

**OPINION No 03/2021  
OF THE EUROPEAN UNION AGENCY  
FOR THE COOPERATION OF ENERGY REGULATORS**

**of 3 May 2021**

**ON THE METHODOLOGICAL ASPECTS OF THE ENTSO-E DRAFT  
TEN-YEAR NETWORK DEVELOPMENT PLAN 2020**

THE EUROPEAN UNION AGENCY FOR THE COOPERATION OF ENERGY REGULATORS,

Having regard to Regulation (EU) 2019/942 of the European Parliament and of the Council of 5 June 2019 establishing a European Union Agency for the Cooperation of Energy Regulators<sup>1</sup> (ACER), and, in particular, Articles 4(3) and 4(5) thereof,

Having regard to Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity, and, in particular, Articles 30(1)(b) and 32(2) thereof,

Having regard to the outcome of the consultation with the ACER's Electricity Working Group,

Having regard to the favourable opinion of the Board of Regulators of 28 April 2021, delivered pursuant to Article 22(5) of Regulation (EU) 2019/942,

Whereas:

**1. INTRODUCTION**

- (1) According to article 30(1)(b) of Regulation (EU) 2019/943, the European Network of Transmission System Operators for Electricity ('ENTSO-E') shall adopt and publish a non-binding Union-wide ten-year network development plan, ('Union-wide network development plan'), (hereafter the 'TYNDP'), biennially.

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<sup>1</sup> OJ L158, 14.6.2019, p. 22.

- (2) According to article 48(1) of Regulation (EU) 2019/943, the TYNDP “*shall include the modelling of the integrated network, scenario development and an assessment of the resilience of the system. The Union-wide network development plan shall, in particular: (a) build on national investment plans, [...]; it shall be subject to a cost-benefit analysis using the methodology established as set out in Article 11 of that Regulation; (b) regarding cross-border interconnections, also build on the reasonable needs of different system users and integrate long-term commitments from investors referred to in Articles 44 and 51 of Directive (EU) 2019/944; and (c) identify investment gaps, in particular with respect to cross-border capacities.*”
- (3) Article 32(2), first subparagraph, of Regulation (EU) 2019/943 requires ENTSO-E to submit the draft TYNDP, including the information regarding the consultation process, to the European Union Agency for the Cooperation of Energy Regulators (‘the Agency’) for its opinion.
- (4) According to article 31(1) of Regulation (EU) 2019/943 “*While preparing the proposals pursuant to the tasks referred to in Article 30(1), the ENTSO for Electricity shall conduct an extensive consultation process. The consultation process shall be structured in a way to enable the accommodation of stakeholder comments before the final adoption of the proposal and in an open and transparent manner*”.
- (5) Article 32(2), second subparagraph, of Regulation (EU) No 2019/943 requires that the Agency provide a duly reasoned opinion as well as recommendations to ENTSO-E and to the Commission where it considers that the draft TYNDP submitted by ENTSO-E does not contribute to non-discrimination, effective competition, the efficient functioning of the market or a sufficient level of cross-border interconnection open to third-party access.
- (6) Pursuant to Article 4(5) of Regulation (EU) No 2019/942, the Agency shall, based on matters of fact, provide a duly reasoned opinion as well as recommendations to ENTSO-E, the European Parliament, the Council and the Commission, where it considers that the draft TYNDP does not contribute to non-discrimination, effective competition and the efficient functioning of the market or a sufficient level of cross-border interconnection open to third-party access, or does not comply with the relevant provisions of Regulation (EU) 2019/943 and Directive (EU) 2019/944.
- (7) On 15 February 2020, ENTSO-E submitted the draft TYNDP 2020 to the Agency for its opinion.

## **2. SUMMARY OF THE DRAFT ENTSO-E TYNDP 2020**

- (8) For the purpose of the present Opinion, the Agency considered the following documents within the scope of the draft TYNDP 2020:
  - The TYNDP 2020 main report.

- The TYNDP 2020 Project Sheets.
- The Stakeholders Engagement report.
- The TYNDP 2020 CBA implementation guideline (hereafter IG).
- Completing the map – Power System Needs in 2030 and 2040 (hereafter PSN).
- A table listing all project-level indicators submitted by project promoters and ENTSO-E’s assessment of whether each submission is compliant with the CBA 3.0 Guideline.
- The TYNDP 2020 Scenario Development Report, on which the Agency issued a separate Opinion<sup>2</sup>.

The draft TYNDP 2020, in addition to the description of the adopted methodologies and their implementation, contains a description and assessment of 154 transmission projects, corresponding to 321 investment items, and 26 storage projects.

### **3. ASSESSMENT OF THE DRAFT ENTSO-E TYNDP 2020**

- (9) The Agency assessed the draft TYNDP 2020 on the basis of the following main criteria:
- a. The objectives set out in Article 4(3) (b) and 4(5) of Regulation (EU) 2019/942 and Article 32(2) of Regulation (EU) 2019/943.
  - b. The essential requirements of the TYNDP, as specified in Article 48 of Regulation (EU) 2019/943.
  - c. The requirements of the consultation process when preparing the draft TYNDP, as specified in Article 31 of Regulation (EU) 2019/943.
- (10) Furthermore, the Agency took into account its previous opinions, recommendations and positions, including those related to:
- a. The draft TYNDP 2014, the draft TYNDP 2016 and the draft TYNDP 2018.

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<sup>2</sup> The Agency’s Opinion No 06/2020 on the ENTSOs’ draft TYNDP 2020 Scenario Report is available here: [https://acer.europa.eu/Official\\_documents/Acts\\_of\\_the\\_Agency/Opinions/Opinions/ACER%20Opinion%2006-2020%20on%20ENTSO-E%20and%20ENTSO%20draft%20TYNDP%202020%20Scenario%20Report.pdf](https://acer.europa.eu/Official_documents/Acts_of_the_Agency/Opinions/Opinions/ACER%20Opinion%2006-2020%20on%20ENTSO-E%20and%20ENTSO%20draft%20TYNDP%202020%20Scenario%20Report.pdf)

- b. The scenarios to be used in the draft TYNDP 2020.
- c. The ENTSO-E draft 3<sup>rd</sup> CBA methodology to be used in the TYNDP, on which the Agency issued an Opinion<sup>3</sup>.
- d. The ENTSO-E document “*Guidance for applicants - transmission and storage project promoters - Criteria for applications and their treatment in the TYNDP 2020*” (hereafter “TYNDP Inclusion Guidelines”)<sup>4</sup>.

### 3.1. Improvements with respect to the previous TYNDP

- (11) The Agency acknowledges that the TYNDP process is complex and resource intensive, and needs to be carried out within a two-year timeframe.
- (12) The Agency acknowledges in particular the following improvements implemented by ENTSO-E:
  - a. Regarding the TYNDP Inclusion Guidelines,
    - a public consultation was organised in a timely manner, and the transparency of the process was increased by publishing the comments received and their treatment;
    - the scope of the document was extended, by including a more detailed description of the TYNDP development process, and its clarity was improved by the inclusion of clarifications on the alternative administrative criteria and on the expected inputs by promoters;
    - the clarity and comparability of the requested data was improved, by aligning the definition of project status “*planned, but not yet in permitting*” with the definition recommended by ACER, and by requesting more structured information on the clustering of projects (reference to the National Development Plan (NDP) project code, and identification of main investment versus other investments)

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<sup>3</sup> The Agency’s Opinion No 03/2020 on the ENTSO-E draft 3<sup>rd</sup> guideline for CBA is available here:  
[https://acer.europa.eu/Official\\_documents/Acts\\_of\\_the\\_Agency/Opinions/Opinions/ACER%20Opinion%2003-2020%20on%20ENTSO-E%20Guideline%20for%20cost%20benefit%20analysis.pdf](https://acer.europa.eu/Official_documents/Acts_of_the_Agency/Opinions/Opinions/ACER%20Opinion%2003-2020%20on%20ENTSO-E%20Guideline%20for%20cost%20benefit%20analysis.pdf)

<sup>4</sup> The TYNDP Inclusion Guidelines are available here:  
[https://consultations.entsoe.eu/system-development/guidance-for-projects-to-apply-to-the-tyndp-2020/supporting\\_documents/190918\\_ENTSOE%20Guidance%20for%20transmission%20and%20storage%20projects%20for%20applying%20to%20the%20TYNDP%202020\\_FINAL.pdf](https://consultations.entsoe.eu/system-development/guidance-for-projects-to-apply-to-the-tyndp-2020/supporting_documents/190918_ENTSOE%20Guidance%20for%20transmission%20and%20storage%20projects%20for%20applying%20to%20the%20TYNDP%202020_FINAL.pdf)

- b. Regarding the process,
- ENTSO-E took measures to increase the coverage of the TYNDP by explicitly inviting all projects with cross-border impact to apply to the TYNDP, and by communicating more effectively the opening of the submission process to current non-TSO project promoters;
  - the data collection process was simplified and improved, by making available a pre-filled application template for the TYNDP 2018 projects, and collecting the costs at investment level for all the investment items.
- c. Regarding the identification of system needs,
- specific quantities of the target capacities at each border are provided;
  - calculations are included for the 2030 study year;
  - a novel, zonal representation was developed and applied for the study year 2040;
  - the 2018 approach based on an unclear RES loop and SoS loop was dismissed;
  - appendices with information on the projects included in the reference grid.
- d. Regarding the CBA assessment and the implementation of the 3<sup>rd</sup> CBA methodology,
- the Agency welcomes important improvements on the transparency of the CBA assessment, namely the publication of the IG document, which provides information on how the 3<sup>rd</sup> CBA methodology was implemented;
  - other improvements, like the inclusion of the date of the latest data update in the project sheets and the clarifications regarding the modelling of the storage projects, provided more clarity on the CBA assessment;
  - the readability of the project sheets is improved, as the project data is presented together in a sole excel file, which allows its comparability and processing, although not the full extent of the information provided in the projects sheets and on-line format is included;
  - The separate presentation of an indicator related to societal well-being as a result of a variation in CO<sub>2</sub> emissions (new indicator B2, formerly included in

B4 in TYNDP 2018), as requested in ACER opinion 11/2019<sup>5</sup>, as this benefit is an additional indicator to the SEW with a different level of reliability<sup>6</sup>.

- The inclusion of new benefit indicators, which provide an extended scope of project assessment, in particular “*Non-direct greenhouse Emissions Benefit*” (B4) and “*Reduction of necessary reserve for re-dispatch power plants*” (B10), although based on promoters’ input and not calculated under consistent methodology.

### 3.2. Remarks on the TYNDP process

- (13) Several delays compared to ENTSO-E’s work programmes (WP) for 2019<sup>7</sup> and 2020<sup>8</sup> were noted for all TYNDP main deliverables. More specifically, the 2020 Scenario Report was delayed by 9 months compared to the initial 2019 planning (July 2020 vs. September 2019), the PSN report was released for consultation with a delay of 4 months (2030 studies) and 7 months (2040 studies) compared to the initial 2020 ENTSO-E planning. As a result, the submission of the draft TYNDP 2020 to the Agency for its opinion was completed as late as February 2021, despite the legal requirement for the adoption of the TYNDP every two years.
- (14) ENTSO-E hosted several public workshops on the development of the TYNDP to consult the associated documents and results. However, the timing of the consultation for most of the deliverables came after the studies were completed and pertained to the results of the activities and not to the assumptions and approaches to be adopted, which may have a significant impact on the outcomes of the studies. For instance, the IG document, which includes the main assumptions and choices made for the CBA assessment, was published for consultation together with the other documents of the TYNDP package, not allowing for comments to have an impact on the CBA assessment of the TYNDP 2020. Similar remarks apply to the scenarios consultation and regarding the needs identification exercise

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<sup>5</sup> The Agency reiterates its recommendation that this indicator should be considered with caution.

<sup>6</sup> The quantities of CO<sub>2</sub> used for this indicator derive from the implementation of the economic dispatching of the generation using the standard CO<sub>2</sub> prices of each scenario. Using higher CO<sub>2</sub> prices would result in different generation dispatching, and CO<sub>2</sub> quantities could also be significantly different. Therefore, the ex-post application of higher CO<sub>2</sub> prices to the initially calculated quantities of CO<sub>2</sub> is not very realistic.

<sup>7</sup> [https://eepublicdownloads.entsoe.eu/clean-documents/Publications/ENTSO-E%20general%20publications/AWP\\_2019.pdf](https://eepublicdownloads.entsoe.eu/clean-documents/Publications/ENTSO-E%20general%20publications/AWP_2019.pdf)

<sup>8</sup> [https://eepublicdownloads.entsoe.eu/clean-documents/Publications/ENTSO-E%20general%20publications/200217\\_ENTSO-E\\_Annual%20Work%20Programme%202020%20\(final\).pdf](https://eepublicdownloads.entsoe.eu/clean-documents/Publications/ENTSO-E%20general%20publications/200217_ENTSO-E_Annual%20Work%20Programme%202020%20(final).pdf)

### 3.3. Remarks on the TYNDP Guidelines for the inclusion of projects in the TYNDP 2020

- (15) On 25 September 2019, ENTSO-E published the document “*Guidance for applicants—transmission and storage project promoters: criteria for applications and their treatment in the TYNDP 2020*” (hereafter ‘TYNDP Inclusion Guidelines’), which lies down the criteria and the procedure for the inclusion of the projects in the TYNDP 2020.
- (16) The Agency acknowledges that the TYNDP Inclusion Guidelines are in general in line with the European Commission’s recommendation on “*Guidelines on equal treatment and transparency criteria to be applied by ENTSO-E and ENTSOG when developing their TYNDPs*”<sup>9</sup>, as set out in Annex III.2 (5) of Regulation (EU) No 347/2013.
- (17) Also, the Agency considers that the TYNDP Inclusion Guidelines can properly serve the objectives of transparency and non-discrimination and eventually improve the quality and credibility of the TYNDP, if they are duly and consistently applied by ENTSO-E and the results of their application are clearly described in the TYNDP. However, the following shortcomings have been identified and need to be improved:
- the Agency notes a few inconsistencies in the TYNDP Inclusion Guidelines, (e.g. which is the reference year of the indicated CAPEX of an investment<sup>10</sup>, and whether the purchase of energy is included in the OPEX of storage projects<sup>11</sup>). In the Agency’s view, in line with the 3<sup>rd</sup> CBA methodology cost data should be provided at the value of the year of the TYNDP (i.e. currently 2020) and the OPEX requested for storage projects should not include the cost for the purchase of energy.
  - the limited, i.e. market-based only, CBA assessment applied to the projects which applied for the second application window, creates discrimination between projects and should be discontinued;
  - it should be clearly stated that the full market and network datasets used for the assessment of the TYNDP candidate projects can be accessed by any interested stakeholder upon request, so that promoters can verify their project results and any other party can carry out analytical work using this data.

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<sup>9</sup> Commission Recommendation of 24 July 2018 on Guidelines on equal treatment and transparency criteria to be applied by ENTSO-E and ENTSOG when developing their TYNDPs as set out in Annex III 2(5) of Regulation (EU) No 347/2013 of the European Parliament and of the Council. [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018H0727\(01\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018H0727(01)&from=EN)

<sup>10</sup> TYNDP Inclusion Guidelines (p.16 and p.21) indicates that the total investment cost (and for each investment item) should be provided at the commissioning year value, while according to the CBA methodology is should be provided at the value of the year of the TYNDP.

<sup>11</sup> TYNDP Inclusion Guidelines (p.21) seems to provide conflicting information on whether the cost of the purchase of energy shall be included in the provided annual operation and maintenance costs.

- (18) Additional considerations with regard to individual projects are provided in the ACER Opinion 04/2021 on the projects included in the EU TYNDP and the NDPs.

### **3.4. Remarks on the TYNDP scenarios and their use for cost benefit analyses**

- (19) In June 2020 the ENTSOs issued the TYNDP 2020 Scenarios Final Report, together with TYNDP 2020 Scenario Building Guidelines. The Agency notes that the report is labelled as final, even though it should be considered part of the draft TYNDP and as such cannot be formally finalised before the Agency's Opinion on the TYNDP.
- (20) In November 2020 the Agency issued its Opinion No 06/2020 on the ENTSOs draft TYNDP 2020 scenario report<sup>12</sup>, aiming to facilitate the implementation of its recommendations before the publication of the draft TYNDP 2020.
- (21) Regrettably, the Agency observed that the majority of its short-term recommendations pertaining to the draft TYNDP 2020 Scenarios Report were not taken on board by the ENTSOs when drafting the TYNDP 2020 Report.
- (22) In the draft TYNDP 2020 Scenarios Report, ENTSO-E claimed to include a slower-progress scenario called Current Trends in the project assessment of the TYNDP 2020. Unfortunately, the Agency notes that the draft TYNDP 2020 fails to include a description and dataset of the Current Trends scenario, reducing the transparency and trustworthiness of the CBA results based on this scenario.
- (23) Specifically regarding the use of scenarios for cost benefit analyses in the electricity sector, the Agency observes that no cost benefit analysis in the draft TYNDP 2020 addressed the study year 2040, although the data were prepared in the scenario development activity.
- (24) According to Annex V(1) and (4) of Regulation (EU) No 347/2013, the cost-benefit analysis should cover multiple study years (at least the years  $n+5$ ,  $n+10$ ,  $n+15$ , and  $n+20$ , where  $n$  is the year in which the analysis is performed). Also, according to section 2.2 of the 3<sup>rd</sup> CBA methodology, the analysis should cover multiple time horizons, at least one for the mid-term horizon and one for the long-term and very long-term horizon. Despite the above stipulations, and the fact that scenarios were prepared for the year 2040, no benefits calculations were prepared for this study horizon or any other one, limiting the visibility of the projects' benefits over a longer horizon.

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<sup>12</sup> The Agency Opinion No 06/2020 is available here:

[https://www.acer.europa.eu/Official\\_documents/Acts\\_of\\_the\\_Agency/Opinions/Opinions/ACER%20Opinion%2006-2020%20on%20ENTSO-%20and%20ENTSOG%20draft%20TYNDP%202020%20Scenario%20Report.pdf](https://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Opinions/Opinions/ACER%20Opinion%2006-2020%20on%20ENTSO-%20and%20ENTSOG%20draft%20TYNDP%202020%20Scenario%20Report.pdf)

- (25) Regarding an important input data for the cost benefit analyses for electricity projects, the Agency observes that yearly transfer capacities (i.e. the same value for all 8760 hours of the year) seem to be used in the ENTSO-E documents. The lack of consideration of season- and time- differentiated transfer capacities reduces the quality of the CBA results.

### 3.5. Remarks on the identification of infrastructure investment needs

- (26) ENTSO-E released its analysis on the infrastructure investment needs “*Completing the map: Power System Needs in 2030 and 2040*” (PSN) for public consultation together with the CBA results and all the other documents of the TYNDP package (with the exception of the Scenario report) from 6 November 2020 to 4 January 2021.
- (27) The Agency notes a lack of substantial consultation of the methodology used for the needs identification. As mentioned in pages 9 and 47 of the PSN “*Comments regarding the methodology itself will be taken into account to improve the future editions of the System needs study, as time does not allow to re-run the study.*” The chosen timing of the consultation did not allow ENTSO-E to take into account comments on the methodology and amend it accordingly for the TYNDP 2020, resulting in a consultation void of effect on the current TYNDP.
- (28) The needs results were presented rather late in the process to perform one of the roles described by ENTSO-E<sup>13</sup>, i.e. to contribute to future project identification.
- (29) Although the starting grid used pertains to the year 2025, the results for the 2030 study horizon regarding generation mix and price difference variation (i.e. figures 2.8, 2.9 and 2.12) are presented against the 2020 grid status, not allowing a connection between the impact of the identified extra capacities and the starting grid used. In the future, ENTSO-E should improve the presentation of the outcomes using the same reference basis.
- (30) Although the additional capacities considered for the construction of the 2025 reference grid are provided in Appendix 2 of the PSN, the current capacities considered per border are not displayed. As a result, the total needed capacities, which should be the main outcome of an infrastructure needs report, cannot be calculated.
- (31) With regard to the methodology used, the Agency notes the following shortages:
- The exercise for 2030 and 2040 was performed using different definitions of zones (NTC model for 2030 and zonal model for 2040), resulting in incomparable outcomes. The consistency and comparability of the results should be ensured in the future, e.g.

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<sup>13</sup> See Draft 3<sup>rd</sup> CBA methodology, page 7, Figure 1: Overview of the assessment process inside the TNYDP and for identifying PCIs

by using the same definition of zones for all study horizons for the needs exercise, as well as with the CBA exercise

- The starting grid used is not appropriate, as it should be limited to projects which are certain to be realised. ENTSO-E adopted a starting grid equal to the reference grid for the purpose of the cost benefit analysis. However, the purposes of these analyses are different.
- The outcomes of the exercise are potentially biased, because they are bound by the TSOs projects/proposals, including immature ones, leaving out other possible options that could be more cost-efficient. In the future the usage of non-mature TSOs proposals (e.g projects under consideration, or projects with a distant commissioning date) should be avoided, and instead all possible options of capacity expansion that could be cost-efficient should be used.
- More transparency is needed regarding the assumed costs. More specifically, while Appendix 3 provides a list of the costs used for each project considered in the needs exercise, uncertainty remains regarding the estimation of the project costs in the case of non-mature projects, and in which cases the indicated costs include the assumed costs of reinforcement of internal networks that would be necessary for the cross-border capacity increases<sup>14</sup>. For the future TYNDPs, ENTSO-E should set up principles on how to construct the costs used in the needs exercise, and provide further information on how the values were derived.
- According to page 60 of the PSN, “2007 was chosen for the System needs study because it is more representative in terms of hours per year and weighs for 50 % in the CBA results. Because 2007 is a wet year, the values for expected generation capacities are not necessarily reflective of reality and may be subject to an over-estimation of hydro penetration. As hydro capacity plays an important role in the stability of the European system, [...], an over-estimation of this generation asset may distort the results slightly”. It is not clear why a wet year is “more representative” than an average one, and why it was used while it may result into distortion of the results of the exercise.
- Regarding the scenario used for the needs exercise, the Agency notes that the single scenario used for the needs exercise is a step backwards compared to the needs identification for the TYNDP 2018, when needs were identified for all available scenarios. Also, the lack of consistency checks for the National Trends scenario

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<sup>14</sup> According to Appendix 3 of the PSN “Cost assumptions are theoretical assumptions that include the assumed costs of reinforcement of internal networks that would be necessary for the cross-border capacity increases”, while in page 61 of the PSN it is mentioned that “costs are not fully reflective of costs associated with internal reinforcement and congestion management that would be required to make the increases in cross-border capacity possible”

assumptions used (e.g. regarding carbon-related assumptions) results in risk of having a patchwork of incompatible assumptions from different countries.

### **3.6. Remarks on the calculation of costs and benefits**

#### **3.6.1. Methodology and modelling approach for benefit calculations**

- (32) The Agency welcomes the improvements introduced in the presentation of the market and grid modelling in the IG compared to the TYNDP 2018. This applies in particular to the more structured and detailed way the steps of the processes are explained, and the more information provided on the assumptions considered and the sanity checks performed. The above improvements certainly contribute to a better understanding of the used methodology.
- (33) However, clarity is still missing regarding the modelling approach followed, despite the Agency's recommendation, in its Opinion No. 11/2019 on the draft ENTSO-E TYNDP 2018 (p.34), that ENTSO-E provide further clarifications regarding the consistency of the modelling assumptions considered in the market modelling tools. More specifically:
- a. Regarding the market modelling tools used, except for a list of the seven tools used (Antares, APG Tool, BID3, Plexos, PowerSym, PROMED, Pymas), and the specific tools used for market simulations per project (which are contained in the IG), their main features and their differences (with a potential impact on the estimated benefits) are not presented<sup>15</sup>, and consequently the impact of the modelling options of each tool on the estimated benefits cannot be evaluated.
  - b. The modelling assumptions considered in the various market modelling tools used (e.g. costs for generation: variable fuel costs, internalised cost of CO<sub>2</sub> emissions, variable operation and maintenance costs, start-up and shut-down costs) play an important role for the consistency of the market studies outcomes. Therefore, it was expected that such information would be included in the TYNDP. However, no such information is provided in the TYNDP package. ENTSO-E should provide the main features and the differences of the various market modelling tools used together with an assessment of the impact of the modelling options on the estimated benefits.
- (34) Regarding the network simulations, in the IG (p.14) it is stated that “*DC load-flow approximation may also be used for [...] losses and NTC calculations*”. In footnote 5 of the same page it is explained that “*Since an AC load-flow for large power systems require typically more iterations to converge towards a solution and higher computation times*”

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<sup>15</sup> Despite the reference in p.9 of the IG “*Further information on these tools can be found in the TYNDP 2020 Insight Report*”, no such information is included in the two insight reports.

*for calculating Jacobians in each iteration, an AC load-flow exhibits computational limitations.”* However, no concrete information is provided on the computational time that would be required to run an AC load-flow model as compared to a DC one. Also, to facilitate a comparison between AC power flow and DC power flow results, for a selected number of cases the results of both analyses should be provided in the TYNDP.

(35) Regarding the  $\Delta$ NTC calculations:

- As stated in p.15 of the IG, *“for the  $\Delta$ NTC calculations only the Antares market output for climate year 2007 was used.”* It is not explained why a) only one tool was deemed enough and b) only one climatic year was used, given that for this climatic year a weighting of only 0.5 is chosen by ENTSO-E for accounting for the results from market simulations<sup>16</sup>.
- Also, despite the fact that modelling information are provided for the first time per project in this TYNDP, in the table *“Modelling information: NTC calculations”* referenced in p.15 of the IG only 139 projects are listed, while the TYNDP 2020 includes 154 transmission projects. For 78 of these projects it is stated that no NTC calculation was conducted for the TYNDP 2020, raising concerns about the consistency of the presented data.
- The approach to select/ filter the critical branches / critical outages (CB/CO) on which to implement  $\Delta$ NTC calculations seems to depend in most of the cases on the relevant TSOs’ expert views. This can be concluded as according to the table *“Modelling information: NTC calculations”* referenced in p.15 of the IG, only in 19 cases a sensitivity analysis was used for selecting the CB/CO, noting that for the majority of the projects (93 cases) no information is provided on the implemented selection approach. ENTSO-E should develop specific criteria for the consistent selection of the critical branches / critical outages and make them available in the IG. Also, in case of manual addition or removal of network elements from the CB/CO lists, these changes should be provided within the TYNDP package for transparency reasons.
- In p.19 of the IG it is mentioned *“In terms of line ratings, the grid model needs to include both winter and summer values, at least for the critical branches to take into account the seasonality during the different points in time.”* It should be

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<sup>16</sup> As mentioned in page 8, section 2.1 of the IG, *“The climate years have been selected based on its representativeness out of all 34 climate years within the PECD Database. The results from market simulations are then considered base on the weighted average from these three climate years. The weighting is as follows: 0.235 for 1982, 0.265 1984, 0.5 for 2007”*

explained why seasonal NTCs are not calculated, despite the fact that the grid model takes into account seasonality.

- In p.19-20 of the IG it is mentioned: *“In case generation power shift is used, it can be distributed among the generators in the following [4] ways” [...] “The chosen method may be dependent on the project and/or border”*. The wide spectrum of the distribution methods of the generation power shift available for each project raises questions on the consistency of the NTC calculation across projects. ENTSO-E, after assessing each of the available methods, should conclude on the preferred method(s), and in case more than one remains in the proposed ones, the criteria for the method selection should be instructed and not be left at the TSOs’ discretion. Also, the Agency deems necessary for transparency that ENTSO-E should make available full details on the power-shift applied, especially for the projects of third party promoters.

### 3.6.2. Reference grid

- (36) Given that the “reference grid” is used as a starting point<sup>17</sup> in the TYNDP CBA for the calculation of project benefits, it has a strong impact on the overall CBA results. According to p. 16 of the IG, and p. 52 of the PSN, *“In the TYNDP 2020, the same reference grid is being used for the identification of system needs and for the cost-benefit analysis of projects.”* Also, according to the, p. 53, of the PSN, *“ENTSO-E decided to use the MAF 2019 grid as the base for the TYNDP 2020’s reference grid. The MAF grid contains all projects under construction or for which there is a high confidence in their availability, high enough to be used as a basis for security of supply analysis. It is built for the year 2025 and is based on expert knowledge.”*
- (37) The Agency notes significant shortages in the construction and use of the reference grid:
- No specific criteria are indicated to have been used for the selection of the projects of the reference grid, except for “expert knowledge”. The mere inclusion in the MAF grid does not provide certainty that *“there is a high confidence in their availability...for the year 2025”*, given that ENTSO-E did not implement specific, objective criteria for the construction of the MAF 2025 grid. The inclusion in the reference grid of many projects which are not expected to be operational by 2025 provides further indications of an inconsistent reference grid. The list of projects

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<sup>17</sup> Market and network models simulations with the project under examination either added to the reference grid or removed from it, are compared to the reference grid situation to calculate the various benefits of the project.

included in the reference grid provided in Appendix 2 of the PSN includes many projects<sup>18</sup> with an indicted commissioning date beyond 2024, which would be the latest expected commissioning date of a project to be in operational availability in 2025, a project with a permitting process rejected<sup>19</sup>, a project still under consideration<sup>20</sup> and four projects which are not part of the TYNDP and were not assessed<sup>21</sup>.

- It is not explained why ENTSO-E deems “reasonable” (p.16 of the IG) to use the same reference for the “start grid” for the purpose of the system needs analysis and for the “expected grid” for the purpose of the CBA analyses. In the Agency’s perspective, the reference grid for CBA purposes represents an “expected infrastructure” in which the project will operate. For this reason it is conceptually different from the one used for the needs identification (which should start from a minimal grid), therefore, it should be identified separately. Also, the reference grid should be differentiated according to each study horizon, as the “expected infrastructure” cannot be considered the same in the course of the years.

- (38) The inclusion of uncertain projects in the reference grid constructed for 2025 and the usage of the same reference grid for the 2030 project benefits reduce the plausibility of the benefit projections, given the potentially significant distortion of the benefit calculations due to a unrealistic reference grid.
- (39) Also, there is no reference to how interdependent projects are handled when constructing the reference grid (considering that the (non-)inclusion of interdependent projects in the reference grid has a strong impact on the CBA results). Especially with regard to

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<sup>18</sup> E.g. project 16 - Biscay Gulf, with a commissioning date 2027, project 124 - NordBalt phase 2, with a commissioning date 2026, project 144 - Mid Continental East corridor, with 3 investment items with a commissioning date 2025, project 164 - N-S Eastern DE\_central section, with a commissioning date of the main investment item 2026 and another investment 2031, project 192 - OWP Northsea TenneT Part 3, with a commissioning date 2025, project 248- Offshore Wind Baltic Sea (II), the main investment of which has a commissioning date 2027, and another investment item 2029, project 266 - Swiss Ellipse I, with a commissioning date of the main investment item 2029, project 378 - Transformer Gatica, with a commissioning date 2025 and in status “Planned But Not Yet Permitting”, project 379 - Uprate Gatica lines with a commissioning date 2025.

<sup>19</sup> Project 124, with a commissioning date 2026 and with the remark “Permit denied. Appeal process ongoing”

<sup>20</sup> Project 379 - Uprate Gatica lines

<sup>21</sup> Projects 164, 191, 192, and 248

competing projects<sup>22</sup>, the criteria based on which the projects are selected for inclusion in the reference grid, and the implementation of the “sequential TOOT” approach are sometimes not sufficiently explained, reducing the transparency of the process.

### 3.6.3. Benefit calculations

(40) Regarding the benefit calculations, the Agency notes the following:

- a. Regarding the calculation of the indicator B1 (SEW), the calculation of sub-indicators B1-RES and B1-CO<sub>2</sub> and their relation with the total SEW indicator should be clarified. In addition, it is not clarified whether the SEW values calculated for internal projects with an NTC cross-border impact derive by implementing method 2 (i.e. applying re-dispatch simulations without considering the  $\Delta$ NTC contribution of the project that derives from the market simulation) described in p. 28 of the IG, or method 3 (i.e. applying re-dispatch simulations taking into consideration the  $\Delta$ NTC contribution of the project that derives from the market simulations) described in p. 30 of the IG. The choice of the method can have an impact on the outcomes of the calculation, and therefore for transparency reasons ENTSO-E should provide this information for each project affected.
- b. Regarding the indicator B5 (Variation in losses), ACER welcomes the partial adoption of the ACER recommendation in its Opinion 03/2020 to simplify the losses monetisation by using (as a second best option) the hourly marginal costs obtained in market simulations. However, it is noted that instead of using the marginal costs of the reference case, as was recommended, the marginal costs of the case with the project  $s'_{h,i}$  is used for PINT projects, and the marginal costs of the case without the project  $s_{h,i}$  is used for TOOT projects. As this approach could lead to unexpected complexities with some marginal costs, and requires the introduction of caps for each scenario, it is proposed to use the hourly marginal costs regarding the reference case (which ENTSO-E used to indicate to be an adequate system condition). Also, the hourly marginal costs used for the calculations should be published in the TYNDP.
- c. Regarding the indicator B6 (Security of supply: adequacy to meet demand), in p. 41 of the IG it is stated that *“In order to properly model the loss of load probabilities, [...] adequacy simulations must be performed with 510 Monte Carlo years, resulting of the matching of the full set of the 34 PECD climate years and*

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<sup>22</sup> For example, projects 153 “France-Alderney-Britain”, 172 “ElecLink”, and 285 “GridLink” are included in the 2019 PCI list as “potentially competing”.

*15 outage patterns time series*". Although the definition of the outage patterns can have a significant impact on the outcomes of the adequacy simulations, no information is provided on how the selected 15 outage patterns were selected out of numerous possible patterns. Also, regarding the monetisation of the sanity check cap, the value used for CONE (40000 euro/MW/y) is selected based on the Combined Cycle Gas Turbine (CCGT) overnight installation cost. It is not explained why the CCGT installation cost is used and not the Open Cycle Gas Turbine installation cost, which is typically the generation used to cover peak loads.

- d. Regarding the indicator B7 (Security of supply - flexibility), and especially B7.1 - Balancing energy exchange, given the lack of concrete methodology resulting in high uncertainties in the results of its calculation, it is positively noted that this indicator remains qualitative. However, the methodology presented on pages 44-45 of the IG, based on which the "range thresholds" are set to assign the qualitative value (i.e. 0,+,++) to the benefit is not clear, and clarifications should be provided on how the "*SEW due to balancing market integration*" and the "*Long Term + Day Ahead cross-border trade social welfare*" are calculated, as well as why the 7,5% ratio was selected, and why the €1mil and €15 mil thresholds were applied to assign the qualitative values to the benefits.
- e. Regarding the indicator B8 (Security of supply – system stability), it is noted that the text on p. 46-47 of the IG, as well as in the Implementation guideline on Project-Level Benefits, does not provide further methodology or guidance on how the sub-indicators B8.0, B8.1, B8.2 and B8.3 should have been calculated by promoters. Calculations for this benefit were submitted to ENTSO-E for 7 storage projects (either for frequency stability or black start services) and only for one transmission project<sup>23</sup> (for which, only the black start services part was accepted by ENTSO-E as "compliant with CBA 3"), showing a very low interest, especially by transmission project promoters. ENTSO-E should provide further guidance in the IG of future TYNDPs on how the indicator should be calculated by promoters.
- f. Regarding the indicator B9 (Avoidance of renewal/replacement cost of infrastructure), ACER reiterates its recommendation in its opinion 03/2020 on the ENTSO-E draft 3<sup>rd</sup> guideline for CBA of grid development projects to dismiss this benefit.
- g. Regarding the indicator B10 (Reserves for re-dispatch power plants), according to the 3<sup>rd</sup> CBA methodology, page 91, it "*can only be applied for projects located in countries that have a specific mechanism for contracting redispatch reserve power plants or connecting countries where at least one country has such a mechanism*".

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<sup>23</sup> For project 170- Baltic States Synchronization with Continental Europe

However, this limited approach does not safeguard consistency across projects assessed and does not reveal the socio-economic benefit of a project irrespective of whether a specific mechanism for contracting redispatch reserve exists or not. Also, the lack of transparency regarding the projects for which the re-dispatch costs were included in the analysis of indicator B1 entails a risk of double counting benefit with indicator B1. ENTSO-E should calculate this benefit in the future TYNDPs for all countries deemed relevant, and as a result of ENTSO-E's re-dispatch studies.

- (41) Although the Agency, in its Opinion No 11/2019 on the draft TYNDP 2018, had requested ENTSO-E to identify the most important parameters for sensitivity analyses for the mid-term studies and include these sensitivity analyses in the next TYNDPs, no such identification was performed for the TYNDP 2020, and a sensitivity analysis is missing (the Current Trends scenario analysis cannot be deemed a sensitivity). This absence is particularly critical for the study year 2025 (5-year-ahead), where only a single scenario is simulated, and no other outcomes are available for other combinations so parameters.

### **3.7. Remarks on the structure of the draft TYNDP 2020 and the presentation of the CBA results**

- (42) The draft TYNDP 2020 comprises of a main report, highlights, Stakeholders Engagement Report, and project sheets, accompanied by 3 implementation guidelines, 2 insight reports, and 6 documents pertaining to the system needs. Out of the above documents, the Agency considers within this Opinion the documents mentioned in recital (8). This structure is similar to the structure of the last TYNDP, for which specific recommendations were made by the Agency in its Opinion No 11/2019. The Agency re-iterates its view that the current structure fails to make the TYNDP comprehensible. The content is fragmented among various separate documents, focuses mostly on presenting limited results of the analysis, and lacks important information on the process, the inputs and the outputs, as analysed in other Sections of this Opinion, failing to present a comprehensive overview of the main elements of the TYNDP package in a transparent and trustworthy manner.
- (43) Despite the inclusion in the 3<sup>rd</sup> CBA Methodology of specific methodology and formulas<sup>24</sup> to calculate the value of an investment by combining the project's costs and benefits, i.e. the Net Present Value (NPV) and the Benefit to Cost Ratio (BCR) indicators, such indicators are missing from the TYNDP 2020, making it harder for stakeholders to compare (possibly competing) projects.

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<sup>24</sup>Section 3.2.4 of the draft 3<sup>rd</sup> CBA Methodology

HAS ADOPTED THIS OPINION:

1. The Agency finds that the draft TYNDP 2020 assessments and the projects included in it generally contribute to the objectives of non-discrimination, effective competition, and secure functioning of the internal electricity market referred to in Article 32(2) of Regulation No 2019/943.
2. However, the Agency notes that the TYNDP 2020 does not sufficiently contribute to the efficient functioning of the market, mainly due to the following shortcomings:
  - a. Delays of scenario development process and lack of data release which compromised the integrity of the TYNDP.
  - b. Unbalanced CBA due to the missing, non-traceable Current Trends scenario.
  - c. Lack of CBA analysis after the study year 2030.
  - d. Poor and insufficient consultations of the scenarios methodology and of the needs methodology.
3. In view of the foregoing, the Agency addresses the following main recommendations to ENTSO-E, as regards the finalisation and adoption of the TYNDP 2020:
  - a. Provide the storyline and full data for the missing Current Trends scenario.
  - b. Publish the baseline capacities per border as used in the starting grid for the needs exercise and in the reference grids for the CBA calculations.
  - c. Include a Benefit / Cost ratio and NPV calculation for all projects for each of the four scenarios.
4. The Agency considers that ENTSO-E should enhance the future TYNDPs by implementing the following main recommendations:
  - a. The scenario development process should be restructured in order to be completed (including taking into consideration the ACER opinion) by December of the year before the TYNDP in order to facilitate the timely development of the other components of the TYNDP.
  - b. Development of scenario assumptions should be done through substantial involvement of relevant stakeholders and experts, e.g. on the inputs of the scenarios, the time horizons, the number and the content of the storylines to be developed.

- c. Transparency of scenario development and availability of scenario data should be ensured. All scenarios should be used in the needs exercise and the CBA analysis in a balanced way, using the premise of economic growth, e.g. slow growth, expected growth (i.e. national trends) and fast growth (e.g. Global Ambition).
- d. A substantial consultation of the needs methodology (including important parameters like the horizons to be studied, the zones modelling, the climatic years to be used) should be conducted early enough in the process in order to enable the consideration of stakeholders comments received.
- e. An appropriate starting network for the needs identification should be defined, i.e. by including only the projects which, at the time of the needs exercise, have a strong certainty of timely implementation (e.g. successful completion of the environmental procedures).
- f. The provisions of the TYNDP Inclusion Guidelines should be duly implemented by ENTSO-E, and non-compliant projects should be excluded.
- g. The impact of the requirement pursuant to Art. 16 (8) of Regulation (EU) 2019/943 on the internal electricity market must be taken into account by ENTSO-E in the modelling of the power system for the development of the scenarios, the needs identification exercise and the calculation of project benefits, where relevant.
- h. Transfer capacities should be calculated with more granularity instead of calculating a yearly NTC (e.g. at least seasonal NTCs). Also, ENTSO-E should improve the calculation of the projects'  $\Delta$ NTCs by performing analyses for all projects. Furthermore, ENTSO-E should improve the transparency of the calculations by providing more information on the selection of the critical branches / critical outages, clarifications on the selected climatic year, and by making available within the TYNDP package full details on the power or load shift applied, especially for the projects of third party promoters.
- i. A consultation of the main elements of the TYNDP CBA (e.g. study horizons, criteria for the construction of the reference grid, scope of the CBA) should be conducted before the beginning of the process for the inclusion of projects in the future TYNDP to allow for stakeholders' comments to be taken into account.
- j. Regarding the reference grid considered for the CBA analysis, the Agency reiterates the following recommendations:
  - i. For the short-term horizon (e.g. N+5), ENTSO-E should include all projects which successfully completed the environmental procedures.
  - ii. For the other study horizons, ENTSO-E should make a proposal based on the principles that i) only reasonably expected projects to be operational at the

- study horizon should be included, and ii) no discrimination of non-TSO projects is possible;
- iii. With regard to competing projects, i) to elaborate on the criteria for prioritising projects and on the implementation of the “sequential TOOT” approach, and ii) to consult with the concerned NRAs to verify the prioritisation of projects and construct the reference grid accordingly.
- k. Regarding the study horizons for which a CBA analysis is conducted, ENTSO-E should extend the studies of the TYNDP 2022 at least to one study year after 2030 (e.g. 2035 or 2040).
5. This Opinion is addressed to ENTSO-E, the European Parliament, the Council and the Commission.

Done at Ljubljana, on 3 May 2021.

**- SIGNED -**

*For the Agency  
The Director*

C. ZINGLERSEN