Consultation on ENTSOs 2020 Scenario Storylines

A Eurelectric response paper

[September 2018]

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

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

We stand for

The vision of the European power sector is to enable and sustain:
- A vibrant competitive European economy, reliably powered by clean, carbon-neutral energy
- A smart, energy efficient and truly sustainable society for all citizens of Europe

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

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

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

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

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

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

Dépôt légal: D/2018/12.105/33

WG Gas-to-Power

Contact:
Ronan HAAS, Advisor Gas-to-Power– rhaas@eurelectric.org

1. What is your name?

Name

Ronan HAAS

2. What is your email address?

If you enter your email address then you will automatically receive an acknowledgement email when you submit your response.

Email

rhaas@eurelectric.org

3. What is your organisation?

Organisation

Eurelectric

4. Are the storylines consistent? (comments below if any)

	Yes	No
National Trends	☑	☐
Global Ambition	☑	☐
European Focus	☐	☑
Distributed Energy	☐	☑
Delayed Transition	☑	☐

Eurelectric welcomes the opportunity to respond to the Consultation on the ENTSOs 2020 Scenario Storylines. Due to growing interdependencies between gas and electricity in Europe, **consistency in the evolution of gas and electricity infrastructures should be addressed.** The TYNDP 2020 is an opportunity for reaching such a goal. The ongoing coordination between ENTSO-E and ENTSOG, such as the delivery of the TYNDP or their joint scenarios up to 2040, must be encouraged.

As a preliminary comment, we believe that the methodology to elaborate the storylines should start by defining **what the possible scenarios in terms of energy demand are**. This is crucial when looking at scenarios with a strong decarbonization objective, as it does not leave so much room

for variations. This is also particularly important to identify energy-specific needs: electricity specific uses, gas-specific uses (if any, for instance for long term storage or heavy transportation), etc... Those values should be explicitly displayed.

National Trends

On the "*National Trends*" storyline, Eurelectric would like to share the following comments:

- This storyline, based on the implementation of national policies, should be elaborated on the most up-to-date national climate and energy plans. As mentioned in this storyline, not all national plans anticipate a significant role for Power-to-Gas.
- The storyline foresees a limited development for Power-to-Gas generation in Europe, while large imports of green gases from external countries may contribute to achieve an objective of 80 % reduction of GHG emissions in order to meet the Paris Agreement requirements.
- This storyline suggests that Power-to-Gas technologies are also developed beyond Europe, potentially at a much larger scale than within the EU. In order to ensure a full consistency of this storyline, it would be of interest if ENTSOs could provide the underlying hypotheses explaining how such a Power-to-Gas development from 3rd countries would be secured. For instance:
    - do ENTSOs assume that a very large development of Solar Power generation at 0-marginal cost in North Africa could enable water electrolysis & hydrogen methanation locally produced at an affordable cost without subsidies. Do you then assume that transport of synthetic methane will be operated through existing gas infrastructures – either LNG or pipelines under the Mediterranean Sea? Therefore, what would be the necessary investments on existing infrastructure?
    - do ENTSOs imply that the foreseen national policies (support schemes, financial tools) are also implemented / replicated out of Europe in order to ease development of Power-to-Gas technologies in countries benefiting from abundant renewable resources (either solar, wind, hydro, or biogas) ?
- As they move towards decarbonisation, each European country is facing different challenges and opportunities. While short or longer term National Regulations may differ among Member States market based approaches and a level playing field for all carbon neutral technologies should drive the decarbonisation of the power sector.

Global Ambition

On the "*Global Ambition*" storyline, Eurelectric makes the following assessment:

- This storyline seems to be consistent and able to meet the EU 2050 decarbonisation targets.
- Eurelectric believes that market-based mechanisms, such as carbon emission trading, are the most cost-effective and efficient tools for mitigating greenhouse gas emissions and stimulating investments in carbon neutral technologies and energy efficiency. The combination of an effectively reformed EU ETS, market based schemes where needed and improved EU electricity market design can lead to credible carbon price signals, driving investments to mature carbon neutral technologies.

- The scenario should not foresee the automatic replacement of a carbon emitting technology by another emitting technology and should rather encompass the broader mix of clean technologies.
- We would like to remind that decisions regarding national energy mix remain a sovereign decision of the national governments. The generation of power (i.e the decision to build a nuclear power plant) should be dependent on the national policy choices.
- Moreover, national specificities (i.e standards of living) should not be ignored in the assumptions on the leading sources of power generation, especially for the residential and commercial sectors.
- Finally, costs of each power generation and storage technology should be explicit.

European Focus

Firstly, this storyline is assumed to be implemented under a European regulatory framework. However, hypothesis related to the evolution of nuclear power generation fleet are not precisely explained. Indeed, whereas it is clearly stated in the *"Global Ambition"* storyline that decommissioning of existing nuclear units will be steered by Member States and that no new nuclear capacities would be commissioned, the *"European Focus"* storyline only states that *"Nuclear is dependent on national political decisions"*. This discrepancy is not only inconsistent with the generic scope of the "*European Focus*" storyline, but it is also confusing regarding the decarbonization pathway of this storyline. This is even more relevant because such a component is key to understand the way GHG emissions reduction objective – set at 80 % in the "*European Focus*" storyline – would be achieved.

Secondly, in a European-focused system competitive and functioning electricity markets underpinned by a robust ETS that provide longer term price signals should be the main drivers for investments in carbon neutral technologies rather than technology specific regulation.

Finally, without a major development of CCS, it seems unlikely that emissions could be reduced by 80% without a stronger reduction in fossil fuels consumption. Such a reduction does not appear very clearly in the scenario description and should be outlined as a key underlying assumptions or constraint.

Distributed Energy

The question of adequacy is raised by the "*Distributed Energy*" storylines on which we would like to do the following comments:

- on the one hand, this storyline points out that the very high overall demand for renewable energy will be embraced by consumers / prosumers and driven by the ambitious CO2 targets. That means that retail markets will become dominant and mainly steered by residual demand.
- on the other hand, it is stated that *"energy production becomes more flexible with intermittent generation"*, gas fired power plants playing only a small role to provide adequacy, but that (synthetic) gas storage LT capacity remains a key component of the energy system.

This highlights that security of electricity and gas supply could be the biggest challenge of this storyline. Thus, meeting a high growing demand due to decarbonization and thus electrification – and the induced high flexibility needed - in a quite disruptive world might not be obvious:

- not only to ensure to meet the demand,
- but also to adapt the energy system in order to be able to provide the upward and downwards flexibility required at any time.

Moreover, we would like to raise the following elements:

- Firstly, DSOs are playing an increasing role to meet tomorrow's grids expectation (i.e. from a "centralized energy flow world" to a more "decentralized world" with more reverse flows locally managed), with large deployment of smart DSM tools and local storage solutions (e.g. batteries).
- Secondly, the residual role of (green) gas for power generation, as described in this storyline "*Distributed Energy*" (*cf. "small role to provide adequacy"*), seems potentially inconsistent with the spider diagram shown on the evolution of electricity generation. This spider diagram suggests that gas could play the same role for power generation in both storylines "*Distributed Energy*" and "*National Trends*" (in which centralized *"gas-fired power generation replaces coal and nuclear on the ST and provide the necessary flexibility to balance RES in the LT"*).
- Thirdly, in a system with a lot of distributed energy, the ETS should be the most important driver for climate protection in electricity generation and the future of coal.
- Finally, geothermal sources as well as biomass and biomethane are depending on the local accessibility. Therefore, they may not completely replace fossil fuels in heating and cooling sector due to the local specificities.

Delayed Transition

This storyline seems consistent, but it does not meet Paris agreement's objectives, even regarding the 80% of GHG emissions reduction.

Decarbonisation may risk of being delayed due to pressure coming from public opinion or political decisions that do not take into account the full spectrum of costs and benefits.

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

	Yes	No
National Trends	☑	☐
Global Ambition	☑	☐
European Focus	☑	☐
Distributed Energy	☐	☑

	Yes	No
Delayed Transition	☐	☑

Different starting points in terms of energy mix, economic situation and industrial activities require different pathways and level of effort across EU countries. Through **a multifactor approach,** all five scenarios are needed to understand the complexity of the energy system and the challenges of the Energy sector. We are nevertheless concerned with the "*Delayed Transition*" storyline as it describes a future with very limited emission reductions which should be contemplated by policy makers. Communication around this scenario needs to be very carefully crafted and its drawbacks highlighted. Therefore, the most relevant development might be a hybrid mix of scenarios.

National Trends

This storyline brings an interesting perspective in terms of low economic growth, poor willingness of decision makers or lack of environmental awareness from society. However, it is not the most relevant one, due to the risk of higher costs (because of national policies) and its lack of ambition.

Global Ambition

This storyline brings interesting elements:

- It does not ignore the European economic situation and investment framework (i.e. takes into account economic and financial constraints).
- The development of technologies such as batteries, Power-to-Gas and CCS (for which barriers are still to overcome) seems rather balanced in terms of penetration. In this storyline, none of these technologies will be dominant, meaning that a mix of solutions is required in each market/area (e.g. transport, heating, industry, power generation).

European Focus

The *"European Focus*" storyline is highly dependent on the assumption that new technologies will be fully available. This scenario should reflect also different starting points, which means that although the common goal is the same, the national preconditions would not be completely leveled even in the short-term perspective. Thus, a key tool to boost implementation of the "*European Focus"* storyline should be the accessibility of innovative technologies and adequate resources to implement them in low-income Member States. For instance, the digital future of the electricity system will require Europe to make smart grids a reality so as to integrate centralized and decentralized technologies, promote customer participation in a secure, flexible and cost-effective manner.

Moreover, a robust governance system must ensure coordination of Member States' efforts, increased cooperation, ensure investor certainty and be flexible to allow ETS to serve as a primary decarbonisation tool.

Distributed Energy

Apart from the questions on adequacy (*cf.* comments above), the key element of the "*Distributed Energy*" storyline is that money is not an issue anymore, which would be a *"very-nice-to-have-scenario*" in a perfect world, but which does not seem really realistic.

In addition to the comments below, this storyline actually raises the following questions/comments:

- to which – financial – extent people & consumers will be committed to climate action, develop their environmental awareness and act in that purpose? How can we make this change in a drastic way and increase consumers' adoption rate for clean solutions?
- Can societal behaviors change in a disruptive way, whatever the current & future economic conditions and the uncertainty on the latter ones? Or how to make such behavioral changes happen?

However, as a reminder of our preliminary comments of the section 5, taking into account such a "very favorable" storyline in this study is very important in order to set an appropriate range of possible futures, as targeted by ENTSOs. It is equally important to highlight what would need to change for such a scenario to happen.

Delayed Transition

< / >

6. Vote on Scenarios

National Trends	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Global Ambition	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
European Focus	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Distributed Energy	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Delayed Transition	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

As mentioned in the previous section, we support a multifactor approach including all the possible developments of the electricity and gas sectors as well as economics, costs, behaviors, global commitment to tackle climate change etc. These developments should be taken into account and ordered within clear and comprehensive storylines, as developed by ENTSOs. Therefore, **scenarios should cover a large spectrum of possible outcomes**. However, in order to have a developed framework and a set of assumptions, we do not think that ranking the different storylines by a vote would be the most relevant way to operate.

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?

The main objective of TYNDP is to identify the needed investments in infrastructures. Looking at energy transition, there are lots of uncertainties concerning the energy mix and the level of energy demand. Furthermore, compared to previous decades, there is a bigger risk of sunk costs in infrastructures. That is why TYNDP has to capture a large scope of possible futures to highlight the risk to invest in infrastructures.

The decarbonisation objectives will need to use CO2-free energies, such as wind, solar, nuclear or green gas. Some of those technologies are not mature as of today, their respective potential and costs being hard to predict.

Additional elements may be considered such as the consequences of a strong natural gas demand reduction on gas and electricity infrastructures (in particular with respect to the need for storage assets for adequacy purposes).

Moreover, it could be relevant to have “crash test” scenarios, so as to identify the risks for future investments if reality – unfortunately – turns out differently.

8. Disruptive Technologies

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

- Regarding water electrolysis and hydrogen methanation, the development of Power-to-Gas may be a key driver for the evolution of the energy system over the coming decades.
- Research and development in batteries (which is one of the most relevant example) and PV panels manufacturing could become game changers in terms of efficiency and manufacturing process :
    - Improvement of conversion rates of PV panels.
    - Improvement of the environmental footprint of batteries (lifetime and lifecycle).
    - PV panels embedded in buildings and windows
- We also see electric vehicles and heat pumps with accumulation having an important potential to transform the energy use to date. The electric vehicle enables the use of energy which proves to be emission free, storable and 3-4 times more efficient than the

energy used in a conventional vehicle. Heat pumps with accumulation shows similar benefits.

- All technologies which can influence electricity demand, and more specifically the flexibility of demand, will have a big impact. ENTSOs' scenarios should be cautious on hypothetical major breakthroughs that would solve all issues at low cost.

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?

Spider Diagrams

Yes. However, the timeline is missing in the diagrams shown. It should be clearly written that they describe the situation in 2050 and not a development path or something in between. In order to better compare the storylines, Spider diagrams should also display the key hypotheses in terms of population, kilometres of transportations, etc… For instance, all storylines seem to foresee that the consumption of gas in transportation will be mainly due to heavy transportation: but then why is this parameter varying so strongly across scenarios?

Decarbonisation Ambition

Figure 1

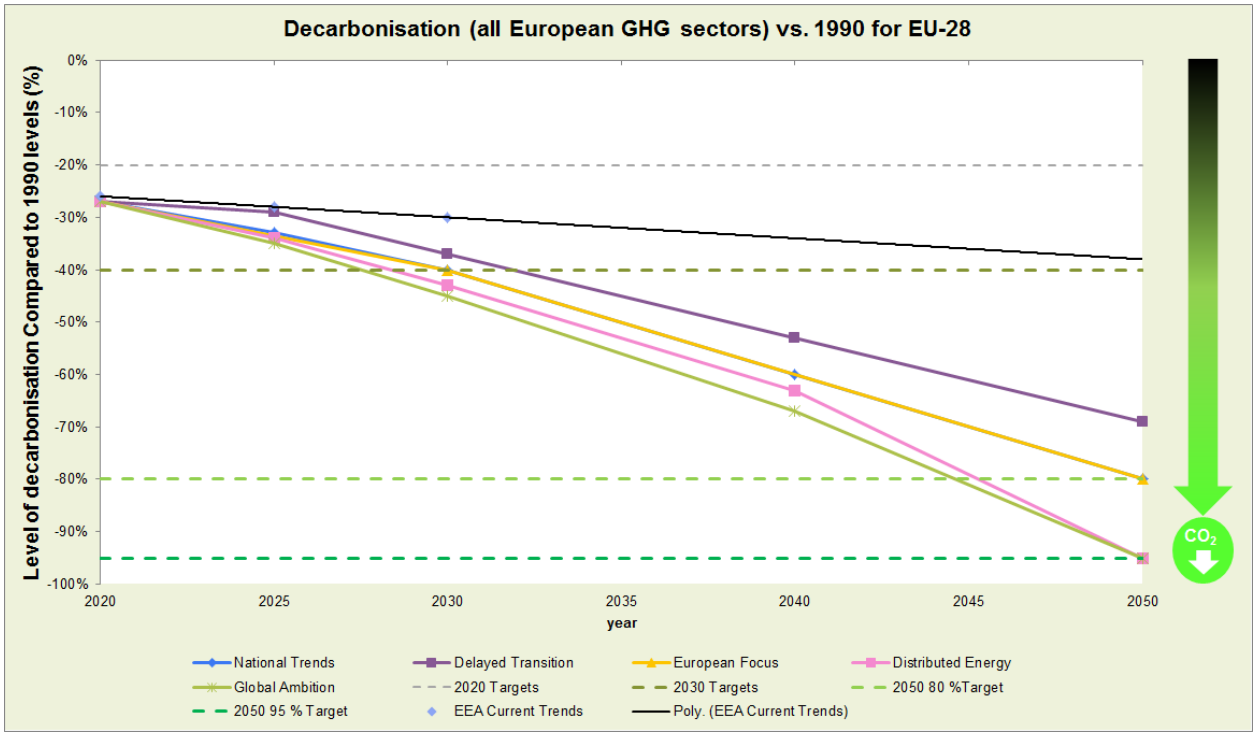
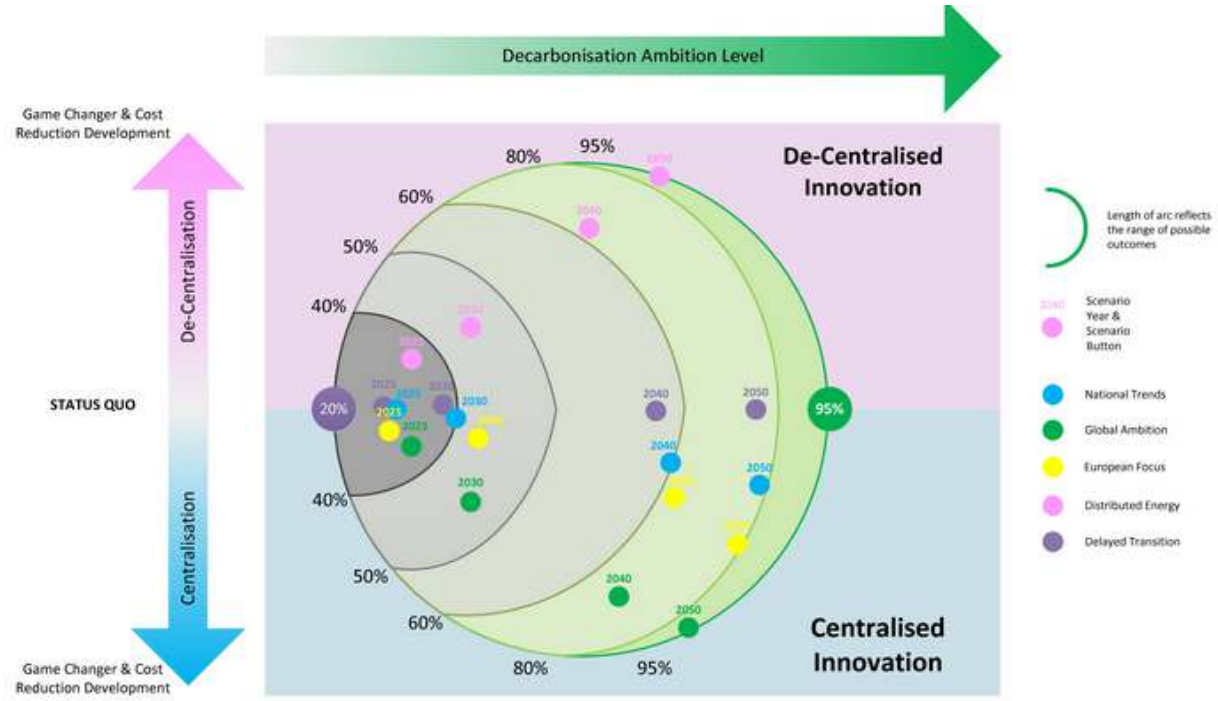


Figure 2



10. Decarbonisation Ambition

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

In all scenarios, high levels of decarbonization are expected. To reach the targets, fossil energy in primary mix should be strongly reduced or even disappear.

Uses based on electricity such as heat pumps (in substitution to fossil heat) or electrical vehicles (in substitution to diesel or gasoline combustion engines) enable both to reduce fossil energy consumption and CO2 emissions as long as electricity is produced by low carbon technologies.

According to the power sector, the potential for electrification is substantial across energy-using sectors and will underpin deep decarbonisation of the economy. Deep decarbonisation is by implication and electrification journey. Electrification is the most direct, effective and efficient way of reaching the decarbonisation objectives.

In order to make this vision a reality, Eurelectric has developed a set of EU decarbonisation and electrification scenarios towards 2050 for the residential, industrial and transport sectors[1]. In the second phase of the project we will analyse the decarbonisation pathways of the power sector and their associated costs. The first part of the study provided the following results:

[1] https://www.eurelectric.org/news/decarbonisation-pathways-electrification-part/

- **Scenario 1** (80% decarbonisation of EU economy achieved in 2050 vs. 1990):
    - direct electrification rate of 29% for transport, 45% of buildings, 38% of industry (2015 baseline is: 1%, 34%, 33%) – overall direct electrification rate of 38% (2015 baseline: 22%);

- **Scenario 2** (90% decarbonisation of EU economy):
    - direct electrification rate of 43% for transport, 54% of buildings, 63% of industry – overall direct electrification rate of 48%

- **Scenario 3** (95% decarbonisation of EU economy):
    - direct electrification rate of 63% for transport, 63% of buildings, 50% of industry – overall direct electrification rate of 60%

Electricity will play a leading role in transport, where up to 63% of total final energy consumption will be electric in our most ambitious scenario. In buildings, energy efficiency is a key driver of emission reductions; district heating and cooling are expected to keep on playing critical roles in some geographies, while 45% to 63% of buildings energy consumption could be electric in 2050 driven by adoption of electric heat pumps. A series of industrial processes can technically be electrified with up to 50% direct electrification in 2050 and the relative competitiveness of electricity against other carbon-neutral fuels will be the critical driver for this shift. Hydrogen and other carbon-neutral alternatives will also play a role and drive indirect electrification.

This equals to a strong clean electricity uptake in total final energy consumption, in all sectors (industry, residential, transport), with strongest increase in transport. Total electricity demand is expected to increase beyond the envisioned direct electrification. In addition to electrification, decarbonisation strategies will always include a combination of multiple levers, technologies and solutions as energy efficiency, green gas, hydrogen, additional use of RES, CCS for industrial processes.

In this framework, supply for indirect electricity (power-to-gas) and other non-emitting fuels (hydrogen, “green gas”) have a key role to play as electricity cannot provide an ambitious decarbonisation level in 2050 on its own.

Therefore, all decarbonisation scenarios should be accordingly based on an increase of electricity in the energy mix and the development of carbon free power generation. Investments would be mostly focused on renewables and energy efficiency, and other carbon neutral assets. At this stage, CCS technology still appears as a very uncertain breakthrough which would require to cope with both cost and technical challenges. Building decarbonisation scenarios based on potential development of this technology may be subject to debate.

Gas would be a credible sustainable option in the post-carbon primary mix providing it becomes decarbonized. At this stage, massive development of biogas still faces significant costs, compared to energies generated without subsidies or support schemes, and may face resources and land availability challenges. In most scenarios, the part of “natural” gas is the primary mix is expected to decrease.

In light of the ongoing EU process on long-term climate policy and on possibly reviewing the year 2030 reduction target (now 40%), one scenario (preferably Global Ambition) should have a more linear emission reduction development towards -95%, with a clearly bigger reduction already for

2030 and 2040. The first reduction measures are usually anyway cheaper, and could thus be reached relatively quickly, than the last measures towards the 95% reduction target.

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?

Yes

12. Role of Coal

Should coal retire on an economical or policy driven basis?

Policy makers should strengthen the ETS scheme to reach an ambitious carbon reduction target. This will enable market-based reduction of coal-fired generation and an optimal progress of decarbonization avoiding to separate national or EU level measure on coal power. Implementation of a robust ETS scheme together with an ambitious EU-wide RES target will be a key component to decarbonize the electricity mix.

National and company decisions to phase out coal will accelerate the decommissioning pace and this is already happening.

When do you think this coal phase out will happen?

2020	☐
2025	☐
2030	☐
2040	☐

Other suggestion

As mentioned in the European Electricity Sector statement published on April 2017, the power sector is already widely investing into low-carbon and innovative solutions to achieve carbon-neutral electricity supply well before 2050, and does not intend to invest in new build coal-fired power plants after 2020.

Does coal play any role in 2050?

Coal has to be phased-out well before 2050, otherwise it would impede achievement of decarbonization objectives set by the Paris agreement (appr. -90% in 2050), whatever the scenarios

of technological development or economic growth. Should some coal plants remain they should have CCS.

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?

Please select only one item

Yes ☐

No ☐

Please justify your answer below

ENTSOs must clarify whether gas demand for power generation also includes green gases or not, and to which extent.

14. Carbon capture and storage, energy efficiency and data centers

In which scenario/s should CCS have a role and in what capacity?

CCS technology still appears as a very uncertain breakthrough which would require to cope with both cost and technical challenges. Building decarbonisation scenarios heavily based on potential development of this technology might be highly uncertain.

Therefore, Eurelectric suggests to have scenarios (at least in their base case) without CCS at all. Then, as an output of the modelling, it could be mentioned what should be the cost of CCS in order to be competitive in each given scenario.

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?

Efficiency gains could slow down the increase of demand from data centers. Electricity prices would not be the lone driver that would impact the location of these data centers. Their location would also depend on national regulation, notably on governance issue to provide security to

citizens for their data. At this stage, evenly spread development around Europe could be considered.

On the long-term, (wholesale) electricity prices should be somehow similar across Europe thanks to market integration, so evenly spread across Europe could actually make sense (or rather proportionally spread, i.e taking into account population, industrial activities, etc)

15. Any other considerations

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

First, we would like to underline one of the TYNDP goals which is to describe the dynamic in power and gas the twenty coming years. The proposed storylines are high level views of 2040 but the link and the consistency with the other time horizons is not explained. The storylines should describe the dynamic (2025-2030-2040) to reach the 2050's objectives for each storyline and should be consistent with scenarios built on the other time horizons.

Furthermore, the total investments costs in power and gas generation and in network should be displayed in order to compare each scenario.

The risk of stranded assets linked to investments in infrastructure and a potential decreasing demand for gas need to be clearly assessed.

Last but not least, the storylines, and in particular the "*Distributed Energy*" one, should highlight the origin and costs of green gases to be used in each scenarios as well as in each EU Member States. For instance, the potential CO2 impact of the entire biomass process should be evaluated.

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.

Storyline names
< / >

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

Economic Development

- Growth, added-value, efficiency

Environmental Leadership

- Commitment, innovation, pro-activeness

Social Responsibility

- Transparency, ethics, accountability

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