Energy Transitions Commission

Key Messages Pack

Headline summary: one-sentence version

A net-zero global economy is technically and economically possible by mid-century, but what we do in the next decade is crucial: we must act now to accelerate the deployment of zero-carbon solutions.

Headline summary: one-paragraph version

A net-zero global economy is technically and economically possible by mid-century, but we need to act in the 2020s to put mid-century targets within reach. Governments, investors, corporates and civil society need to work together to deliver on 3 priorities by 2030:

1. Speeding up the deployment of proven solutions, especially renewable power;
2. Creating the right policy and investment environment, by removing fossil fuels subsidies, raising carbon prices, and tightening standards and regulations;
3. Bringing the next wave of zero-carbon technologies for harder-to-abate sectors to market.

Headline summary: three-paragraphs version

A net-zero global economy is technically and economically possible by mid-century. The technologies and business solutions needed to reduce GHG emissions to net-zero are already available or close to being brought to market. Additional investments required to achieve this goal will be in the order of US$1-2 trillion per year, equivalent to 1% to 1.5% of global GDP. Overall, this transition will improve living standards.

A profound transformation of the global energy system is ahead of us. Clean electrification must be the primary route to decarbonization. Electricity could represent up to 70% of final energy demand by 2050, versus 20% today, and will be complemented by hydrogen, as well as some limited use of sustainable biomass and of fossil fuels combined with carbon capture and storage or use (CCS/U). As a result, demand for fossil fuels will decline dramatically, especially coal and oil demand (-90% by 2050).

Governments, investors, corporates and civil society need to work together to deliver on 3 priorities by 2030 to put mid-century targets within reach:

1. Speeding up the deployment of proven solutions, especially renewable power;
2. Creating the right policy and investment environment, by removing fossil fuels subsidies, raising carbon prices, and tightening standards and regulations;
3. Bringing the next wave of zero-carbon technologies for harder-to-abate sectors to market.

Headline summary: longer version

Net-zero is technically and economically possible.

A net-zero global economy is technically and economically possible by mid-century. The technologies and business solutions needed to reduce GHG emissions to net-zero are already available or close to being brought to market. Additional investments required to achieve this goal will be in the order of US$1-2 trillion per year, equivalent to 1% to 1.5% of global GDP.

Zero must mean zero. The energy and industrial system can and should reach net-zero emissions without permanently relying on negative emissions from the land use sector. But, in the next 30 years, massive investments in nature-based solutions can complement as rapid as possible within-sector decarbonisation.

The energy transition will improve living standards.

The transition to a zero-emissions economy will drive innovation and create new jobs. It will improve living standards – particularly in developing economies – through reduced air pollution, cheaper energy bills, higher-quality homes, more flexible mobility services and more durable consumer goods.

There are three steps to build a net-zero emissions economy:

1. Using less energy, by achieving dramatic improvements in energy efficiency and shifting to a circular economy;
2. Scaling up clean energy provision by building massive generation capacities of cheap clean power, at a pace five to six times higher than today, as well as expanding other zero-carbon energy sources such as hydrogen;
3. Using clean energy across all sectors of the economy by electrifying many applications in buildings, transport and industry, and deploying new technologies and processes using hydrogen, sustainable biomass or carbon capture in sectors that cannot be electrified, like heavy industry or long-distance shipping and aviation.

A profound transformation of the global energy system is ahead of us.

Clean electrification must be the primary route to decarbonization. Electricity could represent up to 70% of final energy demand by 2050, versus 20% today.

- Dramatic falls in cost of renewable energy and of energy storage make this easily affordable. All growth in electricity supply should now come from zero-carbon sources. There is no need to build any new coal-fired power capacity to support economic growth and rising living standards.
- But this will demand a massive ramp-up in clean electricity provision: we need to multiply by 4 the size of the electricity system and phase-out unabated thermal power generation at the same time.

Clean electricity will need to be complemented by hydrogen, as well as some limited use of sustainable biomass and of fossil fuels combined with carbon capture and storage or use (CCS/U).

- Annual hydrogen production will need to increase from about 60 Mt today to 500 to 800 Mt by mid-century to meet the demand for hydrogen, ammonia and synfuels in end-use applications.
- Around 6 to 9.5 Gt of CO2 per year of CCS/U will be needed to make the remaining fossil fuel use near zero carbon, particularly in heavy industry (~40%

of total), hydrogen production from methane (~30% or total) and peak power generation (~20% of total).

- 46 to 69 exajoules of energy will need to be derived from bio-feedstocks, all of which must be delivered in a low-carbon-footprint, sustainable fashion, primarily from residual biomass.

As a result, demand for fossil fuels will decline dramatically, especially coal and oil demand (-90% by 2050).

Each country should shape its own net-zero pathway ahead of COP26.

All developed countries are able to reach net-zero emissions by 2050 at the latest, and so does China. Developing nations should be able to meet a growing energy demand and reach net-zero emissions by 2060, but require development finance to de-risk and attract private green investment.

Resource endowments vary significantly by region and country, and so will the optimal path to net-zero. The revised nationally determined contributions (NDCs) and long-term low GHG emissions strategies soon to be submitted to the UNFCCC as part of the Paris Agreement should be informed and inspired by local opportunities.

We need to act in the 2020s to put mid-century targets within reach.

Governments, investors, corporates and civil society need to work together to deliver a net-zero economy by mid-century. The *Making Mission Possible* report acts as a blueprint for nations and non-state parties. The next decade is decisive. We must act now, otherwise it will be too late.

Before 2030, we need to deliver on 3 priorities:

4. Speeding up the deployment of proven zero-carbon solutions, in particular building massive capacities of renewable power generation;
5. Creating the right policy and investment environment for the diffusion of low-carbon technologies, by removing fossil fuels subsidies, raising carbon prices, and tightening standards and regulations;
6. Bringing the next wave of zero-carbon technologies for harder-to-abate sectors to market.

The *Making Mission Possible* Report

The *Making Mission Possible* report explains why the ETC is confident that we can reach net-zero GHG emissions by mid-century, how to achieve the transition and what steps need to be taken in the 2020s to put the world on the right trajectory. It integrates findings from previous ETC publications and updated analysis to reflect the latest trends in the readiness and cost of key technologies. It describes in turn:

1. The steps to build a zero-carbon-emissions economy by mid-century;
2. The costs, investments and related challenges of the transition towards net-zero emissions;
3. Regional differences, challenges and opportunities;
4. The actions required now to put 2050 targets within reach.

Energy Transitions Commission

FAQ

Section 1: About the ETC

What is the Energy Transitions Commission and what is its mission?

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 order to limit global warming to well below 2°C and as close as possible to 1.5°C. Our 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. This diversity of viewpoints informs our work: our analyses are developed with a systems perspective through extensive exchanges with experts and practitioners. Our ambition is to inform the decisions of public and private decision-makers and support the leaders at the forefront of climate action to speed up the deployment of low and zero-carbon solutions.

Who funds the ETC?

The ETC is primarily funded by the organisations with which our Commissioners are affiliated. Membership fee levels depend on the size and nature (for-profit or not-for-profit) of the organisation. Commissioners all have equal voice and representation on the Commission regardless of whether their affiliate organisation finances the ETC or not. In addition, some of the ETC's work programmes, in particular ETC China and ETC India, are funded by philanthropic organisations. The funding we receive finances the ETC's secretariat, analytical programmes, stakeholder outreach and communications.

Who are the Commissioners and how were they selected?

As of September 2020, the Commission's membership includes 45 leaders coming from energy companies, energy-intensive industries, technology providers, financial institutions, environmental NGOs and academia. They operate across developed and developing countries and play different roles in the energy transition. Commissioners are selected based on their commitment to working towards a net-zero-emissions economy by mid-century. We endeavour to diversify the Commission's membership in terms of sector, nationality and gender. The Commission is chaired by Lord Adair Turner and Dr. Ajay Mathur. A list of Commissioners can be found on our website at http://www.energy-transitions.org/who-we-are.

Are the organizations with which your members are affiliated backing this report?

This report constitutes a collective view of the Energy Transitions Commission. Members of the ETC endorse the general thrust of the arguments made in this report but should not be taken as agreeing with every finding or recommendation. The institutions with which the Commissioners are affiliated have not been asked to formally endorse the report.

Why is [a given Commissioner] not available for questions?

Some of our Commissioners are unfortunately unavailable for questions due to prior commitments, but *Making Mission Possible* has been developed by the Commissioners who not only agree on the importance of reaching net-zero carbon emissions from the energy and industrial systems by mid-century, but also share a broad vision of how the transition can be achieved.

Why have not all ETC Commissioners endorsed the report?

Nearly all our Commissioners have endorsed the *Making Mission Possible* report. A couple were unable to formally endorse the report before publication due to procedural formalities within their organisation.

How does the ETC deal balance achieving impact with the demands of fossil fuel members?

Commissioners all have equal voice and representation on the Commission. We believe it is critical that the ETC brings together voices from across all sectors, including energy-intensive industries, in order to design realistic yet ambitious pathways to net-zero emissions and mobilise all key stakeholders towards this goal. All members of the ETC have agreed to work together to pursue a global net-zero emissions target by mid-century. Our reports are anchored in robust quantitative and qualitative analyses, which are stress-tested and refined with a large panel of experts coming from both our members' organisations and a broader network. The ETC creates a unique space for open dialogue, creating the right conditions for change and advancing the climate agenda.

Does the ETC speak to the challenges of both developed and developing countries?

The ETC develops global roadmaps, while highlighting differences between regional pathways, especially between developed and developing countries. We work with local partners – in China, India, Europe, U.S. and Australia – who have deep country knowledge and play a key role in strengthening and stress-testing our global analyses in light of regional specificities. The ETC believes that all rich developed economies should and can reach net-zero emissions by 2050 and all developing countries by 2060 at the latest, but the developing countries will require development finance to de-risk and crowd-in private investment. However, some developing countries may be able to achieve full decarbonisation by 2050 or earlier, because they are blessed with significant potential solar and wind resources, dramatically reducing decarbonisation costs.

Section 2: About the report and its impact

Who is this report aimed at? Who is your target audience?

The report is primarily aimed at a policymakers around the world, who are preparing the revision of their Nationally Determined Contributions and mid-century strategies ahead of the UNFCCC COP26 summit in November 2021. We aim at putting the objective of "real net-zero" by mid-century at the heart of the revised Nationally Determined Contributions (NDCs) and long-term low greenhouse gas emissions development strategies (LT-LEDS) soon to be submitted to the UNFCCC under the Paris Agreement.

The report provides policymakers with a strong case for "real net-zero" targets by mid-century, a blueprint of the steps that need to be taken to progress towards net-zero emissions, and a clear set of priorities for the 2020s. It complements key findings of other global climate and energy organisations including the IPCC and the IEA, by providing a comprehensive, integrated vision of how to reach net-zero emissions globally, supported by major corporate and finance leaders from multiple sectors and geographies.

The report can also inform the strategies of business leaders and investors who aim to anticipate the profound market transformations that climate action will generate in the global economy. It provides civil society, economic, political and social thought-leaders with clues on the key leverage points for climate action.

How much of the report is constituted of new analyses vs. integration of previous publications?

The *Making Mission Possible* report builds on previous ETC analyses including *Better Energy, Greater Prosperity* (April 2017), which described a path to halving CO2 emissions by 2040 focusing on power decarbonisation and electrification, and *Mission Possible* (December 2018), which showed it was possible to decarbonise even the "harder-to-abate" heavy industry and heavy-duty transport sectors.

In *Making Mission Possible*, we have updated our past analysis to reflect the latest cost and technological trends. This has led us to revise our vision of the possible shape of the energy sector by mid-century, strengthening our conviction that clean electricity is set to play a dominant role in the energy system of the future, complemented by hydrogen, some limited sustainable biomass and a significantly reduced amount of fossil fuels combined with carbon capture and storage or use.

New elements have been included in order to provide a fuller picture of the climate challenge. In particular, the report gives a high-level view of how to decarbonise land use and food systems, and what the implications are for the role of nature-based solutions and of bioenergy in the decarbonisation of the energy and industrial system.

Who has carried out the underlying analysis?

The underlying analysis for this report was developed by the ETC Secretariat, provided by SYSTEMIQ. It brings together and builds on past ETC publications, developed in close consultation with hundreds of experts from companies, industry initiatives, international organisations, non-governmental organisations and academia. The report draws upon analyses carried out by Climate Policy Initiative, Copenhagen Economics, Material Economics, McKinsey & Company, Rocky Mountain Institute, The Energy and Resources Institute, University Maritime Advisory Services, Vivid Economics and SYSTEMIQ for and in partnership with the ETC, as well as a broader literature review. *Making Mission Possible* also references analyses from the International Energy Agency and BloombergNEF.

Is this report overly optimistic?

We are presenting a set of opportunities and are both realistic and ambitious with regards to implementation. We are convinced that decarbonising the economy by mid-century is technically and economically feasible. Our findings and recommendations are

rooted in robust data analysis which itself builds on work from reputable global institutions. The pace of innovation, technology deployment and cost reductions has been steadily increasing, which considerably facilitates the decarbonisation of many sectors like power or light-duty vehicles.

However, our research shows that this speed must be considerably accelerated to reach a net-zero target by mid-century, which requires the immediate and collective mobilisation of governments, investors, corporates, innovators and civil society. We do not underestimate the barriers to implementation and our report discusses how they vary depending on regional challenges and opportunities and how they could be overcome. In particular, we emphasize detailed actions and policies required immediately and over the next decade to drive initial emissions reductions and to make the path to net-zero by mid-century feasible.

The Commission is not making predictions about the future. We are identifying opportunities that we believe governments, investors and businesses should seize, and we are highlighting where we believe they should focus their efforts in order to have the most positive impact.

Are the conclusion of the report valid for all geographies? How did you address regional challenges?

Many of the routes to decarbonisation are relevant in all countries; and in many sectors – such as steel, aviation and shipping – a global policy approach would be ideal. Much of the ETC's work has therefore focused on global trends in technologies and costs. But there are important differences between regions and countries. Countries have different natural resource endowments, different economic fabrics, different income levels and very different current emissions; and they start from different positions – for instance, in relation to existing coal generation capacity. Through its global work as well as its regional initiatives across China, India, Europe, U.S. and Australia, the ETC has sought to identify major regional differences. The 3rd chapter of the report is dedicated to these regional challenges and opportunities.

Is the report advocating or excluding specific decarbonisation technologies?

The ETC is technology neutral. This means that all decarbonisation technologies are considered. However, the ETC prioritises technology solutions in each sectoral decarbonisation pathways based on considerations of cost, feasibility and available local resources. The optimal mix of these different technologies will depend on local circumstances and reflect the evolution of relative costs over time, in particular the costs of direct electricity and hydrogen electrolysis relative to options based on bio-feedstocks or on fossil fuels combined with CCS/U. The costs of the electricity-based routes are highly likely to fall over time, both in absolute terms and relative to the bio and fossil fuels routes.

For bioenergy, bio-feedstocks and bio-materials, their use as decarbonisation technologies must be strictly limited and prioritised, based on how much sustainable, low-carbon-footprint biomass can be used for energy and industrial use without adverse consequences for food supply, land-use change, biodiversity and carbon sequestration in nature.

How does this report differ from existing reports (other ETC analyses and publications from institutions like the IEA)?

Making Mission Possible distinguishes itself by its focus on how to achieve "real net-zero" emissions in the energy and industrial system by mid-century, with minimum reliance on offsets from the land use sector. The report offers a unique integrated perspective on transformations required to reach this target from both an energy provision and an energy use perspective. It focuses the attention of policymakers and private decisionmakers on decisions needed today, by defining 10 critical actions to be undertaken in the 2020s to put 2050 goals within reach.

The report also distinguishes itself from many reports from international organisations and NGOs because it was endorsed by 45 Commissioners representing a diverse set of energy companies, energy-intensive industries, financial institutions and NGOs from developed and developing countries. This report does not advocate for the interest of a given group, but provides a systemic vision of the energy transition informed by the expertise from players positioned across the energy landscape. It constitutes a balanced, pragmatic and ambitious call to action from global corporate leaders to their peers and to policymakers.

What role does the ETC envision for negative emissions?

The ETC's position on offsets and nature-based solutions is that all sectors of the economy aside from agriculture can and should achieve "real net-zero emissions" by mid-century, with a role for CCS/U, but no permanent and major role for the purchase of carbon credits from other sectors or from nature-based solutions.

Nature-based solutions could deliver a very large one-off increase in the carbon stock held in the terrestrial ecosystem (and a matching reduction in atmospheric GHG concentrations), and the purchase of offsets could play a positive role in financing this effort in the early stages of the transition.

What are the next steps for the ETC after the launch of this report?

The ETC will continue to work with our Commissioners to educate and stimulate discussions on the journey to net-zero emissions and priorities for the 2020s in advance of COP26. Our ambition is to inform the decisions of public and private decision-makers in the run up to COP 26.

Our activities encompass the energy sector itself, as well as key energy-consuming sectors in industry, transport and buildings. In each sector, we work with corporate leaders to define a pathway to net-zero emissions and establish the building blocks of net-zero value chains. This work is generally undertaken with a range of partners, industry associations, NGOs and experts. In the harder-to-abate sectors specifically, we work under the umbrella of the Mission Possible Platform, an initiative established by the ETC and the World Economic Forum.

The ETC is continuing to work on the ground across five regions: China, India, Europe, the United States and Australia. In each region, we continue to work with local delivery partners to develop a vision of how to speed up the national energy transition, leveraging both global insights and local knowledge; crystallise a corporate voice in support of policies aligned with a net-zero target; and engage with policymakers to inform long-

term national strategies and the revision of their Nationally Determined Contributions ahead of COP-26.