

EMBARGOED UNTIL 9:00 (GMT) 5TH NOVEMBER 2025

New Global Report Presents Path for Low-Emissions Future through Electrification and Carbon Management

As the world moves towards a net-zero emissions future, a new report tackles some of the toughest questions in the transition: the maximum potential role of electrification, and how to source and manage the carbon we will still need within defined ecological limits.

LONDON, 5th November 2025 – A new major report by the Energy Transitions Commission and Systemiq, **“Carbon in an Electrified Future: Technologies, trade-offs and pathways”**, examines how the world can secure the carbon molecules it will still need in a low and eventually zero-emissions future, without harmful environmental effects. The study analyses emerging technologies that could further reduce the demand for carbon, or make its sustainable production and use possible, reshaping how carbon fits into tomorrow’s energy and materials systems.

*“Electrification will be the backbone of the net-zero economy, but reaching net-zero emissions by 2050 does not mean zero carbon,” says **Adair Turner, Chair of the Energy Transitions Commission**. “This report looks at the innovations that will determine how much carbon we will still need, and how to ensure that every molecule is used responsibly within planetary limits.”*

The study examines how breakthroughs in electrification could minimise the world’s dependence on carbon-based molecules, and how new technologies for sourcing, recycling and managing carbon at end of life can ensure a sustainable use of carbon in those sectors, such as aviation and chemicals, where elimination of carbon input is impossible.

The Key Role of Electrification

The report finds that electrification is the biggest lever to eliminate the majority of carbon use in the energy and materials sectors, and that new and emerging technologies will play a central role in carbon displacement and reducing fossil fuel dependency. Eventually, as much as 77% of final energy demand could be met via the direct use of electricity, with another 6% involving the use of hydrogen or ammonia. Building the far larger clean electricity systems required to meet this demand is therefore a crucial priority.

Sustainable Sourcing, Use and Storage of Remaining Carbon

But even in the most ambitious electrification scenarios, significant carbon inputs will remain essential for some energy and material applications.

The report estimates that in a highly electrified system, we would see an almost 70% reduction in demand for carbon, from 11.5 Gt today, which at end-of-life results in 37 Gt of CO₂ emissions, to between 3.3 Gt–4.8 Gt of carbon by mid-century. This carbon must be sourced, recycled or abated at end of life, and the report explores four different scenarios for the combination of technologies which could make this possible. In the central scenario, approximately 30% of carbon could come from biomass, 13% from recycled carbon, and 57% from fossil fuel sources, but with all end-of-life carbon captured and stored in either solid or gaseous form.

Emphasis is placed on the growing importance of recycling and reuse to build a circular carbon economy. In the most ambitious recycling scenario, and with the right alignment of product design, policy, and consumer behaviour, about a third of carbon can be made circular.

For the carbon that will still need to be sourced, the report discusses the potential for new technologies and enablers, including, for example, properly governed sustainable biomass and viable pathways for scaling up Carbon Capture and Storage (CCS) capacity or high-quality end-of-life plastics storage. Together, these technologies will be essential to closing the carbon loop and ensuring that the remaining use of carbon is fully compatible with net-zero goals.

“Widespread electrification will deliver cleaner power, greater efficiency and sharply reduce our reliance on carbon-based fuels. But even in an electrified world, carbon will remain - a finite resource to be stewarded with the same discipline as land and water. How we manage carbon will determine whether emissions fall quickly enough and enable industries to transition over time to a net-zero economy. Every molecule of carbon should have a provenance, a purpose and a plan for where it goes next,” said **Eveline Speelman, Partner Systemiq.**

A Strategic Framework for the Decades Ahead

The report concludes that managing carbon in a net-zero world will demand a strategic balance between reducing demand, expanding recycling, ensuring sustainable sourcing and developing reliable storage solutions. While many of the necessary technologies already exist – though often imperfect – the challenge now lies in creating the regulatory and financial conditions to allow them to scale rapidly. At the same time, targeted innovation will be essential to close key technology gaps. The report stresses that action cannot wait: clear policy, investment and coordination steps are needed today to secure a sustainable carbon cycle by 2050.

The executive summary is available here: <https://www.energy-transitions.org/publications/carbon-in-an-electrified-future/> [Link will be available from 9:00 (GMT) 5th November 2025]. The full report will be published on 10th November 2025.

Carbon in an electrified future: Technologies, trade-offs and pathways was developed in collaboration with ETC members from across industry, financial institutions, and civil society. This report constitutes a collective view of the ETC; however, it should not be taken as members agreeing with every finding or recommendation.

Note to Editors

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About Energy Transitions Commission

The Energy Transitions Commission (ETC) is a global coalition of leaders from across the energy landscape committed to achieving net-zero emissions by mid-century, in line with the Paris climate objective of limiting global warming to well below 2°C and ideally to 1.5°C.

Commissioners come from a range of organisations – energy producers, energy-intensive industries, technology providers, finance players and environmental NGOs – which operate across developed and developing countries and play different roles in the energy transition. ETC's analyses are developed with a systems perspective through extensive exchanges with a diverse set of experts and practitioners.

The Energy Transitions Commission is hosted by SYSTEMIQ Ltd.

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About Systemiq

Systemiq is a systems change company that works with businesses, policymakers, investors and civil society organisations to reimagine and reshape the systems that sit at the heart of society - energy, nature and food, materials, built-environment, and finance - to accelerate the shift to a more sustainable and inclusive economy. Founded in 2016, Systemiq is a certified B Corp, and has offices in Brazil, France, Germany, Indonesia, the Netherlands, the UK and the USA.

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