

Guest Contribution

A world in transformation: World Energy Outlook 2017

Four large-scale shifts in the global energy system set the scene for the International Energy Agency's 2017 World Energy Outlook: the rapid deployment and falling costs of clean energy technologies, the growing electrification of energy, the shift to a more services-oriented economy and a cleaner energy mix in China, and the resilience of shale gas and tight oil in the United States.¹

These shifts come at a time when traditional distinctions between energy producers and consumers are being blurred and a new group of major developing countries, led by India, moves towards centre stage. Together, these changes are opening up new opportunities for affordable, sustainable access to modern energy, reshaping our response to pressing environmental challenges and demanding a reappraisal of our approach to energy security.

¹ The IEA flagship publication World Energy Outlook (WEO), published in November of each year and widely regarded as the gold standard of energy analysis, provides strategic insight into what today's policy and investment decisions mean for long-term trends.



Fatih Birol

Dr Fatih Birol has served as Executive Director of the IEA since September 2015. Under his leadership, the IEA has undertaken its first comprehensive modernisation programme since the creation of the Agency in 1974. Prior to his nomination as Executive Director, Dr Birol spent 20 years as a staff member at the Agency, serving most recently as Chief Economist. He has been named by Forbes Magazine as one of the most influential people on the world's energy scene and was recognised by the Financial Times as energy personality of the year in 2017.

He is the founder and chair of the IEA Energy Business Council, one of the most active industry advisory groups in global energy. He also chairs the World Economic Forum's (Davos) Energy Advisory Board and serves on the UN Secretary-General's Advisory Board on 'Sustainable Energy for All'.

Clean energy on the rise

In our central scenario, the New Policies Scenario, global energy needs rise more slowly than in the past but still expand by 30% between today and 2040. The way that the world meets its growing energy needs is starting to change: the lead is taken by natural gas and the rapid rise of renewables. Improvements in efficiency also play a huge role, without which the projected rise in final energy use would more than double.

Renewables capture two-thirds of global investment in power plants as they become, for many countries, the cheapest source of new generation. Rapid deployment of solar photovoltaics (PV), led by China and India, helps solar become the largest source of low-carbon capacity by 2040, by which time the share of all renewables in total power generation will have reached 40%.

Policies continue to support renewable electricity worldwide, increasingly through competitive auctions rather than feed-in tariffs. Millions of households, communities and businesses start to invest directly in distributed solar PV. The direct use of renewables to provide heat and mobility worldwide also doubles, albeit from a low base.

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Increasing electrification

Electricity is the rising force among worldwide end-uses of energy, making up 40% of the rise in final consumption by 2040. Industrial electric motor systems account for one-third of the increase in power demand while rising incomes mean that many millions of households add electrical appliances and install cooling systems.

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The world also gains, on average, 45 million new electricity consumers each year thanks to expanding access to electricity but this is still not enough to achieve universal access by 2030. Electricity makes inroads in supplying heat and mobility, allowing their share of final consumption to rise to nearly a quarter. Industry initiatives and policy support push our projection for the global electric car fleet up to 280 million by 2040, from 2 million today.

The challenge for policymakers is to ensure sufficient investment in networks and in a mix of generation technologies that best meet the needs of power systems. Flexibility and interconnection become vital as the contribution of wind and solar PV grows. The proliferation of digital technologies improves efficiency and facilitates the flexible operation of power systems, but also creates potential new vulnerabilities that need to be addressed.

A cleaner economy in China

China is entering a new phase in its development, with the emphasis in energy policy now firmly on electricity, natural gas and cleaner, high-efficiency and digital technologies. Demand growth is slowing rapidly, to less than 2% per year since 2012, and to an average of 1% per year by 2040. Energy efficiency regulation explains a large part of this slowdown: without it, end-use consumption in 2040 would be 40% higher.

While China retains a towering presence in coal markets, the scale of its clean energy deployment, technology exports and outward investment makes it a key determinant of momentum behind the low-carbon transition: one-third of the world's new wind power and solar PV is installed in China. It also

accounts for more than 40% of global investment in electric vehicles, a quarter of the projected rise in global gas demand and, in our scenario, overtakes the United States as the largest oil consumer around 2030.

Stringent fuel-efficiency measures for road transport, however, and a shift towards greater electrification by 2040, mean that China is supplanted by India as the main driving force behind global oil use. It remains a major player in global coal markets, but coal use is set to decline by almost 15% over the period to 2040.

Global gas and shale oil market: a key role for the United States

In the United States, a remarkable ability to unlock new resources in a cost-effective way pushes combined oil and gas output to a level 50% higher than any other country has ever managed: already a net exporter of gas, it becomes a net exporter of oil in the late 2020s. Expansion on this scale has wide-ranging impacts within North America, fuelling major investments in petrochemicals and other energy-intensive industries. It also prompts a realignment of international trade flows and challenges incumbent suppliers and business models.

By the mid-2020s, the United States becomes the world's largest liquefied natural gas exporter and a few years later a net exporter of oil. It remains a major importer of heavier crudes that suit the configuration of its refineries, but a larger exporter of light crude and refined products. This reversal is by no means only a supply-side story; without continued improvements in fuel-economy standards, the United States would remain a net oil importer. In our projections, North America emerges as the largest source of additional crude oil to the international market.