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CLIMATE CHANGE • GLOBAL ECONOMY

How to decarbonise the global economy

Today's report on deep decarbonisation delivered to Ban Ki-moon, the UN Secretary-General, offers a new perspective on how countries can avoid dangerous climate change and achieve sustainable development. The report, produced by the Deep Decarbonisation Pathways Project which is overseen by the UN Sustainable Development Network, describes the joint efforts of independent experts from 15 countries to find national pathways to making economies based on low-carbon energy consistent with the 2-degree Celsius limit on global warming agreed to by governments in 2010. Such low-carbon pathways are feasible, but to achieve them will require a high degree of global cooperation and a novel design of the climate deal to be reached at the Cop 21 meeting in Paris in December 2015.

The internationally agreed 2-degree C limit on warming (compared with the pre-industrial temperature) reflects the warnings of the world's leading climatologists, ecologists, agronomists and economists. The world would breach 2 degrees C at grave peril. The droughts, floods, heat waves and extreme storms that are already disrupting the world would intensify dangerously. Even worse, warming of more than 2 degrees could trigger natural feedbacks (such as carbon and methane release from the melting permafrost) causing runaway climate disruptions that would overwhelm the world's capacities to adjust.

Despite the 2-degree pledge and growing scientific alarm, the world continues to explore, develop, extract and burn fossil fuels at a rate that is increasing rapidly: enough to raise temperatures not just by 2 degrees, but by 4 degrees C or more by 2100. Economic and political momentum is driving the world to the brink. We have just a few years at most to begin the process of shifting to a low-carbon energy.

When the 15 research teams began their study, they noted that today's global carbon dioxide emissions of 35bn tonnes per year will have to fall to some 10-15bn tonnes a year by mid-century, and then to net-zero emissions sometime in the second half of this century.

This deep cut should occur in a growing world economy that is able to meet the aspirations of the world's low-income and middle-income countries to catch up over time with today's high-income countries.

But how can such low-emission levels be met at the same time as the world economy is growing? The research teams identified three main pillars for deep decarbonisation. First, a shift to low-carbon electricity produced by (country-specific) mixes of wind, solar, hydro, nuclear and fossil fuels combined with

carbon capture and sequestration (CCS). Second, the electrification of personal vehicles, buildings and some industrial processes, powered by the low-carbon electricity supply. Third, massive energy efficiency, for example through improved building designs that dramatically reduce the need for external energy to fuel heating, cooling and ventilation. Fourth, outside of the energy system, a shift from net global deforestation and land degradation to net reforestation and land rehabilitation, making the terrestrial biosphere a net carbon sink rather than source.

Each research team has chosen a nationally distinctive path depending on the country's development stage and aspirations, energy endowments, industrial structure and public acceptance. Some countries could opt for nuclear power; others would shun it. Some pathways could deploy CCS while others would reject it.

Developing the 15 pathways has not been easy. One of the main problems is that some of the key technologies that will be needed to sustain a low-carbon economy are not ready for mainstream use. They are predicated on the assumption that enough of these low-carbon technologies can achieve large-scale commercialisation in the next 10 to 20 years. Indeed, the teams have not yet quite reached the emissions benchmark of 15bn tonnes in 2050, but can likely do so by incorporating further low-carbon technologies into their scenarios.

Key technologies in need of a large-scale, global, targeted, coordinated boost of investment include storage of intermittent wind and solar power; CCS; electrification of low-carbon vehicles; low-carbon heating, cooling and ventilation of residential and commercial buildings; fourth-generation nuclear energy; advanced biofuels for aviation and freight; and the electrification of process heating in various industrial sectors.

Beyond the headlines that 2-degree C is still obtainable through deep decarbonisation, there are important lessons for the international climate negotiations. The focus of the negotiations is on emission reduction pledges to 2025 or 2030. Yet if countries do not work with a longer time horizon they are likely to adopt strategies that fall far short of what is needed to stay below the 2-degree C limit.

We therefore need an agreement in which binding pledges to 2025 or 2030 are accompanied by bold national deep decarbonisation pathways to 2050. Countries would all agree to produce these pathways for national and global coordination and scrutiny, but not be bound by the details within them given the technological uncertainties involved. These national pathways to 2050 would be predicated on a shared commitment to the 2-degree C limit and to the global cooperation needed to achieve it, including technology cooperation, financial support and policy coordination. Governments and businesses would agree, up front and with clear funding, on a roadmap to turn today's pre-commercial low-carbon technologies into low-cost, large-scale solutions for the future.

Today's report offers a first glimpse of such a new approach. During the first half of 2015, the Deep Decarbonization Pathways Project will publish a second phase of its work, to measure the costs and benefits of the transition to a low-carbon economy, and to explore how the costs can be shared equitably among countries at vastly different stages of development. Yet we now have a clearer trajectory both to negotiating success in 2015 and safer planet in the 21st century.

The writer is director of the Earth Institute and of the UN Sustainable Development Network that oversees the Deep Decarbonization Pathways

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