



European
Commission

A Systemic Approach to the **Energy Transition** in Europe

Scientific Advice Mechanism (SAM)

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Report



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EXECUTIVE SUMMARY

The fight against climate change is arguably one of the defining global efforts of our time. The Paris Climate Agreement, which was signed by 196 Parties at COP 21 in 2015, aims to limit global warming to 1.5 degrees Celsius compared to pre-industrial levels. To make this possible, greenhouse gas emissions should reach their peak as soon as possible and the whole world should become climate neutral by mid-century.

The EU is leading the way: one of the Commission's six priorities is the European Green Deal, an action plan aiming to reach net-zero greenhouse gas emissions in Europe by 2050. The plan also aims to make the EU's economies sustainable by turning climate and environmental challenges into opportunities making them more modern, resource-efficient and competitive. As part of this reform, the Commission has tabled the 'Fit for 55' package that aims at reducing greenhouse gas emissions by at least 55 % by 2030. Achieving this while maintaining economic competitiveness should ensure that Europe leads the way in achieving a sustainable future for all, fostering diversity across an EU that is united through common goals and catalysing the global transformation toward a clean planet for all.

A condition to achieving these ambitious targets is that the EU energy systems must undergo fundamental change, including:

- the energy systems must be fully decarbonised and integrate a very large share of variable renewable energy sources,
- the transport and industry sectors must be almost fully decarbonised,
- the building sector must ensure major improvements to the energy efficiency of buildings.

Substituting fossil fuels will require investing in renewable plants, grids and pipelines, storage facilities (batteries, fuel cells), carbon-free energy carriers (blue and green hydrogen, methane), boosting the energy performance of buildings, efficient industrial processes and appliances, as well as ensuring new transportation technologies and smart systems. Reducing the overall energy demand will be key to achieving all this without critically stressing the generation and transmission networks.

Under this framework, the opinion on the 'A systemic approach to the energy transition in Europe' is provided in support of the College of the European Commission. The scoping paper that sets out the mandate for this opinion focuses on the following question:

"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?"

The recommendations below are informed by an extensive review of scientific literature, the Evidence Review report prepared by the consortium of European Academies funded through the SAPEA grant agreement, as well as meetings with leading energy experts, Commission staff and stakeholders.

Recommendation 0

Design EU energy policy clearly aimed towards achieving climate neutrality and sustainability, without leaving anyone behind.

Use a holistic approach to maximise synergies and avoid trade-offs and barriers across technologies, regulatory and market measures, and social and behavioural changes.

Recommendation 1

Develop flexible, efficient, and resilient EU energy systems for delivering clean, accessible, and affordable energy services by integrating decarbonised energy sources, electrification and the use of green and blue hydrogen.

- 1.1 Develop energy systems that are flexible in terms of pathways, different technologies, and scales of implementation;
- 1.2 Support investments in integration of infrastructures and general-purpose technologies, including energy generation, transmission, storage, and end-use systems;
- 1.3 Support European research and innovation as a world leader in new technologies and smart systems.

Recommendation 2

Recognise the roles of all actors and stakeholders in creating an inclusive and participatory environment that incentivises and supports low-carbon energy choices.

- 2.1 Incentivise energy efficiency and reduce of energy use while ensuring sufficient services for all;

- 2.2 Support direct participation and innovation among all actors and stakeholders from the public and private sectors to individuals and households, at local, national, European and international levels;
- 2.3 Redistribute the additional revenue created by energy taxation and carbon pricing to support low-income groups and promote sustainable energy systems.

Recommendation 3

Support a coordinated combination of policies, measures and instruments, including carbon pricing as a driving force, to shape an effective, consistent and just regulatory system.

- 3.1 Use a coordinated combination of regulatory measures and incentives to drive the European energy transition;
- 3.2 Make a clear political commitment and undertake supporting actions to steadily move towards very high carbon (and other greenhouse gas) prices to cover all social and environmental costs;
- 3.3 Insist on reciprocal climate commitments by other countries to form 'decarbonisation clubs' and introduce a World Trade Organization-compatible border adjustment mechanism for carbon.

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