Annex 6 – Flexibility, import and carbon budget

Question 1: Energy import range

Feedback (Germanwatch)

However, it is unclear why in the GA scenario in 2050 there will be still imports of fossil natural gas.

Response

The Global Ambition scenario storylines has a stronger focus on imports compared to the Distributed Energy. This translates into higher imports for all energy carriers. Emissions associated with natural gas imports in 2050 are abated through CCS technology.

Feedback (WindEurope)

Energy imports assume a too large level of gas and particularly, hydrogen imports, especially in the GA scenario.
Energy imports are forecasted to be 2.5 PWh in GA and in 1 PWh DE in 2050. A large share of this is hydrogen import. We would caution that the GHG intensity of imported hydrogen may be difficult to assess and validate. For example, if gas-based hydrogen is produced in a third country, it would be unjustified to assume that SMR+CCS has an efficiency of 95% (i.e. almost all of the carbon is captured). Challenges such as inexperienced local authorities or vested interests could lead to underreporting of GHG emissions from the production of gas-based hydrogen. How would this be taken care of in the report's scenarios on hydrogen imports?
The DE and GA scenarios are assuming that there will be an ever-increasing availability of affordable decarbonized methane -either indigenous or imported-, massively deployed from 2030 on. Notably in the Global Ambition scenario, the clean gas imports widely exceed indigenous production. This is assuming that other regions of the world will be able to supply large quantities of decarbonized gas to the EU, which seems to be questionable. This assumption would also have implications in existing and new infrastructures needed to cope with such imports.

Response

Global Ambition shows a comparable level of energy imports in 2050 as the Impact Assessment from the European Commission. The level of energy imports in Distributed Energy is substantially lower.

In the updated scenarios, we have reduced the share of decarbonised hydrogen imports in favour of imports based on renewables (electrolysis). In Global Ambition the renewable share of hydrogen imports is now more than 80 percent. In Distributed Energy all hydrogen imports were already renewable in the draft scenarios. Assumptions regarding hydrogen import potentials are reported in the Scenario Building Guidelines, which is available on the scenario website.

The figures for methane supply were also adjusted in the updated scenarios. More indigenous production was added, both in biomethane and synthetic gas (P2Methane). As a result, the import share for methane is reduced.

Feedback (Enel SpA)

The DE and GA scenarios are assuming that there will be an ever-increasing availability of affordable decarbonized methane -either indigenous or imported-, massively deployed from 2030 on. Notably in the Global Ambition scenario, the clean gas imports widely exceed indigenous production. This is assuming that other regions of the world will be able to supply large quantities of decarbonized gas to the EU, which seems to be questionable. This assumption would also have implications in existing and new infrastructures needed to cope with such imports. In addition to this, to continue importing gas in any form and from any source perpetuates the possibility to continue having significant methane leakages along all the value chain. As stated by the IEA in their Zero Emission by 2050 report and scenario, cutting methane leakages is essential to reach the 1.5ºC goal, and the scenarios proposed are moving in the opposite direction.

Response

Following the public consultation, we have adjusted the figures for methane supply. More indigenous production was added, both in biomethane and synthetic gas (P2Methane). As a result, the import share for methane is reduced. Methane imports in 2050 are now similar or below the level specified in the European Commission Impact Assessment.

Feedback (Eurelectric)

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.

Response

In our current scenario building approach, we define the import requirements per scenario as well as the supply potentials that could be made available for Europe. The assumptions regarding import potentials are provided in the Scenario Building Guidelines report. The design of guarantee of origin certification is beyond the scope of the TYNDP scenarios. The implications of renewable and decarbonised gas imports will be assessed in the TYNDP.

Feedback (EDF)

The breakdown of imports by country is not available.
Some countries bet on massive imports to decarbonize their economies, others have chosen not to

include imports in their decarbonisation strategies. Therefore, there is no common strategy at European level on this issue and only detailed data by country can enlighten on this question.

Response

At scenario level, the gas imports are quantified on an EU level. This means that the share of the different extra-EU suppliers (shipping and pipeline) in the total gas imports is not modelled in the scenarios. However, this exercise will be performed in the gas TYNDP. The import potentials which will be used for this are shown in the Scenario Building Guidelines and on the visualisation platform.

The import and export of electricity per country is part of the expansion and dispatch modelling. The yearly flows and capacity at the interconnections as provided in Excel format on the download page of the scenario website (updated electricity modelling results).

Feedback (Ørsted)

Energy imports are forecasted to be 2.5 PWh in GA and in 1 PWh DE in 2050. A large share of this is hydrogen import. We would caution for two reasons. First, the current energy crisis related to gas prices has shown that the political ambition is to leverage the energy transition to increase energy independence, which should be taken account of in the TYNDP. Second, it is important to mention that the GHG-intensity of imported hydrogen may be difficult to assess and validate. For example, it is unjustified to assume that SMR+CCS production from a third country has an efficiency of 95% (ie almost all of the carbon is captured). However, the report currently does assume a >95% efficiency for CCS. Higher than expected lifecycle emissions, for example from methane leakage, are one reason. The other is that carbon capture technologies still have to be proven at industrial scale. Especially in countries with limited track record for accurately reporting emissions, this might lead hydrogen imports with substantial emissions that would go unaccounted for. How would this be taken care of in the report's scenarios on hydrogen imports?

Response

In the updated scenarios we have reduced the share of decarbonised hydrogen imports in favour of imports based on renewables (electrolysis). In Global Ambition, the renewable share in the hydrogen imports is now more than 80 percent. In Distributed Energy, all hydrogen imports were already renewable in the draft scenarios.

Feedback (Eurogas)

H2 imports figures seem very significant – especially compared to EC scenarios. Further details are needed to assess such level of imports regarding the H2 infrastructure and storages. We believe that import of other hydrogen derivatives, ammonia or e-fuels are also a feasible solution and underestimated.

Response

Following public consultation, we have increased the production of e-fuels (P2M, P2L), especially in Distributed Energy. Imports of synthetic methane were also increased. Infrastructure assessment is beyond the scope of the scenarios but is part of the TYNDP.

Feedback (CurrENT Europe)

Energy imports assume a too large level of hydrogen imports, especially in the GA scenario.

Response

The Global Ambition scenario storyline is designed to focus more on import than Distributed Energy. The assumptions regarding the hydrogen import potentials are documented in the Scenario Building Guidelines. The Extra EU supply potential for TYNDP 2022 was consulted with stakeholders on 27 May 2021 (link).

Feedback (ENGIE)

The figures about peak gas imports potential indicated in the Scenario Building Guidelines for 2030 appear overestimated. Therefore, they tend to underestimate the risks in terms of security of supply (and in turn the need for energy and gas storages). For instance, maximum imports envisaged from Russia and Norway are far higher (approx. 30%) than the more realistic peak values observed historically (February 2018 cold spell). Furthermore, the assumptions about new gas imports from Turkmenistan seem not realistic as the realization of a new Trans Caspian Pipeline seems not achievable (by 2030). Finally, considering the worldwide potential for LNG imports does not seems appropriate: when a peak gas demand occurs due to a cold spell, gas emissions from the regasification terminals only reflect the LNG cargo unloadings programmed before meteorologists could detect such cold spell.
Correspondingly, the aggregated gas supply also appears to be overestimated.
Moreover, we rather agree with the EU Commission's Impact Assessment scenarios where hydrogen will be mainly produced in Europe and transported throughout the continent. Having said that, the expected volumes of H2 for the EU market are very ambitious, so the option of hydrogen imports from outside EU must be regarded. That's clearly a feasible solution (e.g., via pipelines from North Africa). Of course, the soundness of the assumption (up to 1.000 TWh of imported hydrogen in Global Ambition in 2050, but without information on the geographical sources) should be checked given especially the transportation costs over very long distances.
On the other hand, we believe that import of other hydrogen derivatives or e-fuels from abroad could be a feasible solution. In particular, we regret that both the import from e-methane is completely absent from both COP21 scenarios, while for 2040 and 2050 only a very small share of e-methane imports are considered in both scenarios (not clear: figure 27 at page 33 shows a share of e-methane "imports", while the text mentions e-methane "domestic production"). In any case, we believe that both scenarios should give to e-methane imports a more prominent role in order to contribute both to the decarbonization of gas usages and to security of supply in a context dominated by RES and with an ongoing coal phase-out in several important Countries. (see our answer to Q.32 for more considerations about the role of gas, for which there is no dedicated question).

Response

Gas infrastructure assessment is not part of the scenario development but will be included in the TYNDP itself. This infrastructure assessment will consider different climatic conditions, including peak demand situations. The transmission infrastructure capacity data (including the Trans Caspian Pipeline) that will be used in this assessment are collected from the gas TSOs.

The assumptions regarding the extra-EU hydrogen import potentials (per country/region) are documented in the Scenario Building Guidelines. The figures are also available on the visualisation platform.

Following public consultation, the amount of synthetic methane was increased, both for the EU production and through imports.

Feedback (Edison S.p.A.)

Edison appreciates the increased level of data for import, and the splitting between energy carriers. It could still be improved by giving more details for some of the energy vectors, for example the distinction between LNG /bio LNG, and presenting a breakdown of energy import by country.

Response

The import and export of electricity per country is part of the expansion and dispatch modelling. The yearly flows and capacity at the interconnections as provided in Excel format on the download page of the scenario website (updated electricity modelling results).

The share of the different extra-EU suppliers (shipping and pipeline) in the total gas imports is not modelled in the scenarios. However, this exercise will be performed in the gas TYNDP. The import potentials which will be used for this are shown in the Scenario Building Guidelines and on the visualisation platform.

Feedback (BDEW Association of German Energy and Water Industries)

The DE Scenario shows a decrease of imports of gases. This is a likely development in ab-solute terms, as the share of gas in the energy systems will be less compared to today's volumes.
In the GA scenario, with a more diverse supply mix, gas demand is higher than in DE scenario. It is said that with lower uptake of electrolysis within Europe the path to achieve large scale decarbonization entails a more import-oriented vision. From BDEW's point of view it is not necessarily the low uptake of electrolysis that makes import of renewable / decarbonized gases necessary, but the simple amount of volumes of renewable / decarbonized gases that is needed in the sectors which are natural gas supplied today.
BDEW wonders why conventional oil would be imported in 2050 (figure 14 in the Final Storyline report).

Response

We agree that the import requirement does not only depend on the level of alternative supply sources like electrolysis. Indeed, it stems from both the level of other supply sources and the level of demand. As the scenarios are built in an integrated way, supply and demand effects are both considered. In Global Ambition, the demand for hydrogen is higher than in Distributed Energy whereas the green hydrogen production is rather similar. This results in higher imports in this scenario.

All Liquids imports in 2050 are bio- and synthetic fuels. This is also shown in figure 18. By 2050, a limited amount of EU oil production is still envisaged. Any associated emissions are abated with CCS.

Question 2: Electrolysis range

Feedback (Germanwatch)

The amount produced in the DE and GA scenarios do not differ much, although one could have expected higher production values in the DE scenario. Also, it remains unclear, why blue hydrogen remains in the 2050 hydrogen mix in GA.

Response

The reason for the amount produced in the scenarios depends on the level of SMR, imports and demand. This mix is used to meet demand in both scenarios. Blue hydrogen still remains as this is one of the possible options of producing hydrogen, in DE SMR is completely phased out in 2050. The scenarios must look at the range of possibilities.

Feedback (Brintbranchen / Hydrogen Denmark)

However, we do note that a significant amount of electrolysis is assumed to be based on grid electricity. While it is realistic that technically many PtX projects will be connected to the grid, it is also worth being clear on the fact that they will in most cases be developed hand in hand with new renewable electricity production, via e.g. PPAs. Meaning that the power used by these grid-connected electrolysers will be renewable anyway. This is not sufficiently reflected in TYNDP 2022 in our view.

Response

The scenario modelling considers 3 types of connection in 4 hydrogen configurations. These are Dedicated RES, Shares RES (RES connection directly to electrolysers and the electricity market) and Market Based Renewables. The optimisation determines where the most profitable connections lie, and it seems to favour shared RES rather than dedicated RES as excess energy can still be utilised.

Feedback (WindEurope)

Installed electrolyser capacity is assumed to be below the EU impact assessment scenarios (over 500 GW) at 324 GW in DE and 285 GW in GA by 2050. Most of this capacity is expected to be grid-connected (which convey by itself not only the market but regulatory assumptions by the ENTSOs) with only a fraction being connected to dedicated renewable capacity. Hydrogen supply is close to 1600 TWh in DE and around 1400 TWh in GA. This implies that the load factor of the electrolysers would need to be around 80%.

It is therefore sound to raise the assumption for electrolyser capacity and have more of the electricity supply come from hybrid and dedicated renewable capacity (either directly linked or associated with a PPA). The assumption that most electricity comes from the grid (possibly purchased hourly in spot markets as understood in the scenarios documentation), corresponds neither with the reality that large-scale green hydrogen projects are planning to use dedicated or hybrid capacity nor with the need to ensure that the production of hydrogen is undoubtedly associated with renewable generation. The grid-connected electrolysers may also have a negative impact on system balancing if it demands electricity from the grid when there is not sufficient renewable generation available. With a load factor of around 80% it is hard to see that this could be met with solar and wind power without a firm engagement with renewable facilities, with the consequence that the electricity used may in the period have to come from thermal plants.

Response

The development of electrolyser capacity is based only on economic modelling, rather than regulatory considerations, and the objective function of the model is cost minimisation. Therefore, the outcome of the model shows the most economical way of meeting hydrogen demand. It is likely that the dedicated/shared RES in the scenarios cover the large-scale electrolyser projects currently being planned, but the future demand is far greater than the production potential of these currently planned projects, therefore it is possible that a lot of the unplanned electrolysers could be connected to the electricity market in order to utilise the RES resources most efficiently. The reason for the high load factor is of course the fact that the electrolysers are connected to the electricity market which enables the use of the electricity grid to deliver clean electricity at a wider range of times.

Feedback (Ørsted)

Installed electrolyser capacity is assumed to be below the EU impact assessment scenarios (over 500 GW) at 324 GW in DE and 285 GW in GA by 2050. Most of this capacity is expected to be grid connected with only a fraction being connected to dedicated renewable capacity. Hydrogen supply is close to 1600 TWh in DE and around 1400 TWh in GA. This implies a load factor of the electrolysers would need to be around 80% on average.

Electrolysers will be grid-connected, but our assessments (happy to share) suggest that electrolysers are playing a larger role in RES integration. That implies load factors that are typically lower than 80%, since the dispatch of the electrolysers is price sensitive. We would also recommend having a look at the EC work on how an energy system in 2050 with mainly variable generation could look like. (METIS Studies, Study S14) . With a load factor of around 80% it is hard to see that this could be met with solar and wind power alone with the consequence that the electricity used may in period have to come from thermal plants.

Response

The development of electrolyser capacity is based only on economic modelling, and the objective function of the model is cost minimisation. Therefore, the outcome of the model shows the most economical way of meeting hydrogen demand. The reason for the high load factor is of course the fact that the electrolysers are connected to the electricity market which enables the use of the electricity grid to deliver clean electricity at a wider range of times.

Feedback (Enel SpA)

Noting else as said in 28 that the hydrogen production seems too high to us, we support that most of the h2 is produced through electrolysis and welcome the dedicated analysis made on the issue.

Response

The hydrogen production is a result of the electrolyser capacity and the fact that the electrolysers are connected to the electricity market.

Feedback (Oeko-Institut)

Data on ranges is missing in the TWNDP 2022 Storyline Report. In addition, the variation in the scenarios (Distributed Energy and Global Ambition) as suggested in the TYNDP 2022 Draft Scenario Report is small.

Response

Flexibility is slightly different to other key parameters in that the development of each flexibility technology is dependent from a wide range of other parameters that have not yet been quantified at storyline level. In the end it is an output of the electricity market models used to help quantify each of the scenarios. The result of this modelling is captures in the scenario report. With the updated version of this report the scenario differentiation for electrolysis capacity was increased.

Feedback (Environmental Action Germany (Deutsche Umwelthilfe e.V., DUH))

In our understanding, the TYNDP 2022 Storyline Report did not yet define clear ranges for the level of electrolysis capacity (and the infrastructure needs) for the TYNDP 2022 scenarios. The variation between the Distributed Energy scenario and the Global Ambition scenario suggested in the TYNDP 2022 Draft Scenario Report is relatively limited.

Response

The electrolyser capacity is a function of the hydrogen demand, imports, SMR capacity and RES built out rates. If we limit electrolyser capacities it means this demand will have to be met by SMR and Imports, therefore we chose to let electrolyser capacity be an open variable to meets hydrogen demand in the most economical way.

Feedback (Climate Action Network (CAN) Europe)

In our understanding, the TYNDP 2022 Storyline Report did not yet define clear ranges for the level of electrolysis capacity for the TYNDP 2022 scenarios. The variation between the Distributed Energy scenario and the Global Ambition scenario suggested in the TYNDP 2022 Draft Scenario Report is relatively limited. It would be good to provide an explanation why fossil hydrogen produced through steam methane reformation with CCS still remains in the mix until 2050.

Response

Blue hydrogen still remains as this is one of the possible options of producing hydrogen, in Distributed Energy, SMR is completely phased out in 2050. The scenarios must look at the full range of possibilities.

Feedback (Eurelectric)

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).

Response

The electrolysis capacities follow demand, import and SMR capacities, and the model optimises capacities in order to reduce costs in the most economic manor.

The TYNDP scenarios are not national studies, and the capacities will not be the same as national studies. The TSOs mentioned are involved in the Scenario building cycle and all data must be approved before publication.

The scenarios make no assumption on the ownership of electrolysers as this is not in the TYNDP scope.

Feedback (EDF)

The production of hydrogen from electrolysis seems to be huge, particularly for France as it reaches about 400 TWh in GA in 2050. This huge development from electrolysis leads to a French power generation higher than 1000 TWh in both scenarios. This assumption seems to be very ambitious. Regarding the capacity, 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, particularly with 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).

Response

The electrolysis capacities follow demand, import and SMR capacities, and the model optimises capacities in order to reduce costs in the most economic manor. The power generation capacities are limited to boundary conditions given by the TSOs, therefore the production shown in the scenarios is possible.

The models are built on a pan-european level where the models can see where the best locations for cheap, carbon free energy is. We limit the generation capacity potential, but we don't limit how much electrolysers can be built, else hydrogen demand will have to be met but more SMR and imports.

It should also be noted that the TYNDP scenarios are not national studies, and the capacities will not be the same as national studies. The TSOs mentioned are involved in the Scenario building cycle and all data must be approved by the TSO experts before publication.

Feedback (CurrENT Europe)

Installed electrolyser capacity is assumed to be below the EU impact assessment scenarios (over 500 GW) at 324 GW in DE and 285 GW in GA by 2050. Most of this capacity is expected to be grid-connected with only a fraction being connected to dedicated renewable capacity. Hydrogen supply is close to 1600 TWh in DE and around 1400 TWh in GA. This implies that load factor of the electrolysers would need to be around 80%.
It is, therefore, sound to raise the assumption for electrolyser capacity and have more of the electricity supply come from hybrid and dedicated renewable capacity. The assumption that most electricity comes from the grid does not correspond with the reality that large-scale green hydrogen projects are planning to use dedicated or hybrid capacity. The grid-connected electrolysers may also have a negative impact on system balancing if it demands electricity from the grid when there is not sufficient renewable generation available. With a load factor of around 80% it is hard to see that this could be met with solar and wind power alone with the consequence that the electricity used may in the period have to come from thermal plants.

Response

The development of electrolyser capacity is based only on economic modelling, and the objective function of the model is cost minimisation. Therefore, the outcome of the model shows the most economical way of meeting hydrogen demand. The reason for the high load factor is the fact that the electrolysers are connected to the electricity market which enables the use of the electricity grid to deliver clean electricity at a wider range of times.

We believe that the scenarios do reflect the fact that large-scale green hydrogen projects are planning to use dedicated or hybrid capacity as this is also present in our scenarios, but the level of hydrogen demand required far exceed the production capacity of these projects.

In terms of system balancing, the hydrogen network will have other flexibilities such as grid, storage and imports. Electrolysers connected to the grid can actually help with system balancing through upward and downward regulation.

Feedback (ENGIE)

Both 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.
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).

Response

The electrolysis capacities follow demand, import, RES build out rates and SMR capacities. The model optimises capacities in order to reduce costs in the most economic way.

The TYNDP scenarios are not national studies, and the capacities will not be the same as national studies. The TSOs mentioned are involved in the Scenario building cycle and all data must be approved before publication.

The scenarios make no assumption on the ownership of electrolysers as this is not in the TYNDP scope.

Feedback (Edison S.p.A.)

The production of hydrogen from electrolysis seems to be huge, particularly for Italy as it reaches about 165 TWh in DE and 105 in GA in 2050. This important development from electrolysis leads to a massive Italian power generation in both scenarios. This appears to be very ambitious.

Response

The scenarios are created with the TSOs who ensure the outcomes are possible.

Question 3: Does carbon budget benchmarks resulting from scenarios appropriate?

Feedback (Agora Energiewende):

Agora Energiewende suggests an ambitious decarbonising pathway anchored around the 2030 and 2050 targets. Our analysis shows that a carbon budget of 20 Gt CO2 for the time between 2030 and 2050 can be realistically achievable, with an interim target of 85% GHG emission reduction by 2040. If not the case already, methane leakage from downstream and upstream fossil fuels infrastructure should be included in the carbon budget. See also: https://static.agora-energiewende.de/fileadmin/Projekte/2021/2021_07_EU_GEXIT/AgoraEW_Phasing_out_fossil_gas_in_the_EU_Interim_Results_20211028.pdf

Response:

Thank you for your comment and the information provided.

The carbon budget assessment for the TYNDP scenarios covers the period from 2020 until 2050. Our analysis shows that the majority of the carbon budget requirement is expected in the first ten years, between 2020 and 2030. For the 20-year period between 2030 and 2050 the cumulative emissions in both Distributed Energy and Global Ambition are below 20 Gt.

Methane emissions (which includes methane leakage) are included in the carbon emissions calculations.

Feedback (BDEW):

"A global CO2 budget is a necessary basis for discussion of international climate policy in order to be able to assess the ambition levels of the parties as a whole. Currently, there is no established methodology for the question of how a global CO2 budget could be broken down and if it can be transferred between the nations. However, such a methodology is crucial for determining whether a budget approach makes sense and fits into the target architecture. As long as there is no common agreement amongst the COP, the budget cannot be distributed between the nations.

Moreover, the determination of this budget is a dynamic process. The budgets currently available are still provisional, e.g., reduction scenarios for non-CO2 gases are still to follow."

Response:

Thank you for your comment.

Indeed, there is no established methodology to define a carbon budget for Europe or per country. Consequently, carbon budget assessment can currently only be performed by making some assumptions. For this purpose, we have used the methodology we defined for TYNDP 2020 based on exchange with CAN Europe. We used two main approaches to define the European share in the global carbon budget: based on population and based on equity.