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**OPINION OF THE AGENCY FOR THE COOPERATION OF ENERGY
REGULATORS No 12/2016**

of 4 October 2016

**ON THE ENTSO-E DRAFT TYNDP 2016 SCENARIO
DEVELOPMENT REPORT**

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 Regulators¹ (hereinafter referred to as “the Agency”), and, in particular, Article 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 1228/2003², and, in particular, Article 9(2) thereof,

HAVING REGARD to the favourable opinion of the Board of Regulators of 14 September 2016, delivered pursuant to Article 15(1) of Regulation (EC) No 713/2009,

WHEREAS:

- (1) Pursuant to Article 6(3)(b) of Regulation (EC) No 713/2009, the Agency shall provide an opinion to the European Network of Transmission System Operators for Electricity (“ENTSO-E”) in accordance with the first subparagraph of Article 9(2) of Regulation (EC) No 714/2009 on relevant documents referred to in Article 8(3) of Regulation (EC) No 714/2009. Point (b) of Article 8(3) of Regulation (EC) No 714/2009 requires ENTSO-E to adopt a non-binding Community-wide ten-year network development plan (“TYNDP”) every two years. Pursuant to Article 8(10) of Regulation (EC) No 714/2009, the TYNDP shall include, among other features, scenario development.
- (2) On 23 June 2016, ENTSO-E published a draft version of the Ten-Year Network Development Plan 2016 for consultation (draft TYNDP 2016 for consultation)³. ENTSO-E also made available, among other documents related to the draft TYNDP 2016 for consultation, the “2016 Scenario Development Report - Final after public consultation - 3 November 2015” (“draft SDR 2016”)⁴, indicating that this document describes the scenario development for the draft TYNDP 2016 for consultation.

¹ OJ L 211, 14.8.2009, p.1

² OJ L 211, 14.8.2009, p.15

³ <http://tyndp.entsoe.eu/>

⁴ 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) Scenario development is a fundamental prerequisite for the analysis of the TYNDPs and, with regard to the draft TYNDP 2016 for consultation, has been published as a separate report. The Agency considers it important to assess the draft SDR 2016 as a stand-alone document and separately from its forthcoming Opinion on the draft TYNDP 2016.

HAS ADOPTED THIS OPINION:

1. General remarks

According to ENTSO-E, the draft SDR 2016 explores possible future situations of load and generation, which will be the baseline on which TYNDP 2016 projects are to be assessed⁵. For the long-term horizon 2030, four contrasting ‘Visions’ are presented, which differ in terms of “energy governance and Renewable Energy Sources (RES) ambitions”⁶. In addition, a mid-term 2020 ‘best estimate scenario’ allows to value grid infrastructure candidates at a mid-term horizon. The aim of the draft SDR 2016 is to provide insight into how ENTSO-E’s scenarios for TYNDP 2016 are developed, to highlight how infrastructure needs ‘are linked to choices’ in future energy policies, and to engage on these topics in a transparent manner⁷.

The Agency deems that the draft SDR 2016 meets the objectives of non-discrimination, effective competition and efficient and secure functioning of the internal market in electricity, according to Article 6(3)(b) of Regulation (EC) No 713/2009.

More specifically, the non-discrimination objective is covered by the information and consultation process used for preparing the draft SDR 2016.

The objectives of effective competition and long-term efficient functioning of the market are covered through the transparent release of information concerning the future scenarios for the European power system, including generation and transmission needs, which allows potential investors to compete in covering such needs on an informed manner.

The objective of secure functioning of the internal market is covered through the growth analysis in electricity demand and generation capacities in the EU, which is a prerequisite for running security-related analyses in the ENTSO-E TYNDP 2016.

2. Improvements in the draft SDR 2016 compared to previous practices

The Agency positively acknowledges that the draft SDR 2016 is, in many instances, in line with previous Agency’s recommendations, since it:

- has been prepared in the year before the TYNDP, adopting a two-year cycle for scenario development and for the subsequent TYNDP⁸;

⁵ Draft SDR 2016, p. 3.

⁶ Draft SDR 2016, p. 3.

⁷ Draft SDR 2016, p. 3.

⁸ The previous ENTSO-E practice was to adopt yearly reports.

- clearly focuses on the scenario development process for the subsequent TYNDP and leaves the adequacy assessment⁹ largely out of the scope of the SDR, improving the approach which led in the past to the preparation of ENTSO-E documents addressing both scenario development and generation adequacy, entitled Scenario Outlook and Adequacy Forecast (SO&AF);
- has been prepared aiming at inputs from stakeholders, including through a first workshop on 16 September 2014, a second workshop on 11 March 2015 and a webinar on 10 June 2015, as well as consultation with the Network Development Stakeholder Group¹⁰;
- has been subject to a formal public consultation from 21 May 2015 till 22 June 2015, well in advance of the preparation of the ENTSO-E TYNDP 2016;
- has been prepared with a consultation covering a broader spectrum of aspects compared to the 2013 consultation¹¹ and including specific questions to facilitate stakeholders' participation and feedback¹² (although still subject to future improvements as discussed in the next Section of this Opinion);
- has been updated after the public consultation, for instance as regards “data references”¹³ and includes a short list of stakeholders' comments¹⁴ relevant for the draft SDR 2016 itself¹⁵ and the indication of the way in which they were taken into account by ENTSO-E;
- provides (and provided since the draft SDR 2016 version for consultation) a clear timeline for the overall TYNDP process¹⁶;
- includes a detailed description of the stakeholder engagement process and provides links to the ENTSO-E webpages¹⁷ where agenda, presentations and other meeting documents are publicly available;
- adds to the “2030-only” study horizon a mid-term study horizon at year 2020;

⁹ Draft ENTSO-E SDR 2016, p. 6: “A remaining key link will be the 2020 best estimate scenario, which is introduced as the mid-term horizon for TYNDP project assessments, and which is closely related to the bottom-up scenario B in SO&AF”.

¹⁰ <https://www.entsoe.eu/major-projects/ten-year-network-development-plan/long-term-network-development-stakeholder-group/Pages/default.aspx>

¹¹ The Agency noted in its Opinion no. 21/2014 on the draft ENTSO-E Scenario Outlook and Adequacy Forecast 2014 that the consultation on the TYNDP 2014-2030 Visions (19 July-20 Sept. 2013) dealt with the 2030 Visions data rather than with the four Visions approach.

http://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Opinions/Opinions/ACER%20Opinion%2021-2014.pdf

¹² Draft version for consultation of the ENTSO-E SDR 2016, dated 21 May 2015, p. 4.

¹³ Draft SDR 2016, p. 41.

¹⁴ Draft SDR 2016, pp. 47-48.

¹⁵ Other comments were relevant for the subsequent TYNDP or were considered by ENTSO-E for future reports.

¹⁶ Draft SDR 2016, p. 4.

¹⁷ Draft SDR 2016, p. 5.

- uses a single scenario for the mid-term study horizon (best estimate scenario called “expected progress”), allowing stakeholders easily to understand the meaningfulness of the mid-term results;
- aims at describing the methodologies (amendment of load profiles, re-sizing and reallocation of hydro generation, reallocation of RES, thermal optimisation)¹⁸ used to derive the so-called “top-down scenarios”, Vision 2 and Vision 4, from the bottom-up scenarios Vision 1 and Vision 3;
- includes a significant revision of the 2030 visions used for the 2014 TYNDP, in particular a downward correction for demand and RES in Vision 3 and Vision 4 compared to the corresponding Visions in the 2014 TYNDP, which were characterized by unrealistically high assumptions;
- includes, as an annex, some background tables displaying two scenario inputs (annual demand and installed generation capacities) and one output of market studies (annual generation) for each scenario of the draft SDR 2016;
- has been accompanied by the publication of market modelling datasets, which include the most relevant assumptions and data sources ENTSO-E used to build the five scenarios (4 Visions and the 2020 Best Estimate) to be used for the TYNDP 2016¹⁹, like demand values, generation capacity, interconnection capacities, fuel and CO2 prices. The Agency notes that while hourly demand values are available, hourly generation capacity values are still missing.

3. Remarks on the involvement of stakeholders

The Agency overall appreciates ENTSO-E’s efforts to engage with stakeholders during the preparation of the draft SDR 2016.

3.1 Scope of stakeholders’ consultation and transparency

The Agency notes, however, that the involvement of stakeholders does not cover some fundamental aspects of the process, such as the decision on the number of scenarios and the overall approach to be taken, including, for example, the opportunity to run sensitivity analysis and the possibilities to adopt probabilistic assessments.

Although some of the accepted stakeholder inputs for the draft SDR 2016 can be found in its “B. Annex”, a full list of inputs from stakeholders and how they have been taken into account by ENTSO-E seems missing.

¹⁸ In particular, Section 6 of the draft SDR 2016.

¹⁹

<https://www.entsoe.eu/Documents/TYNDP%20documents/TYNDP%202016/rgips/TYNDP2016%20market%20modelling%20data.xlsx>

The Agency also notes that the preparation process for scenario development for the electricity TYNDP 2018 already started, with appropriate cooperation between ENTSO-E and the European Network of Transmission System Operators for Gas (ENTSOG) and with an open consultation on the scenario building approach over multiple study horizons.

As already indicated in its letter to the ENTSOs regarding a consistent and interlinked electricity and gas market and network model²⁰, the Agency recommends a common document by the ENTSOs to describe the storylines and the rationale for the development of the various scenarios, especially the longer-term ones, to be used in the future TYNDPs.

The Agency recommends ENTSO-E to accompany the common document with a full list of comments and stakeholders' feedback as regards cross-sectoral and electricity-specific topics, and with ENTSO-E's evaluation and, where appropriate, implementation of the comments received.

3.2 On availability of scenario-related information and data to stakeholders

The Agency repeatedly affirmed that full transparency and availability of information and data to stakeholders is essential. In this respect, while observing that market-modelling datasets for the TYNDP 2016 are published, ENTSO-E seems not to have yet made available the network datasets for TYNDP 2016.

Therefore, the Agency calls on ENTSO-E to continue also for subsequent TYNDPs the good practice started by making available the network datasets used for the 2014 TYNDP²¹. Full transparency would also contribute to stakeholders' understanding and feedbacks for the development of future scenarios.

4. Remarks on Scenarios

4.1 Long term scenarios, "visions" and "axes"

The draft SDR 2016 contains four different scenarios ('Visions') for the year 2030. According to ENTSO-E²², *"the TYNDP 2030 Visions present contrasting scenarios that reflect similar boundary conditions and storylines for every country, and which differ enough from each other to capture a realistic range of possible future pathways. All result in different future challenges for the grids which a TYNDP grid endeavours to accommodate"*.

Furthermore, for ENTSO-E²³ *"it is important to note that the scenarios do not aspire to give a forecast of the future, nor is there any probability attached to any of the 2030 Visions. The Visions do not have the pretext to show what some would hope the future to be like, but rather give the full spectrum of what is considered realistic"*.

²⁰

http://www.acer.europa.eu/Official_documents/Other%20documents/ACER%20views%20on%20a%20consistent%20and%20interlinked%20electricity%20and%20gas%20market%20and%20network%20model.pdf

²¹ <https://www.entsoe.eu/publications/statistics/network-dataset/TYNDP-2014-input-datasets/Pages/default.aspx>

²² Draft SDR 2016, p. 4.

²³ Draft SDR 2016, p. 5.

ENTSO-E, in order to keep the number of long term Visions limited, worked around two main axes that limit the number of Visions to four.

The Agency reaffirms its recommendation²⁴ that, as there is no single theoretical and methodological framework for scenario-based analysis in the energy sector, ENTSO-E should also take into account possible alternative approaches to the four-vision approach and describe their advantages and drawbacks, so as to provide a better understanding of the selected approach.

As already noted in the Opinion No. 21/2014, a review from selected experts and a specific workshop with invited speakers would contribute to improving and making the future ENTSO-E methodology more robust.

The Agency considers that consistency is needed in scenario-building for electricity and gas infrastructure development. As consistency between electricity TYNDP 2016 and upcoming gas TYNDP seems improving but still limited²⁵, for the future scenario development activities, the Agency requests ENTSO-E to:

- align the timings of TYNDP scenario development processes between the electricity and gas sectors;
- increase the granularity of the study horizons: especially in the mid-term, ENTSO-E should adopt a study horizons around n+5 and n+10, to increase the accuracy of CBA assessments and achieve substantial alignment with Regulation (EU) No 347/2013;
- evaluate near-term uncertainties mainly by complementing a best-estimate scenario by sensitivity or probabilistic analyses;
- carry out a broader discussion on the inclusion of a so-called best-estimate scenario in all study horizons;
- adopt common input data sets, namely common fuel (coal, gas and oil) prices and carbon dioxide prices in electricity and gas TYNDPs, as well as compatible assumptions on prices in electricity and gas markets;
- consider using “fixed years” (2020, 2025, 2030, etc.) to enable comparison of assessments performed in subsequent years and reduce workload in performing analysis.

Irrespective of whether actual studies are performed by ENTSO-E, the latter should provide the scenario input data for the following years: 2020, 2025, 2030, 2035 and 2040. This will promote consistency and facilitate the comparison of national scenarios with the ENTSO-E scenarios.

Finally, ENTSO-E should better discuss how uncertainties could be tackled. For example, given that only one scenario is developed for 2020, some sensitivity analyses should be performed when assessing projects with respect to that year. ENTSO-E should provide, in the

²⁴ Agency’s Opinion no. 21/2014, p. 7.

²⁵ For a comparison of ENTSO-E and ENTSG scenario development approaches, see for instance the ENTSG presentation at 13 January 2016 TYNDP workshop (especially slide 19)

http://www.entsog.eu/public/uploads/files/publications/Events/2016/TYNDP036_160113_SJWS_1_Demand_Scenarios.pdf.

future Scenario Development Reports, some indications on the most important parameters for such sensitivity analyses, together with possible ranges for these parameters.

4.2 Approach for constructing “top-down” scenarios

ENTSO-E indicates²⁶ that “*top-down scenarios (2030 Visions 2 and 4) take a bottom-up scenario as starting point (resp. 2030 Vision 1 and 3), and adapt it step by step to simulate and analyse European governance and Member State coordination*”.

According to ENTSO-E²⁷, “*a key strength of the ENTSO-E scenarios is that it combines the views of national plans provided via TSO correspondents, the expertise and large variety of tools of dozens of market modelling experts, and the pan-European perspective via elaborate scenario development methodologies. Considering a quite close time horizon (max. 15 years) ENTSO-E scenarios are not developed as starting-from-scratch based on ideal optimizations, but are strongly linked with both national development plans and pan-European coordination*”.

Regarding optimisation models, ENTSO-E observes²⁸ that “*pure energy-models (such as the PRIMES model used in the EC trends) allow to look forward based on an optimization of all energy components, not purely electricity but also gas and oil which all interact. On the other hand power-based models (such as the ones used by ENTSO-E) are based on electricity market simulations which take into account full-year hourly based profiles of load and climate data, as well as grid constraints*”.

While the effort of ENTSO-E for an increased “top-down” nature of the scenarios compared to the 2014 TYNDP scenarios is welcomed, the Agency notes that some optimisations performed by ENTSO-E may raise doubts. For instance, ENTSO-E developed an optimisation strategy to perform a reallocation of RES (onshore wind, offshore wind, photovoltaic), with the objective to minimise the total system operation cost. In particular, it re-allocates the available RES among all ENTSO-E countries in the most economic and efficient way, taking into account market potential and limitations of a 2030 grid. Considering the number of assumptions and the limitations transparently described by ENTSO-E itself²⁹, the Agency observes that such an optimisation may be too ideal and perhaps not realistic.

In the future Scenario Development Reports, ENTSO-E should either accept a high level of “ideal optimisations” and use directly the available European Commission’s scenarios or really limit the number of optimisations and put a stronger focus on “bottom-up” scenarios.

²⁶ Draft SDR 2016, p. 36.

²⁷ Draft SDR 2016, p. 5.

²⁸ Draft SDR 2016, p. 7.

²⁹ ENTSO-E indicates that this methodology gives crucial insight in the benefit increase of step-by-step optimal re-allocations, which could be a role-model for policy initiatives on pan-European energy governance. The optimisation steers new RES investments across Europe based on efficiency (climate data) and substitution of energy production with high marginal costs. It is acknowledged that the present methodology has some specific limitations: no overall shift between technologies is considered (e.g. the total installed capacity of PV remains the same, and is not ‘traded’ for wind), the same installation cost per technology/MW/country is assumed and only one profile per technology per country is used.

4.3 Feasibility of Visions

In its Opinion No. 21/2014, the Agency suggested ENTSO-E to consider the possibility of adopting criteria in order to assess the scenarios, including the following:

- i. Adequacy of the generating capacity mix (e.g. using deterministic or probabilistic indicator);
- ii. Economic viability of generation, in terms of equivalent full-load hours (capacity factors) of conventional (at least) generating units;
- iii. Flexibility, so that the system is able to cope with intermittent RES;
- iv. Dependence on gas-fuelled generation.

The use of any criteria to check the viability of scenarios is not explicitly indicated in the draft SDR 2016. For adequacy, just qualitative descriptions are given (e.g. “limited” and “high” back-up capacity for 2030-Vision 1 and 2030-Vision 3).

The Agency considers that the economic viability of generation may also entail a feasibility check at national level: ENTSO-E could estimate the expected cost of new generation installations in each country over the TYNDP study horizon. Such estimates could be useful for policy-makers to assess the national feasibility of a potential generation development.

The Agency calls again on ENTSO-E to develop criteria to check the viability of scenarios.

The Agency also reaffirms its suggestion for the development of ‘technology datasheets’, in which the important expectations for the main technologies used in the scenarios would be registered (e.g. evolution of capital costs and efficiency factors for each relevant technology and equivalent full load hours for intermittent RES). Such assumptions might be used as a cross-check of the validity and quality of the scenarios.

Further, as suggested by a recent consultancy study³⁰, an important instrument to cross-check the validity and to increase the robustness of scenarios would be a broader cooperation with policymakers (European Commission, Member States, as well as NRAs and the Agency) in defining the scenarios. For instance, the scenarios developed by the European Commission and their consultants should be taken into due consideration³¹. As also noted in the consultancy study, this cooperative approach would allow for more consistency with policy directions and is likely to increase the transparency and acceptability of the scenarios among stakeholders.

³⁰ Exergia 2016: CBA methodologies for electricity transmission infrastructure and scenarios for energy and power system planning

<http://www.acer.europa.eu/Events/ACER-workshop-on-scenarios-and-cost-benefit-analysis-methodology-for-assessing-cross-border-infrastructure-projects/Documents/Final%20Report%20-%20CBA%20and%20scenarios.pdf>

³¹ European Commission, “EU Reference Scenario 2016 - Energy, transport and GHG emissions Trends to 2050”, July 2016. https://ec.europa.eu/energy/sites/ener/files/documents/REF2016_report_FINAL-web.pdf

4.4 On values of specific parameters: interconnection capacities

ENTSO-E indicates³² that “*the reference interconnection capacities assumed for the draft quantification of the scenario were derived from the TYNDP 2014. The ones used for the final quantification of the scenarios, presented in the draft SDR 2016, are based on the TYNDP 2016 list of projects*”.

The Agency notes that more information is necessary on how very important parameters, like the reference interconnection capacities, were derived.

ENTSO-E used the reference interconnection capacities to define the so-called “reference network” (which is indeed the reference market model) and to derive “base case” results for each scenario.

The Agency considers that the approach of assessing interconnection capacities based on the sum of capacity increase given by each proposed project may result in underestimations or overestimations of the economic profitability of the assessed projects, depending on the quantity of proposed projects. To limit this problem, the Agency suggests that ENTSO-E builds the reference market model by considering the minimum value between the target capacity³³ and the reference capacity at each boundary³⁴.

As described in ENTSO-E draft cost benefit analysis 2.0 methodology³⁵, a multiple Take Out One at a Time (TOOT) approach may be used at specific boundaries (either country borders or internal boundaries) to provide a better estimation of the benefits of each project. When multiple TOOT is used at a boundary, ENTSO-E should transparently provide the list of projects and their sequence, so as to allow stakeholders to understand how the benefit results were derived.

4.5 On values of specific parameters: RES penetration

ENTSO-E indicates³⁶ that “*the four 2030 Visions are on track with the recent set targets for 2030*” and that “*the percentage of the demand covered by RES spreads from 44% in Vision 1 to close to 60% for Visions 3 and 4*”.

³² Draft SDR 2016, p. 41.

³³ Following up to a recommendation from the Agency, ENTSO-E introduced the concept of target capacity in the 2014 TYNDP (“For every boundary, the target capacities correspond in essence to the capacity above which additional capacity development would not be profitable, i. e. the economic value derived from an additional capacity quantum cannot outweigh the corresponding costs”).

³⁴ For consistency purposed, a similar approach (with specific simplifying assumptions about the projects included in the reference network model) could be applied in network studies.

³⁵

https://www.entsoe.eu/Documents/TYNDP%20documents/Cost%20Benefit%20Analysis/160729_CBA%202%20draft%20for%20ACER%20opinion.pdf?Web=1

³⁶ Draft SDR 2016, p. 7.

The estimates for RES production to cope with the European policy targets defined by the Council in 2014 range from 43% to 47%³⁷. If this estimate is confirmed, one of the ENTSO-E 2030 scenario (Vision 1) would be in line with the EU targets, one (Vision 2) would be above the EU targets and two scenarios (Vision 3 and Vision 4) would be significantly above the EU targets.

The Agency considers that the current approach may determine unrealistically overestimated results for Visions 3 and 4, including in terms of infrastructure needs and projects, and recommends that ENTSO-E always uses a balanced range of assumptions for each parameter in the different scenarios (when possible, with “low”, “average” and “high” assumptions).

Done at Ljubljana on 4 October 2016.

For the Agency:



Alberto Pototschnig
Director

³⁷ Commission staff working document SWD(2014) 15 final, “Impact Assessment Accompanying the document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions A policy framework for climate and energy in the period from 2020 up to 2030” Brussels, 22 January 2014. http://ec.europa.eu/smart-regulation/impact/ia_carried_out/docs/ia_2014/swd_2014_0015_en.pdf



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