ACER
Agency for the Cooperation of Energy Regulators

OPINION OF THE AGENCY FOR THE COOPERATION OF ENERGY REGULATORS No 01/2017

of 3 February 2017

ON THE ENTSO-E DRAFT TEN-YEAR NETWORK DEVELOPMENT PLAN 2016

THE AGENCY FOR THE COOPERATION OF ENERGY REGULATORS,

HAVING REGARD to Regulation (EC) No 713/2009 of the European Parliament and of the Council of 13 July 2009 establishing an Agency for the Cooperation of Energy Regulators[1], and, in particular, Articles 6(3)(b) and 17(3) thereof,

HAVING REGARD to Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation (EC) No 1228/2003[2], and, in particular, Articles 8(3)(b) and 9(2) thereof,

HAVING REGARD to the favourable opinion of the Board of Regulators of 25 January 2017, issued pursuant to Article 15(1) of Regulation (EC) 713/2009,

WHEREAS:

(1) On 28 November 2016, the European Network of Transmission System Operators for Electricity ("ENTSO-E"), with reference to Article 9(2) of Regulation (EC) No 714/2009, submitted to the Agency for its opinion the draft Ten-Year Network Development Plan ("draft TYNDP 2016"), accompanied by the draft Mid-Term Adequacy Forecast 2016 ("draft MAF 2016").

(2) On the same date, ENTSO-E submitted 12 insight reports. When reviewing the draft TYNDP 2016 and the draft MAF 2016, the Agency took into account:
   a. the aforementioned 12 insight reports;
   b. the Scenario Development Report for the TYNDP 2016 ("draft SDR 2016"), as scenario development is an essential requirement of the draft TYNDP 2016 pursuant to Article 8(10) of Regulation (EC) No 714/2009)[3];
   c. the Regional Investment Plans 2015, as the main output of the regional cooperation of transmission system operators (TSOs) referred to in Article 12 of Regulation (EC) No 714/2009; and
   d. ENTSO-E publications on interaction with stakeholders regarding the TYNDP.

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[1] OJ L 211, 14.8.2009, p.1.
[2] OJ L 211, 14.8.2009, p.15.
[3] The draft SDR 2016 was already published in November 2015: https://www.entsoe.eu/Documents/TYNDP%20documents/TYNDP%202016/rgips/TYNDP2016%20Scenario%20Development%20Report%20-%20Final.pdf

(3) On the same date, ENTSO-E informed the Agency that "*the consultation comments and their detailed response*" were not part of the submission and were to "*be released on ENTSO-E website in the next few days*". On 7 December 2016, ENTSO-E published the relevant information.

(4) The Agency assessed the draft TYNDP 2016 on the basis of the following main criteria: (i) the essential requirements of the Ten-Year Network Development Plan ("TYNDP"), as specified in Article 8(10) of Regulation (EC) No 714/2009, as amended by Regulation (EU) No 347/2013[4], and (ii) the objectives set out in Article 6(3)(b) of Regulation (EC) No 713/2009 and Article 9(2) of Regulation (EC) No 714/2009.

(5) Furthermore, the Agency took into account its previous opinions, recommendations and positions, including those related to:

a. the draft TYNDP 2012[5] and the draft TYNDP 2014[6];
b. the scenarios to be used in the draft TYNDP 2014[7,8] and the draft TYNDP 2016[9];
c. the cost benefit analysis (CBA) methodology to be used in the TYNDPs[10,11];
d. the selection of projects of common interest (PCIs)[12,13,14];

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[4] OJ L 115, 25.4.2013, p.39.

[5] Agency's Opinion No 06/2012 on the European Ten Year Network Development Plan 2012 http://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Opinions/Opinions/ACER%20Opinion%2006-2012.pdf

[6] Agency's Opinion No 01/2015 on the ENTSO-E draft Ten Year Network Development Plan 2014 http://www.acer.europa.eu/official_documents/acts_of_the_agency/opinions/opinions/acer%20opinion%2001-2015.pdf

[7] Agency's letter to ENTSO-E on the Agency's position on ENTSO-E Scenario Outlook and Adequacy Forecast 2013-2030, on generation adequacy assessments and on scenarios for the ENTSO-E Ten-Year Network Development Plan http://www.acer.europa.eu/Official_documents/Other%20documents/Letter%20Konstantin%20Staschus_ENTSOE_SOAF_130718.pdf

[8] Agency's Opinion No 21/2014 on the draft ENTSO-E Scenario Outlook and Adequacy Forecast 2014-2030 http://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Opinions/Opinions/ACER%20Opinion%2021-2014.pdf

[9] Agency's Opinion No 12/2016 on the ENTSO-E draft Scenario Development Report for TYNDP 2016 http://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Opinions/Opinions/ACER%20Opinion%2012-2016.pdf

[10] Agency's position on the ENTSO-E "Guideline to Cost Benefit Analysis of Grid Development Projects" http://www.acer.europa.eu/Official_documents/Position_Papers/Position%20papers/ACER%20Position%20ENTSO-E%20CBA.pdf

[11] Agency's Opinion No 01/2014 on the ENTSO-E guideline for cost benefit analysis of grid development projects http://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Opinions/Opinions/ACER%20Opinion%2001-2014.pdf

[12] Agency's Opinion No 16/2013 on the draft regional lists of proposed electricity projects of common interest 2013 http://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Opinions/Opinions/ACER%20Opinion%2016-2013.pdf

[13] Agency's Opinion No 14/2015 on the draft regional lists of proposed electricity projects of common interest 2015 http://www.acer.europa.eu/official_documents/acts_of_the_agency/opinions/opinions/acer%20opinion%2014-2015.pdf

[14] Agency's letter on proposal to establish a Cooperation Platform to support the work of the Regional Groups and to facilitate the third PCI selection process, 2 February 2016. http://www.acer.europa.eu/en/electricity/infrastructure_and_network%20development/infrastructure/documents/dominique%20ristori_ec_160202_cooperation%20platform_web.pdf

e. the consistency checks with national network developments plans[15,16];
f. the monitoring of the implementation of investments in electricity transmission networks[17,18].

(6) In this Opinion, the Agency did not consider the storage projects part of the draft TYNDP 2016, pending the ENTSO-E's CBA guideline to identify specific benefits of storage projects[19],

HAS ADOPTED THIS OPINION:

1. General remarks

The Agency notes that the draft TYNDP 2016 includes the modelling of the integrated network, as required by Article 8(10) of Regulation (EC) No 714/2009. Other essential requirements (scenario development and a European generation adequacy outlook) are provided in complementary reports (the draft SDR 2016 and the draft MAF 2016).

Further, the draft TYNDP 2016 is, to some extent, based on a CBA methodology, as further discussed in the rest of this Opinion. However, the ENTSO-E CBA methodology is not applied fully and consistently for developing the draft TYNDP 2016 (see Section 10 of this Opinion).

The Agency deems that the draft TYNDP 2016 contributes to non-discrimination, effective competition, long-term efficient functioning of the internal market in electricity and to a sufficient level of interconnection open to third party access, according to Article 6(3)(b) of Regulation (EC) No 713/2009 and Article 9(2) of Regulation (EC) No 714/2009.

In comparison to the TYNDP 2014, the Agency positively acknowledges the following improvements:

- a better preparation and explanation of the scenario development activity, as already noted in the Agency's Opinion No. 12/2016;
- the availability of complete information and minutes for the TYNDP-related workshops and meetings;
- the classification of each TYNDP cluster as a mid-term project, a long-term project or a future project;

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[15] Agency's Opinion No 08/2014 on the national Ten-Year Electricity Network Development Plans pursuant to article 8(11) of regulation (EC) No 714/2009
http://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Opinions/Opinions/ACER%20Opinion%2008-2014.pdf

[16] Agency's Opinion No 04/2016 on the national Ten-Year Electricity Network Development Plans pursuant to article 8(11) of regulation (EC) No 714/2009
http://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Opinions/Opinions/ACER%20Opinion%2004-2016.pdf

[17] Agency's Opinion No 16/2014 on the implementation of investments in electricity transmission networks
http://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Opinions/Opinions/ACER%20Opinion%2016-2014.pdf

[18] Agency's Opinion No 08/2016 on the implementation of investments in electricity transmission networks
http://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Opinions/Opinions/ACER%20Opinion%2008-2016.pdf

[19] Agency's Opinion No 01/2014, section 3.1.

- the use of a mid-term study horizon (year 2020) in addition to the year 2030;
- the use of a single scenario for the mid-term study horizon (best estimate scenario called "expected progress"), allowing stakeholders to easily understand the meaningfulness of the mid-term results;
- the introduction of a new approach (albeit not yet implemented for all borders) meant to identify the economic-efficient target capacities by assessing socio-economic welfare (SEW) increases vs. capacity increases;
- the extension of the TYNDP cluster sheets with the intention to provide more information on each cluster and a clear relationship to one or more infrastructure investment needs.

On a less positive note, two other essential requirements defined by Article 8(10) of Regulation (EC) No 714/2009 do not seem fully complied with, as:

- the assessment of the resilience of the system seems largely missing;
- the draft TYNDP 2016 does not sufficiently build on national network development plans.

Regarding the first unmet essential requirement, the Agency considers that the system resilience and the objective of secure functioning of the internal market are not appropriately pursued by the draft TYNDP 2016, as further discussed in Section 9.3 of this Opinion. The Agency regrets that the security of supply criterion was not further assessed and monetised by ENTSO-E as recommended by the Agency[20]. Rather, the security of supply analysis appears to be totally left out of the scope of the draft TYNDP 2016, as:

- no identification of infrastructure investment needs/bottlenecks in relation to security of supply was performed[21];
- no security of supply results are provided in the draft TYNDP 2016 project sheets[22].

Regarding the second unmet essential requirement, instead of including all projects with cross-border relevance from the national network development plans[23] and of defining a procedure for the inclusion of candidate third-party projects in the TYNDP (as done in the TYNDP 2014)[24], ENTSO-E published and made reference to a document called "Guidelines on equal treatment and transparency criteria to be applied by ENTSO-E when developing its TYNDP as set out in Annex III 2(5) of Regulation (EU) No 347/2013" [25] and labelled as "first draft of the EC guidelines" (draft guidelines for inclusion in the TYNDP). The draft guidelines for inclusion in the TYNDP indicate that "*project inclusion in the TYNDP must obey transparent and non-discriminatory principles*" (p.5) and provide detailed legal and technical criteria (sections 3.3 and 3.4).

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[20] Agency's Opinion No 01/2014, p.2.
[21] This analysis was presented in the TYNDP 2014.
[22] Security of Supply results were presented for ten projects in the TYNDP 2016, see Agency's Opinion No 01/2015.
[23] As already indicated since its Opinion No 08/2014 (recital 3), the Agency considers all relevant national planning instruments, including "investment plans" as "national ten-year network development plans". The same opinion explains the interaction between national network development plans and the EU TYNDP, see page 4.
[24] https://www.entsoe.eu/Documents/TYNDP%20documents/Third%20Party%20Projects/130923_New%203rd%20parties%20procedure_FINAL.pdf
[25] https://www.entsoe.eu/Documents/TYNDP%20documents/TYNDP%202016/20150217_Guidelines_Update_ENER_TC_24.02.2015_1st%20draft.pdf

In the second semester of 2015, after some discussions in the Network Development Stakeholder Group (NDSG)[26], ENTSO-E decided that candidate projects not fulfilling the draft guidelines for inclusion in the TYNDP would also be assessed and included in the draft TYNDP 2016, instead of being simply excluded. However, such projects would have to be clearly distinguishable from the ones that are fully compliant with the draft guidelines for inclusion in the TYNDP.

The draft TYNDP 2016 lacks clarity on which projects did not comply with the draft guidelines for inclusion in the TYNDP. In November 2015, ENTSO-E made available on its website a datasheet file on "the final list of projects which are to be assessed under the TYNDP 2016 framework"[27]. This datasheet file indicates that 38 projects of non-ENTSO-E Members (15 transmission projects and 23 storage projects) and 1 transmission project promoted by both an ENTSO-E Member and a third party promoter meet the draft guidelines for inclusion in the TYNDP, while 8 transmission projects of non-ENTSO-E Members are considered by ENTSO-E as non-compliant[28].

Given the principle of consistency between the TYNDP and the national network development plans defined in Regulation (EC) No 714/2009 and the potential risk to inflate both plans with non-credible projects, ENTSO-E, when preparing future TYNDPs, should:

- include all projects of national network development plans with cross-border relevance;
- define, after consultation with stakeholders, and duly apply a procedure for inclusion (and exclusion) of additional candidate projects which are not included in the national network development plans.

Furthermore, despite i) the Agency's recommendations in its Opinion No 16/2015 on PCIs, ii) the work of the EC-ENTSOs-ACER PCI Cooperation Platform[29] set up in February 2016 and iii) some initial improvements compared to the TYNDP 2014, the draft TYNDP 2016 is not fully fit for an effective identification of infrastructure investment needs and for the subsequent selection of PCIs, due to various missing output data and a lack of appropriate transparency (see Section 8 of this Opinion).

Finally, the Agency regrets that all the objectives pursued by Regulation (EC) No 714/2009 are hindered by the approach and structure of the draft TYNDP 2016 (see Section 2 of this Opinion). In fact, the draft TYNDP 2016 does not allow the public to understand the main elements of the process of building the TYNDP[30], nor the interested stakeholders to have an adequate degree of understanding of the approaches, the methodologies used by ENTSO-E, and the relation between inputs and outputs of the various studies carried out. The draft TYNDP 2016 also lacks clarity due to the absence of

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[26] https://www.entsoe.eu/Documents/TYNDP%20documents/Long-Term%20Development%20Group/150918_ND%20SG_recommendations.pdf

[27] https://www.entsoe.eu/Documents/TYNDP%20documents/TYNDP%202016/rgips/Project%20list%20TYNDP2016%20assessments.xlsx

[28] 281 ANAI: Abengoa Northern Atlantic Interconnection, 282 ASEI: Abengoa Southern Europe Interconnection, 284 LEG1, 285 GridLink, 291 Greenwire Loop, 293 Southern Aegean Interconnector, 294 Maali, 296 Britib.

[29] The Cooperation Platform is the informal working group consisting of representatives of the European Commission, ENTSOs and ACER. It was established in the beginning of 2016 with the aim to discuss and agree on practical improvements for the next PCI selection round.

[30] Regrettably, the draft TYNDP 2016 includes a proposed process for the TYNDP 2018 (p. 36-38 of the Executive Report), but not the actual process used for the TYNDP 2016. A too short description of it is given in the insight report "Stakeholder engagement", chapter "*Looking back: the TYNDP 2016 – when, what and your suggestions*".

definitions of the used terms (e.g. mid-term, long-term, future projects, grid transfer capacity (GTC), average marginal price difference, average of hourly marginal cost spreads).

2. Structure of the draft TYNDP 2016 and role of complementary reports

The approach and structure of the draft TYNDP 2016 is characterised by significant differences compared to the previous editions, including especially:

- the preparation of a separate report (the draft SDR 2016) regarding the scenario development activity;
- a different cycle of preparation of the Regional Investment Plans (RIPs), which have been issued in the year before the draft TYNDP 2016 and included an analysis of the infrastructure investment needs and an investigation of new potential projects to serve them;
- the preparation of a separate report (the draft MAF 2016) regarding generation adequacy.

The Agency commends the aforementioned changes as important improvements compared to the previous TYNDP editions.

The draft TYNDP 2016 is accompanied by 12 insight reports, covering different topics, from stakeholder engagement to regional infrastructure investment needs, prospects of the future system and new technologies, etc.

The Agency regrets the limited added value of the insight reports and notes different types of problems:

- the overlapping, duplication and lack of clarity on the role of the insight reports (as shortly explained below, this is applicable to the five "regional" insights reports, to the insight reports on "Future system perspectives", "Viability of the energy mix" and "Data and expertise as key ingredients", as well as to the insight report "The link between system adequacy and TYNDP");
- the inappropriate "promotion" of ENTSO-E views and recommendations (insight report "A push for project of common interest");
- the detachment from the content of the draft TYNDP 2016 (insight report "Technologies for the transmission system");
- the insufficient or not fully focused content (insight report "Stakeholder engagement").

Although the insight reports contain reference to the results of the six ENTSO-E RIPs 2015, it is not clearly explained how the RIPs' content is related to the results presented in the regional insight reports. Furthermore, a comprehensive overview of the methodology used in the various regions to identify the infrastructure investment needs, which is an important output of the TYNDP, is missing. The consequence of these shortcomings is that information on the studies conducted, on the main assumptions considered and on the tools and the methodologies used in the various regions is missing.

The report on "Future system perspectives" conveys the impression of providing some further information about the future perspective beyond the draft SDR 2016 for the TYNDP 2016 process. However, the insight report "Future system perspectives" seems to be merely a summary of the draft SDR 2016 for the TYNDP 2016.

It is also noted that some chapters of the executive report (e.g. chapter "*Energy transition requires grid, grid requires everyone's support*") or insight reports (e.g. "*Technologies for Transmission*

System") seem to lack a clearly defined purpose and their contribution to the value of the draft TYNDP 2016 is not evident.

The Agency notices that ENTSO-E uses the draft TYNDP 2016 or its insight reports to propose changes of processes outside the scope of the TYNDP (e.g. PCI process, cross border cost allocation (CBCA)). For instance, some statements within the insight report "A push for project of common interest" seem to have the sole purpose of promoting ENTSO-E's views. The Agency believes that the TYNDPs should not be used for such purposes. It is suggested that, in the future, ENTSO-E limits its messages to the scope of the TYNDP and avoids subjective conclusions.

Overall, the Agency notes that, while the new format of the draft TYNDP 2016 (executive report and project sheets accompanied by 12 insight reports) aims at making the TYNDP more comprehensible to readers, it however fails to deliver this goal, as the rearranged content focuses mostly on presenting limited results of the analysis. In ENTSO-E's pursuit of producing a report, understandable to the wider public, the current structure of the draft TYNDP 2016 report leaves most stakeholders with too many ambiguities.

The Agency thus recommends ENTSO-E to produce a transparent and detailed full report, providing interested readers full information about the process, inputs, methodology and outputs, while an executive report including information relevant to the general public could be concise and streamlined.

ENTSO-E should aim at producing a comprehensive report that can allow an appropriate degree of understanding of the construction of the TYNDP to both the general public and other stakeholders.

For future TYNDPs, ENTSO-E should maintain two insight reports (or annexes), subject to the following amendments:

- "technologies for network development", with a much clearer link to the content of TYNDP clusters, e.g. by listing the clusters that foresee network reinforcement via dynamic line rating and other innovative technologies, so as to display how much new technology is actually being progressively exploited in the European network;
- "stakeholder engagement", with a much more detailed description of the process for building the TYNDP, of the inputs provided by stakeholders and their evaluation by ENTSO-E.

ENTSO-E should describe the overall TYNDP process and how it relates to the PCI selection, including a clear identification of infrastructure investment needs performed by the TYNDP, with clarity and details on the methods and indicators used.

3. Remarks on stakeholder involvement

3.1 Network Development Stakeholder Group

ENTSO-E continued the practice of interaction with a (renamed) stakeholder group, which has been convened eight times during 2015 and 2016. The NDSG contributed to the preparation of a couple of insight reports and provided feedback on the TYNDP preparation[31].

The Agency positively acknowledges the continuation of interactions with the NDSG and the availability of related documents and information.

3.2 Public workshops, other interactions and related documents

ENTSO-E organised various workshops, consultations and webinars[32] on the TYNDP 2016 and related topics. A significant amount of information is published, including agendas and presentations.

The Agency however notes that it is not immediately clear how these interactions affected the preparation of the draft TYNDP 2016 and how stakeholders concretely helped and contributed to improving it. The Agency also regrets that the regional TYNDP workshops were not organised (while this was the practice used at the time of the TYNDP 2012 and TYNDP 2014).

3.3 Outcomes of TYNDP public consultation

A number of changes were made to the executive report and to each of the 12 insight reports following the public consultation which lasted from 23 June to 9 September 2016. Among other changes, a new chapter was added to the executive report: "User's Guide to a new, updated and enriched TYNDP for electricity". This new chapter is a response to several stakeholders' comments requesting clarifications on the content of the TYNDP, the assessment process and results, or the link between the TYNDP and the selection of PCIs.

Participants in the public consultation on the draft TYNDP 2016 largely stated that the TYNDP is a useful document. Nevertheless it is not necessarily easy to read in the new version/webpage. Participants also noted difficulties in understanding the TYNDP results and consequences.

The draft guidelines for inclusion in the TYNDP provided for a reporting by ENTSO-E to project promoters every two months on the status of the assessment of projects. However, only one written to-all feedback was provided in the whole period.

In terms of stakeholder involvement, the Agency recommends ENTSO-E to continue organising interactions and workshops and make it clearer and more evident how these interactions contribute to the development of the TYNDPs. Results could be displayed in more detail (more charts and graphs vs. less descriptive general text).

[31] https://www.entsoe.eu/major-projects/ten-year-network-development-plan/long-term-network-development-stakeholder-group/Pages/default.aspx
[32] http://tyndp.entsoe.eu/reference/#consultations

4. The timeline of the TYNDP process

The basic steps for the preparation of every network development plan are:

- the definition of scenarios (approach, number and dates of study years, assumptions);
- the identification of infrastructure investment needs expected for these scenarios;
- the studies to define or refine the projects fit (or preliminary solutions to be further considered) for the identified infrastructure investment needs;
- the CBA for each project (which could be differentiated depending on the advancement of the project under analysis).

The TYNDP should be characterised by the same steps and further built on the national network development plans. This implies that many projects could be defined and refined in national and multilateral studies outside the ENTSO-E TYNDP process and then passed to the TYNDP CBA.

The Agency considers that the development of the draft TYNDP 2016 did not truly respect the sequence of these basic steps. From the information published on ENTSO-E website, the window for submission of candidate projects took place in April 2015 (the deadline was 30 April 2015), while the ENTSO-E RIPs 2015, in which the infrastructure investment needs were identified, were published for consultation in June 2015. This timeline does not allow the logical sequence of, firstly, identifying the infrastructure needs and, secondly, opening the application window for candidate projects able to fulfil one or more of the identified needs.

The Agency stresses that, in future TYNDP processes, the applications of candidate TYNDP projects not present in the national network development plans should take place at a later stage, so that projects submitted for inclusion in the TYNDP can respond to the identified infrastructure investment needs.

5. Remarks on scenarios, input data and future perspectives

The Agency already issued its Opinion No. 12/2016 on the draft SDR 2016, with the following main recommendations for future electricity (and - as far as applicable - gas) TYNDPs:

- to align the timing of the scenario development process of future electricity and gas TYNDPs;
- to increase the granularity of study horizons for future TYNDPs;
- to use "fixed years" (2020, 2025, 2030, etc.) to enable comparison of assessments performed in different TYNDP years and to reduce workload for the analyses;
- to prepare a joint document by the ENTSOs describing the storylines and the rationale for the development of the various scenarios, especially the longer-term ones, to be used in the future TYNDPs;
- to provide an accompanying document with a full list of stakeholders' comments and feedback as regards cross-sectoral and electricity-specific scenario topics, and with ENTSO-E's evaluation and, where appropriate, implementation of the comments received;
- to provide indications on the most important parameters for sensitivity analyses for the mid-term studies, together with possible ranges for these parameters;
- to consider alternative approaches to the "four-visions" approach for the long-term;
- to consider the option to use the available European Commission scenarios (and their top-down optimisations) or to put a stronger focus on "bottom-up" scenarios;
- to develop criteria to check the feasibility of scenarios, regarding generation adequacy of the generation mix, economic viability of generation investments at plant level, flexibility to cope

with intermittent renewable energy sources, dependence on gas-fired generation and economic feasibility/affordability at country level;
- to develop "technology datasheets" as a cross-check of the validity and quality of the scenarios;
- to provide more information as regards the assumptions on (reference) interconnection capacities and possibly to increase the role of economic-efficient target capacities at each border for the definition of the "baseline networks";
- to avoid over-estimated RES-E shares, as happens in Vision 3 and Vision 4;
- to adopt common input data sets in electricity and gas TYNDPs, as well as compatible assumptions on prices in electricity and gas markets;
- to provide scenario input data for 2020, 2025, 2030, 2035 and 2040;
- to broaden the cooperation with policymakers (European Commission, Member States, as well as National Regulatory Authorities and the Agency) in defining the scenarios;
- to have scenarios reviewed by selected experts and through a specific workshop with invited speakers.

6. Remarks on the identification of infrastructure investment needs

Within the framework of the EC-ENTSOs-ACER PCI Cooperation Platform, it was agreed to include a systematic identification of the infrastructure investment needs in the TYNDP in order to facilitate the PCI selection process, to which the TYNDP is a major input. This exercise should be performed for all study years, all scenarios and all three categories, i.e. market integration, security of supply, and new generation connection. Infrastructure investment needs (also named "bottlenecks") for these three categories were already presented in the TYNDP 2014 for the two extreme visions (chapters 4.3 and 4.4, figures 4-2 to 4-5 of the TYNDP 2014).

The draft TYNDP 2016 presents only a map with 10 main boundaries and other regional boundaries (p. 17) and, only for 9 main boundaries, the maps indicating with different colours the ranges of the target capacities in 2030 for all scenarios (p.19-22). Further, the annex to the draft TYNDP executive report includes a range of optimal levels of interconnection target capacity for most of the main boundaries (with the exception of the Ireland - Great-Britain & Continental Europe and Great-Britain – Continental Europe & Nordics borders).

The Agency positively acknowledges the addition of an "investment need" section in the project sheets. However, for most of the projects, this section does not describe the need that the project is deemed to cover, but rather describes other benefits of the project, not focusing on the need in question. A (quantified) assessment of the need that shall be covered by the proposed project, reflecting the conclusions of the discussions in the framework of the Cooperation Platform, should be included in the project sheets.

Simple indicators to identify the infrastructure investment needs would be:
- Market integration: increase of SEW per capacity increase (Eur/MW);
- Generation connection: reduction of generation curtailments (GWh);
- Security of supply: reduction of expected energy not supplied (GWh).

In the chapter "*Main barriers for power exchanges in Europe*", the main "boundaries" in the European system are presented, and, in the annex, further information on these boundaries is

provided. These main boundaries refer to 33 national borders[33], out of about 80 borders in the studied system. However, no comprehensive information is provided on the criteria and the thresholds applied for the selection of the critical barriers among all boundaries, nor are the boundaries where there are competing projects indicated, i.e. those for which the sum of the projects' capacity is higher than the target capacity of the boundary.

In the relevant chapter of the draft TYNDP 2016, "*2030 targets for interconnection capacities*", it is stated that "*the TYNDP 2016 fine-tunes the interconnection target capacities for every main boundary by 2030 reported in the TYNDP 2014, based on additional TSO co-ordinated studies*". This sentence is unclear as:

- the interconnection target capacities were not explicitly presented in the TYNDP 2014,
- the methodology used for the stated fine-tuning is not explained,
- the additional TSO studies that were carried out are not clearly documented.

The Agency reaffirms its recommendation that the target capacities for each boundary, based solely on technical-economic assessments, should be clearly reported in the TYNDP.

Further, the draft TYNDP 2016 (p. 18) explains that the optimal interconnection level is defined "*when the societal economic benefits brought by an additional project fail to overcome its costs*". Due to practical complexities, ENTSO-E adopted a simplified approach considering only SEW benefit and relatively large capacity increases (1 GW or more). Although specific values would be expected to be indicated as an outcome of this analysis, this data is not provided, nor are the reference cost curves that were considered for each boundary. The Agency acknowledges that reference costs for many boundaries were presented in the RIPs 2015, however the level of transparency was largely different across the RIPs; some of them presented precise figures, while others provided graphs with wide ranges.

Further explanation should be given on the methodology used for deriving the target capacities for each boundary (on the SEW calculations, the reference costs used, the size of capacity increase steps and – if applicable - the additional parameters taken into account), and also on the resulting numbers (listing the main drivers for the results). More explanations should be given, especially considering the fact that it is unclear whether the same methodology is used for each boundary, since the degree and the type of explanation for each of them differ a lot.

Further, the draft TYNDP 2016 executive report states (p. 19) that "*in a well-integrated Internal Electricity Market, it is economically sound that the grid is sized so that the load factor of every grid element is lower than 50%*". This statement is not further explained, and it is irrelevant for the identification of the target capacities or, likely, for any other purpose.

The Agency recommends ENTSO-E to include in the future TYNDPs an expanded scope of the "target capacity identification" beyond the "main boundaries" already investigated, the reference cost figures considered for the calculation of the target capacities, and the calculated target capacities for each scenario.

[33] A few national borders belong to two main boundaries.

7. Methodology and modelling approach

In general, the methodology used for assessing projects should allow project promoters easily to replicate the results. To achieve this, both the CBA methodology and the modelling approach should be available and understandable.

As discussed within the framework of the Cooperation Platform, ENTSO-E was expected to provide a comprehensive list of the market modelling tools used and the main features of these tools (in a comparable way) and to clarify the differences between them (with a potential impact on the estimated benefits). Instead, a list of only three tools[34] is provided in the insight report "Data and expertise as key ingredients", without providing a clear picture on the impact of the modelling options of each tool on the estimated benefits.

The TYNDP modelling approach also fails to take into account the impact of capacity calculation methodologies, including the effects of loop-flows on the net transfer capacity (NTC). Different capacity calculation methods can also impact the resulting cross-border capacities and may thus be considered. By doing so, the results provided in the TYNDP would be more realistic in terms of actual capacity available to the market.

Also, as discussed with ENTSO-E within the framework of the Cooperation Platform, ENTSO-E was expected to achieve an adequate level of consistency of the costs considered in all market modelling tools (e.g. for generation: variable fuel costs, internalised cost of CO_2 emissions, variable operation and maintenance costs, start-up and shut-down costs). However, from the text on page 2 of the "Data and expertise as key ingredients" insight report - "*All market studies, with whatever simulation tool, are done for the whole ENTSO-E perimeter. [...] For particular infrastructure projects more detailed modelling assumptions were tested, such as [...]*" - one can conclude that there is no consistency of the modelling assumptions considered in the various market modelling tools.

The Agency recommends ENTSO-E to provide further clarification regarding the consistency of costs and other modelling assumptions considered in the market modelling tools used.

8. Remarks on output data

Although the chapter of the draft TYNDP 2016 executive report "*27% RES in Europe's energy supply by 2030 means more grid*" mentions that "*the TYNDP portfolio reduces border average marginal price differences*", no data is provided for any vision, but only a graph for vision 3, without figures. In addition, a clarification of the potential difference of the terms "average marginal price differences" (potentially meaning difference of yearly average cost/price) and "average of hourly marginal price / cost spreads" (which accounts for cost spreads in both directions instead of "netting" them) should be included.

Also, in the same chapter, it is mentioned that "*TYNDP2016 market flow studies show that in the various 2030 scenarios the portfolio of mid-term and long-term grid infrastructure investments result in a reduction of over 40% of the number of congestion hours (as compared with the existing grid situation)*". However, no overall data on congestion hours is provided, neither on any 2030 vision

[34] Insight Report, p.2 "The tools used in TYNDP studies are among others: (…) BID, Antares, PowerSym"

nor regarding a scenario with no investments, so that the reader could understand the impact of the proposed investments on congestion.

Although some of the outputs are presented for all visions (e.g. the exchange balances and the target capacities), it is not the case for all of them (e.g. the reduction of marginal costs spreads).

The Agency recommends ENTSO-E to present complete and detailed output data and results for all scenarios and study years in the future TYNDPs.

9. Remarks on TYNDP clusters and investments and their descriptions

The description of some investments does not provide a clear picture of what is included in these investments (e.g. cluster 31-investement item 642, 96 – inv. item 801, cluster 86). In other cases (e.g. clusters 191, 192), the description of the whole cluster is repeated for each investment item and the real content of each investment item is unknown.

Furthermore, disregarding the Agency's Opinion on the draft TYNDP 2014 and the recommendation contained therein related to a specific very large Northern Seas project (p. 28), ENTSO-E included in its draft TYNDP 2016 a corridor named "Long term conceptual project "Northern Seas offshore grid infrastructure"" and labelled it as project 271, without any concrete investment description. In the Agency's view, ENTSO-E should not include non-concrete projects in the TYNDPs, because this would endanger the credibility of the TYNDP.

Also, many investment items of clusters, although mentioned in the datasheet file made available on ENTSO-E's website after the 2015 consultation on projects, are not included in the draft TYNDP 2016 project sheets (e.g. for clusters 4 and 151). Vice versa, items included in the draft TYNDP 2016 project sheets (pdf file) are not included in this datasheet (e.g. cluster 147, investment item 1002). Finally, a cross-border cluster (project 299) has been included late in the TYNDP process while it should have been included since the beginning, as it is part of a national network development plan[35].

The above facts create confusion about the real characteristics of the projects. Therefore, harmonisation of the available information and improvements in their description are necessary in the TYNDPs. If investments (or full projects) develop over time, the variation should be clearly traced and explained in the TYNDPs.

10. Results of the application of the CBA methodology

10.1 Clustering

Table 1 below presents a classification of the transmission clusters in the draft TYNDP 2016 according to the number of investments included in each cluster, based on the content of the latest ENTSO-E datasheet "TYNDP 2016 project data"[36].

[35] It is acknowledged that project 299 has specific features as it connects the transmission network of a country to the distribution network of another country and this may have added complexity in the inclusion process.
[36] While the draft TYNDP 2016 lacks clarity on which projects do not comply with the EC guidelines, ENTSO-E has made available on its website a datasheet file on "*the final list of projects which are to be assessed under the TYNDP*

Table 1: Summary of the transmission clusters in the draft TYNDP 2016

	Clusters matching guidelines	Investments within the cluster	Clusters not matching guidelines	Investments within the cluster
Cluster with 1 investment	85	85	8	8
Cluster with 2 investments	27	54	0	0
Cluster with 3 investments	17	51	0	0
Cluster with 4 investments	22	88	0	0
Cluster with 5 investments	6	30	0	0
Cluster with 6 investments	4	24	1	6
Cluster with 7 investments	3	21	0	0
Cluster with 8 investments	1	8	0	0
Cluster with 9 investments	1	9	0	0
Cluster with 13 investments	1	13	0	0
Cluster with 37 investments	1	37	0	0

TYNDP 2016	168	420	9	14
TYNDP 2014	127	371	0	0

Regarding the clustering of the investment items and the implementation of the clustering rules, the Agency observes the following:

- in many cases, the time difference for the commissioning of the investment items exceeds 5 years, which is the threshold set by the ENTSO-E clustering rules. Clarification is needed for these cases;
- regarding the projects which are labelled as PCIs, and according to the data provided by the promoters in the PCI monitoring activity of 2016, in most of the cases they either include investment items that are not part of the PCI or they miss some PCI investment items. This misalignment will make the CBA indicators more difficult to use for the upcoming assessment of PCI candidates, and the introduction of rules for the allocation of benefits from a project to an investment item level seems to be necessary.

The Agency recommends ENTSO-E to apply the appropriate arrangements (e.g. re-clustering) in order to fulfil the clustering rules, and in cases where this is not deemed appropriate due to special conditions, provides in the TYNDP a justification for the necessity of the selected clustering.

Also, ENTSO-E should propose rules for the allocation of benefits from a project to an investment item level in order to facilitate the PCI selection process.

Moreover, a higher consistency between the data included in the TYNDP and the national network development plans should be aimed at. The Agency notes that, in many cases, the clustering of investments, as well as technical elements (e.g. starting or ending substations) of the projects and commissioning dates, are different from those of projects included in the national network development plans. Although there is reference to the relevant national network development plans web link in the project sheets, the corresponding investment numbers of the national network

2016 framework" in November 2015, which was used for Table 1. Cluster 271 is considered not to be a project meeting the guidelines.

development plans are missing, making cross-checking of the investments included in the TYNDP hard to carry out.

The Agency recommends that the data included in the TYNDP and national network development plans should be aligned in order to achieve higher consistency of the various plans.

10.2 Costs

Regarding reported cluster costs, it is acknowledged that more clarity is provided compared to the TYNDP 2014, as in many cases it is clarified that the reported cost refers only to the expected investment cost of the project. However, the following shortages are noted:

- the project costs, usually with regard to future clusters, are not always included in the project sheets (mid-term cluster 245 and future clusters 168, 214, 231, 233, 238, 256, 257, 260, 261, 274, 275, 278 and 279);
- the cost explanation is not always filled in. It is noted that, in most of the cases, only the CAPEX is included, while the life-cycle costs are missing;
- it seems that the reference year of the project costs reported is 2015. In some cases, this is explicitly confirmed by the cost explanation. However, in a few other cases, the explanation seems contradictory (for instance, for cluster 39 "undiscounted CAPEX at time of delivering at investment level"). According to the current CBA methodology, future costs should be discounted to their present value, "*so that they can be meaningfully used for comparison and evaluation purposes*".

In its Opinion No 01/2015 on the draft TYNDP 2014, the Agency restated its expectation that ENTSO-E specifies costs at investment level. Also, as discussed with ENTSO-E within the framework of the Cooperation Platform, the TYNDP was expected to provide more clarity on which part of costs are included in the figures reported in the TYNDP, as well as to the degree of compliance of cost calculations with the CBA methodology.

In addition, the draft TYNDP 2016 indicates that "*around 150 billion euros of investments in grid infrastructure*" are foreseen, but only 80 billion Euros are related to projects already endorsed in national network development plans and/or intergovernmental agreements by 2030. The distance between these two figures may raise doubts on the maturity of many projects included in the draft TYNDP 2016 as "future projects" and eventually on the credibility/quality of this part of the TYNDP.

Table 2 below summarises the cost information by project groups, albeit this summary is not necessarily consistent, due to underlying inconsistencies in the draft TYNDP 2016.

Table 2: Estimated investment cost of draft TYNDP 2016 projects and cost confidence

Group	Number of clusters (with costs)	Estimated cost (million Euro)	Cost confidence (million Euro)	Cost confidence (%)
Mid-term clusters	77 (76)	57610	+/- 6840	+/- 11,9%
Long-term clusters	30 (30)	21670	+/- 3310	+/- 15,3%
Future clusters	69 (56)	77590	Not reliable	+/- 18,1%

Note 1: the cost confidence of future clusters is provided only for 38 clusters out of 56 with cost data. A total figure is therefore deemed as not reliable. The cost confidence percentage is referred only to those clusters with a confidence figure.
Note 2: the corridor 271 is excluded from the figures for future clusters.

The Agency therefore suggests ENTSO-E to disaggregate expected investments for the groups of mid-term projects, long-term projects and future projects.

In order to facilitate the monitoring of the consistency of projects data in the TYNDPs with the data provided in the national network development plans, and to facilitate the PCI selection process, the Agency reaffirms the importance that project costs, including lifecycle costs, are presented at an investment level, for all projects, and according to the CBA methodology rules.

10.3 Benefits

A certain degree of improvement in the level of explanation of the benefits of each project displayed in the draft TYNDP 2016 is acknowledged. Still, ENTSO-E and its TSO members should go further than a few lines of explanation (e.g. including explanations and graphs on the impact of a particular project on the generation mixes in various countries, etc.) better to explain the main determinants of the project benefits for each scenario.

Also, the description of project results (in particular benefits) should be complemented by an assessment of the variations with regard to the previous TYNDP, especially when benefits change significantly compared to the previous TYNDP. An explanation of the result variation due to changes in scenario assumptions would be useful for the readers to understand the determinants of the benefit of a project.

Explanations of the benefits of each project should also be complemented by quantitative results regarding the expected use of the project (percentage of time that an interconnector imports or exports, amount of energy exchanged, expected average flows, etc.).

In its Opinion No 01/2015 on the TYNDP 2014, the Agency recommended ENTSO-E to calculate security of supply impacts with network modelling, including probabilistic features, whenever appropriate. The Agency also recommended ENTSO-E to add a quantified analysis of the system resilience to the CBA methodology in order to complement the security of supply indicator.

No information is provided on the calculations of the benefits. However, it can be noted that indicator B1 is reported either as "0" or "non-applicable" for all the assessed projects. Therefore, one can conclude that no improvement in the application of the CBA methodology can be noted compared to the TYNDP 2014 and that ENTSO-E even made a step backwards.

The Agency reaffirms its recommendation to calculate security of supply impacts with network modelling including probabilistic features, whenever appropriate. Also, in order to facilitate the PCI selection process, the Agency recommends ENTSO-E to include, where applicable, the local contribution of projects, making clear whether the contribution is due to system stability and/or adequacy.

As discussed with ENTSO-E within the framework of the Cooperation Platform, ENTSO-E was expected to improve clarity of what less RES curtailment means in terms of societal benefit and to explain whether its monetary impact has been considered in the calculation of the socio-economic welfare.

The Agency recommends ENTSO-E to improve clarity on what less RES curtailment means in terms of societal benefit especially with regard to its relation to the socio-economic welfare. Double counting effects must be avoided in the future TYNDPs.

An improvement in the calculation of the benefit of a reduction of thermal losses of the grid due to the connection of a new project was introduced for the first time, as a monetised figure presented for each scenario and study year further to the quantities of losses. However, although ENTSO-E was expected to provide the unit values (€/MWh) used to calculate the monetary values of losses and to explain the source of the unit values and the methodology used to calculate them, no such data was made available in the TYNDP.

The Agency recommends ENTSO-E to provide the unit values used for the monetisation of the benefit of losses and an explanation of why these values are used.

As discussed with ENTSO-E within the framework of the Cooperation Platform, ENTSO-E was expected to improve the transparency of the calculation of the B7 indicator, by including a description explaining the values assigned for each project to this key performance indicator. However, no such data was made available in the TYNDP.

The Agency recommends ENTSO-E to improve the transparency of the calculation of the B7 indicator or simply remove it from future TYNDPs.

11. Adequacy

Within the draft TYNDP 2016, adequacy issues are touched upon in different documents, but the focus is in the draft MAF 2016. Since the draft MAF 2016 covers only the mid-term adequacy assessment (up to 2025), the longer-term assessment remains missing from the draft TYNDP 2016. Such absence is not compatible with the requirements of Article 8(4) of Regulation (EC) No 714/2009. As stated in the draft MAF 2016, ENTSO-E followed the Report of the European Electricity Coordination Group on the need and importance of generation adequacy assessment in the European Union, stating that adequacy assessments are more useful when focused on the mid-term horizon (up to 10 years). Although the Agency is aware of the recent Commission's proposal for a revised regulation and it recognises the uncertainties of long-term predictions and that mid-term predictions are more certain, this does not relieve ENTSO-E of its duties as currently stipulated by Regulation (EC) No. 714/2009.

In addition to the different time-horizon of the draft MAF 2016 compared to other parts of the draft TYNDP 2016, the draft MAF 2016 seems detached from the draft TYNDP 2016 also in other aspects, such as the lack of reference to the projects, the limited reference to scenarios and the calculated NTC and the absence of apparent link to the future needs for infrastructure. The Agency thus recommends strengthening the connection between the Mid-term Adequacy Forecast and the TYNDP.

The draft MAF 2016 looks at two horizons: 2020 and 2025. Both time-horizons are depicted through bottom-up scenarios, although the document only mentions the 2020 scenario as consistent with the Expected Progress 2020 scenario of the draft TYNDP 2016. The consistency of the 2025 adequacy scenario with the TYNDP would need to be elaborated, especially regarding how the commissioning of new infrastructure projects was taken into account, how this impacted cross-border capacity and what is exactly meant by "conservative assumptions regarding evolution of transmission capacity".

Compared to the previous adequacy assessments, the draft MAF 2016 presents certain improvements, especially regarding the probabilistic assessments of pan-European adequacy. For the first time, the probabilistic assessments go beyond assessing only weather conditions and include to some extent also other impacting variables (e.g. generation, demand and transfer capacity). The Agency welcomes ENTSO-E's focus on probabilistic adequacy assessments and would like to see the assessment of uncertainties also in the domain of project specific benefits through e.g. probabilistic market studies.

Regarding the probabilistic approach of the draft MAF 2016, the definition of individual events as dependent or independent of each other seems missing. For example, cross-border capacity and high load seem interdependent to some extent, as TSOs should try to reach the highest available import capacity during high-load conditions. Similarly, as stated by Poland in appendix "Country comments on the MAF 2016", the Polish TSO observed a close relation between the load increase and the level of the non-usable capacity. As these were simulated randomly in the draft MAF 2016, the impact of higher probability of outages is not visible in the adequacy results. The Agency would thus encourage ENTSO-E to keep improving the probabilistic assessment of adequacy, taking into account the interdependency of individual assumptions.

Regarding the results of the assessments, it is observed that some country-specific factors have not been taken into account, especially in terms of demand-side response, capacity markets, reserves, etc. As these might substantially influence the results, the Agency recommends taking them into account in the future adequacy assessments. This can be achieved also by introducing an additional scenario for each study horizon, as was done for the previous adequacy assessments. Additional scenarios would also provide more insight into uncertainties of adequacy related conclusions.

The treatment of some factors can lead to an overestimation of adequacy concerns. For instance, strategic reserves are not taken into account in the base case scenario. Also, the decision to create only two hydro profiles for the whole of Europe (with strong correlation of hydro conditions within each region) for "pragmatic reasons" and without supporting statistical evidences or analysis may lead to overestimations or underestimations of adequacy concerns.

In addition to the draft MAF 2016, valuable insight into the adequacy related topics such as flexibility, inertia and voltage related issues are covered in the insight report on "Viability of the Energy Mix". This report describes the foreseen evolution of the energy mix and the technical and economic challenges resulting from it. The technical part clearly shows a reduction of inertia, system flexibility and increased need to invest into voltage regulation, while the economic part shows the expected development of the marginal price. Even though most of the technical and economic aspects are quantified (except voltage issues), further conclusions could be developed showing how these future changes could impact the consumer and how the TYNDP projects could mitigate these effects.

In addition to improving the probabilistic assessment of adequacy, the Agency recommends ENTSO-E to strive towards reaching a higher level of linkage of future MAFs and the rest of the related TYNDP.

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For the Agency:

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