

Eurelectric Response to Stakeholder Consultation on an EU 2040 climate target

A Eurelectric response paper

June 2023

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.

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WG Climate Change & Decarbonisation
WG Renewables and Storage
WG Hydropower
WG Thermal and Nuclear
Generation and Environment Committee

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Stakeholder Consultation 2040 Targets

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KEY MESSAGES/EXECUTIVE SUMMARY

- Eurelectric welcomes the stakeholder consultation on an EU 2040 climate target and fully supports the efforts to meet the objectives of the European Climate Law, in line with the 1.5 °C ambition set by the Paris Agreement. The EU has not had any climate target for 2040 before, hence by politically establishing such a new target the investor community will get more clarity and confidence about the EU's decarbonisation path ahead. Also, it should lay the foundation for the development of an ambitious, cost-effective, and highly supportive EU 2040 policy framework.
- The electricity industry is engaged in a deep decarbonisation process and considers that the EU's electricity supply can be fully climate-neutral well before 2050 if the right enablers are activated, including investment in generation capacities and distribution networks; streamlined permitting processes; access to raw materials and components for net-zero technologies; and a stable, predictable regulatory framework.
- Electrification is the most direct, efficient, and effective way to achieve the society's decarbonisation goal, as it reduces emissions in three ways: switching to carbon-neutral power generation, reducing total energy demand, and replacing fossil-based inputs to industrial processes.
- If properly implemented, a forward-looking energy transition based on ambitious intermediary targets on the way to climate-neutrality by 2050, driven by a market-based climate policy, will lower energy bills and bring economic benefits to the society at large. The benefits of a decarbonised energy system will outweigh the associated costs, including the costs of imported fossil fuels and the effects of climate change.
- Eurelectric believes that carbon removals will play an indispensable part in reaching the EU's climate neutrality goal for 2050. Hence it is urgent that carbon removals are incorporated in the formulation of the EU 2040 climate target and fully supported by the policy framework that will be developed in the next step. At the same time, achieving negative CO₂ emissions by carbon removals must not in any way replace or reduce the efforts to mitigate emissions by phasing out fossil fuels. The EU climate policy framework must continue to incentivise the pursuit of greenhouse gas emissions abatement through cost-effective and market-driven solutions, including electrification, phasing out of fossil fuels and deployment of clean and renewable generation capacities.

- Climate policies can affect different sectors of the economy in different ways and consequently different societal groups bear an unequal share of the transition costs. To be successful and maintain public support, any policy designed to decarbonise the economy must ensure the cost of the transition is allocated fairly through balancing its environmental objectives against any regressive effects arising from the implementation of that policy. To pursue an affordable and inclusive energy transition, we must protect consumers, and empower them to play an active role, through greater differentiation in price signals, cost reflective network tariffs and an efficient use of both smart meters and grids. In addition, it is essential to enable financial support to facilitate customers' access to advanced and innovative energy services by mitigating upfront costs and allowing for co-investment, especially to vulnerable customers.
- Eurelectric encourages policymakers to remain technology open to enable cost-efficient emissions reduction in the energy sector leading to full economy-wide carbon-neutrality by 2050 while ensuring security of supply, competitive energy prices and social acceptance.
- It is also essential that the European Commission is more actively involved in the governance of global normalisation and standards (including the GHG Protocol, the ISSB, etc.). This would ensure coherence of between these standards and EU policies and standards, avoiding unnecessary administrative burden and enabling compliance both at EU and international level;

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Emissions reduction ambition and net emissions reduction by 2040

Eurelectric welcomes the stakeholder consultation on an EU climate target for 2040 and fully supports the efforts to meet the objectives of the European Climate Law, as well as the 1.5 °C ambition set by the Paris Agreement. In addition, Eurelectric welcomes the initiative on the EU 2040 climate ambition and considers it being very timely, bearing in mind that the EU Climate Law requires such a target to be presented by the European Commission in May 2024 (no later than six months after the Paris Agreement's global stock-take at COP28) before updating the EU's Nationally Determined Contribution (NDC) in 2025.

Considering the EU's objective of achieving climate neutrality by 2050, the current energy crisis, and the urgent need of getting rid of the dependence on imported fossil fuels, the European power sector encourages EU policymakers to maintain the RePowerEU pace, which represents a speedier transition towards climate-neutrality than what could be achieved through the implementation of the 'Fit for 55' Package alone. The EU has not had any climate target for 2040 before and, hence, by politically establishing such a new target the investor community as well as businesses in general will get more clarity and confidence about the EU's decarbonisation path ahead.

Eurelectric's [Decarbonisation Speedways](#), the updated analysis of scenarios towards 2050, shows that with RePowerEU, Europe is already on a trajectory leading to around 80% GHG emissions reduction by 2040. If the right conditions are in place, decarbonisation efforts, complemented by carbon removals, could make an 80-90% net emissions reduction target achievable. What is also highly relevant for the Current Policies Scenario is the effect on GHG emissions of revised legislations under the 'Fit for 55' package, including the new Linear Reduction Factor (LRF) of the EU ETS Directive.

While setting an EU 2040 climate target provides clarity about the way forward and investment signals, the ambition should be accompanied by an enabling policy framework that ensures its timely, cost-effective and successful achievement. This will rely on the following enablers:

- A robust EU carbon market as a key driver for the decarbonisation;
- The right Electricity Market Design fit for net zero, providing the necessary long-term investment signals in fossil-free generation technologies and related infrastructure;
- Strengthening of the EU-ETS to remain the leading instrument of EU climate policy;
- Flexibility with short and long-term storage to address increased variability;
- Fossil-free dispatchable power plants to complement and regulate very high shares of renewable energy;
- A cohesive industrial policy to defend the EU's industrial competitiveness and technological leadership;
- An improved financial framework to catalyse investment and innovation for the next wave of decarbonised power generation technologies;
- A smarter and reinforced distribution grid to increase system efficiency;
- Accelerated permitting and land and maritime space use policies for the build-out of new decarbonised power generation and grids;
- Focus on skills and training for the workforce;

The electricity sector is pioneering Europe's climate neutrality journey. Not only is it the most progressive sector in terms of decarbonisation, but it can also provide the solutions (e.g. direct and

indirect electrification) needed for other sectors to accelerate their transition. While the power sector accelerates its efforts, it is critical to ensure that all sectors contribute adequately to the achievement of climate neutrality ambitions.

Role of carbon removals in the 2040 climate target

Carbon removal technologies

Eurelectric believes that carbon removals will play an indispensable part in reaching the EU's climate neutrality goal for 2050, but it must not in any way reduce or replace the efforts to mitigate emissions by phasing out fossil fuels. Hence it is urgent that carbon removals are incorporated in the formulation of the EU 2040 climate target and fully supported by the policy framework that will be developed in the next step. The EU climate policy framework must continue to incentivise the pursuit of greenhouse gas emissions abatement through cost-effective and market-driven solutions, including electrification, phasing out of fossil fuels and deployment of clean and renewable generation capacities.

Carbon removals should be primarily used for delivering negative emissions and capturing the residual CO₂ emissions in hard-to-abate sectors, where no other technological decarbonisation solution is available.

Eurelectric encourages policymakers to consider establishing separate targets for GHG emissions reductions, nature-based removals, and industrial removals, as the levers needed to deliver, and their level of maturity differs. This can support the ramp-up of negative emissions in the short and medium term. Moreover, such a tailored approach would prevent hampering the functioning of proven decarbonisation tools, like the Emissions Trading System, until the uncertainties regarding the accuracy and scalability of removals is proven. At this stage, it is recommended to count the result of an industrial carbon removal project against the national ESR targets, while carbon farming projects naturally belong to the LULUCF. In the long term, the inclusion of carbon removals into the EU-ETS might be possible.

A stepwise approach is recommended, prioritising the development of a high-quality framework over a rushed implementation. Eurelectric acknowledges that the proposed Framework for the establishment of a certification mechanism for carbon removals seeks to provide a label to prove the sustainability/quality of removals. If, in time, the certification mechanism paves the way for the establishment of an EU-wide market for carbon removal credits, it is important to clearly define the relationship between certificates and credits, as well as their ownership.

Opportunities associated with higher climate ambition

What are the benefits of an ambitious climate target by 2040?

Establishing an EU 2040 climate target would improve the visibility and confidence for investors about the pathway to meet the EU's long-term climate ambition. However, the targets must be well-balanced across different sectors and be accompanied by the right enablers, to ensure their cost-effective and efficient achievement. As usual, the European Commission will table a package of necessary updates to the legislative framework once the new ambitions have been set by the EU leaders.

A well-designed forward-looking energy transition, driven by a market-based climate policy, will lower energy bills and bring economic benefits to the society at large. The benefits of a decarbonised energy system will outweigh the associated costs, including the costs of imported fossil fuels and the effects of climate change.

In terms of enabling factors, we highlight the important role of EU space data and services which should be further developed and used for this purpose (e.g. increased use of Copernicus data.)

Contribution of individual sectors to the EU's climate ambition

Which sector should do more to reduce GHG emissions?

The potential of different sectors to further reduce GHG emissions may vary. The electricity industry has been the ETS sector with the highest emissions reductions, and it is taking further steps to power the EU's economy with decarbonised electricity. Going forward, it is essential to enable the electrification of end-use sectors – such as transport, heating and cooling, and industrial applications- to ensure their efficient decarbonisation.

Where direct electrification is not yet an optimal solution, indirect electrification, through the use of electrolytic low-carbon hydrogen, could play an important role in reducing emissions.

Sectors expected to reach climate neutrality first

If all enablers are in place, the power sector is likely to reach net-zero around 2040, thus supporting the decarbonisation of end-use sectors. Currently, the sectors with the largest potential for decarbonisation are road transport and buildings sectors, where direct electrification could lead to significant emissions reduction. Also, parts of the industrial sector – for example low temperature process heat – could benefit from direct electrification. For other industrial applications, for example primary steel production, direct electrification is not yet fully available. In such cases, the scale-up of electrolytic hydrogen offers a significant potential for decarbonisation. Innovative solutions, including hydrogen and its derivatives such as e-methanol or e-kerosene, will however be needed to put aviation, maritime and agriculture on clear net-zero pathway. Considering aspects such as the efficiency, availability and costs of hydrogen, this should only be used where it makes most sense.

Capacity to innovate

The overall European electricity industry has the capacity to innovate and has access to EU dedicated facilities for the green transition. However, it is important to note the diversity of companies and portfolios, as well as the different starting points in the energy transition. The

existing funds are generally oversubscribed and highly competitive, thus limiting the direct contribution to support the decarbonisation of the electricity industry.

Should the 2040 targets step up the climate ambition, the allowances dedicated to the Modernisation and Innovation Fund must be proportionally increased. In addition, granting access to other funds, such as regional funds (FTJ, FEDER) would improve the electricity industry's ability to innovate.

Moreover, it is important to note that the most innovative projects are not necessarily the most efficient in terms of GHG reduction in the short term but could lead to important reductions when deployed at a larger scale.

While recognising the role of the EU in financing innovative technologies, we regret that some funds are limited to SMEs, which often do not have the capacity to use all of them, thus restricting innovation.

Lastly, existing regulatory frameworks and supply chain capabilities could be a barrier to the expansion of renewables, putting the success of the energy transition at risk. Current domestic renewables supply chains cannot provide the volumes required and need to grow substantially to reduce the exposure to external markets' volatility.

How to improve incentives for climate action

Climate policies and the trajectory to climate neutrality by 2050 will require us to change our consumption patterns, both for products and services. In this regard, Eurelectric believes that the following measures included in the Consultation questionnaire would be very helpful:

- Support sharing and leasing services to support access to technologies that reduce the net GHG emissions (PVs, heat pumps, EVs etc);
- Measures to ensure the most vulnerable have access to sustainable, climate-friendly products and services;
- Ensure the price of goods reflects their impact on climate change;
- Ease financing of investments in solutions that will lead to the reduction in personal GHG emissions (eg. installing heat pumps, buy EVs etc);

Incentivising new consumption patterns would be key. Currently the lack of level playing field is one of the most important barriers to accelerating end-use electrification. At the same time, fossil energy carriers are often subject to much lower absolute taxation levels as the environmental effects of their use are not included.

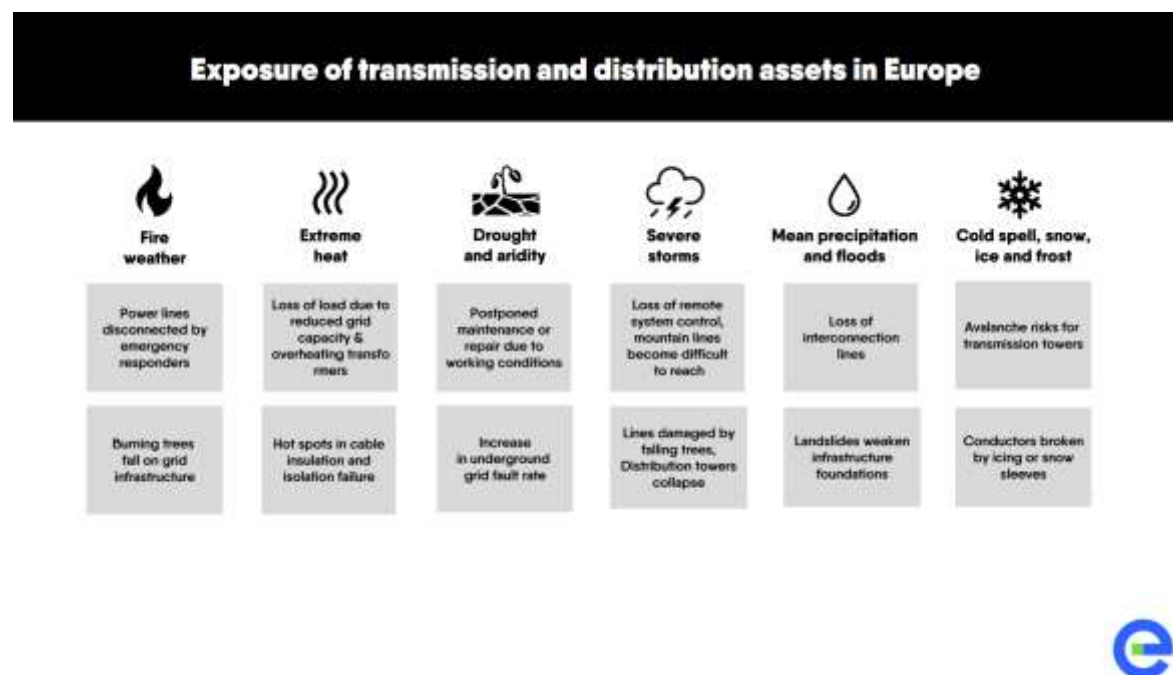
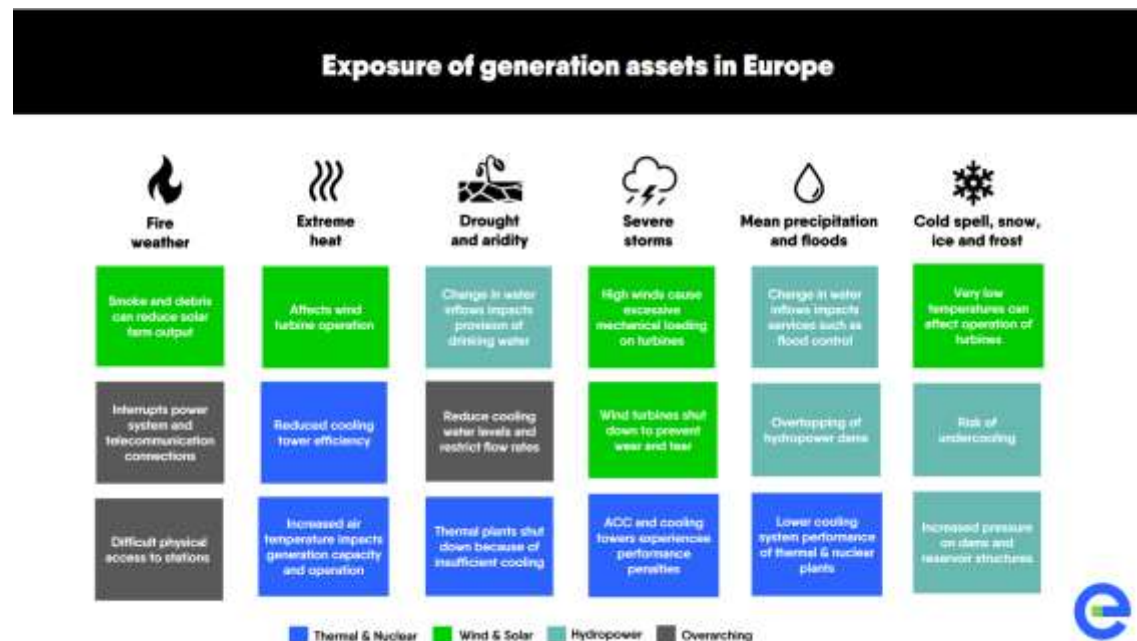
Thus, energy taxation should put an end to the uneven treatment of energy carriers and set the framework for better allocating the weight of taxes and levies on the different energy carriers, considering their climate impact.

A host of additional measures to support consumers are outlined in Eurelectric's report ["Power2People"](#).

The impacts of the climate crisis

The latest IPCC reports have shown that the world is likely to miss its target to keep warming below 1.5C. This means more extreme weather events and more stress on the electricity system. Climate adaptation and resilience must become as much of a priority as climate mitigation.

As shown in our report, the [Coming Storm – building electricity resilience to extreme weather](#), the number of climate related natural disasters is on the rise. Heatwaves, storms, dry periods, cold spells are likely to affect electricity generation, transmission and distribution.



The power system already has a host of adaptation measures available for the management of climate hazards. These include physical hardening and upgrading of networks, physical protection measures, additional water spill gates for hydropower dams, resizing of thermal and nuclear plant cooling systems, additional redundancy of grid design, preparedness planning, backup systems, and digital tools to enhance visibility and management of the energy system down to low power voltage levels.

In 2021, Eurelectric's [Connecting the Dots](#) report estimated that €33 billion would be required in the decade 2020-2030 to support distribution system resilience, or the equivalent of 8% of the grid investment needs prior to the new targets set by RePowerEU.

In addition, Eurelectric recommended an integrated approach to climate mitigation and adaptation. A failure to reach energy decarbonisation goals could result in increased adaptation costs in the long term, and a failure to adapt to climate change could be devastating for the European economy. Indeed, the price of inaction now far outweighs the cost of building sustainable, resilient communities. Nowhere is this truer than regarding Europe's crucial electricity infrastructure.

Conversely, the benefits of such a reinforced system will reverberate through society by acting as a solid foundation for the widespread electrification of transport, heating and cooling, and industrial processes and the integration of renewable and clean energy sources. This, in turn, will benefit mitigation, by reducing direct emissions, and adaptation, by facilitating the flexibility of the grid. The latter then lowers costs for final customers by reducing demand peaks and the need for expensive hardening of the grid.

In this regard, Eurelectric's overarching [recommendations](#) are:

- Consider adaptation in partnership with mitigation;
- Take a holistic view to ensure stronger coordination and continuous communication between all stakeholders;
- The regulatory framework for system operators, taxonomy screening criteria for private investments and resilience funding must encourage power system climate adaptation.

Possible effects of climate change

Considering the above, Eurelectric considers that the main climate change related impacts for society in the next 20 years are: negative impacts on critical infrastructure, negative impacts on energy supply and natural disasters. This view does not refute the possibility of other negative impacts mentioned in the questionnaire, such as those on the economy and employment, food production, water availability etc.

The electricity industry is already undergoing transformation efforts to cope with these new conditions and cushion the effects of climate change on supply.

Expert Section

General policy framework

Scope and role of EU-wide carbon pricing instruments

The EU Emissions Trading System has improved in many ways since its establishment in 2005 and today it constitutes a very powerful policy tool to curb emissions and encourage fuel switch cost-effectively. The recent reform of the EU ETS has expanded its scope through the inclusion of additional sectors; while the creation of a separate ETS for buildings and transport significantly expands the carbon market concept across the EU and paves the way for market-based reduction efforts in other key sectors with high CO₂ emissions.

Compliance Markets

While options to link the EU ETS with other compliance markets – following the example of the linkage with the Swiss ETS – could be pursued, Eurelectric advises in favour of a cautious approach with regards to linking the EU ETS with other types of compliance markets, that have not yet proven their optimal and efficient functioning. Such linking between ETS and other compliance systems must be carried out very carefully to mitigate potential risk of unintended volatility and preserving the strong integrity of the EU ETS.

ETS coverage of all fossil fuels

As the ETS has proven its ability to drive emissions reductions across the targeted sectors, in the long run, it could cover all fossil fuel uses. However, it took many years of development to bring the EU ETS to its current form. Thus, it is crucial not to disturb the achieved stability and resilience.

ETS coverage of all GHG emissions from other sectors

The non-ETS sectors must also contribute to the achievement of the climate target. Sectors which are not exposed to any CO₂ price, or an insufficient CO₂ price, should be addressed. This can be done using the most efficient tool for each sector.

While non-ETS sectors need to start delivering carbon reductions as soon as possible to catch up with the ETS sectors, it must also be remembered that some of them will move into the ETS through electrification.

Eurelectric recommends the establishment of stand-alone systems which would allow for gradually setting up the required regulatory framework and administrative capacity, in particular in terms of verification and monitoring. No relationship between the new systems and the ETS1 should be established, until their efficiency is proven. If the trading system for the new sectors (EU ETS2) has proven effective for GHG reductions, and prices are similar, they could be assessed for possible integration in the EU ETS 1 and the required changes in the cap trajectory, MSR parameter, price impacts must be studied.

When it comes to Carbon Capture and Utilisation (CCU), the provision adopted in the recently revised EU ETS that aims to avoid double counting of emissions from RFNBOs is very helpful. “No double counting” is a principle that should apply to any CCU use case across all sectors, and not only to hard-to-abate sectors as proposed in the questionnaire. To maintain the integrity of the EU

ETS, no CO₂ ultimately emitted should go unaccounted for and no CO₂ should be double counted, which is essential to incentivise the development and deployment of sustainable solutions.

Future role of CBAM

The introduction of a Carbon Border Adjustment Mechanism (CBAM) for electricity is welcome, but Eurelectric believes that ultimately its end goal should be to encourage neighbouring markets to develop their own carbon markets, and link them to the EU ETS. Building on the successful link with the Swiss ETS, further linkages would support a larger, more stable carbon market and enable a level-playing field with electricity generated at the other end of interconnectors. Thus, we encourage policymakers to strive for cooperative solutions on defining a uniform carbon price between the relevant industry nations (“Club of the Willing”).

Eurelectric thus believes that Europe should promote mechanisms which could make domestic industries more carbon efficient whilst simultaneously encouraging third parties to become more climate friendly, in line with EU trade policy objectives.

Eurelectric suggests exploring options to add additional sectors and emissions scopes in CBAM after a first assessment following its implementation has been conducted. Priority in the expansion of CBAM should be given to sectors at risk of carbon leakage and highest absolute emissions, as well as end-products.

Regarding the current scope of the CBAM, we regret that hydrogen carriers (e.g. e-ammonia and methanol) are not on an equal footing with hydrogen in terms of carbon leakage protection and call for their rapid inclusion in the CBAM.

Lastly, when it comes to the removal of free allocations to additional ETS sectors that would be included in CBAM, same rules and standards as for the first sectors should be applied.

Future role of Effort Sharing

Eurelectric believes that all sectors need to contribute to the achievement of climate neutrality ambitions. We generally support the application of carbon pricing in non-ETS (1 and 2) sectors, as a CO₂ price signal is essential to tackle CO₂ emissions. A separate EU wide emission trading system for emissions/carbon pricing of current ESR sectors, which are not yet covered by the existing EU ETSs, needs to be assessed in terms of its capacity and efficiency for delivering emissions reductions at a first step.

In order to keep the involvement of Member States in driving emissions down, the ESR should be maintained. However, the ESR and associated national targets should cover GHG emissions that are not subject to EU ETSs, once it has been assessed and confirmed that the ETS is sufficient to drive emissions reduction. The new EU ETS2 needs to prove its ability and efficiency in practice before it is possible to fully consider, for example, any merger with the ETS1 as well as disconnection from the ESR.

Mitigation of GHG emissions from the land sector

The role of carbon removals

General role of carbon removals

Eurelectric welcomes and supports the European Commission initiative to prepare a robust, EU-wide certification system for carbon removals to complement mitigation efforts and reach the net-zero ambition. While carbon removals will play an indispensable part in reaching the EU's climate neutrality goal for 2050, EU regulation must continue to incentivise the pursuit of greenhouse gas emissions abatement through cost-effective and market-driven solutions, including electrification, phasing out of fossil fuels and deployment of clean and renewable generation capacities.

Carbon removals should be primarily used to capture the residual CO₂ emissions in hard-to-abate sectors, where no other technological decarbonisation solution is available or used for delivering negative emissions.

Relative contribution of nature-based removals and industrial removals

Eurelectric encourages the European Commission to increase the level of ambition of 5 Mt CO₂ industrial carbon removals proposed in the Sustainable Carbon Cycles Communication, considering the current plans of the business community and the significantly higher target for carbon farming (42 Mt CO₂).

On one side, technology-based carbon removals can be measured and verified accurately and offer a high-quality and long-duration (permanent) removal of CO₂ from the atmosphere. On the other, nature-based solutions have additional contribution to combat biodiversity loss.

Considering the benefits brought by the two solutions, Eurelectric recommends a balance between LULUCF sinks and industrial removals.

Carbon removal technologies

The role carbon capture will play in removing fossil CO₂ from the electricity industry is likely to be limited and depend on the selected trajectory towards net-zero. According to Eurelectric's Decarbonisation Speedways study, 133 Mts of CO₂ would need to be captured to reach a net-zero power sector in 2040, while continuing with the trajectory set by the Fit for 55 scenario. In the same scenario, in 2050 the power sector is assumed not to emit any GHGs, and 106 Mt CO₂ emissions from end-use needs to be captured to reach a net-zero economy.

However, the feasibility of CCUS remains questionable, with two main hurdles represented by scale (only 45 Mt CO₂ captured globally) and significantly high costs, linked to their early stages of development.

Expert Section

Technologies

Barriers to carbon capture and storage

Carbon capture and storage will be needed to deliver negative emissions, but their role is likely to be limited in the electricity industry. Yet, our study shows that cost of carbon capture remains too high to be economically interesting. The pursuit of GHG abatement through cost-effective and market-driven solutions, including electrification, phasing out of fossil fuels and deployment of clean and renewable generation capacities, must be prioritised.

However, considering the role of carbon removals in delivering negative emissions and compensating for unavoidable CO₂ and overshooting, it is important to address the key barriers like routes-to-market and availability of sufficient revenue streams for carbon removal activities, public acceptance, and CO₂ storage availability.

Carbon capture and use or storage

Renewables, which represented 50% of the capacity in 2020 should reach 84% by 2050 to decarbonise the power sector. Much of the heavy lifting will be done by 2030, when renewables could reach 81% of the total installed generation capacity, in the Decarbonisation Speedways RePower-EU inspired scenario. Thus, between 2030 and 2040, the increase will be of two percentage points. As natural gas will be phased out soon after 2040, it is expected that RES hydrogen plus biomethane will play a complementary role (6%-13% depending on scenario) to ensure system inertia.

Considering the power sector decarbonisation trajectory, the role of CCUS for capturing CO₂ from the combustion of fossil fuels in the power sector should not be considered a priority. Eurelectric encourages policymakers to prioritise the capture of CO₂ from the production of biomass, and to give considerations to direct air capture (DACCS) which is currently less competitive and mature than capturing CO₂ from industrial processes. In addition, the use of captured CO₂ for the production of RFNBOs and products to replace virgin fossil carbon should also be prioritised, as this approach favours the circular economy.

Eurelectric supports the permanent storage of captured CO₂ and the delivery of negative emissions, as well as the application of carbon capture to CO₂ from non-energy related processes, where no technological alternatives to abatement exist.

Energy technologies

The energy system is responsible for around 75% of the EU's GHG emissions and it is currently undergoing a rapid transformation. In particular, the power sector has taken significant steps to reduce its emissions, with the CO₂ intensity likely to reach 77gCO₂/kWh by 2030, down from 241 gCO₂/kWh in 2021.

Due to their relevance for accelerating the energy transition towards climate neutrality, Eurelectric encourages policymakers to treat with high priority the following options included in the questionnaire:

- Deployment of renewable energy technologies, including wind, solar and hydro

- Nuclear energy
- Electricity storage, long duration storage and heat storage
- Demand management, demand response and greater digitalisation of the energy systems
- Energy efficiency first principle

Other forms of renewable energies, like geothermal, wave or tidal could be explored, as they mature.

While not mentioned as a high priority option in the survey, grids (including electricity distribution grids) are an essential enabler of the energy transition and should not be forgotten. In order to interconnect demand and supply centres across Europe, including novel solutions such as offshore hybrids, a rapid buildout of physical infrastructure and a supportive market framework are needed.

Opportunities and challenges regarding energy technologies and their development

Electrification is a direct, efficient, and effective way to achieve society's decarbonisation, as it reduces emissions in three ways: switching to carbon-neutral power generation, reducing total energy demand and producing carbon-neutral fuels.

Eurelectric's study "Decarbonisation Speedways" finds that direct electrification is necessary to fully decarbonise the EU economy by 2050, with at least 60% of final energy consumption supplied through direct electrification (versus 23% in 2020). Currently, approximately 70% of the final energy demand in transport, buildings and industry relies on fossil fuels. This is the main target for decarbonisation.

To reach the required levels of electrification and decarbonisation and put the economy on a path to full carbon neutrality by 2050, several critical enablers must be implemented:

- A robust EU carbon market as a key driver for the decarbonisation;
- The right Electricity Market Design fit for net zero, providing the necessary investment signals in fossil-free generation technologies and related infrastructure;
- Flexibility with short and long-term storage to address increased variability;
- Fossil-free dispatchable power plants to complement and regulate very high shares of renewable energy;
- A cohesive industrial policy to defend EU industrial competitiveness and technology leadership;
- An improved financial framework to catalyse investment and innovation for the next wave of decarbonised power generation technologies;
- A smarter and reinforced distribution grid to increase system efficiency;
- Accelerated permitting and land use policies for the build-out of new power generation and grids;
- Focus on skills and training for the workforce;

If properly implemented, the transition will lower energy bills and bring economic benefits. Benefits of a decarbonised energy system outweigh the associated costs, considering the long-term effects of climate change. At household level, the Eurelectric's latest assessment shows that electrification can progressively unlock:

- Higher energy efficiency gains, with household energy consumption decreasing on average by 45% by 2050;
- Ever lower household energy bills, with an energy bill reduction up to 40% in 2050;

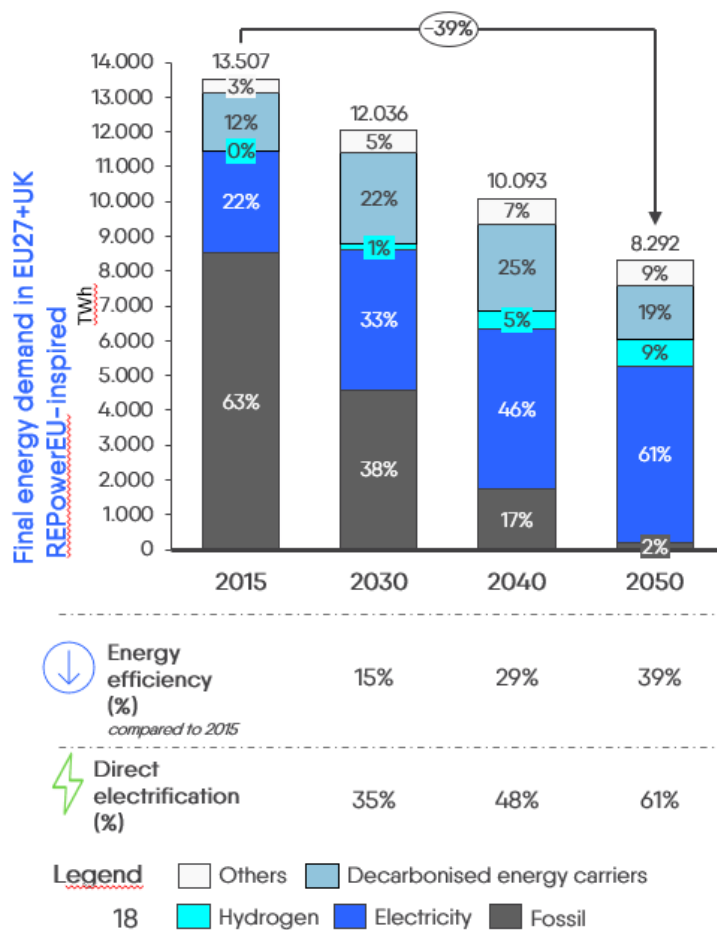
The economic benefits of the transition include:

- €28-37bn average electricity cost reduction (thanks to 50-65% lower RES costs than fossil generation)
- €175bn annual savings in avoided fuel imports
- €27-32bn annual CO2 savings in ETS

Technologies

Direct and indirect electrification

Direct electrification is the main route for decarbonisation, thus, to achieve the EU goals, all sectors must be largely electrified. Clean electricity will be available via large shares of RES and other decarbonised power generation, whereas RES hydrogen or bio-based energy carriers must replace fossil fuels, only where direct electrification is not an option. Indirect electrification is only favoured for hard to abate sectors, such as heavy industries and heavy transport.



Furthermore, efficiency gains via electrification leads to reduced total energy demand.

Generation technologies

RES capacities, which represented 50% in 2020 should reach 84% by 2050 to decarbonise the power sector. Much of the heavy lifting will be done by 2030, when renewables could reach 81% of the total installed generation capacity, in the RePower-EU inspired scenario. Thus, between 2030 and 2040, the increase will be of two percentage points. Combined solar PV and wind capacity that was 352 GW in 2020 must reach 2209 GW by 2040. To reach these renewable capacity targets, the expansion of solar, onshore and offshore wind needs to be accelerated significantly compared to historical growth rates. 90 GW of annual installation is needed.

Nuclear that is a dominant technology in the current electricity mix will continue to provide a significant share of the EU's decarbonised electricity in a context of increased electrification. In absolute terms, nuclear capacities will see a 5% increase in the number of TWh generated. In addition, natural gas will be phased out soon after 2040 and RES hydrogen plus biomethane will play a complementary role (6%-13% depending on scenario) to ensure system inertia. In addition, flexibility activation of flexible generation and storage technologies, such as hydropower reservoirs and related run-of river plants, pump storage hydropower and batteries, will be essential for balancing the system. The amount of flexibility needed by 2050 is estimated to be around 531 TWh and 728 TWh.

Investments

The climate transition will require a shift in investment flows. It is very important to promote green financing to ensure that resources are appropriately allocated to climate-friendly economic activities.

Annual investments in generation capacities and distribution grid should accelerate. Eurelectric's latest analysis, shows that an annual investment in generation of EUR 100 bn (REPowerEU-inspired scenario) is needed to decarbonise the power sector. EUR 117 bn would deliver to fully decarbonise the economy (Radical Action scenario). This should also be paired with grid investment of approximately EUR 34-39 bn/year.

Improved financial frameworks to catalyse the needed investments as well as the right environment for innovation such as the next wave of decarbonised power generation technologies, e.g. Small Modular Reactors and floating offshore wind.

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



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