



Group of Chief Scientific Advisors

Scoping paper:

A systemic approach to the energy transition in Europe

18 March 2020

1. Issues at stake

The European Union has set ambitious climate targets and the need to decarbonise the economy is a primary political objective. The European Commission has proposed a target of net zero greenhouse gases (GHG) emissions in the EU by 2050. The goal is clear but the pathway to reach net zero emissions is not. It will require a major transition of the European energy system away from the current reliance on unabated fossil fuels towards low carbon or renewable sources of energy.

There are concerns from some that current policies are not sufficient while others fear that they are too expensive and may harm important branches of the economy. Moreover, parts of the European population articulate increasing resistance against new infrastructure, rising prices for energy, and potential or real job losses in certain sectors. Despite efforts at the European or national level to date, the need for the reduction of GHG emissions has grown in urgency and the extrapolation of current efforts indicates that targets will be missed significantly unless additional, more effective measures are taken.

In order to meet the targets, there will need to be a clear understanding of what is known, what is only partially known and what is currently unknown with respect to the European energy system. Although many features of the energy system are based on physical and technical realities, there is currently no decarbonised energy system at the national level. Progress has been made, particularly with some electricity systems, but the feasibility of the complete decarbonisation of society, including heating, mobility and industry has yet to be demonstrated at scale.

Multiple technological solutions will be required to decarbonise the energy supply and end uses of energy including transport and heating. Many of the elements required in terms of technology are well understood. However, how to successfully scale up and integrate these elements is still uncertain. Often, there are inflated claims made for individual technologies and their ability to offer a singular solution to the challenge. It is unlikely any such technology, either existing or in development, can deliver such claims on its own. Thus, there is no ‘silver bullet’ that will provide the solution and there are many uncertainties regarding the most effective policies. A systemic approach is needed to fully understand the interdependencies and developments in order to provide a robust information-based anticipation of future requirements and possible solutions.

Related to this is the question of how energy availability, in particular power generation, storage, and the mix of primary energy sources and carriers, will vary over time. Understanding this could lead to greater insight into the possible long-term scenarios for the future European energy system in 2050 and to an agreement on the fundamental characteristics of that system. In addition, the increased integration of different sectors and carbon neutral energy carriers will need to be better understood and exploited.

Changes in the extraction and the use of materials resulting from the energy transition will also be important. How to secure availability from global markets of affordable, environmentally friendly and socially acceptable supply of raw materials for the energy transition may become an important issue. This could also enable a move towards a more circular economy or one that has lower environmental impact while still delivering net zero GHG emissions. However, it might also imply ‘trade-offs’, for instance negative impacts on resource use, biodiversity or pollution.

Rapid developments in the digital world will play a significant role in the future energy system through smart grids, the internet of things, industry 5.0 and digitalisation. While increasing the demand for energy supply this could provide opportunities for greater control at the system level coupled with new and improved services that will facilitate decentralisation and may help increase consumer participation and end-user engagement.

Added to this are the wider factors that will influence the technical elements of the energy transition. Changes to energy markets and business models will be necessary and offer great potential but it is unclear which will be effective and acceptable. Within society, there is a range of companies and citizens from proactive consumers, 'prosumers', who will drive innovation to those who are less active or even hostile to change. Understanding how to engage with all citizens and encourage business participation will therefore be critical.

The range of interdependent issues noted above highlights the need for a systemic approach: this will involve technology, business, citizens and society, Member States and their institutions, local authorities, economic and fiscal mechanisms, legal factors, and geopolitics. It should provide added value beyond any single subject analysis and recommendations that are flexible, adaptable and deliverable.

Concerns over social equity will be central to ensuring the energy transition does not affect certain sections of society unfairly. It will also be important to understand the link between climate action and the Sustainable Development Goals (SDGs) as well as the different stages of technological and societal development across Member States.

Support for and participation in the energy transition by politicians, scientists, experts, citizens, business and other non-governmental organisations will be critical to success. What advice can be offered to make the transition acceptable and manageable for our society and business? This should include: how to build on the current unprecedented levels of public enthusiasm to tackle climate change; how to leverage the engagement of prosumers to impact wider society; and how to communicate the advantages of the energy transition in terms of improved services, cleaner environment and sustainability, and business opportunities.

2. EU policy background

The European Union already has a strong record of policy initiatives reducing its emissions of GHG while maintaining economic growth. In November 2018, the Commission adopted the 'clean planet for all' strategy¹, aiming for a prosperous, modern, competitive and climate-neutral economy by 2050. Emissions in 2018 were 23% lower than in 1990 while the Union's GDP grew by 61% over the same period.

In December 2019, the European Commission presented the European Green Deal², an ambitious package of measures designed to deliver a sustainable green transition. The Green Deal Communication sets the path for action in the months and years ahead – a roadmap for making the EU's economy sustainable by turning climate and environmental challenges into opportunities across all policy areas³ and making the transition just and inclusive for all. The actions will be updated as needs evolve and policy responses are formulated.

The European Climate Law proposal (4 March 2020) aims to establish a legal framework for achieving climate neutrality in 2050. It also tasks the Commission to review existing policies and Union legislation in view of their consistency with the climate-neutrality.

On 10 March 2020, the Commission has adopted an EU industrial strategy to address the challenge of the green and the digital transformation, identifying crucial value chains that need to be developed in the EU. It also focuses on the need to ensure a just transition and considers the need

¹ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0773>

² https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

³ https://ec.europa.eu/info/sites/info/files/commission-proposal-regulation-european-climate-law-march-2020_en.pdf

to equip workers with new skills and help communities dependent on these industries to manage the transition.

Together with the industrial strategy, a new circular economy action plan was adopted in March 2020 to help modernise the EU's economy and draw benefit from the opportunities of the circular economy domestically and globally. A key aim of the new policy framework will be to stimulate the development of lead markets for climate neutral and circular products, in the EU and beyond.

The Commission is also working on building a dynamic repository on data on clean energy technologies and solutions (current and expected status by 2030 and 2050, gaps, value chain analysis per technology, EU clean tech industry on the world map) in order to develop a common basis of understanding across services and feed into the Research and Innovation prioritization in the new context of the Green Deal.

The Commission will present a smart sector integration strategy in Q2 2020, exploring the potential of better linking the electricity, renewable and decarbonised gases, heating and cooling, transport, and industrial and agriculture sectors to reap the synergies and facilitate the timely and cost-effective decarbonisation of the energy system.

In 2021, the Commission will propose a Carbon Border Adjustment Mechanism to reduce the risk of carbon leakage, in full compatibility with the World Trade Organization (WTO) rule and will revise the Energy Taxation Directive aligned with climate objectives and providing a coherent policy framework.

All these packages set the framework for delivering on the European Green Deal, building on an increased emphasis on the need for climate action within the European Institutions. The implementation of these new or revised policies will need to rely on evidence and a clear understanding of the current state of knowledge and will require a systemic understanding of the social, economic and geopolitical issues. There is a desire to do it quickly but right.

3. Request to the EC's Group of Chief Scientific Advisors

In view of the above, an impartial, independent and systemic approach with insight of experts with a multidisciplinary background will be needed to fully understand the interdependencies and developments in order to provide a robust information-based anticipation of future requirements for the energy transition.

In this context, the European Commission's Group of Chief Scientific Advisors is asked to provide by the first quarter of 2021 a scientific opinion on a systemic approach to the energy transition in Europe. As energy transition pathways tend to differ across Member States, the main question to the European Commission's Group of Chief Scientific Advisors is:

How can the European Commission contribute to the preparation for, acceleration, and facilitation of the energy transition in Europe given the present state of knowledge on the possible transition pathways?

Considerations should include constraints from technologies, services, primary energy sources, economics, raw materials availability, preferred pathways, social considerations and environmental boundaries. The scientific opinion will take account of previous work by the national academies through alliances such as the Euro-CASE report *Energy transition in Europe: common goals but different paths*⁴.

⁴ <https://www.euro-case.org/platforms/platform-energy/>