

The path to a low-carbon economy

How can the world's economies, whose prosperity has been built on fossil fuels, transform themselves to avert catastrophic climate change?



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The year 2015 was one of positive achievements for our collective future, with the adoption of both the Paris Agreement and the UN Sustainable Development Goals. The former committed to limit the rise in global temperature to well below 2°C, while the latter emphasised that social,

economic and environmental progress are inextricably entwined.

The energy sector sits at the centre of those agendas. Energy systems across the world account for the vast majority of greenhouse gas emissions. Our economies – agriculture, industries and services – are powered by energy. Reliable energy access is essential to raise living standards for the estimated 767 million people still living in poverty today – and for the many more not

▲ Inner Mongolia, China. A labourer loads coal into a furnace at an unauthorised steel factory. China has recently embraced climate action and positioned itself to be a world leader but, as in many countries, official efforts are challenged by illegal operations

yet enjoying the prosperity levels reached in developed economies.

The challenge is to build an energy system that can meet the needs of a growing world population expected to reach 11 billion

people by 2100. Such a system must allow the global economy to flourish while also achieving net-zero emissions before the end of the century.

Nothing short of a massive transformation in global energy systems can enable us to solve this twofold challenge. If instead we meet growing energy needs with increased hydrocarbon use, the world could be 4°C warmer than pre-industrial levels by the end of the century. The environmental consequences of that will be worst in developing countries and underprivileged communities.

Collective action required

Achieving this crucial energy transition requires action by governments, business and citizens across the world. The Energy Transitions Commission – a coalition of incumbent and disruptive energy players, energy-intensive industries, investors and environmental NGOs – was set up to argue for and ensure commitments to that action.

The Energy Transitions Commission's flagship report, *Better Energy, Greater Prosperity*, makes clear the scale of the challenge. But it also has two positive and optimistic messages: that it is technically and economically feasible to put the world on a well below 2°C trajectory; and that doing so will create major attractive investment opportunities.

Achieving a well below 2°C trajectory is technically and economically feasible. We can cut by half the carbon emissions from energy systems by 2040, while enhancing social and economic progress, if four parallel transition strategies are implemented.

First, we must decarbonise power systems by deploying renewable technologies. We must use this clean electricity to power an extended set of applications across the economy, with particular focus initially on the wider electrification of transport and housing. In the next 20 years, such clean electrification will be the single most important driver of the energy transition, delivering half of the carbon emissions reductions required by 2040.

This transformation is clearly economically feasible. In the last eight years, wind power costs have fallen by 65 per

cent, solar costs by 85 per cent, and battery costs by 70 per cent. Within 15 years it will be possible not only to deliver renewable electricity at prices that are fully competitive with fossil fuel-based power, but also to provide the low-cost backup and storage required to make it possible to run power systems that are 80 to 90 per cent reliant on intermittent renewables.

Sophisticated grid control and demand management systems, with incentives to encourage power use and battery charging when supply is plentiful, will produce further significant cost reductions.

So, decarbonising power is vital and possible, but it is not sufficient to drive us towards net-zero emissions. To achieve that, we must also decarbonise sectors that are hard to electrify, especially in heavy industry and long-distance transport (trucking, shipping, aviation). The technologies to do that – bioenergy, hydrogen, carbon capture

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and sequestration – exist, but it is not yet clear which of these will be most economic in each sector. Crucially, these technologies are not achieving the cost reductions we are now seeing in renewable power and batteries, as they are not being deployed on the scale required to drive future rapid cost reduction.

Over the next 20 years, we must therefore achieve that scale of deployment and cost reduction. To do that, we must use the same type of public research and development and deployment support that triggered the renewables success story.

However, decarbonising energy supply could become a never-ending race if the amount of energy consumed in the world keeps growing rapidly. Alongside decarbonisation efforts, we must therefore

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restrain the growth in global energy demand by using energy more efficiently. Our objective should be to increase energy productivity (GDP per unit of energy consumed) by three per cent per annum, about twice the historic pace.

Analysis shows that this is technically feasible: by deploying the best technologies currently available, we could theoretically keep global energy demand flat by 2050. Reality is trickier, though, as this implies improving the energy efficiency of billions of buildings, home appliances, vehicles and industrial plants.

Increasing investment

That is why, in addition to energy efficiency improvements, we should pursue structural changes in the economy that enable GDP growth while using less energy-intensive goods and services. Efficient urban design, circular and sharing economy models, and the increased digitalisation of economic activities could be the most important drivers of this energy productivity revolution.

Second, we must develop multiple forms of carbon sequestration to absorb residual emissions. These include natural carbon sinks (for instance, through reforestation), carbon capture and storage in underground reservoirs, and carbon capture and conversion into CO₂-based products.

These possibilities must certainly not be treated as a ‘get-out-of-jail-free card’ that removes the need for rapid falls in fossil fuel use. But we should acknowledge that, without significant use of carbon sequestration, particularly to help decarbonise heavy industrial sectors, emission reduction numbers are unlikely to add up to what is required.

This four-dimensional strategy can meet both the climate change and development challenges. But isn’t this plan a spending black hole?

The answer is no, because the second positive message of our report is that this energy transition does not represent a major macroeconomic challenge. On the contrary, it is an incredible investment opportunity,

investment for social and economic development are very often two sides of the same coin. It is about providing reliable energy access to households and businesses; constructing affordable, comfortable and energy-efficient buildings; developing transport infrastructures that meet mobility needs while avoiding health-destroying air pollution; and strengthening the competitiveness of industries, through lower energy costs and greater innovation.

Developing countries have an opportunity to leapfrog to efficient, decentralised energy systems with high upfront capital costs but low operating costs. They can avoid investing in old fashioned, less efficient and centralised energy systems that can lock them into higher costs in the future.

Unlocking economic opportunities

Investors are increasingly aware that the low-carbon economy can provide attractive returns on investment, especially at a time of historically low interest rates. Green finance events and new energy departments within banks and asset management firms reveal this growing interest.

But many investors are still cautious, unsure about how costs and public policies will evolve. Often, they are also worried about the country risks associated with investment in emerging economies. The development of blended finance tools – through which development banks and other sources of public money de-risk green investments for private investors – is therefore likely to be crucial to unlock economic opportunities related to the energy transition.

The key challenge we face is to shift investment flows away from the fossil fuels sector towards renewables, clean technologies and energy-efficient infrastructure and equipment. Do that, and we can achieve the massive energy transition required to limit the rise in global temperatures to well below 2°C while also ensuring economic and social progress.

Collectively meeting this challenge is possible, but public policy-makers, investors and businesses must act now to accelerate the pace of change. ●

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Finally, we need to acknowledge that fossil fuel use won’t disappear immediately. If the three transitions described above are implemented, demand for hydrocarbons will decrease significantly (by approximately one third) by 2040, but will still represent about half of global energy supply. The challenge is to make that compatible with the fact that we must limit CO₂ emissions from energy systems to 900 billion tonnes at most between now and 2100 if we are to limit warming to well below 2°C.

How can we do that? First, we have to optimise the remaining use of fossil fuels by prioritising the least polluting fuels – gas (stripped of methane leakages) rather than oil, and anything rather than coal – and the applications where they are most difficult to substitute, such as heavy industry and long-distance transport.

and a potential driver of economic prosperity. We estimate that \$300–\$600 billion per annum of incremental investment is required to build low-carbon energy systems across the world. Given total global savings of around \$20 trillion annually and global GDP of \$78 trillion, this is significant but entirely manageable.

Indeed, in a period of slow global growth, with extremely low or even negative real interest rates signalling a dearth of investment opportunities relative to desired global savings, increased investment in a green, low-carbon economy could be a positive factor underpinning global demand and growth.

This is particularly true in developing countries, where almost 60 per cent of low-carbon investment needs are concentrated. Investment in green infrastructure and