's answer: Acknowledged and the comment will be considered when further updating the CBA Guidelines.

currENT Europe

2 The SEW indicator captures redispatch, which needs to be decided on centrally, as a key indicator of system performance across Europe. ENTSO-E should publish redispatch data and costs centrally once a year.

CurrENT also urges ENTSO-E to consider the need for an indicator that captures the use of network optimisation technologies consistently with the so-called NOVA principle (optimisation ahead of reinforcement ahead of new networks). Employing such technologies – in addition to expanding our networks – is crucial for a variety of the CBA indicators, including RES and SEW, as well as losses and flexibility.

The energy efficiency first principle should also be enshrined in the CBA approach, thereby emphasising the importance of overall system efficiency.

We also believe that the indicators must properly reflect the ability of technology solutions to address congestion and increase transmission capacity.

The CBA's Stability and Avoidance of Renewal/Replacement of Infrastructure also should be amended to include such benefits from network optimisation technologies as faster and more efficient deployment, redeployability and modularity.

ENTSO-E's answer: Acknowledged and the comment will be considered when further updating the CBA Guidelines.

SuperNode Ltd

3 The SEW indicator captures redispatch, which needs to be decided on centrally as a key indicator of system performance across Europe. ENTSO-E should publish redispatch data and costs centrally once a year.

The energy efficiency first principle should also be enshrined in the CBA approach, thereby emphasising the importance of overall system efficiency. We also believe that the indicators must properly reflect the ability of technology solutions to address congestion and increase transmission capacity.

ENTSO-E's answer: Acknowledged and the comment will be considered when further updating the CBA Guidelines.

Smart Wires

4 While the SEW indicator covers technologies that reduce congestion and increase network capacity, the aspect of avoiding curtailment and thus having more RES for less is not yet captured. What is more, there is a need for annual studies in the near term (2022–2025) and then 5-year studies after that.

There is a need for a requirement to demonstrate that optimisation must be carried out before new circuits are built. (the so-called NOVA principle of optimisation ahead of reinforcement ahead of new networks). The alternatives considered should be described, and a CBS carried out as part of the submission to ensure that projects being brought forth as PCIs meet EU and national legal requirements.

The CBA scalability and deferred investment need to be amended to include the benefit of early and speedy deployment, redeployability, and modularity.

ENTSO-E's answer: Acknowledged and the comment will be considered when further updating the CBA Guidelines.

EDF SA

5 EDF first considers that the CBA is a tool to objectively assess a project from an economic point of view on the basis of all the potential costs and benefits that can be monetised. The CBA delivers an assessment of the net social welfare of a project. It is not to be confused with the multi-criteria assessment that, in addition, takes into account non-monetisable criteria that will help prioritise projects. In such assessments, the qualitative insight and the relevance of these non-monetisable criteria are taken into account by attributing specific weighting factors that should remain transparent. Sometimes, the situation can become complex as some criteria may have both monetisable and non-monetisable costs or benefits, and this could potentially lead to double counting a given cost or benefit.

EDF is not very comfortable with the idea of taking into account many additional criteria in the assessment, as proposed by ENTSO-E. First, because many may raise monetisation issues and could lead to double (or more)-counting (see Q15) and, second, because it could put out of sight the economic efficiency criteria, which is essential to reach decarbonisation at the best cost.

ENTSO-E's answer: Acknowledged and the comment will be considered when further updating the CBA Guidelines.

Q17. Assessment of the commissioning years: In the TYNDP 2022, ENTSO-E is considering a method to assess the commissioning years of submitted projects in the case when no information is given within the latest available national development plan or when no update from the NRA exists. In this case, the commissioning year will be reviewed against comparable projects. For this test, all projects submitted to the TNYDP 2022 will be categorised by distinct criteria (e.g. technology, AC, DC, the project status, and the country they are built in). The commissioning years of the projects to be checked will then be compared against a group of comparable projects. This comparison will be made using the average of a specific factor, applied to all projects within this group, that calculates as x=(cost/capacity)*length.

Do you think this approach is sufficient in order to compare commissioning years? If not, what additional information would be needed to make the comparison - or what is not needed?

Anonymous

I do not have sufficient expertise to challenge this choice; it seems OK to me.

Smart Wires

1 The group of comparable projects is not specific regarding whether this is within a country or region or of the same type in Europe. Countries have national and cultural issues that vary greatly.

The x-factor seems strange, a quad line and single conductor line can be a factor of 4:1, yet the cost is much the same. This could mean a group of quad lines in Germany of the same length would have an x-factor of as much as a quarter of Austria, which generally uses fewer conductors.

ENTSO-E's answer: Acknowledged and the comment will be considered when further updating this methodology.

EDF SA

2 EDF welcomes the idea of improving the methodology by assessing the commissioning years to ensure the robustness of the analysis but, again, this question is beyond the scope of the Implementation Guidelines. At this stage, EDF is not able to comment on the formula proposed by ENTSO-E to calculate the specific factor. This requires a deeper analysis. ENTSO-E could engage with stakeholders and present why they chose this approach and the related hypotheses.

ENTSO-E's answer: Acknowledged and the comment will be considered when further updating this methodology.

Anonymous

Yes.

ENTSO-E's answer: ENTSO-E appreciates this positive feedback.

Q18. Assessment of commissioning years: in relation to the previous question, **do you think that, in general, the length of an interconnection project has a major influence on its duration?**

Anonymous

I do not have sufficient expertise to provide a relevant answer.

currENT Europe

1 No. The primary factors affecting the duration of a project are largely independent of its length, for example, public acceptance and approval processes for the project and environmental factors.

ENTSO-E's answer: ENTSO-E appreciates this constructive feedback and will consider this in further improving this indicator.

SuperNode Ltd

2 No. The primary factors affecting the duration of a project are largely independent of its length, for example, public acceptance and approval processes for the project and environmental factors.

ENTSO-E's answer: ENTSO-E appreciates this constructive feedback and will consider this in further improving this indicator.

Smart Wires

3 No. The relevant factor here is public acceptance and approvals for the project and environmental factors.

ENTSO-E's answer: ENTSO-E appreciates this constructive feedback and will consider this in further improving this indicator.

EDF SA

4 EDF indeed considers that the length can have an influence on the duration of a project, but it may not be of major influence. Other factors like the route and public acceptance are far more important to bringing a project to completion. EDF is of the view that TSOs, due to their experience, are best placed to analyse the factors that have the most impact on a project's duration.

ENTSO-E's answer: ENTSO-E appreciates this constructive feedback and will consider this in further improving this indicator.

Anonymous

Yes, but also capacity (bigger towers) and territory (e.g., national parks).

ENTSO-E's answer: ENTSO-E appreciates this constructive feedback and will consider this in further improving this indicator.

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