bdew

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Position paper

ENTSO-E and ENTSOG draft 2020 Scenario Storylines

BDEW answers to the consultation

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General remarks

As foreseen in Regulations (EU) 714/2009 and (EU) 715/2009, respectively, the European networks of transmission system operators for electricity (ENTSO-E) and for gas (ENTSOG) have to publish their Ten Year Network Development Plans (TYNDPs) on a biennial basis. Annex V of Regulation (EU) 347/2013 specifies the input data sets on which the methodology for a harmonised energy system-wide cost-benefit analysis for projects of common interest has to be based.

BDEW welcomes that ENTSO-E and ENTSOG jointly develop the scenario building storylines which describe the possible future European energy system in medium and long term up to the year 2050. Considering the development over this time horizon is a complex task, represented in the different scenario building storylines. This stresses the importance of combined expertise from electricity and gas. The joint approach of ENTSO-E and ENTSOG correctly takes into account that both systems are parts of one energy system which has to be considered as a whole. It avoids contradictory assumptions regarding the overall development of the energy systems.

With this paper, BDEW presents its answers to the public consultation held from 2 July to 7 September 2018 by ENTSO-E and ENTSOG. BDEW gives answers to those questions which could be assessed with the help of its members' expertise. BDEW supports the idea to describe different storylines as a starting point for the analysis of possible developments of the economy and the energy sector.

However, not all of the questions can be answered on the basis of the information delivered in the consultation documents.

On the one hand, the storylines present the overall developments in a qualitative way. Yet, in order to assess their consistency and plausibility, more information on the underlying assumptions – also quantitative ones – are necessary. Among others, the development of the price for emissions allowances will have a major influence on the demand for the different production technologies, especially from industrial customers. Besides, next to assumptions on the overall (yearly) demand and supply for different primary energies, their fluctuations over the time (e.g. hourly consumption and production) are crucial for a sound assessment. In addition, BDEW misses comprehensive assumptions on the potential developments in the heating sector as well as for transport and residential energy demand. The storylines should comprise assumptions on the shares of the different technologies used in the base years, adding up to 100%.

On the other hand, technical limits have to be taken into account. For example, in industrial processes like the production of steel, fertilizers or chemicals fossil fuels serve as feedstock. In these cases, they cannot be exchanged by electricity but e.g. by hydrogen or sustainably produced hydrocarbons. This leads to the question how high amounts of these substitutes can be provided for the relevant industries, at least in the storylines with a high CO2 reduction.

One instrument to overcome these problems and to improve the information generation process is to involve DSOs into the establishment of the scenarios and the grid development plans from the very beginning.

Due to the limited information, BDEW does not answer all questions on the storylines. Please find more comments in the respective fields for each storyline.

Since the German TSOs for Electricity and Gas organised with BDEW are part of ENTSO-E and ENTSOG, respectively, they abstain from voting on the present position paper.

A. Questions on you and your organisation

1. Name

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3. What is your organisation?

BDEW Association of German Energy and Water Industries

B. Questions on the Storylines

4. Are the storylines consistent?

National Trends [Alpha]:

Answer: [No answer]

Comments: The assumptions for the macro-economic trends and the development of energy use in the different sectors (transport, residential and commercial, industrial) are mainly reasonable. However, assumptions on the use of district heating and combined heat and power (CHP) are missing.

One aspect to be considered is that the national grid development plans and the underlying scenarios do not cover the whole period until 2050 but a maximum of 15 to 20 years (in Germany, the latest plan for electricity goes until 2030 and comprises one scenario until 2035, the latest plan for gas goes until 2028). If the European TYNDPs are meant to look at the “definitive future” (year 2050), the current national grid development plans cannot serve as a basis for the whole period. They have to be expanded and developed jointly between both sectors (electricity and gas) in close cooperation with DSOs and grid users.

The storyline does not sufficiently explain how the 80 % decarbonisation is reached. In this context, the expectations with regard to power-to-gas (P2G), biomethane, large batteries or CCS should be depicted.

Global Ambition [Beta]

Answer: [No answer]

Comments: This storylines describes a 95% CO2 reduction until 2050. This can only be achieved if ambitious measures are being taken already in the next years. To assess the consistency of this storyline, milestones on the way to 2050 have to be described. For every technology, it makes a very large difference whether the whole amount of CO2 reduction is supposed to take place after 2035 or whether the reduction process starts before that date. A study issued by “dena” shows that, in order to reach the 95 % target in Germany, 15 GW of P2G plants have to be built until 2030. Taking into account planning, permission and construction processes, necessary changes in the legislation have to be prepared right away.

Due to the already existing considerable level of distributed generation in many countries – renewables, large and small CHP – it seems incomprehensible that this storyline is focussing solely on centralised generation. Leaving alone this aspect, a centralised generation in combination with a high degree of electrification would provoke large needs of seasonal storage. The storyline lacks further explanation on this issue.

Also in this storyline, assumptions on the use of district heating and combined heat and power (CHP) are missing.

The storyline describes hybrid heat pumps to become the predominant heating appliance for end users (residential and commercial). Changing heating appliances in a significant volume requires high renovation rates. The storyline should elaborate this point.

If the gas mix is expected to be rather carbon neutral for heating appliances (residential and commercial) as well as for the industrial sector, the sources for this gas have to be explained. This has to be included in the storyline "Global Ambition".

European Focus [Gamma]

Answer: [No answer]

Comments: In this storyline, assumptions on the development of power-to-gas (P2G) are missing. A transformation towards synthetic gases is expected after the mid 2030s, but this term does not comprise the P2G technology.

Distributed Energy [Delta]

Answer: [No answer]

Comments: In this storyline, a strong increase in electric heat pumps is explained with a high level of decentralised PV installations. As heat pumps are especially needed in winter time when PV production is rather low the explanation is not logical. Electrification of winter heat loads need stable electricity production – e.g. through large scale wind power production and seasonal electricity storage.

With regard to residential and commercial buildings, the storyline assumes "very high levels of renovation and insulation". It remains unclear what level is meant by this and how it is triggered. In many countries the level of renovation is far below 1 %.

In this storyline, assumptions on the development of power-to-gas (P2G) are missing. Some development of synthetic gases is expected, but this term does not comprise the P2G technology.

The storyline doesn't describe assumptions on storage. This has to be added.

Delayed Transition [Epsilon]

Answer: [No answer]

Comments: [No comments]

5. Do you believe that the storylines are plausible/credible? If not why not?

National Trends [Alpha]:

Answer: [No answer]

Comments: The storyline doesn't provide enough information for a final assessment. The description is mainly limited to qualitative statements; the plausibility can only be assessed if quantitative messages for different milestones are added.

Global Ambition [Beta]:

Answer: [No answer]

Comments: The storyline doesn't provide enough information for a final assessment. The description is mainly limited to qualitative statements; the plausibility can only be assessed if quantitative messages for different milestones are added.

As described above (question no. 4), a "dena" study shows that considerable investments in P2G plants is necessary (15 GW until 2030) in order to reach the 95 % target in Germany. With planning, permission and construction processes taking some years, the investment decisions have to be taken in a few years. However, under the current economic conditions, there is little chance that companies decide to invest in P2G plants. Without major changes of the relevant legislation we will not see these investments to materialise in the next years. Thus, this part of the "Global Ambition Scenario" is very unlikely to happen.

With regard to heating appliances, BDEW also expects efficiency gains and a growth in heat pumps and supports using existing electricity and gas infrastructures for these purposes. However, it appears unlikely that heat pumps assume the predominant position in this segment. Changing heating appliances requires renovation, but experience shows that renovation rates, despite higher prognoses, are rather low (even in Germany with a financial support scheme renovation rates stay far below 1 %). Therefore, BDEW does not expect this prospect to materialise.

In the storylines for the TYNDPs 2018, the maximum deployment of electric vehicles attains 25 % in the EU in 2040. From BDEW's point of view, this assumption is very unlikely to happen, the value is too high.

European Focus [Gamma]

Answer: [No answer]

Comments: The storyline doesn't provide enough information for a final assessment. The description is mainly limited to qualitative statements; the plausibility can only be assessed if quantitative messages for different milestones are added.

In the storylines for the TYNDPs 2018, the maximum deployment of electric vehicles attains 25 % in the EU in 2040. From BDEW's point of view, this assumption is very unlikely to happen, the value is too high.

Distributed Energy [Delta]

Answer: [No answer]

Comments: The storyline doesn't provide enough information for a final assessment. The description is mainly limited to qualitative statements; the plausibility can only be assessed if quantitative messages for different milestones are added.

The storyline doesn't describe assumptions on storage. If this implies that the storyline does not see any need for storage, BDEW doesn't agree. Also in a world with distributed energy there is need for storage.

Delayed Transition [Epsilon]

Answer: [No answer]

Comments: The storyline doesn't provide enough information for a final assessment. The description is mainly limited to qualitative statements; the plausibility can only be assessed if quantitative messages for different milestones are added.

In general, the description of this storyline appears rather plausible from today's point of view since it reads like an extrapolation of today's actual situation. However, BDEW underlines that the energy industry, politics and the European society have to take all efforts to make a more ambitious development with regard to CO2 reduction happen. This storyline could materialise if decarbonisation efforts are not given the highest priority in European politics, e.g. due to other topics being considered as more urgent. This is why this storyline should be maintained in the range of potential futures in this project in order to show what would happen if energy and climate policy are pushed back.

6. Rank the scenarios from 1 being your favourite, 5 being your least favourite

National Trends	☐
Global Ambition	☐
European Focus	☐
Distributed Energy	☐
Delayed Transition	☐

7. Range of Potential Futures:

Based on the Storylines descriptions do you believe that they capture a broad enough scope of possible futures? If not which elements need to be better contrasted?

From BDEW's point of view, the 5 storylines capture a broad enough scope of possible futures.

8. Disruptive Technologies:

Which disruptive technologies can you see having the biggest impact on our scenarios?

Different technologies – disruptive and less disruptive ones – have a big impact on the scenarios.

One very important factor influencing the scenarios is the availability and affordability of technologies enabling a decarbonised or low-carbon transport, not only for private transport but also for the transportation of heavy goods. As long as electric vehicles are perceptible more expensive than cars with conventional engines, e-mobility will only spread slowly. Gas and/or hydrogen driven transportation of heavy goods depend on the necessary infrastructure (filling stations) as well as economically advantageous conditions e.g. tax reliefs for the users.

Also the development of technologies allowing the transformation from electricity into other forms of energy (Power-to-X) as well as the effective deployment of sector coupling have a big influence on the scenarios. As one example, power-to-gas allows combining the electricity and the gas systems by shifting electricity production surplus to the gas system where considerable transport capacities can be used (see also question no. 13). Besides, it will be of utmost importance for the scenarios whether the technologies to use or to store CO2 are further developed. If solutions for a large scale, secure application of CCU or CCS are found, this offers new opportunities for an economy with low CO2 emissions which could still be based partly on coal.

High efficient PV cells with 40 % efficiency have been developed in the lab already. If these cells were installed at a large scale this would drive electrification as long as enough storage capacities are available.

As the storylines go until 2050 technologies which are currently in development could have a strong influence. Nuclear Fusion is one of them, it could be a game changer at the end of the period regarded here.

Artificial Photosynthesis to produce H2 is still in the lab phase but could make H2 or H2-based fuels a lot more accessible.

Methane cracking could become an interesting technology. It does not demand CCS but would best be applied in combination with carbon capture and usage (CCU) of the elementary coal.

In addition to disruptive technologies, disruptive developments in the political and/or economical areas could occur which could influence the development of the energy sector. A shift in political priorities, political instability or economic decline in many European countries could hamper the ambitions for decarbonisation. On the other hand, negative events like natural catastrophes as well as positive examples from other parts of the world or other sectors could give a boost to climate policy and decarbonisation ambitions in Europe.

9. Do you think spider diagrams are an effective method of displaying/comparing the scenario parameters as shown at the Stakeholder Workshop on 29th May? Are there more effective methods of achieving the same goal?

The spider diagrams shown in the workshop presentation allow a first orientation but they cannot replace more detailed written explanation.

C. Questions on the decarbonisation ambition

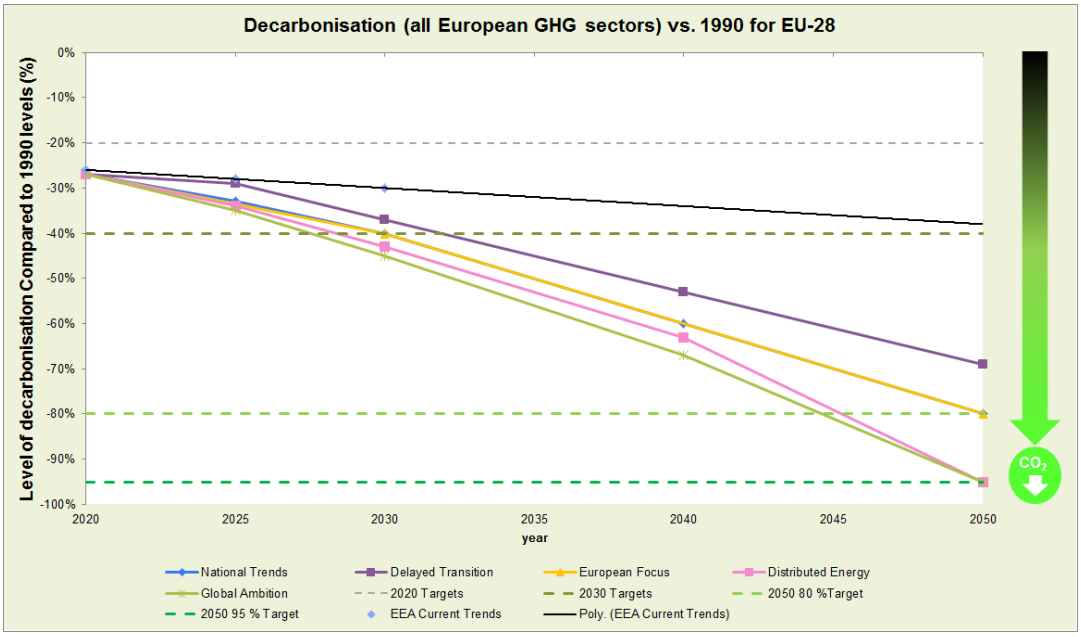

Figure 1

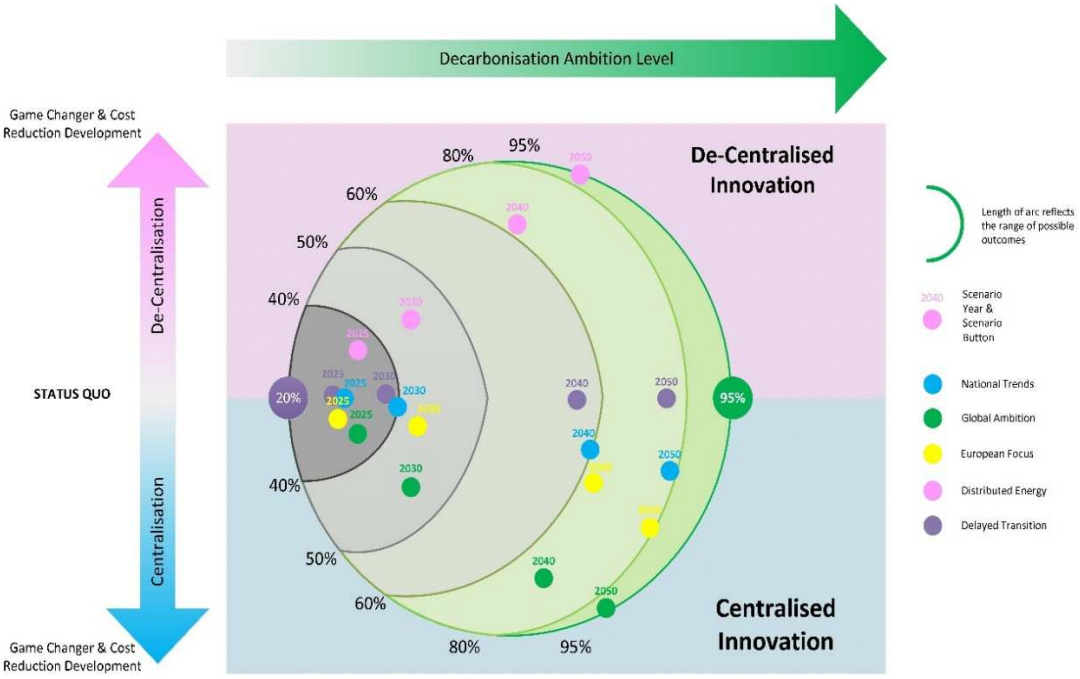

Figure 2

10. Decarbonisation Ambition:

Do you think our scenarios allow us to reach the levels of decarbonisation shown in the chart? (Figure 1)

Since the storylines do not provide exact data and the time for in depth analysis is limited, BDEW cannot evaluate whether the levels of decarbonisation shown in the chart can be reached.

11. Primary Energy Mix:

For TYNDP 2020 we propose use a primary energy mix, in order to calculate the decarbonisation ambition. Do you agree with this approach?

Indeed, the primary energy mix could be a means to calculate the decarbonisation ambition in each storyline. One challenge will be to transform final energy consumption per energy source into primary energy consumption per energy source, taking into account that CCS or CCU, if applied, reduce the CO2 emissions.

In this calculation, also the primary energy used for other purposes than the energy production as such (e.g. the energy used for producing the power plants) could be taken into consideration.

As stated in the answers to question no. 4, the storylines lack a comprehensive description how the different energy sources add up to 100 %. This has to be added for each storyline.

In the “central matrix” (chapter 3.2 of the consultation document), among others green gases are considered. BDEW agrees that the import of renewable gases or green gases is an important measure for CO2 reduction in the future. This, however, can only be realised with the necessary infrastructure. The existing LNG or pipeline infrastructure can be used for this purpose. In the storylines considering significant H2 usage also the pipelines needed for the transportation (either H2-natural gas mixtures or pure H2) have to be included in the simulation.

In addition to these gases being imported BDEW asks to consider their domestic production which apparently is not included in the “central matrix”.

Besides, it is not enough to consider the shares of annual supply of the different energy sources or technologies. In addition to this, for each storyline a detailed calculation on the level of hourly loads is needed; this has to comprise demand, supply, generation and storage and should include extreme scenarios like cold spells and several days of “Dunkelflaute” (situations without electricity production from both wind turbines and photovoltaics, due to weather circumstances). Otherwise, the storylines are not consistent in themselves and give the wrong impression.

Apart from that it has to be stated that it won't be possible to "predict" the achievement of a decarbonisation target solely by simulating the primary energy mix. Most importantly, physical restrictions especially in the infrastructures have to be taken into account. Already today we witness considerable grid congestion situations e.g. within Germany where, with the rise of wind power, the electricity production has shifted to the North while the demand is still predominantly located in the South. This shift in electricity production sites – which will even increase with the increasing number of offshore wind parks – requires more transport capacities. The current political debate in Germany shows that it can take decades to build new transmission grids. Without new grids, it won't be possible to transmit the electricity produced hundreds kilometres distant from load centres or even on remote places like offshore wind farms to the customers. Therefore, the success of the decarbonisation policy also depends on the progress in the development of the infrastructure.

12. Role of Coal:

Should coal retire on an economical or policy driven basis?

As experience shows, the retirement of a technology can heavily affect certain regions whose wealth bases to a large extent on this technology. BDEW expects that this will also be the case for coal used for electricity production. In order to alleviate negative effects for the regions with production sites and to enable a shift to economic structures based on other industries, the phase out of coal should not come as a "sudden death" but with a sufficiently long transition period. Besides, coal-based power plants still present a high share of electricity production as well as of reliable capacity indispensably needed for security of supply in many European countries. It would not be possible to replace it by new technologies (e.g. renewables) within a few years.

One important mechanism inducing the retirement of coal is the European emission trading scheme (ETS). We can notice that the mechanism takes effect and the process of shutting down coal-based power plants for economic reasons has begun. With the continuous reduction of the EU-wide amount of available emission certificates, this process will continue over the next years.

In addition to this economic mechanism, political decisions (on national basis) can support the retirement of coal-based power plants. In Germany, the government recently installed a commission composed of experts from the industry, research, politics and civil society entrusted with the task to develop a proposal on how the retirement of coal could be organised in Germany taking all aspects into account. The commission is expected to present its proposal by end 2018.

When do you think this coal phase out will happen?

2020	☐
2025	☐
2030	☐
2040	☐
Other suggestion	✓

Other suggestion: As explained above, a sufficient transition period should be granted in order to alleviate negative economic effects for regions with coal-based production sites and to give all countries the chance to develop and deploy other technologies.

Does coal play any role in 2050?

Regardless of the scenarios and their different CO2 reduction targets for the whole economy, the latest ETS reform has already logged in an 87 % CO2 reduction in the energy sector (compared to 2005). This means that it has already been decided that coal will play only a marginal role in 2050.

Therefore, most coal-fired power plants will be shut down by the middle of the century. Instead, high-efficient gas-fired plants can play a more prominent role than today since gas has significantly less CO2 emissions than coal-fired power plants and is highly flexible, a feature which will be increasingly needed in a world with high shares of volatile renewable energy sources. The higher the CO2 reduction scenario target is set, the higher must be the share of “green gas” replacing coal.

If CCS and/or CCU got accepted, there would be a way for coal to be used with much less CO2 emissions. However, BDEW is doubtful whether these technologies will spread in Europe to a significant extent.

With regard to coal-fired power plants, it should be acknowledged that in some power plants (such as fluidised bed combustion plants) a broad mix of energy carriers such as biomass, waste, residues and other fossil fuels including coal may be used, leading to overall product-specific emission factors which are comparable to gas-fired Combined Cycle Gas Turbines (CCGT) and thereby lower than the emission factors of Open Cycle Gas Turbines (OCGT). Hence, in figure 5 (primary energy) for the situation in 2050 ("change from today") a “moderate reduction” (“- -“) of coal use should be assumed for these two less ambitious scenarios instead of setting "not available" ("- - - ").

13. The merit order (gas vs coal) leads to uncertainty on gas demand. We consider that this uncertainty needs to be reflected in the scenarios. Do you think that the scenarios reflecting the uncertainty on gas demand related to the merit order (gas vs coal) is the most appropriate approach?

Yes	☐x
No	☐

Please justify your answer below

From BDEW's perception, all storylines except "Distributed Energy" describe gas to cover a substantial part of the electricity production in the future since coal will continuously retire (see question no. 12). Therefore, all storylines must explicitly address the uncertainty on gas demand. From BDEW's perspective, gas will have to play a role as a complementary electricity generation technology to balance the volatile production from wind and solar. If merit order effects constantly prevent gas-fired power plants from being profitable the regulatory setting of the market design should be reviewed in order to guarantee the security of the electricity system.

Besides, the huge potentials of artificial gases produced via electrolysis and methanation have to be exploited in order to enable the use of wind and solar surplus production and to transport the energy over long distances.

D. Other questions and comments

14. Carbon capture and storage, energy efficiency and data centers:
In which scenario/s should CCS have a role and in what capacity?
What are your assumptions relating to demand vs. efficiency gains in appliances, lighting, white goods, gadgets?
Should we consider that data centers are showing only in countries with current plans, countries with lower electricity prices or evenly spread around Europe?

For the production of decarbonised gas directly at the well CCS is important. CCS for large consumers could be the only chance to speed up decarbonisation of that sector.

Storage and flexibility should be analysed in all storylines since it is essential in a world with large shares of volatile electricity production and peaks in demand (e.g. heating in winter) which do not necessarily coincide with supply. The amount of flexibility and storage capacities needed should be defined via simulations.

BDEW expects that industrial consumers will take part in the flexibility market provided that this does not disturb their production processes. But any concept based on demand side flexibility has to take into account that the service needed (ramping up or ramping down) is not always available. Electricity consumption can only be reduced if consumption actually takes place and the production process permits it, and it can only be increased if the customer can make use of the additional electricity.

Energy efficiency can play a very important role for decarbonisation, but substantial efficiency gains can only be achieved over long time periods. In the residential area, the heating sector offers the highest potential for energy efficiency gains. They can be best attained with a combination of different measures like more efficient heating appliances, home batteries in combination with PV, hybrid heat systems and decarbonised gas. Of course, research & development in these areas can provide additional improvement.

Decarbonising within the targeted time framework requires to make best use of existing infrastructure (grids and appliances) in order to save time and costs. Customers should have a choice between heating systems and fuels.

We are only at the beginning of the rapid transformation of the energy sector. The efforts to improve and optimise the energy system will go on while first measures are taken. The process of permanent improvement should not be undermined.

The storylines will be the framework for the TYNDPs for both electricity and gas. The TYNDPs will lead to concrete projects. Also with regard to these projects it is important to discuss alternatives and to compare costs and risks.

15. Any other considerations

Do you have any more comments relating to our scenario storylines?

As already stated in our general remarks and in the answer to question no 8, an integrated approach for all sectors is of high importance. The grid infrastructure for electricity and gas has to be considered as one system where both sides interact. Especially with regard to the gas grids in Europe, the next decade will be very decisive. The gas grids can contribute substantially to decarbonisation if the potentials of CO2 reduction measures within the gas industry (e.g. use of biomethane) as well as the sector coupling by transforming electricity surplus to the gas sector (electrolysis or methanation of electricity generated from renewable sources) find widespread application. These conditions give gas grid operators the necessary perspective to invest and to unlock the CO2 reduction potentials.

16. The ENTSOs have now applied storyline names, please provide your feedback if you feel these adequately reflect the scenarios? If not, we are open to your suggestions.

[no answer]