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CAN Europe's submission to ENTSO-E and ENTSOG public consultation on the TYNDP 2026 Scenarios' input assumptions, data, parameters and methodologies

Climate Action Network (CAN) Europe is Europe's leading NGO coalition fighting dangerous climate change. With over 200 member organisations active in 40 European countries, representing over 1,700 NGOs and more than 40 million citizens, CAN Europe promotes sustainable climate, energy and development policies throughout Europe.

Consultation I TYNDP Scenarios

Scenarios Innovation Roadmap

4. How would you rate the Innovation Roadmap (clarity, comprehensiveness and format)? (rank 1 to 10 - 10 most satisfactory)

6.

5. Do you think that the prioritisation of innovations for the TYNDP 2026 planning cycle could be improved, and if yes, why and how?

The Innovation Roadmap is pointing to the future, and is intended to be a living document. It is inspiring per se, as it documents and already shows the potential for future improvements. Having no apparent hierarchy may have advantages and disadvantages.

1. As CAN Europe has learned in the Stakeholder Reference Group (SRG), the change of the TYNDP scenario framework constrains the ability to implement new innovations in the TYNDP 2026 cycle. An aim to address the ACER Scenario Guidelines is understandable, but some questions are posed, if the trade-off could have been avoided.

According to CAN Europe, it would be important to plan each two-year cycle to always allow the modelling framework (if necessary) and a reasonable number of individual elements to be enhanced.

2. Because the prioritisation of the innovations is not really clear to stakeholders, the document does not yet act as a concrete Roadmap. Some leeway is useful, but it is unclear to stakeholders how the Roadmap translates into a plan.

Besides internal, more justification should be provided what aspects at least will be improved in a cycle and why.

3. The current criteria for an innovation in ENTSOs is primarily operational: time * impact. Although this is practical, it lacks external criteria, and living in a climate emergency, this might not lead into “an optimal choice" of innovations.

It could make sense to consider which innovations - improvements to the framework, to the modelling or of any other type - would deliver the highest contributions to emissions reductions. CAN Europe underscores the importance of ESABCC’s advice and opinions.

4. It would be recommended to harvest innovations also from the wider community. E.g. highly innovative stakeholders (also from outside the SRG) could propose innovations, to be documented, at a platform, to add into a growing pool of ideas, as openly available. It could be assumed to raise interest in energy stakeholders around EU27, and beyond.

6. Are any innovations missing in the Scenarios Innovation Roadmap that should be mentioned in future editions?

1) **modelling and simulation of a 100% renewable energy system is imperative**
→ Given the scale and pace of the energy transition, these requirements and key elements should be systematically integrated into the TYNDP Scenarios.

2) **open source modelling**
→ CAN Europe strongly encourages advancement of open source approaches across all vectors for modelling results to be studied by a range of energy stakeholders, harnessing expertise widely to identify emerging issues.

3) **very high flexibility levels**
→ A clear integration and synchronisation of flexibility potentials from a EU-wide perspective would be very helpful. Without a deep representation of all flexibility options, eventual grid needs could be overestimated.

4) **topology and grid distribution level**
→ Distribution national development plans, as available data, could be factored in. Increasing the modelling topology would improve relevance.

5) **demand-side assessment**
→ A systematic demand-side analysis could be integrated into the TYNDP scenarios process. The TYNDP scenarios do not study potential demand-side changes, as a structural issue.

6) **prioritise innovative grid technologies higher**
→ Make innovative grid technologies in the Innovation Roadmap prominent, and elaborate on their contribution.

7) **acknowledge seasonal and long term energy storage technologies and related data**
The TYNDP scenarios, modelling, and methodology, seem to acknowledge the role of storage technologies, and associated innovation, in a limited matter, which may create a bias.

→ New storage projects across a range of innovative technologies are emerging. Explicitly recognise their role and integrate related data systematically. Start with JRC's "European Energy Storage Inventory: Real-time Energy Storage Dashboard". https://ses.jrc.ec.europa.eu/storage-inventory

8) **resilience of energy infrastructure against extreme events, such as extreme heat**, including the impacts on grids and generation capacities.

→ Such an assessment could be important especially for the long-term and very long-term timeline in the TYNDP studies or as another knowledge product.

7. Is there anything that you would like to add?

1. Breyer et al. (2022) On the History and Future of 100% Renewable Energy Systems Research.
https://web.stanford.edu/group/efmh/jacobson/Articles/Others/22-100PctRE-History.pdf

2. he Energy Transition Model, ETM, with a visual interface, does not yet make the modelling process open source across electricity, hydrogen and gas vectors.

3. In line with the spectrum of innovations, at various scales, much more can be achieved. A more granular representation of different flexibility and non-wire measures, technologies and arrangements help represent future energy systems. Improved EV modelling is a first step.

4. ENTSOs' response to SRG over TYNDP 2024 modelling approach: "in **electricity**, a transmission/distribution split is somewhat detectable through the modelling tools used. However, the **gas system** is not explicitly modelled, and for **hydrogen**, such information would require updating the current models". https://2024.entsos-tyndp-scenarios.eu/annex-3/ More work is required here.

5. The 2026 scenario framework, and its variants around an economic story lack room to study demand-side measures.

6. A new FSR paper (2025): *"There is urgent need to modernise and upgrade the electricity grids using innovative and digital technologies. Such technologies can make the use and management of the existing grid more efficient, thus postponing the need to expand capacity and giving the energy efficiency first principle a concrete and practical definition."*: https://cadmus.eui.eu/bitstreams/4fa8c1e5-fd55-444e-a639-31c2a9a7d8cf/download ACER's Opinion has also called for translating EE1st Principle in TYNDP Scenarios.

7. A 90 GWh seasonal thermal storage is being built in Vantaa, Finland by 2028: https://helsinkismart.fi/worlds-largest-cavern-thermal-energy-storage-built-in-vantaa/

8. See also: https://www.npr.org/2025/06/26/nx-s1-5443660/amid-extreme-heat-some-power-grids-may-struggle-to-keep-up-with-rising-energy-demand and https://www.euronews.com/business/2024/08/14/edf-cuts-nuclear-production-in-reaction-to-soaring-temperatures

The Innovation Roadmap is intended to be regularly updated. Currently as a concrete PDF document, presumably, the ideas could be made available in a visual form in a platform, even allowing comments from the energy community, to help showcase the cutting-edge innovation and solutions of the European energy sector, to reflect the energy competitiveness of the EU27 in a globalised world.

Draft supply assumptions – encompassing H2 import potential and prices, technology cost, and commodities prices, CO2 cost and synfuel import cost

8. Do you think that the draft import potentials for H2 and ammonia could be improved, and if yes, why and how?

No response.

9. If you answered to the previous question, please reference a source to support your claim.

No response.

10. Do you think that the draft technology costs could be improved, and if yes, why and how?

Assumption about battery storage CAPEX fails to reflect that battery storage technology, similarly to solar panels, has undergone rapid cost reductions. The average price of lithium ion battery packs dropped $115 USD/kWh in 2024, falling by 20% compared to 2023 and is 84% lower than the average cost a decade ago. The current assumption of over 1300 €/kW for a utility-scale battery with 4 hours energy-to-power ratio in 2030 seems to underestimate the cost reduction potential. Higher adoption of LFP chemistries, continued market competition, improvements in technology, material processing and manufacturing are likely to exert downward pressure on battery prices. We would strongly suggest that preliminary assumptions on CAPEX for battery storage are revised to take into account future efficiency gains.

11. If you answered to the previous question, please reference a source to support your claim.

Sources:

1) BloombergNEF Press release (December 10, 2024) https://about.bnef.com/insights/commodities/lithium-ion-battery-pack-prices-see-largest-drop-since-2017-falling-to-115-per-kilowatt-hour-bloombergnef/

2) Preliminary ERAA 2025 Economic and technical investment parameters: https://eepublicdownloads.blob.core.windows.net/public-cdn-container/clean-documents/sdc-documents/ERAA/ERAA_2025/Economic%20and%20technical%20investment%20parameters.zip

12. Do you think that the draft commodities prices, CO2 cost and synfuel import cost could be improved and if yes, why and how?

No response.

13. If you answered to the previous question, please reference a source to support your claim.

No response.

14. Is there anything that you would like to add?

Excel 2.1.: As a technical note, it is unclear why the excel sheet on ‘Gasblend’ still refers to NT+, DE and GA scenarios. It appears that the sheet should be updated.

Excel 2.4.: It appears that there are no technology costs assigned with storage technologies.

Assigning costs to emerging technologies is a known methodological issue, but it is recommended that this issue is addressed explicitly and stated openly in the future. Please also see our answer to Question 6 on seasonal and long term energy storage technologies.

Suggestions:

As the first step, it would be strongly recommended to add a mention or a footnote to the Draft Technology Costs excel that no costs for a set of storage technologies have been assigned due to a difficult to project future costs.

As the second step, we would recommend adding a range of storage technology costs. Source: US DoE (2022) 2022 Grid Energy Storage Technology Cost and Performance Assessment. US Department of Energy. https://www.energy.gov/eere/analysis/2022-grid-energy-storage-technology-cost-and-performance-assessment

As the third step, as mentioned in Question 6, we believe that JRC’s “European Energy Storage Inventory: Real-time Energy Storage Dashboard” should feed and be integrated into TYNDP scenarios and modelling reference data. https://ses.jrc.ec.europa.eu/storage-inventory

Modelling Methodologies and Assumptions

15. Do you think that the draft market modelling methodologies and their relevant assumptions could be improved and if yes, why and how? ‘

Overall, an improved documentation of assumptions on the different sources and origins of hydrogen is helpful, and it is recommended that associated rationales continue to be clarified, as it would allow seeing into the prioritisation and interplay of future electricity and hydrogen infrastructures, and assist stakeholders in assessing the proposed volumes.

Although implied by the materials package, a more explicit clarity on the prioritisation of green hydrogen (H2) is also called upon.

16. Do you think that the draft target compliance and gap filling methodologies can be improved and if yes, why and how?

On **target compliance**, ENTSOs mention “there are no specific targets for 2035 and 2040” for TYNDP 2026. The cut-off date was 24.12.2024.

Already in February 2024, EC launched a process to introduce the 2040 climate target. Therefore, we would expect the ENTSOs to already anticipate such changes, as they begin to prepare for the TYNDP 2028 cycle and foresee its timeline, and for it to provide stronger target compliance to both 2035 and 2040.

On **Gap Filling Methodology**: As a general concern, a SRG WG1 working paper (draft 11.6.2025) identifies the following problem in the current Gap Filling methodology:

“Reducing FEC from liquids without a corresponding increase in other fuels (e.g. electricity, LPG, hydrogen etc), besides possibly translating into demand destruction, risks underestimating infrastructure needs to support the modal shift necessary to reach EU targets, such as electrification of transport.”

It is recommended that thought is put into this issue.

17. Do you think that the draft carbon budget methodology can be improved and if yes, why and how?

“The carbon budget for the scenarios is set to 16 GtCO2-eq in the period from 2030 to 2050.”

1) Concerning the carbon budget, for CCS, we appreciate the document making a specific reference to the ESABCC advice on thresholds.

2) But, the TYNDP Scenarios should explain even more clearly how the carbon budget impacts the overall scenario results (and more widely, eventual energy infrastructure designs).

3) Finally, concerning the 2040 timeline, a recent comparison note, published by négaWatt in May 2025, which has taken ESABCC advice on feasibility criteria, hints that the previous TYNDP 2024 deviation scenarios were worryingly close to the limit of ambition of the ESABCC benchmark and recommendations (nègaWatt 2025, p. 7). Also in the question of the carbon

budget, TYNDP 2024 scenarios appeared as less ambitious than more progressive European energy scenarios. Learning from such analyses is recommended, also with a view to the on-going and future cycles.

Source: Balancing ambition and feasibility: Comparison of major EU energy and climate scenarios for 2040 https://www.negawatt.org/IMG/pdf/2040_scenario_comparison_-_ambition_and_feasibility.pdf

18. Do you think that the draft scenarios grid methodology can be improved and if yes, why and how?

On electricity grids, the methodology would do well to consider, if it will be necessary to acknowledge the potential role of Grid Acceleration Areas (GAAs), which currently act as a non-binding mechanism.

As an observation, the criteria for electricity grids seems to be far more strict than for H2 grids. It is not fully clear why this is the case.

19. Do you think that the draft scenario weather years selection methodology can be improved and if yes, why and how?

We warmly welcome the progress and accommodation of future simulated weather years. CAN Europe believes this can create a more realistic picture of the conditions under which future energy infrastructures are presumed to operate. Concerning the next steps:

First, we would hope for an expanded Methodological Note, with further details of what this means in terms of operationalisation, as well as any limitations. Current explanation gives an overview for judging internal consistency, but we fear that stakeholders are only able to gain a piecemeal and superficial understanding, lacking a big picture. This could have been avoided with slightly more explanatory slides.

Secondly, there are real-life implications deriving from the methodology, which require further illustration (potentially elsewhere in TYNDP). An analysis of the interlinkages of the gas and electricity networks as i.e. lower heat demand in winter, coupled with higher heating sector electrification, and temporal power to heat storage, has implications for RES development and similarly electrified cooling in the central heating networks, and also allows solar power to be utilised to a fuller degree than when just thought of as a electricity system element. Such solutions might be obvious in some EU countries, but in others such measures are a new solution. Having this issue, and related implications, clearly explained and reflected would be an added value for TSOs, and also gas TSO, in some MSs.

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Finally, this issue also relates to future energy demand projections. In some countries, inflated projections are a potential cause of concern. Gogolewski (2025) is worried of unrealistic NECP assumptions in Poland, of future lower heat demands not properly reflected, as explained in: "The demand for energy in the country will increase because…".

Translated from: https://wysokienapiecie.pl/110901-popyt-na-energie-w-kraju-wzrosnie-bo-do-polski-masowo-rusza-imigranci/

20. Is there anything that you would like to add?

On question 17 on the carbon budget methodology, we find it interesting that the document mentions EC 2040 Impact Assessment scenario three. “Reason for selection of S3: Consistency with last cycle. Represents the recommended scenario by ESABCC to stay aligned with the European climate goals.” However, it is not clear if Scenario 3 is applied only to this particular element, and why only to this element. It could be useful to systematically widen the application of S3 also into TYNDP Scenarios, as it could e.g. make more clear potential savings (and assist in demand-side optimisation).

As one related, practical measure, e.g. a sensitivity analysis could be applied consistently to the central scenario (NT+), and across its different aspects.

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CAN Europe members would like to inquire whether cases of demographic decline are factored in energy demand or grid development planning in TSOs’ demand projections. In those countries that are experiencing a demographic decline, for example Poland, supply-side projections could be checked against demand assumptions.

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As another methodological exercise, to assess necessary supply levels, it would be interesting to validate the accuracy of the TYNDP past and future scenarios with a cross-check of historic energy carrier demand projections by TSOs, with factual, realised carrier demand and use levels. If discrepancies persist e.g. at a particular country, an analysis of the possible reasons for such continued discrepancies could be started.

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As time goes by, it is likely that even more ambitious change could be required, as already has been illustrated by the discussion around the 2040 climate target.

Accordingly, it would be an advantage to see TYNDP Scenarios, as a set, to apply a proactive level of ambition across their methodological choices, and also to show potential trade-offs, in order to avoid a situation of reactively adjusting to potential future changes.

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29 JULY 2025

CAN Europe’s submission to ENTSO-E and ENTSOG TYNDP 2026 Scenarios Economic Variants Development Methodology – Draft for public consultation

Consultation I TYNDP Scenarios

Draft economic variants methodology (see the methodology)

4. How would you overall rate the draft economic variants methodology? (choose between 1 to 10 - 10 being most satisfactory)

6.

5. Do you think that the draft methodology for building economic variants could be improved and if yes, why and how?

For context, CAN Europe is a member of the Stakeholder Reference Group (SRG) to TYNDP Scenarios. SRG follows the evolution of the TYNDP scenarios and associated modelling. TYNDP Scenarios assumes a pan-European view for PCI/PMI project selection, but they are used by TSOs and many other actors, as an important planning tool, as is well known. The new TYNDP 2026 Scenario Framework resembles something of a single-scenario approach.

In principle, the question concerns 1) the overall scenario framework and 2) the construction of the variants themselves.

Transmission system operators (TSOs) and national regulatory authorities (NRAs) may seek planning certainty to implement infrastructure, and the new TYNDP 2026 scenario framework with a narrow (or conservative) approach is argued to align with a conducive policy-making rationale. However, nothing inherently requires scenarios to be built with such an approach. It has been claimed that the old variants ("DE" & "GA") were "too" wide to be useful and policy relevant, but the issue may also stem from some other observed limitations of the scenarios, and also to how they aged over time.

Some limitations of the new framework may include:

1) With a narrow approach, it remains unclear how much of a stress test the variants will eventually provide.

2) On the economic variants, the two variants seem not to differ fundamentally from the central scenario, apart from a minor percentage (%) adjustment +/-. Usually, scenario analysis aims to generate insights i.e. 'to learn with the scenarios'. It is still unclear what we can actually learn from such a deviation.

3) The Initial Test Results (see slide 8) show limited deviation in key parameters, such as final energy demand, methane demand or H2 demand, raising questions of insights.

4) To plan for the long-term, resilience against other types of uncertainties will remain relevant. It will be imperative to test the central scenario with strategic 'sensitivity analyses' and/or 'what if' types of variants - against key uncertainties. This would, in fact, also strengthen the central scenario, as requested by ACER and EC.

5) If the variants are intended to be stress tests, at least nutshell descriptions of storylines would help better understand "what are they stress tests for". At the moment, we primarily see a technical methodology to construct the variants. Apart from internal validity, relevance to energy infrastructure planning is very difficult to assess.

6. Is there anything that you would like to add?

From an internal validity perspective, the methodology is rather well articulated and justified. However, as written above, from an external validity and relevance perspective, according to CAN Europe's view, it is far too early to judge if the new TYNDP 2026 framework, which seems to allow very limited room for imagination, is actually 'optimal' or 'preferred'.

Overall, the timeline for building the scenarios has been tight. Complying with the process timeline is one important criteria, but if requests to test the TYNDP 2026 Scenarios are not feasible, this would appear to be one of the key limitations of the current cycle.

An improvement in the next TYNDP cycle (i.e. TYNDP 2028 framework) would be to enhance the timeline design, with time for sensitivity analyses across 2-3 critical factors on key issues that are analysed systematically. They could help elevate strategic discussions on key emerging issues of the energy transition to generate valuable insights. These could also be e.g. proposed by stakeholders. Such issues could entail, but are certainly not limited to a far higher role of non-fossil flexibility, battery storage growth (thanks to changes in battery quality and lower prices), as well as spotlighting issues of fossil fuel phase outs in energy infrastructure.

In the future, alongside techno-economic drivers, attention to integrating the political, social and environmental aspects of the transition into the framework can be assumed to require elevated attention.

To conclude, the experience with TYNDP 2026 scenarios should be documented and feedback collected to better assess the usability of the framework for the TYNDP 2028 cycle, and beyond, also with possible adjustments in mind.

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