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CAN Europe Submission to Public consultation on TYNDP 2024 Scenarios Input Parameters

Climate Action Network (CAN) Europe is Europe's leading NGO coalition fighting dangerous climate change. With over 180 member organisations from 38 European countries, representing over 1.500 NGOs and more than 47 million citizens, CAN Europe promotes sustainable climate, energy and development policies throughout Europe.

4. Please provide your comments about the TYNDP 2024 scenarios strategy.

CAN Europe would like to thank for the opportunity to comment on the newest update to the TYNDP Scenarios. In the following answers, we provide our comments, observations and some recommendations to its different components as well as the process.

First, as an overall point, although this Consultation is more about an update, CAN Europe points out that the three main scenarios, and their storylines, already are quite dated. Concerning the “use of the future”, they make for a conventional, and these days, increasingly outdated scenario set in a dynamic, evolving energy landscape, in the context of a climate crisis, whose consequences are already felt across the EU (as well as globally). Around the EU, the citizens, experts, and the private sector are concerned over record temperatures, wildfires and floods, as intensifying phenomena, resulting in increasingly severe stress effects for people, nature and the economy. As a context to infrastructure planning, a lack of climate ambition, also in such exercises, means societies are presented with limited choices. This bigger picture, as a necessity to increase the alternatives available should not be overlooked in framing exercises on planning, investment or prioritisation of diverse types of infrastructures, related assumptions, and how they are required to operate under climate stress.

Second, against the harsh reality of the climate emergency, underscored by climate science, a key problem of the scenario framework remains that it conveys an idea of a minimum effort in terms of emission reduction and energy demand reduction. A low ambition for 2030 is problematic. The idea that the NECPs are seen as the ceiling of the EU ambition and not the floor, or a starting point, is reinforced by this kind of a framework.

As a reminder, even the current levels of EU targets are not enough to keep the EU (or the rest of the world) in line with Paris Agreement limits. In other words, considerably higher levels of ambition aligned with the +1.5 C target have to be a starting point for a scenario exercise, for it to be useful in anticipatory policy-making and strategic planning.

See also:
Climate Analytics (2022). 1.5°C pathways for the Council of Europe: accelerating climate action to deliver the Paris Agreement. Climate Analytics.
https://www.airclim.org/sites/default/files/documents/1.5_pathways_coe.pdf

CAN Europe (2022) The EU can achieve climate neutrality A DECADE earlier than planned – New report by Climate Analytics. CAN Europe. September 2022
https://caneurope.org/eu-can-achieve-climate-neutrality-a-decade-earlier-than-planned-new-report-climate-analytics/

Additionally, this time around, most EU27 member states had not yet submitted their draft NECPs, as they should have by June 30th, 2023, which limits the assessment of future scenarios. It could be useful to strategically think how to arrange for an optimal alignment with actually consolidated inputs, after a public consultation nationally, and a European Commission assessment on potential gaps.

Fourth, although it is stated that the “Energy Efficiency First” principle is applied, the currently proposed scenarios overshoot by approximately 10% the final energy consumption targets for the European Union. In the scenarios, energy efficiency and energy savings do not stand out as a main driver of the proposed transition. This becomes clear, for instance, in the Distributed Energy (DE) scenario, as a deviation scenario, which fails to adequately elaborate on demand-side flexibility potential for energy demand reduction, articulating the possibility of changes in how societies are organised, including lifestyles changes. Change in societies can, in turn, lead to lower energy demand across different sectors (transport, industry, buildings, etc), even in those perceived as “hard-to-abate”. Any potential for circularity also does not stand out from the scenarios.

Fifth, in relation to these points, we would like to draw your attention to the new European Scientific Advisory Board on Climate Change, ESABCC (2023) analysis of a 1,000 scenarios, highlighting 36 of them, who identify three types of pathways:

1) demand reduction;
2) high-RES; and
3) mixed options.

Out of the three types of pathways, demand-side focused pathways are justified, and may be preferable, as they prioritise lower energy and lower natural resource use, which also come with co-benefits for the Sustainable Development Goals, energy security, biodiversity and lower environmental risks. From this view, a 2040 ambitious scenario should have been considered and/or be added in the very near future, alongside an effort to fully phase-out fossil fuels from all sectors, both domestic and imported ones.

Sixth, our fear in this scenario approach is that it leads to an overemphasis or maximisation of investments into infrastructure, and it downplays, if not overlooks, the role of socio-technical change as well as societal engagement. For instance, a modest EC/EU ambition on energy savings translates into a “minimal” effort, unnecessarily narrowing down the exercise.

Seventh, an absence of socio-economic analysis on the costs of the scenarios overlooks how the transition costs can be minimised for consumers, society and the environment. Additionally, a recommended perspective would be to assess the costs of inaction, as environmental damage and climate change impacts (means as cost of lost infrastructure, crops, hazard to people's lives, health costs and compensation cost to those who suffered due to climate disasters). What happens, if we do not take a more ambitious approach? This is not considered by the scenario framework.

Economic efficiencies and/or savings accrue from air quality, sustainable ways of living, adequacy of energy supply through renewables, innovation, flexibility, micro-mobility, public transport, and so on. On the other side of the coin, inaction/delayed action means climate change will negatively and deeply impact the environment, economy, livelihoods and health, etc.

Circularity of materials in the industry (use of secondary material), as a move away from fossil fuels gradually, while remaining competitive in the future, implies minimising resource extraction and use, also affecting infrastructural design(s).

Omitting these enablers in the scenarios ignores the full value of a transition for European citizens.

Eighth, although it appears as if the DE scenario could be the most appealing one to citizens for them to become involved as part of the energy transition, and perhaps nearest to reflecting long-term drivers changing the energy landscape, certain aspects should be far more carefully defined. For instance, what is minimal Carbon Capture and Storage (CCS), and which sectors/industries should realistically use it?

Or, what is minimal nuclear, and what are the practical implications of relying on nuclear power? A reliance on nuclear power conveyed by the scenarios is bad news for the climate, as a signal to governments to overlook dramatic changes in the energy landscape already underway, not to make any alternative plans, not to mention high costs and long construction times—rendering climate targets unachievable, as articulated by Haywood et al. (2023) in Joule. https://www.cell.com/joule/fulltext/S2542-4351(23)00281-7

Ninth, GA and DE, as two deviation scenarios, are not easy to compare. Although some differentiation is provided at the Storylines report (p. 23-24), a refined futures table, which differentiates specific factors, their future states, and clarifies the underlying logics across the scenarios systematically, could assist in this task.

Tenth, in addition, we ask the scenario framework to think about clear and explicit phase out dates when it comes to coal, fossil gas, oil and nuclear.

As iconic common points, we would like to see a pronounced role across seven categories:

1. More ambitious, wider and deeper scenarios to assist decision-makers
2. Capturing demand-reduction and energy savings
3. Higher and more divergent RES rates
4. Consideration of circularity
5. Treatment of nuclear issue as an uncertainty, as reflected by Haywood et al. (2023)

6. H2 treated as RE H2, with verified, and detailed capacities
7. Clear phase-out dates for fossil fuels, to be treated within the exercise

An omission of such considerations implies that energy futures are not widely mapped. Instead of “opening up”, they are “closed down”, as a limitation to strategic decision-making.

In some of our further answers, we provide additional support through the Paris Agreement Compatible (PAC) modelling work, and its newest 2.0 updates, conducted by CAN Europe (in partnership with the EEB, RGI and REN21).

Further readings:

- PAC 2.0 scenario updates at: https://www.pac-scenarios.eu/
- PAC 2.0 scenario in a nutshell (June 2022)
- https://caneurope.org/content/uploads/2022/06/CAN_Europe_PAC_scenario_2_in_a_nutshell_FAQs_jun22.pdf
- PAC 1.0 Technical Summary (June 2020) https://caneurope.org/content/uploads/2020/06/PAC_scenario_technical_summary_29jun20.pdf

5. Do you agree on one central scenario in 2030 aligned with ACER's Framework Guideline?

__ Yes
X No
If you selected No, please specify.

According to the ACER’s Framework Guideline, as stated in the recital 31 ‘’The ENTSOs shall consider the NECPs, if up to date, as the basis for developing scenarios.’’.

The NECPs have not been submitted nor have gone through consultation in the majority of the EU27 countries, so it is difficult to base a full analysis on assumptions of national efforts.

Moreover, it would make sense to also include a 2030 gross emission reduction target of at least 65% below 1990 levels, aligned with what is needed according to the scientific community (in parallel to a 2040 scenario according to ESABCC’s analysis).

Since the EU has not reduced emissions enough in line with a net zero 2040 target, we emphasise that reduction efforts of even higher ambition than that seem necessary for the world to have any chance at remaining under +1.5 C, as per Climate Analytics (2022).

Climate Analytics (2022). 1.5°C pathways for the Council of Europe: accelerating climate action to deliver the Paris Agreement. Climate Analytics. https://www.airclim.org/sites/default/files/documents/1.5_pathways_coe.pdf

6. What are your views about the updates for the 2024 Scenarios Storylines Report? Specify

Overall, we acknowledge that the TYNDP 2024 scenario storylines rely extensively on the storyline framework already present during the TYNDP 2022 scenario cycle.

1) On the process: We welcome the increased transparency and the willingness to further increase participation from different stakeholders.

However, the public consultation dates around the Storylines Report are too restrictive for this important consultation. We recommend a longer consultation period next year/next time. Ideally, this should not take place during mid-summer, as many key experts across organisations are absent, and some potentially for the entire consultation period, and especially at its key stages, due to summer holidays around Europe. What could seem like a technicality undermines the depth of stakeholder participation, and an ability to fully engage in the process.

We would like to propose the following practical solution(s). We recommend a two-month consultation period, so that the stakeholder inputs can be thoroughly built. As a further solution, in case this Consultation sticks at the current summer period, at around Q2-Q3, it could start in mid-June and last until mid- to late-August. This would provide stakeholders due time to consolidate their feedback, especially in a long consultation.

Advancing the stakeholder engagement, we recommend that the expert advice from the Working Group Scenario Building (ETAG) should be accessible.

2) On relevance: Although this time an update, an additional scenario of increased ambition, without discarding the existing ones, could also have been included, especially to assess and fully consider the potential for more ambitious pathways.

We also would like the scenario set to acknowledge greater sensitivities and wider uncertainties.

3) On the content: Although we commend an enhanced alignment with the EU targets, we would welcome scenarios that are aligned with the current climate reality and ESABCC's advice. Moreover, it would be great to assess a fully decarbonized pathway that is based on reduction of energy demand across all sectors, in order to minimise (unnecessary) resource usage and to remain below 27.5Gt CO2eq cumulatively, referring to the 2020-2050 period (50% probability), as suggested by PAC 2.0 calculations.

ESABCC (2023) Scientific advice for the determination of an EU-wide 2040 climate target and a greenhouse gas budget for 2030–2050. European Scientific Advisory Board on Climate Change. 15 June.
https://climate-advisory-board.europa.eu/reports-and-publications/scientific-advice-for-the-determination-of-an-eu-wide-2040/scientific-advice-for-the-determination-of-an-eu-wide-2040-climate-target-and-a-greenhouse-gas-budget-for-2030-2050.pdf/@@display-file/file

7. What would be the other important drivers (please see the 2024 Scenarios Storylines Report, Figure 3) that you would like to see in the next cycle? (Please provide an explanation on how it could be included and differentiated among scenarios)
Specify

In principle, the selection of drivers is welcome (e.g. Green Transition, Energy efficiency and technologies, Decentralised vs. centralised). But, although "the scenarios are intended to project the long-term energy supply and demand considering the ongoing energy transition" (Storylines, p. 2), an actual translation of those drivers in the scenarios is relatively low, as seen by:

- Climate ambition seems to be quite modest.
- It is unclear, how the scenarios address a move in the direction of present political climate, in jointly addressing strategic autonomy (reducing imports) as well as climate targets (mitigation), as for instance argued by the EESC (2022): https://www.eesc.europa.eu/en/our-work/opinions-information-reports/opinions/strategic-vision-energy-transition-enable-eus-strategic-autonomy
- The targets for final energy consumption are overshot, the "Energy Efficiency First" principle is not fully translated, resulting in modest energy efficiency ambition.
- Roles of circularity, sufficiency and behavioural change should be articulated in further detail, at many sectors and levels
- We acknowledge that the technological part should play an important role. However, a focus on the technological challenge, at the expense of conceptualising the future more widely, does not allow re-imagining it.
- A moderate consideration of a changing energy landscape suggests there is more work to do to fully consider the role of flexibility.
- The role of trade-offs and positive gains. For instance, a consideration of the impact of a relative increase in the renovation rate would be interesting, e.g. to discuss what are the benefits of it reaching 3% by 2030
- The transport and industry sector should undergo major changes to align with a climate-neutral future, but such dynamics are absent in scenarios that rely on infrastructural design
- The exercise is frontloaded in terms of technology, and this gives a false impression that mere fuel switches are enough.

As other drivers, potential solutions, and further ingredients for differentiation:

- In terms of the scope and input parameters, uncertainties concerning Europe, such as the fluctuating level of imports due to geopolitical factors, as also illustrated by the Ukraine crisis, should be thoroughly considered.
- The scenario framework could reveal actual trade-offs, such as the fact that we need to improve the European railway infrastructure, while flying less, and as citizens, also play a role in the transition (e.g. consume less meat), et cetera.
- An analytical consideration of a primarily RES based energy system would be very timely, as such considerations are already put forth by a range of scientific studies, and an analysis of how it could be possible beyond nuclear power, and related infrastructural requirements.

- A more articulated role for demand-side flexibility, to illustrate changes into a far more interactive and two-way energy system, to be pushed further, as part of the modelling.
- The critical role of digitalisation, as an enabler, should be better conceptualised. Digitalisation, as a megatrend, assists consumers, enables demand-side flexibility, grid operations, interaction, smart technologies, EVs. The green and digital transitions can reinforce each other, or clash, as EU JRC argued in 2022. https://joint-research-centre.ec.europa.eu/jrc-news-and-updates/twin-green-digital-transition-how-sustainable-digital-technologies-could-enable-carbon-neutral-eu-2022-06-29_en
- It is quite enlightening, when alternative decarbonization pathways are created. This may entail more "radical" and transformative approaches as well as the identification of interacting levers. (E.g. a reduction of the current car fleet x The fleet is quickly electrified x Higher role for circularity.)
- More strategic options could open up, if one acknowledges the risks of relying on uncertain or carbon-intensive resources and technologies.
- Demonstrate and differentiate, what are the benefits of not entirely relying on current patterns, and a differentiation of their positive implications.

When the future is "used" (R. Miller 2018) for analytical purposes, it would be good to show such elements, and to demonstrate more prominently emerging issues and weak signals already shaping our societies in a scenario exercise.

As a recent example, the impact of COVID-19 (which some claimed as "a black swan event", although more of an event societies were ill-equipped for), saw European cities, such as Paris and Brussels, make dramatic investments towards cycling infrastructure. There is potential for underlying changes in other sectors, e.g. car fleet, indoor temperature, dietary habits, or transport modalities. If leveraged, and signalled in sectoral planning as well as supportive infrastructures, such considerations have untapped potential. The leading energy transition literature conceptualises transitions as both socio-technical (Markard et al. 2012; Sovacool, 2016; Köhler et al. 2019) as well as socio-cultural affairs (C.A. Miller et al. 2015; Sarrica, 2016). In our view, the TYNDP framework remains a bit thin on the former, and the latter aspects are almost entirely downplayed by the framework. See also:

CLEVER (2023) Climate neutrality, Energy security and Sustainability: A pathway to bridge the gap through Sufficiency, Efficiency and Renewables, 89 p. négaWatt Association. https://clever-energy-scenario.eu/wp-content/uploads/2023/06/CLEVER_final-report.pdf

In conclusion, the scenario framework and its underlying modelling, would do well to be more "pulled" by the future. Instead of a narrow use of the future (i.e. extrapolating from historical data), the scenario exercise could open up futures, so scenario users can assess and discuss a wider range of alternatives, as an open basis for choosing solutions for the European citizens, economy and society.

Literature:

Köhler, J. et al. (2019). An agenda for sustainability transitions research: State of the art and future directions. Environmental Innovation and Societal Transitions 31: 1-32. https://doi.org/10.1016/j.eist.2019.01.004

Markard, J., Raven, R. & Truffer, B. (2012). Sustainability transitions: An emerging field and its prospects. Research Policy 41: 955-967. https://doi.org/10.1016/j.respol.2012.02.013

Miller Clark A., Richter, Jennifer & O'Leary, Jason (2015) Socio-energy systems design. *Energy Research and Social Science* 6: 29-40. https://doi.org/10.1016/j.erss.2014.11.004

Miller, R. (2018), Introduction: Futures Literacy: Transforming the Future. Miller, R. (Ed.), *Transforming the Future: Anticipation in the 21st Century*. Paris: UNESCO, London and Routledge, New York, pp. 1-11. https://unesdoc.unesco.org/ark:/48223/pf0000264644

Sarrica, M., Brondi, S., Cottone, P.F., & Mazzara, B.M. (2016). One, no one, one hundred thousand energy transitions in Europe: The quest for a cultural approach. Energy Research and Social Science, 13, 1-14. https://doi.org/10.1016/j.erss.2015.12.019

Sovacool, B. (2016) How long will it take? Conceptualizing the temporal dynamics of energy transitions. Energy Research & Social Science. 13: 202–215. https://doi.org/10.1016/j.erss.2015.12.020

8. What are your views about the gap closing methodology for NT+ scenario? (Please see the TYNDP 2024 Scenarios Storyline Report, Annex 2)
Specify

We value the opening up of the Gap Closing Methodology for NT+ scenario. We provide the following remarks on adding further value to the methodology.

Overall, based on the current methodology, it is quite difficult to comment on the gaps to be closed. The following remarks may enable us to think how they could be filled.

First of all, for transparency, as it stands, it is possible only to assess the national trend scenarios as "after" the gap has been closed. We find piecing this together very difficult. An addition to show nationally foreseen contributions "before" and "after" would be beneficial and help in identifying main areas of gaps. It would be very helpful to understand what sectors should be targeted, to discuss and ideate, where change(s) should come from.

As a practical example, it may be unclear to a user of the scenarios how much a MS is missing the target, and how much the methodology was adjusted, if e.g. a 50% or 60% adjustment is necessary.

Secondly, we are unsure how this will align with member states' aspirations. A low ambition at a country-level and at a TSO-level could result in a low NT+ trajectory, and a larger gap to be filled. Therefore, we fear that we will see that the starting point may differ, the deviation may differ, and the final numbers may differ, as a challenge to analytical consistency.

Thirdly, we acknowledge that the methodology seems to redistribute % wise how much the gap is, and then distribute it across %, across sectors, in a technology-agnostic and technology-neutral way. Although a transparent methodology, which we commend, as a trade-off, the potential of different member states to actually prioritise actions is missed. A more refined approach could perhaps aim for synergy between the two views.

As a purposeful use of scenarios, this strengthens the ability of stakeholders to understand and learn what can and/or must change.

9. What are your views about the added value of this transition to the new tool (ETM) for the transparency of the scenarios building process? (1 - no added value ; 10 very high added value)

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10. Do you think the demand figures within DE & GA scenarios are consistent with their storylines?
__ Yes
X No

If you selected No, please explain

Here, we acknowledge that the question is about the consistency with storylines, and raise broader issues.

First, we would like to note that in PAC 2.0 scenario modelling, our final energy demand ends up being much lower already for 2040 than in DE or GA scenarios. This is because unlike in the modelling for the TYNDP, a broader facet of socio-technical change is explored, and as a benefit, a wider scope of possible energy futures are covered.

In numbers, final energy demand per carrier in DE and GA is at around 9k TWh (2040) and 8k TWh (2050), and at PAC 2.0, much lower for 2040 and 2050.

Similar conclusions are articulated at the recently published CLEVER scenario, referenced above, which sees final energy consumption fall to just below 5k TWh for EU27 (2050).

We also think that an integration of the role of circularity (circular economy), alongside acknowledgment of sufficiency, would help in articulating the role of demand.

Secondly, in terms of the DE and GA scenarios, we would like clarity on the amount of methane in these scenarios. The sustained use of methane seems incompatible with climate emergency. For instance, in GA in 2050, there is 1171 TWh of methane. We are also curious as to why there is more methane in DE than in GA?

Although some could be biomethane, we cannot immediately see whether biomethane is included.

Thirdly, here, we welcome the ETM, as an interface. As a technicality, there could be ways to further improve on the user experience or the ETM.

Let us examine DE, as a deviation scenario, from a demand perspective, learning with the ETM. If we take a country example, such as Finland, it would appear that:
- fossil electricity remains in buildings in 2040 and 2050;
- fossil electricity grows in households from 2019 to 2040 and to 2050
- fossil electricity in industry triples from 96.35 PJ (2019) to 266.55 PJ (2050).

Source: https://tyndp2024-myc.energytransitionmodel.com/82,83/charts/final-demand/by-sector-and-carrier?title=TYNDP2024%3A%20Distributed%20Energy%20-%20Finland

1) Does a growth in fossil electricity imply an underlying problem in the scenario logic?
2) What does this fossil electricity consist of?
3) At the ETM, to explain this, could data labelling and visual representation be advanced?

Fourth, we express strong hesitation to the projections of future H2 demand. As there are considerable expectations around H2 at the moment in Europe, it is reasonable to anticipate some H2 figures to be on the higher side. Electrification should be prioritised first, and H2 as fully renewable H2, based on real demands, for a transition towards an efficient energy system. Such demand figures are quite important, as they inform demand planning, and some caution may be needed in interpreting such assumed demands. In principle, the target should be to minimise H2 in general. Please also read carefully our answer to Q17 on H2 and additionality.

Finally, e.g. with a view to Q10, to avoid unnecessary confusion, in future editions, such questions could clearly explain to stakeholders what are considered as model input parameters, and what are the model outputs.

11. Do you think the market shares of technologies within DE & GA scenarios are consistent with their storylines?
__Yes
X No
If you selected No, please explain

We acknowledge that the question is about consistency with storylines as well as related issues, and that the “best estimates” are provided by the data from the TSOs on country-based capacities, and their lower and higher ranges, as modelling boundaries. We also provide further comments on capacities in Q13.

Overall, the scenario set seems to inadequately consider the role of distributed, electrified technologies, assisted by digitalisation, as a key driver of the energy transition.

Solar PV:

It appears as if some solar PV trajectories remain on the conservative side.

At the level of storylines, DE only writes “higher” and GA “lower” for solar PV. Higher, as compared to what? Lower, as compared to what? In their current logic, both DE and GA should, as deviation scenarios, in principle, be “higher” than the Best Estimate. Then, the question is, how much.

At least, the “lower” should not imply lower than BAU estimates, as it would seem illogical, given that the two deviation scenarios are about the energy transition.

There is no market segmentation between industrial, commercial and residential for solar PV, so such details cannot be commented on.

References:
20230704 Draft supply Excel document - Sheet 1.1 Solar trajectories
Storylines, July 2023, p. 23-24
Presentation at 13 July 1st Public Consultation Workshop

Onshore wind:

At storylines, for onshore wind, DE says “higher” and GA “lower”. See comment above.

References:
20230704 Draft supply Excel document - Sheet 1.2 Wind onshore trajectories
Storylines, July 2023, p. 10-11, 23-24
Presentation at 13 July 1st Public Consultation Workshop

Offshore wind:

At storylines, for offshore wind, DE is at “lower” and GA “higher”.

If in DE, offshore wind is “lower than X”, and harnessed less, and also efficiency and savings are not that ambitious, what is used in its place? (Storylines, July 2023, p. 10-11, 23-24).

The DE summary storyline could also comment on offshore wind (ibid., p. 10).

References:
20230704 Draft supply Excel document - Sheet 1.3 Wind offshore trajectories
Storylines, July 2023, p. 10-11, 23-24
Presentation at 13 July 1st Public Consultation Workshop

Electric heat pumps:

The role of pure-electric heat pumps would appear to have been downplayed.

Nuclear:

It appears that none of the three scenarios assess European energy infrastructure, and its future, without nuclear.

For a scenario set with a main scenario, and two deviation scenarios, as a spectrum of futures, this seems to undermine the analytical use of the set. It might have been more logical, if the DE scenario was a high-RES scenario and the GA a nuclear-based scenario. Although there are some hints of this, the distinction is not complete. Then again, such distinction would still overlook the point of savings, efficiency, and demand-reduction, as well as many other important factors, and be of limited analytical use (Reference: 20230704 Draft supply Excel document - Sheet 1.4 Nuclear ex-ante capacities).

To further analyse potential market shares and on-going market developments, we recommend complementing this (old) scenario set with a 100% RES scenario to see and learn how the system could learn, and be made to work without nuclear.

12. Do you think the amount of biomass in the scenarios is sustainable?
__Yes
X No
If you selected No, please explain

As an overall comment on the question-framing, it would be helpful to include a definition on sustainable biomass, which may also entail assumptions and European/global perspectives, to answer this question in more detail.

Supply Figures for DE & GA Scenarios

The draft supply figures and their methodologies can be reached via 20230704 – Draft Supply Inputs for TYNDP 2024 Scenarios for consultation and 20230704 – Draft Supply Tool (EU-level). The first spreadsheet includes the country specific renewable and battery trajectories, nuclear capacities, the cost of the technologies, the commodity and CO2 prices and extra EU import potentials. Please note that the Best Estimate figures within the trajectories are not part of the consultation as they represents TSOs' best estimate for the upcoming NECPs whose draft version should be submitted to the EC in summer of 2023. The Draft Supply Tool excel quantifies the supply details for the total energy demand of each energy carrier.

ENTSO-E and ENTSOG also published their electricity and hydrogen reference grid for information within 20230704 – Electricity and Hydrogen reference grid and investment candidates. Please note that this document also includes the project candidates for electricity whose CAPEX are according to ENTSO-E's proposal, and project candidates for hydrogen whose CAPEX are calculated according to ENTSOG's proposal. These draft cost methodologies and figures are part of this public consultation.

13. In your view, are the RES trajectories (wind, solar, battery) & nuclear capacities reasonable?

See also related answers in question 11.

RES:

According to the current calculations, the associated RES capacities are not enough for the necessary level of climate ambition.

Reminding on the role of addressing energy demand, as well as on the ESABCC (2023) findings, to reach climate ambition, one would expect a transformation either through interventions in energy efficiency (buildings, industry, etc) or through higher RES deployment. This is not the case in the scenario framework.

According to the PAC scenario results, a reduction of energy demand of more than 50% is achieved between 2020 and 2040. At the same time, in principle, a tripling of renewables capacities compared to the 2020-2022 period, e.g. from 35 GW per year to 105 GW per year is necessary, as a pathway. So, in our assessment, the presented scenarios do lack ambition in terms of renewables (RES) deployment.

Additionally, in the case of any envisioned hydrogen (H2) demands, the higher the H2 demand, the higher logically should also be RES demands. This does not appear to be the case, as a problem for consistency. We do not find substantially higher RES capacities, as an underlying driver, in spite of their focal role in the transition.

Solar PV:

As per the solar trajectories, any high-RES scenario would expect to see 2030 solar PV figures at or above 1 TW. Such figures were also suggested by the PAC 1.0 findings. As indicative numbers for solar PV, for 2030, the market outlook from Solar Power Europe Medium Scenario projects 920 GW, and a High Scenario was predicting 1,184 GW installed by 2030.

Hence, for a deviation scenario, the 785 GW in the DE scenario for 2030 is far behind.

Solar Power Europe (2022) European Market Outlook for Solar Power 2022-2026. Solar Power Europe. 19 December.
https://www.solarpowereurope.org/press-releases/new-report-reveals-eu-solar-power-soars-by-almost-50-in-2022
CAN Europe (2020) Building a Paris Agreement Compatible (PAC) energy scenario. Technical Summary of Key Elements. CAN Europe.
https://caneurope.org/content/uploads/2020/06/PAC_scenario_technical_summary_29jun20.pdf

If solar PV capacities were assessed in combination with the final energy demand/consumption, and demand is reduced, only then, lower capacities could be

foreseen, at the deviation scenarios. However, we do not find logic applied consistently in the scenario framework.

For 2040, the best estimate for solar mentioned is at 989 GW. PAC 2.0 preliminary findings anticipate installed capacities at around 1,300-1,400 GW for 2040, accompanied with robust demand-reduction efforts.

Additionally, a split between solar PV market segments would be helpful.

Wind (onshore / offshore):

For 2030, the newest update to PAC 2.0 modelling estimates around 400 GW of onshore wind, compared to the 348 GW best estimate. For 2040, we estimate around 673 GW of onshore wind, against which a best estimate at 494 GW seems low. Therefore, it appears that the onshore capacities of 'best estimate' are on the modest side.

For 2030, the offshore best estimate seems a bit modest. For 2040, PAC 2.0 modelling estimates approximately similar figures, however, with strong demand reduction measures.

Note: Again, where our PAC 2.0 modelling seems to align more closely in the offshore figures, this would only result from lower energy demands achieved through energy savings, a maximally efficient energy system, and related systems change. In their absence, higher RES capacities than proposed by the framework, overall, would be foreseen.

Only integrated climate ambition could minimise even higher RES capacities.

Batteries:

We recommend consideration and mentioning all storage options.

Nuclear:

Nuclear is sustained across scenarios, which CAN Europe generally does not agree with. Nuclear should be phased out (no need for any sort of baseload in the future, slow ramp-up in case needed, quite expensive, and due to environmental concerns). The fact that the GA scenario foresees an increase in nuclear capacities is quite problematic.

As indicated through our PAC 1.0 and PAC 2.0 modelling, it is possible to phase out nuclear capacities and generation by 2040 and create a fully flexible and renewable power system. It is also possible to phase out coal by 2030 across the EU, gas by 2035 and oil by 2040, if an ambitious enough energy demand-reduction pathway is considered. Such a pathway is also innovative.

Finally, our aim is to reach climate neutrality by 2040, and we also recommend and kindly remind of the urgent climate crisis, as a perspective. In PAC, we triple yearly installations of renewables and reduce energy consumption by 25% by 2030, with 2020 as a reference year.

14. In your view, are the technology costs appropriate?

It is difficult to predict technology costs into the future.

The RES already assume a cost reduction trajectory, and have shown substantial cost improvements, especially over the 2010s. It is also fair to assume that sustained R&D focus, societal transition and innovation efforts as well as continued market development continue to decrease related costs.

Pressure on fossil based technologies, eventually, means external constraints, even if the exact timespan is uncertain. Such market constraints are already being valued and priced by market actors, e.g. as risks, transferring into societal and economic valuations both indirectly and directly, through various policy measures and market mechanisms. Overall, to minimise carbon risk, we recommend an anticipatory approach, also with a view to costs and markets, with some caution on overly optimistic cost assumptions.

15. In your view, are the prices (presented in the 20230704 – Draft Supply Inputs for TYNDP 2024 Scenarios.xlsx, sheet 3) appropriate?
20230704 – Draft Supply Inputs for TYNDP 2024 Scenarios for consultation

It is quite challenging to comment on prices, potential price volatility, and associated forecasts, for the future.

16. In your view, are the extra-EU methane import potentials reasonable?
Yes
X No
If not, please provide us an alternative source (should be reliable and cover 2050 time-horizon)

To advance the current modelling, as the EU aims to search for optimal pathways for decarbonisation, the scenario exercise would add further value, if it helps consider how the EU can move beyond methane imports.

17. In your view, are the extra-EU H2 import potentials & prices reasonable?
Yes
X No
If not, please provide us an alternative source (should be reliable and cover 2050 time-horizon)

We note how the formulation on import potentials, and their sources were explained as upper, theoretical potentials.

First, CAN Europe's position is quite sceptical on the level of any high H2 numbers, as H2 demand should be kept for very limited applications. The focus should be on RE H2 and before expansion, as fossil based H2 needs to be phased out. An expansion of H2 from fossil-based sources would potentially come into conflict with the EU's own climate targets. Because of this contradiction, we expect lower numbers than envisioned in the REPowerEU, which does not take these factors into account.

Instead of the upper (theoretical) potentials, it would make more sense to analytically focus on when and where to actually use H2, as RE H2. Evidently, we need to decarbonize the existing hydrogen production, which is based on fossil fuels, before moving ahead with added H2 capacities. Now, a part of the question-setting implies that imports are needed, even when there is lack of clarity of both demand, and assurance on the type of H2 used. Reducing energy demand minimises H2 needs, and means that H2 could be produced from within Europe, instead of imports.

As most climate action should come from within the EU, we are a bit concerned about the idea of H2 imports. According to IRENA, as at the end of 2021, almost 47% of the global hydrogen production is from natural gas, 27% from coal, 22% from oil (as a by-product) and only around 4% comes from electrolysis.

Source: IRENA https://www.irena.org/Energy-Transition/Technology/Hydrogen

Secondly, we recommend familiarising with EEB's Policy Brief concerning hydrogen, and integrating into the work the additionality principle.

Quoting EEB: "For hydrogen to be considered as renewable and supportive of the transition to climate neutrality, its production needs to be based on additional renewable electricity. Additionality means that renewables-based electricity used in electrolysers for the production of renewable hydrogen is additional with respect to the renewables-based electricity used to meet the final electricity consumption needs. Remarkably, the development of renewable energy for hydrogen production should happen in synergy, and not in competition with the decarbonisation of other sectors."
https://eeb.org/wp-content/uploads/2023/01/EEB_Policy-brief-hydrogen_final_20230126.pdf

Finally, on where any H2, as RE H2, would actually be used, it may be worth looking at a paper by Fabian Neumann et al. (2022) on "The Potential Role of a Hydrogen Network in Europe", published in *Joule*, who argue that their model "can capture bottlenecks in transmission networks, the variability of demand and renewable supply, as well as regional opportunities for the retrofitting of legacy gas infrastructure and the development of geological hydrogen storage. Their results show consistent system cost reductions with a pan-continental hydrogen network that connects regions with low-cost and abundant renewable potentials to demand centres, synthetic fuel production and cavern storage sites." Available at: https://doi.org/10.1016/j.joule.2023.06.016

18. Do you agree with the methodology on how the demand is supplied per energy carrier and how the conversion factors are used? (See 20230704 - Draft Supply Tool (EU-level).xlsx)

Yes

No

If you selected No, please specify

We do not have comments on this specific question.

19. Do you think the preliminary supply figures are differentiated according to the storylines?

Yes

No

If you selected No, please specify

With a view to any change between TYNDP 2022 final and the new TYNDP 2024 update, and associated divergence, with a view to electricity and methane demand, supply has remained largely unchanged.

Deviation in rate of electrification is only at around 10%. Deviation in methane supply has gotten smaller in DE and GA storylines. We wonder about this, given that scenarios should usually be quite different from one another.

We find 800 TWh of methane in 2050 remaining, and this is not in the hard to abate sectors. For instance, in buildings, in a sector that is not hard to abate, and more logically, the DE scenario should prioritise electric heat pumps.

For example, based on the amounts of methane left in the TYNDP, it is unclear how the 2040 climate targets can be met in a logical way.

20. What are your views on the cost methodology of H2 investment projects? I.e., 75% repurposing and 25% new build, European Hydrogen Backbone report as cost basis, 15% distance between capitals? Specify.

We do not have a comment on this question.

However, on the use of the 'European Hydrogen Backbone" study, we would note some problems in an over-reliance on a single source.

21. What are your views on the cost methodology for electricity investment candidates? I.e., to use submitted candidate projects as electricity investment candidates? Specify.

We do not have a comment on this question.

Modelling Methodology and Assumptions

The innovations implemented in the TYNDP 2024 Scenarios seek to improve those already implemented in TYNDP 2022. The aim is to enhance the representation of a fast-changing energy system and the integration of its different sectors. The TYNDP 2024 scenarios presents five main innovations which are EV Modelling, Hydrogen (P2G) Modelling, Offshore Modelling, Hybrid Heat Pump Modelling and Expansion Modelling. For the details, please check 20230704 – Modelling Methodologies & Draft Assumptions, 20230711-H2 Steel Tank Methodology and 20230711 - Carbon Budget Methodology documents under the download section.

22. In your view, is the carbon budget methodology appropriate?
Yes
X No
If you selected No, please provide an alternative source

First, although appreciative of the consideration of a carbon budget associated with the TYNDP framework, CAN Europe is unsure how the carbon budget methodology actually affects the eventual scenarios and planning. This is an incompatibility, with a view to the climate crisis.

We note that the TYNDP assumes a population approach (per capita) for EU27, as a simplified approach, but would recommend instead to use an equity approach based on historical responsibility and capacity to act. It is critical that recommended pathways stay within a carbon budget that is consistent with the achievement of the 1.5 goal of the Paris Agreement.

Second, the fact that the global carbon budget is extrapolated until the year 2100 means possible negative emissions make this figure better. Since the plan refers to 2050, it would be essential also to include the 2020-2050 figures.

Third, concerning our suggestion for a consideration of the 2020-2050 budget, we have specific remarks:

1. This is called a "carbon budget" and expressed as CO2eq. CAN Europe asks for more granularity of what this contains, and is unsure if these are CO2 or GHG budgets, as there is no mention of coefficients.
2. Could you explain, what is your cumulative budget for all GHGs for the 2020-2050 period, based on your 2050 projection, and taking into account the 50% (500Gt) and 67% (400Gt) probability of keeping global temperature below +1.5C?
3. It would also be interesting to see an estimation of the role of land sinks until 2050, in Mt per year or a total for the 2020-2050 period.

Fourth, could you kindly clarify your final figure that is communicated, is it 28.5Gt CO2eq or 21.6Gt CO2eq, and for which period? Does the latter figure deduct the years 2020-2021 (or 2021-2022)?

Fifth, to inform you, in CAN Europe's Paris Agreement Compatible (PAC) scenario exercise, as a pathway to climate neutrality, the newest 2.0 update calculates a GHG budget. The cumulative 2020-2050 carbon budget in PAC 2.0 is 27.5Gt.

Sixth, climate science should also be taken into account when creating pathways. The analysis by the European Scientific Advisory Board for Climate Change (ESABCC) suggests that the EU has already exceeded its fair share of the global emissions budget, which the Board proposes to compensate with a clear commitment to at least 90% GHG reduction

target by 2040, additional mitigation efforts (including by 2030) at home and support abroad. The Board also recommends the inclusion of a 2035 climate target to align the EU process with the Paris Agreement process. In its recent advice, the ESABCC recommended that the EU should stay within a GHG budget of 11-14 GtCO2eq in the period 2030-2050. It would be important to show whether DE and GA take this advice into account.

Finally, on related considerations, we also recommend familiarising with Climate Action Network (CAN) Europe's draft position paper concerning the Carbon Budget, version dated 22 June 2023. https://caneurope.org/content/uploads/2023/06/2023.06.22-Position-Paper-on-EU-climate-targets-and-equitable-GHG-budget.docx.pdf

23. What do you think about the EV innovation & its relevance to the scenario model? (rank 1 to 10 - 10 most satisfactory)

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7 X
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24. In your view, are the assumptions on the EV methodology reasonable?

Yes
X No

If not, please provide us an alternative source (should be reliable and cover 2050 time-horizon)

Please read our wider comments in question 25.

25. How could the methodology be improved for the next cycle? Please explain.

We commend efforts to improve on the modelling, but would provide wider commentary on the assumptions.

We would also hope the modelling to acknowledge what the impacts of socio-technical change as systems change would be.

We would not consider adding EVs alone into the model, as a one-to-one technology shift or fuel switch on the existing fleet, but would hope for further differentiation. Generally, we would be wary of the modelling signalling a message that "EVs can do the transition", as it is well known that this alone is not enough, to achieve a sustainability transition. We would like

the scenarios to treat in a more pronounced way the potential role of public transport, car-sharing as well as micro-mobility.

The modelling for heavy trucks in DE and GA, still sees liquids and methane used in 2050 (4% in DE; 7% in GA). In the current scenario set, for differentiation, it would seem logical for DE to have an even higher share of electrification (now: 62% in 2050).

In GA, 31% of heavy trucks are electric and 50% of heavy trucks use hydrogen in 2050. These are quite high numbers for hydrogen, given that to align with climate goals, this would have to be renewable hydrogen.

Prioritising RES, electrification, and an additionality principle of hydrogen, mentioned in Q17, has real impacts to the modelling. In the PAC 2.0 scenario, at most 5-10 percent for heavy trucks are for hydrogen (H2), as fully renewable hydrogen, while methane is also phased out fully.

CAN Europe (2023). Civil society shows Europe's way to climate neutrality by 2040. CAN Europe 23 March. https://caneurope.org/civil-society-europe-climate-neutrality-2040-scenario/

Overall, there should also be a scenario that presents the possibility of a drastically reduced car fleet, for instance due to car sharing, system innovations, et cetera.

In terms of charging the EV fleet, there could be granularity on street chargers: public, commercial street chargers, and superchargers.

Perhaps as part of a scenario with quick decarbonization by 2040, as proposed by ESABCC, a smaller fleet should be considered, and this in turn would have an impact on the material usage and the energy demand. From PAC 2.0 modelling, where car sharing is proposed, as a lever, it is possible for the scenario user to visually see what is the effect on emissions when the car fleet is heavily reduced and/or the usage per vehicle (with more people using it) is increased.

Additionally, for scenarios to open up futures for decision-makers, several scenarios should couple assumptions on further enhancing public transportation, fewer flights, more trains, as electric ones.

In their absence, as has been argued, related modelling is prone to over-emphasise infrastructural expansion, as non-optimal investment, which comes at a cost to be borne by European societies, tax-payers as well as implies unnecessary environmental burdens and losses in Europe, and beyond.

Given the already steep climate challenge, any non-optimal investments make achieving climate targets for the whole of society far more difficult. In many sectors, other than energy (here, urban planning is quite a good example.), integrated and holistic planning approaches and frameworks are already advancing at a fast pace, and becoming far more commonplace.

**

Finally, as a technicality on Q25, in terms of time, efficiency, and heavy workload caused by the consultation, as well as the specificity of each question, for the next edition, we propose every consultation question at the survey portal to provide a direct link to the source material, with careful guidance on the aspects to be commented on.

26. What do you think about the P2G innovation & its relevance to the scenario model? (rank 1 to 10 - 10 most satisfactory)

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27. In your view, are the assumptions on the P2G methodology reasonable?

Yes
No

if not please provide us an alternative source (should be reliable and cover 2050 time-horizon)

CAN Europe does not leave a comment on this question.

28. How could the P2G methodology be improved for the next cycle? Please explain.

CAN Europe does not leave a comment on this question.

29. What do you think about the offshore innovation & their relevance to the scenarios model? (rank 1 to 10 - 10 most satisfactory)

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30. In your view, are the assumptions on the offshore methodology reasonable?

Yes
X No

if not please provide us an alternative source (should be reliable and cover 2050 time-horizon)

The use of Offshore Network Development Plans is mentioned in the materials, and there are also mentions on “lower” and “higher” ranges, as estimates.

Instead, we would like to ask whether the assumptions of the three scenarios are fully consistent with the aim of differentiation, and what are the exact assumptions provided for the differentiation.

31. How could the methodology for offshore be improved for the next cycle? Please explain

As two more general points:

The DE scenario has more offshore than the GA scenario, which makes us wonder why the DE scenario is not a high RES deployment scenario.

We would like to emphasise the importance of more integrated infrastructural planning for the European energy system, which implies demand-reduction. Integrated planning, reducing demand, could also have an impact on the offshore trajectories, and reducing environmental pressures, such as uncertain impacts on marine ecosystems. To illustrate this point, in terms of the proposed offshore targets, as capacity additions, in the PAC 2.0, we illustrate what is the effect of an enhanced building stock, and a transformed built environment, resulting from an increased renovation rate, for the reduction of European energy demand.

See: Public Consultation Presentation slides 19, 25-26, 51-53

32. What do you think about the Hybrid Heat Pump innovation & its relevance to the scenario model? (rank 1 to 10 - 10 most satisfactory)

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33. In your view, are the assumptions on the Hybrid Heat Pump methodology reasonable?

Yes
X No
If not, please provide us an alternative source (should be reliable and cover 2050 time-horizon)

As per modelling methodology, hybrid Heat Pumps (HHP) combine an electric heat pump with a gas (H2 or CH4) boiler.

Why would hybrid heat pumps using CH4 be needed in the future in the first place? Still in 2050? What will they be blended with in that future? Would this be renewable H2, as the only non-fossil fuel? How much RE H2 would they be allocated, and how? At the moment, hybrid heat pumps are still reliant on fossil fuels, even if less so.

We do not foresee hybrid heat pumps in a Paris Agreement Compatible (PAC) scenario.

In our scenario, the installation of new heat pumps are coupled with the renovation of buildings. An increased ambition on the renovation rate also speeds up heat pump installations, and avoids unnecessary energy wasting.

To familiarise, we also provide here a link to our on-going work at PAC 2.0 modelling, illustrated at:
https://pathwaysexplorer.climact.com/pathways?visualisation=0&region=EU27&source=model&scenario=EU27%3A+Preliminary+%28CE%29+Net+Zero+2040+100%25RE+%28in+progress%29

34. How could the methodology for hybrid heat pumps be improved for the next cycle? Please explain.

Non-hybrid options (= stand-alone electric heat pumps) are already available in the market in 2023. Looking at this question from the year 2030, 2040 or 2050, citizens might not necessarily opt for a hybrid heat pump.

**

As noted in previous responses, as a minor technicality, also to Q34, in future consultations, it would be helpful, if a direct link to the methodology used would be attached next to the actual survey question, not only at headline level.

35. Do you find the assumptions on the H2 steel tanks methodology appropriate?
Yes
X No
If not, please provide us an alternative source (should be reliable and cover 2050 time-horizon)

We cannot reliably answer this.

**
As a minor technicality to Q35, in future consultations, at the online survey portal, it would be helpful to provide a direct hyperlink to the methodology attached next to the question, to save time by multiple respondents.

36. What are the most important modeling innovations that you would like to see in the next cycle?

Overall, we warmly welcome opening up this question, and consider this not only as a technical one, but to be of wider relevance to European citizens. A range of organisations, with diverse expertise, far beyond CAN Europe alone, are eager to contribute to advancing the European energy transition, be it at the integration of the DSO level, on the role of cities, whole-of-energy systems modelling, to make sense of digitalising energy systems, expedite the uptake of new innovations, enhanced biodiversity protection, et cetera.

First, the modelling of sector coupling was a priority enhancement of the 2022 edition, and we recommend advancing this work.

Secondly, we would also like to see more analytical clarity on how fossil gas phase-out, H2 infrastructure phase-in, related priorities, and trade-offs are modelled. A lack of clarity may provoke misalignments. An example on addressing this issue is presented in the paper by Neumann, F., Zeyen, E., Victoria, M., Brown, T. (2022) "The potential role of a hydrogen network in Europe", available at https://arxiv.org/abs/2207.05816v2, who in their analysis, discovered lower infrastructure needs than would be anticipated.

Thirdly, we encourage further work on modelling energy storage options, and to mention all energy storage options for the next edition(s). In case some of these are not considered, the reason could be mentioned. Transparency on technology choices, such as perceptions of technology readiness levels, would enhance transparency on subsequent judgement.

Fourth, we hope for estimates for costs related to the transition, to be compared with other decarbonization scenarios. The least costly scenario (or scenarios) that achieve the decarbonization targets could be presented together with an assessment of how it is compatible with a 1.5 degree target aligned greenhouse gas emission budget, in line with ESABCC's recommendations on a 2040 target.

Fifth, we hope the potential of circularity to be considered in a more pronounced manner, and perhaps to be differentiated across the scenario set. A circular economy in increasingly electrified European economies builds from (new) inter-sectoral linkages, and accordingly, so do its energy demands that have to be climate-compatible.

Sixth, we hope for the inclusion of 2035 and 2040 milestones for cross-comparison of diverse pathways, and also to assist countries, sectors and actors in the energy transition. Some have already announced their 2035 climate targets.

Finally, we warmly welcome all improvements to align TYNDP scenarios with the EU27 climate and energy policy objectives, such as the REPowerEU package across the scenarios as well as stakeholder involvement.

Building on CAN Europe's earlier comments to the scenarios and the process itself, while welcoming these advances, it should be self-evident that all TYNDP scenarios illustrate divergent pathways that are compatible also with the 1.5°C objective. This means ambition that is higher than that presented at the EU or Member-State level. Given the constantly

heightening climate concern by European citizens, private sector and decision-makers, in our assessment, the present GA or DE scenarios do not adequately respond to this task. We also express our concern of the lack of ambition in timeline, and call for net zero emissions by 2040, to assess the variety of available solutions for emissions reductions. In other words, there is no time to lose.

Already with a view to TYNDP 2026, we would strongly recommend ENTSO-E and ENTSOG to consider and make preparations to evaluate and reassess its scenario design. What primarily manifests as techno-economic modelling with storylines, at a narrow mode, scenarios can open up widely and deeply to help key actors and stakeholders to conceptualise more diverse and transformative pathways. As revealed first by the COVID-19 crisis and then, recent turbulence, many complexities, uncertainties and non-linear developments have to be considered. This would be in line with the latest recommendations of the foresight community on the “use of the future” for the most purposeful use of scenario methodology possible, to assist upon the most up-to-date policies at Member States as well as when aggregated for the EU27.

39. If you tick this box, we will not publish your answer to this consultation. However, your answer, without your name and organization, may be shared with EU and national authorities, drafting committee members, and other persons or entities involved in the adoption process of the consulted document to ensure the performance of ENTSO-E legally mandated tasks.

The answer can be shared publicly.