eurelectric
powering people

ENTSOs consultation TYNDP 2022 Scenarios

A Eurelectric response paper

November 2021

Eurelectric represents the interests of the electricity industry in Europe. Our work covers all major issues affecting our sector. Our members represent the electricity industry in over 30 European countries.

We cover the entire industry from electricity generation and markets to distribution networks and customer issues. We also have affiliates active on several other continents and business associates from a wide variety of sectors with a direct interest in the electricity industry.

We stand for

The vision of the European power sector is to enable and sustain:

- A vibrant competitive European economy, reliably powered by clean, carbon-neutral energy
- A smart, energy efficient and truly sustainable society for all citizens of Europe

We are committed to lead a cost-effective energy transition by:

investing in clean power generation and transition-enabling solutions, to reduce emissions and actively pursue efforts to become carbon-neutral well before mid-century, taking into account different starting points and commercial availability of key transition technologies;

transforming the energy system to make it more responsive, resilient and efficient. This includes increased use of renewable energy, digitalisation, demand side response and reinforcement of grids so they can function as platforms and enablers for customers, cities and communities;

accelerating the energy transition in other economic sectors by offering competitive electricity as a transformation tool for transport, heating and industry;

embedding sustainability in all parts of our value chain and take measures to support the transformation of existing assets towards a zero carbon society;

innovating to discover the cutting-edge business models and develop the breakthrough technologies that are indispensable to allow our industry to lead this transition.

Dépôt légal: D/2021/12.105/52

Authors:
Eurelectric TYNDP Drafting team

Contact:
Louise RULLAUD, Senior Advisor Distribution & Market Facilitation - Infrastructure & Flexibility Lead – lrullaud@eurelectric.org
Ronan HAAS, Advisor Wholesale Markets - Sector Integration Lead – rhaas@eurelectric.org

ENTSOs consultation - TYNDP 2022 Scenarios

A Eurelectric response paper November 2021

KEY MESSAGES/EXECUTIVE SUMMARY

- **The Ten-Year National Development Plan (TYNDP) is an important tool to support Europe's decarbonisation strategy**. Based on robust scenarios, the responsibility of ENTSO-E and ENTSOG is to identify future infrastructure needs in order to support an integrated & decarbonised energy system while ensuring security of supply. The TYNDP is also a relevant document to support the work of all the parties engaged in achieving our climate objectives.

- **Any scenario developed to shape Europe's future should be compliant with the EU's 2030 and 2050 targets**. We welcome that the Global Ambition (GA) and the Distributed Energy (DE) scenarios are built in line with the Paris Agreement. However, the National Trend (NT) scenario, based on the National Energy and Climate Plans (NECPs) is not meeting the long-term goal of the Paris agreement because its emissions trajectory exceeds any pathway for carbon neutrality by mid-century. Unless the NECPs are complemented with credible and effective policies, NT scenario should not be considered as the central policy scenario, guide the other scenarios nor be used to select the Project of Common Interest or planning purposes.

- **Transparency and inclusiveness are the key drivers of the TYNDP development.** These two values have been strengthened in the scenario building exercise for the 2022 edition. Eurelectric has noted more clarity on the way stakeholders are informed and consulted during the different stages of the TYNDP development, especially the scenarios building. We strongly encourage the ENTSOs to maintain high considerations to stakeholders' engagement, to keep strengthening it (e.g. by better involving DSOs, explicit treatment of energy storage, etc) and adapt it to the revised TEN-E Regulation.

- **Electrification is a direct, effective, and efficient way of reaching carbon neutrality.** The direct electricity demand projected by GA and DE scenarios (respectively 36% and 47%) remains low compared to the European Commission 2030 impact Assessment (from 46 to 50%). Eurelectric would welcome a more ambitious electrification rate in one of the scenarios with more applications using electricity directly (especially in the transport sector), underlying both energy and cost efficiency gains in close connection with consensus assumptions on technology costs and commodity prices.

- **The coupling of different energy carriers is now included in the TYNDP**. The impacts of sector coupling are better reflected in the modelling and the scenario results. However, the current approach (which is limited to electricity and hydrogen) is likely to undervalue the benefits of system integration that could be achieved with a more integrated and comprehensive view on the energy systems, esp. for achieving the decarbonisation targets in cost-efficient way for the consumers.

1 to 3. Identification questions

Not relevant

Stakeholder Engagement

4. Are you satisfied with the level of stakeholder engagement during the joint ENTSO-E & ENTSOG Scenario building process?

- ○ **Satisfied**
- ○ **No opinion**
- ○ **Unsatisfied**

If unsatisfied, please make suggestions how we can improve for the next process:

COMMENT:

Eurelectric welcomes the efforts made by ENTSO-E and ENTSOG (hereafter the ENTSOs) to ensure an inclusive and transparent TYNDP process. We are actively engaged to provide the power sector's view and contribute to the multiple consultation channels developed by the ENTSOs.

In line with their regulatory obligations, Eurelectric encourages the ENTSOs to maintain and strengthen the extensive consultation process involving all the relevant stakeholders, market players, national regulatory authorities and other public authorities.

Eurelectric welcomes the presentation by the ENTSOs of the draft scenario report during several informal bilateral meetings, ahead of its publication and during the consultation process. This approach improves the stakeholder's visibility on the procedure and its overall understanding. The public release of numerous data and different materials supporting the draft scenario Report is a also going into the right direction.

Going forward, Eurelectric supports the thorough revision of the governance for the elaboration of the TYNDP engaged in the ongoing revision of the TEN-E Regulation. This will ensure a coordinated, cost-effective and future-proofed approach to both electricity and gas infrastructure requirements and associated investments. It will also ensure that solutions proposed took advantage of synergies between sectors so as to ensure a resilient and economically optimal suite of possible solutions.

In particular, Eurelectric recommends the following:

- Maintain and continuously reinforce the direct involvement of the relevant stakeholders all over the process – i.e. drafting of the energy system wide cost benefit analysis (CBA), TYNDP scenario building but also for the infrastructure Gaps identification reports.
- With regards to DSOs 'involvement, and since integration of systems is not limited to the TSO level, there is a need for a greater role of DSOs in the TYNDP process. DSOs should be closely involved into the development of the TYNDP scenarios and in the selection of PCIs, starting from the scenario building exercise. DSOs have an overview on the sources connected to their grid (EV, DER, heat pumps) as well as technologies that will provide flexibility to the energy system (batteries, networks digitalisation, Demand Side Response, Power-to-gas and other...) DSOs can provide useful assumptions as regards peak demand and the impact of flexible demand.
- While allowing an extensive involvement of all relevant stakeholders throughout the entire TYNDP process, the ENTSOs should ensure consistency with existing processes

pertaining to DSO / TSO coordination existing at national level to avoid any duplication of work.

- Ensure a closer oversight from the European Commission and ACER to make certain that scenarios are based on electricity and gas demand forecasts which are compliant with the Paris Agreement, in close cooperation with the relevant stakeholders. The objective of the TYNDP scenario exercise is to provide bases for an efficient expansion of energy infrastructures. Therefore, we would support more visible cooperation with the Commission in the field of scenario building, ensuring all technical resources are targeted to climate objectives and are fully compatible with narratives defining likely outlooks for the EU.

5. Among the different engagement options, rank them in the order of your preference. Rank from 1 (most preferred) to 3 (least preferred).

Workshop & webinars	**1**	**2**	**3**
Consultations	**1**	**2**	**3**
Bilateral discussions	**1**	**2**	**3**

6. Are you satisfied with the format and the level of explanation that was provided at the Scenario Workshop

- **Yes**
- **Neutral**
- **No**

Please comment:

N/A

Clarity of reports

7. Are you satisfied with the format and the level of explanation provided in the TYNDP 2022 Draft Scenario Building Report?

- **Satisfied**
- **No opinion**
- **Unsatisfied**

COMMENT:

With regards the format:

Eurelectric has noticed worthwhile improvements in the 2022 draft scenario building report compared to the previous version. The quality of the documents prepared by the ENTSOs stresses the efforts made to provide a balance between summarising the in-depth analysis of possible forecasts and the communication of clear messages. However, to make it even more user-friendly, we would like to share the following considerations:

- We are missing explicit cross references between the numerous documents to get a comprehensive overview when deep diving into one of the aspects raised in the report. This impacts on the overall understanding of the reports as it requires the reader to navigates between multiple deliverables (excel, visualization platform, guideline, main report).
- We suggest that it would be better to centralise more information directly on the visualization platform including all the graphs/figures from the report and guidelines.

- We also suggest wider description of basic market changes in the energy sector, including flows of energy from distributed energy sources (bottom-up) and resulting from this increased role and new tasks of DSOs.
- A Balance worksheet resembling the ones from PRIMES scenarios would be of help.
- Since most of the questions from the present consultation are related to specific points of the scenarios, we would welcome to bring together all relevant information from the multiple deliverables (figures, graphs, explanations) in a unique document to facilitate stakeholders' work.

With regards the level of explanation for the scenario results:
The report contains many high-level elements on energy demand (electricity, methane, hydrogen) and on energy supply (electricity, gases, biomass, imports), but very few pieces of information on infrastructure (electricity, gas, hydrogen; transmission, distribution) whose development is inevitably linked under different modalities to the different scenarios, with also very different cost implications.
Visibility on infrastructures (existing and new) is nevertheless essential to get a view on the actual feasibility of the scenarios, their cost implications, and of the underlying infrastructure constraints (if any), especially in the scope of different scenarios set to test the resilience of the existing infrastructure.
We would like to stress that market-driven activities are not in the scope of ENTSOs and that any assumptions of additional investments should not only be supported by a (political) vision, but also by appropriate investment frameworks (which would allow the required investment to be realised concretely).
For instance, it could be interesting to understand how the conclusions could be impacted by any evolution of the bidding zones considered for the power sector (see Fig 3. jn the scenario building guidelines report) or whether/where structural congestions could stay/materialize/evolve.

With regards the level of explanation for the electricity cost:
The report is only reporting on a weighted average of marginal prices of electricity. Usually, the marginal cost of energy is used when assessing the savings in energy costs made as fixed costs associated will not change with kWh volumes. But the fixed cost must be paid and represent the investment costs in network infrastructure and plant. Therefore, it would be interesting to explain in some details why this aggregated result should not be compared with real market data (simplified model compared to model used for market coupling, existence of different price zones, etc.) and which are the selection criteria for the technology cost and commodity price assumptions.
As a matter of fact, the energy cost component in the electricity bill only represents on average about one third of the electricity bill for households throughout Europe. Clearly, this section gives a wrong message about the overall cost of the energy transition. It does not give a view on the other costs components beyond the commodity (networks tariffs at transmission and distribution levels, support mechanisms, etc.). Yet, the TYNDP exercise aims at identifying infrastructure gaps and the related network investments required. Incidentally, we would like to stress that grid operators are the best place to provide estimates on the network cost component and that the absence of such an element is therefore really surprising.
Instead of reporting an approximative proxy of the cost of electricity, it would have been more interesting to report the energy system costs as a whole, split according to e.g. the value chains (generation/production, networks (transmission/distribution), additional support, taxes…; both for electricity and gases). For the credibility of the modelling exercise, it would be very welcome to see a close relation between energy mixes, technology cost, commodity prices and obviously infrastructures, beyond the scenario narratives.

With regards the level of explanation for the benchmarking:
The exercise is not really detailed. Beyond the charts, the text provided is merely descriptive, but it does not discuss the fundamentals behind the differences.
There is no benchmarking provided on infrastructures (electricity, gases).

8. Are you satisfied with the format and the level of information provided in the TYNDP 2022 Scenario Building Guideline?

- (●) **Satisfied**
- ( ) **No opinion**
- ( ) **Unsatisfied**

COMMENT:

Eurelectric welcomes the publication of a Scenario Building Guidelines Report alongside the main report. The document provides additional background materials and contextual aspects to better understand the aggregated figures provided in the Scenario Report. It also better reflects the interactions of the power sector with other selected applications (electrolysis, prosumers, electric vehicles, district heating). Overall, it is a good summary at an advanced level for non-technical experts in modelling. In addition, we welcome that ENTSOs provides a clear explanation on how they have considered stakeholders' input to draft the scenario report (cf. the paragraph 1.3 "Summarizing the improvements").

We also gladly received the improvement compared to the methodology report provided in TYNDP 2020.

Although the report is a high-level description of the scenarios and their methodologies, we believe there is still room for improvements:

- While we welcome that ENTSOs have added an appendix dedicated to the investment costs for the various technologies, Eurelectric is still missing more details such as methodology for data aggregation.
- The value selection for technology costs and commodity prices across time requires further justification that a certain flexible link with scenario narratives.
- There is no evaluation on perspective needs of ancillary services in the future, being critical services to the operation of the electric grid this should be included, maybe with studies detailing the prospective growth of the different services and which technologies are expected to fulfill this demand.
- A comprehensive aggregated analysis on overall cost and investments breakdown of the proposed scenarios for the entire energy system would help to better understand cost-efficiency and economic implication of the scenarios proposed.
- The definition of certain specifics, for example the "market configurations" for hydrogen seem excessively elaborated while finally addressed through arbitrary criteria; in such cases more simple and transparent criteria (open perhaps to probability) may carry certain value.
- Additional work is still needed to catch the exact benefits of energy system integration for the consumers. What would be the sensitivity of the analysis to some parameters chosen (e.g. activation prices for vehicle-to-grid)? Which discount factor is used in the capacity expansion model (i.e. how is the increasing uncertainty weighted in the objective function)?

One should also make it clearer that modelling results are necessarily a simplification of reality. The complexities of some policies can only be captured in a stylised manner in modelling.
In particular, scenarios illustrate different pathways based on certain predefined assumptions fixed at some point in time, but which are inherently subject to changes (e.g. evolution in energy

policies related to COP, actual investments/divestments by market players, etc.). Finally, scenarios results do not prescribe that the required levels could be achieved by Member States or by market players. Regarding Member States, the final outcome of the negotiations over the Commission's proposals (Fit for 55 package, upcoming H2 and gas market decarbonization package, etc.), transposition of directives and the governance process will likely lead to different results/achievements.

9. Are you satisfied with the format and the level of information provided in the Visualisation Platform/Data set ?

- ○ **Satisfied**
- ○ **No opinion**
- ● **Unsatisfied**

COMMENT:

The publication of the Visualisation Platform and the corresponding data is a good step towards more clarity and transparency.

This first attempt provides an interesting conceptual tool, which should be further promoted and upgraded in the future.

Going forward, it would be highly relevant to dig more into the details. For instance:

- Provide more information on demand and the impact of flexible demand. This could be done via detailed data sets in xls. format provided especially for demand, generation, cross border capacities, etc. A visualisation by sector for (electricity) demand as well as further details on the assumptions (e.g. number of EVs, heat pumps for example) would also have been appreciated. Moreover, information on the electricity demand for electrolysis should be added.
- Clarify whether figures are at transmission level with embedded generation already offset, or otherwise.
- Provide sources for the figures indicated in the graphs as this is currently missing.
- Provide additional information on costs - especially regarding decarbonised gases, CCS/CCU and biomethane and the initial impact in infrastructures deployment/repurposing.

Eurelectric also identifies some limitations in the tool:

- Only KPIs selected by ENTSO-E are outlined;
- There is no possibility to change the type of chart (e.g. from percentages/relative scale to numbers/absolute scale);
- No possibility as well to add other scenarios/benchmarks;

We would recommend to centralise any figures/graphs, provided in the report and its guidelines, also in the Visualisation platform. Hence it will help the user to get all data centralised in one point in a user-friendly way.

European Targets and Storylines

10. Do you agree that the ENTSO-E and ENTSOG's joint scenarios should be built to be compliant with the EU -2030 and 2050 targets as a minimum standard?

- (●) **Yes**
- ( ) **Neutral**
- ( ) **No**

If no, please comment why

COMMENT:

No comment.

11. ENTSO-E and ENTSOG introduced National Trends as the central policy scenario. National Trends is aligned with national energy and climate policies and strategies as stated at the end of 2020. Do you agree that member state energy and climate policies should be used to develop National Trends?

- (●) **Yes**
- ( ) **Neutral**
- ( ) **No**

If no, please comment why

COMMENT:

Over the last years, Eurelectric has been advocating for ambitious and coherent NECPs to ensure that EU reaches its 2030 targets. This will provide more certainty to investors across sectors and ensure consistent reporting under the United Nations Framework Convention on Climate Change.
The NECPs can be a strong basis for ENTSOs scenarios but only if the key elements are adequately
defined and reflected in the final plans. However, the current versions of NECPs are not complete nor sufficiently robust. Indeed, the forecasts lack sufficient level of information regarding cost analysis, policies needed to ensure their implementation and hurdles to be cleared. Indeed, the downside of using the NECPs is that when focusing too much on "declared political ambitions", one could lose sight of reality (ambitions are important, actions and policies even more, without the latter, the ambitions will not materialize (fully) and the scenarios could become disconnected from reality). In addition, successful "breakthrough" innovations can drive investments in certain technologies, such events are hard to predict and can also increase the disconnection between ambitions and realisation. All the above means that building such scenario with minimum quality and transparency standards is very challenging.

To be effective, the NECPs should come with credible and effective policies, this will provide confidence to investors that the regulatory framework is fit for purpose and to deliver the needed investments, and flexible capacity in particular. Overall, we welcome that the Global Ambition and the Distributed Energy scenarios are built in line with the Paris Agreement, also here, sufficiently ambitious actions and policies will be required to be in line with such scenarios.

If not, then unfortunately the NECPs do not meet this ambition, any NT scenario based on them would then devolve to 'Business as usual' alternative Scenario. In that case, National Trends should not be considered as the central policy scenario to guide other scenarios, as it misses the 2030 decarbonization target agreed in the EU Climate Law.

12. Scenario diversity is essential when it comes to the assessment of future gas and electricity infrastructure needs. In your opinion, do the 3 scenarios cover a broad enough range of plausible pathways aiming to achieve 2050 EU-27 targets?

- ○ **Yes**
- ○ **Neutral**
- ○ **No**

If no, please comment why

COMMENT:

Eurelectric agrees with the necessity to develop diverse scenarios for the development of the TYNDP. Looking at the TYNDP 2022 draft scenario Report – apart from the National Trends scenarios – there are only two scenarios available over the long-term (2030/2040/2050), not three.

These two scenarios are rather extreme/opposite ones (polarized), either decentralized or centralized development of the energy system, covering a wide range of possible pathways for the decarbonisation process. Therefore, it is not easy to predict whether which one might materialise in Europe and may subsequently lack coherence and comprehensive range of pathways towards 2030 and 2050 targets.

Thus, it could be interesting to:

- quantify a more balanced scenario ("a mix" of the extreme ones) to get a more probable picture of the future.
- Adequately insert DSOs in the methodology while their role is not adequately re-transcripted (based on the evolution of the market and the decentralization of the energy sources).
- Provide a two-ways sensitivity analysis (more pessimistic / more optimistic). The variations of electrification and demand should, theoretically, affect the primary energy supply scenarios, and maybe some variations on the technologies providing the energy needed (4.2.1 of the report).
- Include some additional diversity in solar generation development where the solar capacity difference between DE and GA is quite small.
- More diversity would as well be needed in the domestic (EU) production of synthetic methane instead of imports, as onshore wind resources especially in the Nordic countries could be used for profitable production of synthetic fuels.
- More demand response (both downward and upward) in Distributed Energy.

Paris Targets and Decarbonisation

13. The COP21 Paris Agreement and IPCC Special Report 1.5°C provide evidence on the need for a carbon budget in the global effort to tackle climate change. ENTSO-E and ENTSOG compare the carbon budget resulting from the scenarios to benchmarks based on equity and population. Do you agree that these benchmarks are appropriate?

- ◉ **Yes**
- ○ **Neutral**
- ○ **No**

If no, please comment why

COMMENT:

N/A

14. The Distributed Energy and Global Ambition scenarios aim at achieving a carbon-neutral EU-27 economy by 2050. Do you think the scenarios are helpful in identifying / assessing those challenges?

- ◉ **Yes**
- ○ **Neutral**
- ○ **No**

If no, please comment why

COMMENT:

The DA and GA scenarios miss some targets needed to achieve the Fit for 55 ambitions, for example the level of energy efficiency is significantly low if compared to PRIMES policy scenarios linked to the 2030 target plan and the Fit for 55.

The DE and GA scenarios are indeed elaborated in line with the ambition enshrined in the Paris Agreement and in the EU Green Deal and Climate Law. The finalisation of the Fit-for-55 & the Gas decarbonisation Packages, and their transposition in national Law shall define the specific tools and policies to make the EU ambition a reality. Until then, we can argue that the DE and GA scenarios represent, by definition, two extreme and not very realistic scenarios, because built on extreme assumptions. In particular, DE scenario, which builds upon a very decentralised production and consumption patterns, requires the realization of millions of investment/consumption choices at decentralised level and might therefore be very difficult to achieved in practice.

More generally, the uncertainty about the maturity of investment options in any of the two scenarios creates uncertainty which has to be reflected in some variants to both scenarios.
For instance, there could be a third central scenario (like the MIX from the EU Commission Impact Assessment), in order to capture the fact that most probably the energy transition will feature a balanced mix of decentralised and centralised technologies with for example, a narrative more biased to electrification solutions but still open to market signals and energy imports; if compatible with cost/prices outlook may provide a workable base for future infrastructure analysis.
Furthermore, even though the genuine purpose of TYNDP scenarios is not to deal with adequacy and cost for consumers, we observe that those two dimensions are key in influencing the realisation of the scenarios.

15. ENTSO-E and ENTSOG use a total energy model to capture the impact of sector coupling between energy carriers. Modeling of sector coupling has been expanded in the Draft Scenario Report 2022. Do you agree that the ENTSO-E and ENTSOG's approach identifies the potential benefits and challenges of sector coupling?

- ○ **Yes**
- ○ **Neutral**
- ◉ **No**

If no, please comment why

COMMENT:

Using a total energy model to capture the impacts of sector coupling between energy carriers is a good approach as such. However, the development of energy scenarios and their quantification should be more integrated:

- Today, even if the TYNDP scenarios are common to ENTSO-E and ENTSO-G, part of the quantifications and modelisation computing seem to be still performed separately by ENTSO-E and ENTSO-G, with limited interactions and, at the end, favoring certain energy carriers over the other at the expense of reduced direct electrification in the approach followed for sector coupling. The 2030 Climate Target Plan impact assessment by the European Commission, policy scenarios in support of Increased Climate Ambition foresee a direct electrification share of the final demand ranging 46-50% by 2050. Even if the DE scenario is reaching the low ranges of the EC's scenarios with 47% direct electricity demand share, GA scenario falls too low with only 36% by 2050.The Modeling approach of sector coupling consider expansion model for both electricity and hydrogen systems. However, the future development of the methane system is not included. The residual demand for methane (shifting progressively from natural gas to biomethane and synthetic methane) should be taken into account in the modeling exercise and become the result of the interaction of market and technology, in opposition of a narrative driven outcome. For instance, Eurelectric estimates that methane gas will still represent 15% of total installed capacities and 5 % of yearly electricity volumes by 2050, to ensure system stability in regions with a limited access to RES, nuclear or hydro.
- The current approach (which is still limited in terms of interactions between energy carriers – electricity, gases, heat…) is likely to undervalue the benefits of system integration that could be achieved with a more integrated and comprehensive view on the energy systems, esp. for achieving the decarbonization targets in cost-efficient way for the consumers (residentials and industrials). For instance, power-to-gas and gas-to-power flows should be better described and highlighted, notably when it comes for 2-week cold snaps, extreme daily peaks and "kalte Dünkelflaute" scenarios modelling. Such scenarios are instrumental not only to assess the supply/demand balance of each system but also for identification of both adequacy issues or network congestion constraints (for which infrastructure investments needs may be identified).

16. ENTSO-E and ENTSOG scenarios use external data on LULUCF (Land Use, Land Use Change, and Forestry) to provide input to the scenarios on carbon sinks. The scenarios also consider the development of net negative emission technologies. Do you agree that including external LULUCF and net-negative emission technologies within the scenario is appropriate?

- ○ **Yes**
- ○ **Neutral**
- ○ **No**

If no, please comment why

COMMENT:

We do not oppose their inclusion because, in principle, LULUCF and net negative emissions are also drivers of the effort to reach climate neutrality and can reduce the need for other decarbonization technologies. However, there should be an expectation of economic viability if they are indeed considered. Further details on forecasts and cost references are needed.

Their best estimate should be adequately taken into account, and this could well be from external sources, provided that data reflects the most accurate and up-to-date view. In this case

data seem however not to be the most up to date (Long-Term Strategy of the European Commission 2018).

17. Based on feedback from the TYNDP 2022 Storyline Report, ENTSO-E and ENTSOG's scenarios consider different levels of deployment of Carbon Capture and Sequestration (CCS) for pre- and post-combustive processes. Do you agree that the CCS assumptions in the different scenarios sufficiently capture the storylines?

- ○ **Yes**
- ○ **Neutral**
- ○ **No**

If no, please comment why

COMMENT:

We take note that DE scenario considers a minimum CCS assumption, while the GA scenario envisages a significant role for CCS (761 MtCO2 removals), way beyond any other relevant scenario from the Commission scenarios, to offset the remaining residual emissions. In our view, GA scenario could overestimate the actual potential of CCS and net-negative technologies which feasibility at commercial size remains to be tuned and proven. CCS and net-negative emission technologies should be treated with caution when incorporated into long-term decarbonization scenarios exercises. Such assumptions, and in both scenarios, can have significant impact on the global results and on the contribution of other technologies that could be required to reach carbon neutrality in 2050 in absence of such intensive use of CCS.

In the finalisation of the assumptions regarding CCS, we encourage the ENTSOs to consider the following elements:

- The EC's 2030 Climate Target Plan impact assessment does not see significant deployment by 2030 of CCS for power generation in any of the scenarios considered during this time period. By 2030, the European Commission would rather see the necessity to look at all innovative low-carbon and carbon neutral technologies to turn industry carbon neutral, such as CCS or hydrogen-based steel
- For Eurelectric, the total CO2 abated through CCS should represent less than 200 Mt by 2050, which is in line with the EC's scenarios. Indeed, 4 - 6% of electricity will be supplied by emitting sources by 2045. Therefore, emissions will need to be offset by CCS/CCU or other CO2 offset technologies in order to reach 100% decarbonisation. CCS can be a solution to abate emissions from centralized fossil generation that is operating at sufficient utilization to justify the high upfront costs required for these installations. Moreover, we see additional use of CCS for industrial processes. While CCS is still an expensive technology, there are potential synergies in technology development and scale advantages as it is also likely to be needed for other sectors where no other solution is feasible (e.g. abating process emissions in cement production)

18. The Distributed Energy and Global Ambition scenarios consider different technology pathways to decarbonisation. The Distributed Energy is a scenario focusing on higher RES development and aiming at EU energy autonomy. The Global Ambition scenario focuses on the development of a global clean energy economy with low-carbon technologies and large-scale RES development. Do you agree that these scenarios are consistent with the assumptions made in the Storyline Report?

- [ ] Yes
- [ ] Neutral
- [ ] No

If no, please comment why

COMMENT:

As already stated, both scenarios GA and DE appear polarised and uncertain to materialise (especially DE, which requires coordination and realisation of millions of investment/consumption choices). In some cases, the results of two scenarios are very similar and shouldn't be expected to capture the risk of divergent outcomes. In practice, this might give a wrong impression about the decarbonisation pathways to users of the scenarios, possibly leading to some form of technologic lock-in or neglecting the impact of alternative solutions. Therefore, there is the need for one or more additional scenarios, more balanced, to capture uncertainty and risk.

Demand & Supply Ranges

19. Biomass: As outlined in the Storyline Report in April 2021, the biomass assumptions for the Distributed Energy and Global Ambition scenarios were based on the EC Impact Assessment scenarios. Do you agree that these scenarios are consistent with the assumptions made in the Storyline Report?

- [ ] Yes
- [ ] Neutral
- [ ] No

If no, please comment why

COMMENT:

Eurelectric notes a significant increasing share of biomass (especially of biomethane) in both scenarios in the primary energy supply (point 4.2.1), which is not clearly explained in the point 4.2.2 (especially which countries consider this usage in their NEPC or how they reached this scenario).

Eurelectric has reasonable concerns regarding the relevant role of biomass – especially the role of biomethane) in both the DE and GA scenarios from TYNDP 2022 draft Scenarios which is not sufficiently justified in the report. Hence, Eurelectric recommends providing more information explaining the figures for biomass/biomethane in the coming decades but also on the technology required to scale it up and the expected costs making the outcome feasible at the referred time horizons.

20. BEV and FCEV: The Storyline Report outlined ranges for the development of battery electric vehicles and fuel cell electric vehicles based on stakeholder consultation feedback. Do you agree that these scenarios are consistent with the assumptions made in the Storyline Report?

- [ ] Yes
- [ ] Neutral
- [ ] No

If no, please comment why

COMMENT:

Eurelectric notes a significant increasing share for the development of Fuel Cell Electric Vehicles (FECVs) by 2050 in both scenarios for passenger cars and heavy duty.
We do not agree with this assumption on FECVs. First of all, Eurelectric believes that a high share of FCEV in passenger car fleet, in particular referring to Global Ambition scenario, limits the potential of decarbonization and energy efficiency in the transport sector.
Moreover, given the discontinuation of some early FCEV models in the passenger car segment, Eurelectric does not expect a high FCEV scenario to be realistic in 2030 to say the least. At the same time, several truck manufacturers have already addressed to focus only on BEV. The development is limited by the lower efficiency of FECV and the expected progress in technology and cost vs. EV.
This element has been also confirmed by several automotive CEOs when describing their company's plans for the coming decade. Additionally, a 'path dependency' effect will affect the adaptation of Fuel Cells for Passenger cars as opposed to Hybrid/Battery Electric vehicles. It is foreseen that EV Charging stations will be plentiful by 2030 so that the economics of then competing against such a network with Fuel Cells requiring Hydrogen will be increasingly difficult. For instance, customers of EV can expect to charge easily their passenger vehicles at home.

FCEV would have relevance in the heavy-duty segment in case the FCEV can actually respond to technical and cost challenges set on them by EV. In particular, it seems unlikely that battery systems will be economic in powering trucks given the high weight of battery required for long distance heavy trucks. In these cases, the higher power density afforded by FCEV and Hydrogen will be much more feasible if the practical challenges of this technology could be fixed to make it operational.

21. Heat Pumps: The Storyline Report defined ranges for the share of electric and hybrid heat pumps in 2030 and 2050 based on stakeholder consultation feedback. Do you agree that these scenarios are consistent with the assumptions made in the Storyline Report?

- ○ **Yes**
- ○ **Neutral**
- ○ **No**

If no, please comment why

COMMENT:

Eurelectric notes that DE scenario provides a very ambitious development for electric heat pump while GA rather gives a strong emphasis for the development of hybrid heat pump (twice the figures forecasted in DE scenario in terms of market shares).

In this regard, Eurelectric would rather support DE scenario, compatible with a higher degree of electrification, because it gives a predominant role for proven efficient paths to efficient Cooling and Heating solutions through electric heat pumps, which is overall aligned with Eurelectric scenarios and the objective of carbon neutrality by 2050.

A key element for discussing the shares of electric and of hybrid heat pumps is related to the impact that each technology could have on the demand figures, esp. during stress events (contribution to peak load). As pointed out in the scenario report, one should pay attention that technologies having an impact during stress events or cold snaps could have in turn implications

on security of supply and on the cost for consumers, making assumptions on hybrid heat pumps a key parameter for scenario design.

Another important element to consider in the analysis is the overall cost linked to the installation of heat pumps such as the renovation cost of the building. Energy efficiency goes hand in hand with an efficient heating system to avoid energy losses. Installing heat pumps in building with poor energy performance would have a detrimental impact on the energy system costs (cf. impact on demands, both for peak figures and for yearly figures).

22. District Heating: The Storyline Report defined ranges for the share of district heating in 2030 and 2050 based on stakeholder consultation feedback. Do you agree that these scenarios are consistent with the assumptions made in the Storyline Report?

- ○ **Yes**
- ○ **Neutral**
- ○ **No**

If no, please comment why

COMMENT:

Eurelectric notes an overall increase of the market shares for district heating in both scenarios. However, DE Scenario has a stronger focus on this technology compare to GA Scenario.

In Eurelectric study "Decarbonisation Pathways", district heating is part of the "alternatives". Thus, the market share of district heating is maximum 20% in the case of residential buildings and 10% for commercial buildings. District heating is an efficient way of flexible utilisation of different sources of waste and ambient heat through heat pumps. District heating also enables utilisation of excess renewable electricity through power-to-heat installations, when combined with heat accumulators. District heating should solely be based on renewable and recovery energy by 2050 alongside a fossil fuel phase-out.
As mentioned in the previous question, another important element to consider is the overall cost linked to the installation of heat pumps such as the renovation cost of the building. Energy efficiency goes hand in hand with an efficient heating system to avoid energy losses.

23. Wind Energy: The Storyline Report defined ranges for the share of wind energy in 2030 and 2050 based on stakeholder consultation feedback. Do you agree that these scenarios are consistent with the assumptions made in the Storyline Report?

- ○ **Yes**
- ○ **Neutral**
- ○ **No**

If no, please comment why

COMMENT:

First of all, Eurelectric welcomes that ENTSOE has provided a clear distinction between onshore and offshore wind generation/capacity in its scenarios.

However, Eurelectric has identified some discrepancies between the figures provided on wind capacity in the Visualisation Platform on one hand and the Excel files on the other hand.

When looking at the figures from the Visualisation Platform, we note that DE scenario foresees a total capacity for wind by 2050 of 1 727, 452 GW (onshore: 1 296, 478 GW /offshore : 430, 974

GW) while GA scenario foresees a less ambitious evolution by 2050 with a total wind capacity of 1 377, 559 GW (including onshore: 828, 117 GW/Offshore : 549, 452 GW). At a first glance, the figures provided in the GA seem to be more aligned with Eurelectric forecasts as laid down in its most ambitious scenario in the "Decarbonisation Pathways ' (total wind capacity of 1.110 GW by 2045 (643 GW for wind onshore and 467 GW for wind offshore).

But as a general comment, the power system resulting from TYNDP's assumptions is featured by a very high penetration of RES in both scenarios (over 65% in 2030 and even over 90% in 2050). While we fully support to the largest possible extent the integration of renewable energy sources to reach the objectives of the Green Deal, we wonder whether the following elements have been considered and are properly reflected in both scenarios with regards the evolution of wind generation:

- the potential for cost reduction over time for the wind power industry which may scale up this technology.
- Permitting procedures which are currently too lengthy and hampering the deployment of new power generation capacity and electric grids.
- The need to get an adequate grid expansion, both at transmission and distribution levels, which raises challenges from a cost and time perspective.
- The impact on the adequacy of the electricity system, considering the low levels of baseload and dispatchable generation (e.g. nuclear around 10% of generation in 2030 and between 1% and 5% generation in 2050, while gas represents 15% in 2030 and 5% in 2050)
- The role of hybrid offshore.

24. Solar/PV: The Storyline Report defined ranges for the share of solar/PV energy in 2030 and 2050 based on stakeholder consultation feedback. Do you agree that these scenarios are consistent with the assumptions made in the Storyline Report?

- ○ **Yes**
- ○ **Neutral**
- ○ **No**

If no, please comment why

COMMENT:

Eurelectric notes that the difference between the two scenarios with regards solar capacity is very small. For instance, by 2030, the solar capacity for GA is 445 278 MW while for DE the solar capacity is 450 330 MW.

As stressed in our reply to question 23, the power system resulting from TYNDP's assumptions is featured by a very high penetration of RES in both scenarios (over 65% in 2030 and even over 90% in 2050).
While we fully support to the largest possible extent the integration of renewable energy sources to reach the Objectives of the Green Deal, we wonder whether the following elements have been considered and are properly reflected in both scenarios with regards the evolution of wind generation:

- the potential for cost reduction over time for the solar power industry which may scale up this technology.
- Permitting procedures which are currently too lengthy and hampering the deployment of new power generation capacity and electric grids.

- The need to get an adequate grid expansion which raises challenges from a cost and time perspective.
- The impact on the adequacy of the electricity system, considering the low levels of baseload and dispatchable generation

25. Nuclear: The Storyline Report defined ranges for the share of nuclear in 2030 and 2050 based on stakeholder consultation feedback. Do you agree that these scenarios are consistent with the assumptions made in the Storyline Report ?

- **Yes**
- **Neutral**
- **No**

If no, please comment why

COMMENT:

Eurelectric welcomes TYNDP 2022 draft scenario report recognizes the role of nuclear as a non-emitting baseload provider and a support to the entire system reliability. However, both GA and DE scenarios foresee a declining nuclear capacity in Europe between 2030 and 2050 (from 97 to 86 GW in GA scenario and from 77 to 19 GW in DE scenario) whereas Eurelectric deep decarbonization scenario projects an increasing capacity (from 104 GW in 2030 to 121 GW in 2050).

Moreover, we would like to add that:

- The storyline on nuclear should integrate more consideration regarding the permitting procedure for the development of nuclear power plants as well as their location.
- when comparing capacity and generation in each scenario on the draft Report, the resulting average running hours appear very low in both DE and GA scenarios (around 5.300 hours in 2030, around 3.700 hours in 2050). Such values appear unrealistic given the typical baseload functioning of nuclear technology and the low level of dispatchable generation estimated in the TYNDP scenarios.

26. Energy Imports: The Storyline Report defined ranges for the share of energy imports in 2030 and 2050 based on stakeholder consultation feedback. Do you agree that these scenarios are consistent with the assumptions made in the Storyline Report?

- **Yes**
- **Neutral**
- **No**

If no, please comment why

COMMENT:

Eurelectric welcomes the assumption made by all the scenarios of a decreasing dependency of the EU towards energy imports. According to the draft scenario report, imports will represent from 10% of primary energy demand (DE scenario) to 25 % (GA scenario).

However, careful consideration should be given to the ability of third countries to supply large quantities of renewable and low-carbon power and gas to the EU, especially during stress events / scarcity periods. For instance:

- The storylines and the scenarios need to include elements, not only on the cost and technology sides, as above mentioned, but also on the ability of third countries to certify the renewable and low-carbon features of the commodity exported to the EU, respecting the same environmental, efficiency and emissions standards applicable to the EU
- We would welcome additional elements regarding renewable and low-carbon gas imports, especially the implications on existing and new infrastructures needed and the use of similar certification standards than applied within EU.

27. Hydrogen: The Storyline Report gave an outlook of hydrogen sources available for each scenario. Do you agree that the hydrogen supply in these scenarios is consistent with the assumptions made in the Storyline Report?

Yes
Neutral
No

If no, please comment why

COMMENT:

According to the final storyline report, in the GA scenario, hydrogen comes from a wider range of renewable and low-carbon sources being European as well as imports. However, in the draft scenario report, we note that:

- in the GA scenario, the volumes of low carbon and renewable hydrogen imports are exactly the same : 247 TWh in 2040 and 468 TWh in 2050 (Figure 28). However, the starting point in 2030 isn't the same. It is surprising to see the exact same volumes for both renewable and low-carbon imported hydrogen in 2040 and 2050.
- According to the reports, hydrogen will be used in a wider range of sectors to better mitigate the challenge of deep electrification. Eurelectric disagree with a deeper and broader use of H2 beyond the hard to electrify sectors - i.e certain industrial sectors (e.g. steel, cement, chemicals) or selected heavy duty or long-distance transport segments. For the other sectors, we do not believe in the use of hydrogen due to its lack of energy and cost efficiency compared to direct electrification. In any case, the discussions on the future of hydrogen is inevitably linked to the kind of deployment of its market and the infrastructure allowing it. We would like to find more transparency on these two elements across the scenario descriptions.
- In DE scenario, hydrogen is mainly produced by electrolysis with electricity produced by European wind and solar capacity – complemented with a limited amount of SMR - andused in the hard to electrify sectors. We believe that this scenario is more credible and aligned with both the Commission's targets (H2 Strategy) and the industry application already engaged or foreseen.

Looking at both scenarios from a broad perspective:

- We note the total absence of unabated hydrogen produced from SMR (grey hydrogen), which is a very positive aspect (though with a feasibility to be proven in practice), fully aligned with the EC Hydrogen Strategy.
- The overall demand for hydrogen projected by the scenarios seems very ambitious. For instance, GA and DE scenarios see respectively 747 and 819 TWh, whereas Eurelectric's most ambitious decarbonization scenario sees 389 TWh. For Transport, it is respectively 780 and 563 TWh, but only 88 TWh in Eurelectric's decarbonization Study. For Residential

and Tertiary, 451 TWh (GA) and 140 TWh (DE) are projected, against 72 for Eurelectric's Decarbonization Study.

However, other sources of decarbonized gases such as synthetic e-methane seem to be considered as marginal both in GA and DE scenarios (lower than all scenarios of the EU Commission Impact Assessment). We believe that at least one scenario should consider the role of synthetic gases, which could help provide firmness to the electricity system via gas-fired assets.

28. Electrolysis: The Storyline Report defined ranges for the level of electrolysis capacity in 2030 and 2050 based on stakeholder consultation feedback. Do you agree that these scenarios are consistent with the assumptions made in the Storyline Report?

- ○ **Yes**
- ○ **Neutral**
- ○ **No**

If no, please comment why

COMMENT:

Both Paris-aligned TYNDP scenarios are very ambitious in terms of electrolysis capacity, already by 2030 (58 GW in GA and 69 GW in DE), overshooting the objective enshrined in the European hydrogen strategy by 2030 (40 GW). On the other end, we observe that the increase of electrolysis capacity will be rather limited between 2040 (265 GW in DE and 217 GW in GA) and 2050 (390 GW in DE and 344 GW in GA). We believe instead that the uptake of electrolysis capacity will accelerate rather after 2030 and especially after 2040, as hydrogen will be gradually introduced to decarbonize the hardest-to-abate sectors.

However, looking at the national figures of electrolyser capacities provided by the Visualisation platform, we have noticed some very ambitious figures, especially for France. Indeed, the scenarios foresee a French electrolyser capacity of 25-32 GW in 2040 (depending on the scenario), reaching 28-54 GW in 2050. These values seem very ambitious compared to the national scenarios recently released by the French national TSO RTE. They are also high compared to other countries:

- for Germany, ranges are 20-27 GW for 2040 and 16-31 GW in 2050 (the electrolyser capacity in GA scenario is even declining between 2040 and 2050).
- for Spain, ranges are 12-14 GW in 2040 and 15-19 GW for 2050.

We take the opportunity to remind that investment and management of power-to-gas installations should primarily be market-based and open to competition among market players. Investments by regulated entities could discourage investments by market participants and create competition distortions. To avoid conflicts of interest and market foreclosure, system operators should be precluded from investing in and running power-to-gas installations except in clearly defined circumstances (time, scope, etc.), in line with the case for electricity storage in the Directive on the Internal Market for Electricity (2019/944).

TYNDP 2022 Scenarios Improvements

29. ENTSO-E and ENTSOG have made several improvements to methodologies in relation to prosumer and vehicle-to-grid modeling. Do these improvements reflect your expectations?

Yes
Neutral
No

If no, please comment why

COMMENT:

While we notice and welcome several improvements to the methodologies in relation to prosumer and vehicle-to-grid, we would like to mention the two following elements:

- Prosumers and vehicle-to-grid modeling are both in a DSO area of activity. Therefore, we would welcome an even closer cooperation with DSO experts on this matter particularly.
- The modelling approach with separate EV and Prosumer nodes makes a lot of sense. They are a key driver of self-consumption for residential customers and very different across countries. Differentiating the delivery cost per country would also be an appropriate refinement

30. ENTSO-E and ENTSOG have made several improvements to methodologies in relation power-to-gas configurations. Do these configurations reflect your expectations about the future operation of these units?

Yes
Neutral
No

If no, please comment why

COMMENT:

Further use of scenarios

31. As a stakeholder, do you intend to use our scenarios, or do you see opportunities for further use of these outside the TYNDPs?

Yes
Neutral
No

If no, please comment why

COMMENT:

Some of Eurelectric's members are building their own internal energy scenarios for strategy purposes and are constantly challenging their vision with others. TSOs – and by extension TYNDP's vision and scenarios – are very important for us when it comes to carrying out benchmarking practices. They also use them for their external communications and internal discussions.

More specifically, for Distribution System Operators, there is a need to coordinate the planning with other Distribution operators and associated TSOs. To be effective both should coordinate e.g. if Distributed Energy based on connections to Distribution Network this must be feasible.

However, the scenarios developed by ENTSOs for the TYNDP process are ones among many scenarios available on the development of the European energy system. As they should be focused on the development of the energy infrastructure, they are not necessarily fully adapted to other contexts like (i) energy policy and its impact assessments, (ii) analysis of investments (business plans) by market players.

One should also keep in mind that TSOs might have a bias in the technology choice, given their remuneration scheme (OPEX/CAPEX discussion, RAB, unbundling). This is the reason why a proper inclusion of stakeholders' feedback on the TYNDP scenarios, models and results is important.

32. If you have any further comments on the scenarios, please state them here.

COMMENT:

It is unclear why the final demand of electricity turns downwards in both scenarios from 2040 to 2050 , although electrification would most probably be a cheaper way than hydrogen to replace most of the still remaining fossil fuel use.

The upward demand response possibilities (e.g. in electrolysis and by electric boilers in district heat production, incl. heat storage) and the flexibility potential in biomass power generation in certain countries are not sufficiently included, which has resulted in too big curtailments of e.g. nuclear generation.

One key element of the energy transition is that the market players across sectors (electricity and gas, but also heat and other industrial sectors) will be the driving forces for these industrial changes. The infrastructures will have to be adapted to their needs, in a cost-efficient way (and not the other way round). The current practice of ENTSO-E and ENTSO-G might not be fully in line with such a market-driven view. They focus on the needs for their own infrastructure (electricity and gas) without strong requirements for the economic viability of the underlying market-related assumptions (existing assets, business development based on market signals…). The cost dimension is also missing: the financial impacts of choices made (separately) by ENTSO-E and ENTSO-G in the their exercise on the consumers (residential, services and industrials) is under-considered (e.g. impacts on peak demands, optimized use of existing infrastructure). Consequently, the cost benefits of a sound complementarity of energy systems are not sufficiently investigated. For instance, the electricity and gas systems are complementary for managing some stress events (e.g. Dunkelflaute events) and, more generally, for building up a cost-efficient and resilient energy system (cfr energy system adequacy, not only electricity or gas).

Eurelectric pursues in all its activities the application of the following sustainable development values:

Economic Development

- Growth, added-value, efficiency

Environmental Leadership

- Commitment, innovation, pro-activeness

Social Responsibility

- Transparency, ethics, accountability

Union of the Electricity Industry - Eurelectric aisbl
Boulevard de l'Impératrice, 66 – bte 2 - 1000 Brussels, Belgium
Tel: + 32 2 515 10 00 - VAT: BE 0462 679 112 • www.eurelectric.org
EU Transparency Register number: 4271427696-87