

How tech and policy could drive change and bring us closer to a 2-degree future



A Verisk Business

## What if decarbonisation accelerates?

The global energy transition is underway. The question is, how and when? How can the world move towards deeper-decarbonisation, one in which existing and viable technology trends accelerate, help steer policy, and become bound together to shape far faster cuts to emissions than what we see today under current pledges? Find out in Wood Mackenzie's 4th annual carbon-constrained scenario, which provides an alternative view to our base case for the global energy transition.

# Decarbonisation: two possible scenarios



## Oil Demand

### Our base case

We expect oil demand to peak in 2036

### Accelerated decarbonisation

Demand for oil peaks in 2031



## Renewables

### Our base case

By 2035 20% of global power needs will be met by wind or solar

### Accelerated decarbonisation

By 2040 wind and solar will represent about 40% of total power supply



## ICE Cars

### Our base case

Global gasoline and diesel car stock peaks in the early 2030s

### Accelerated decarbonisation

Global gasoline and diesel car stock peaks in the late 2020s –  
by 2040 100% of new vehicles sold in the US and Europe will be electric



## Electric Vehicles

### Our base case

Electric cars displace 5.5 million barrels per day of oil

### Accelerated decarbonisation

Electric cars displace 11 million barrels per day of oil



## Autonomous Vehicles

### Our base case

22 million autonomous vehicles on the road by 2040

### Accelerated decarbonisation

64 million autonomous vehicles on the road by 2040

The accelerated decarbonisation scenario delivers a far lower emissions outlook than our base case, towards a 2-degree future, but not reaching it. It echoes the recent IPCC report in October that pathways towards even lower emissions (1.5 degrees) are out of reach unless we make immediate and drastic changes to our way of life.

An outlook such as the IEA's Sustainable Development Scenario (IEA SDS) starts with an emissions budget and works backwards to illustrate a consistent energy future. But the carbon-constrained scenario considers decarbonisation trends we already see in the marketplace – the rise of renewables, growth in electric vehicles, electrification of end-use demand, increasing efficiency, etc. It describes a future in which these become the overwhelming drivers of energy system evolution, with policy following technology.

A lower-carbon future is the result; a world in which coal demand has already peaked and will head into inexorable decline. An outlook for oil which sees growth until 2031, but declines thereafter, as the electrification of the global vehicle fleet gathers pace. A future for gas which is positive through 2040, though not without signs that renewables could eventually curtail the need for the lowest-carbon of fossil fuels.

The Paris Agreement in 2015 was something of a turning point for international climate policy. The intervening years have seen limited progress made, but decarbonisation proceeds apace, regardless. Even in the United States, where support for decarbonisation is currently absent at the federal level, we expect emissions to decline through the long term.

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The carbon-constrained scenario thus illustrates a world where technology joins – and potentially outstrips – policy as a key force behind these trends. It speculates on the next stage of advancement towards tackling climate change. It is largely aspirational, but achievable with technological disruption and significant policy mediation. ”

**David Brown**  
Senior Product Manager for Cross Commodity Research

A lower-carbon future is the result; **a world in which coal demand has already peaked** and will head into inexorable decline.





# Macro energy and carbon overview

Fossil fuel use will not disappear, but the landscape of demand will be far more challenging for suppliers. Clean air, rather than lower carbon, is the goal in emerging markets – putting coal demand into structural decline. Oil demand will grow to 2031, but after this the impact of EVs becomes unmistakable: by 2040 global consumption has fallen below 2013 levels. Gas demand will not peak before 2040, and helps displace coal in the heating sector in China, but growth is relatively subdued at 1% per annum.

Peak fossil demand accelerates under the carbon-constrained scenario. Peak fossil demand arrived in 2012, but our scenario envisages fossil fuels having a 77% share of global energy demand – versus 79% in our base case – as major markets such as China and the EU reach similar levels of fossil fuel shares.

The relatively benign emission targets implied by the Nationally Determined Contributions (NDCs) of the 2015 Paris Agreement will be met at a global, OECD and Non-OECD level. Emerging markets will similarly meet their targets with room to spare, while developed regions will find the goals challenging.

But the carbon-constrained scenario cannot meet the ultimate goal of the Paris Agreement – to keep global warming to no more than 2 degrees, and preferably 1.5 degrees above pre-industrial levels. Much more radical action would need to occur to achieve such an outcome. We plan to explore what action is required in the coming months.

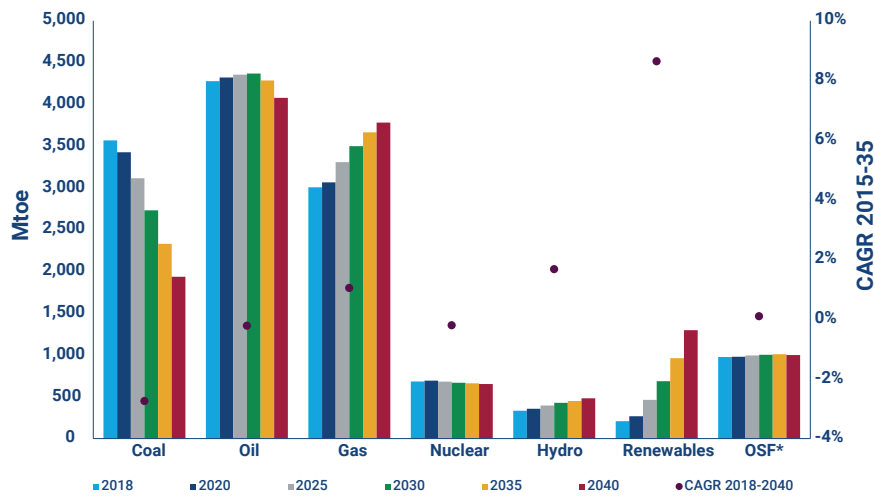
## Who is setting the pace of change?

The balance between technological developments and policy management will influence how quickly the energy transition plays out at market and regional level. Here are four factors that influence the pace of change.

### 1. Maturing economies

As economies develop, the energy intensity of economic growth tends to fall, as services replace industry, vehicle fleets become more efficient, and energy-consuming capital stock is renewed. In the carbon-constrained scenario, accelerating energy efficiency is evident across all regions. Major economies will reach an 'intensity floor' by 2040. As a result, average global demand growth (for all fuels) is limited to 0.1% from 2018-40, vs. 1.9% from 2000-18.

## World primary energy demand by fuel, 2018 - 40



Source: Wood Mackenzie

**Wind and solar** represent about **7%** of total power supply in **2018**. By **2040** that share will approach **40%**.

## 2. Disruption in the transport sector

Through coordinating with our global oil and transport teams, we developed a coordinated and integrated outlook for electric vehicles (EVs). By 2040, the US and EU will see EVs account for 100% of new vehicle sales, with other key markets not far behind. Vehicle electrification will drive power demand all over the world; transport oil demand (including biofuels) will peak in 2031 before falling into decline.

## 3. Increasing demand for electricity

Electrification of end-use demand is evident beyond the transport sector, and in all regions of the world. In emerging markets, incremental demand growth is preferentially met by electricity; in developed markets electricity will cannibalise demand from other fuels. Indexed to 2018, fossil fuel demand barely grows, while power demand ramps up at an average rate of almost 2% per year.

## 4. Growth of renewables

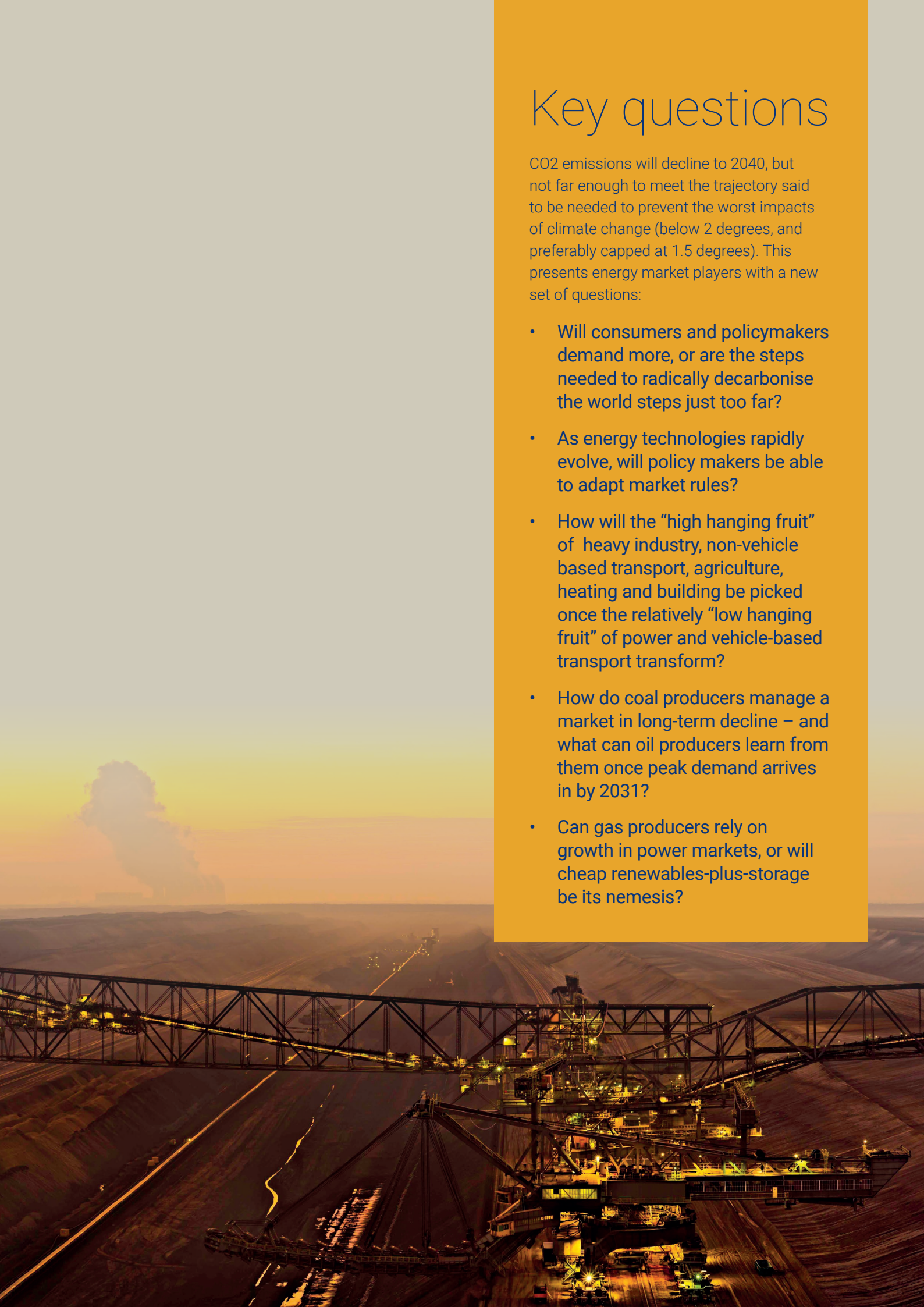
Global growth in power demand will be entirely met by non-hydro renewables. Wind and solar represent about 7% of total power supply in 2018. By 2040 that share will approach 40% - with some markets in excess of 50%. Due in part to renewables' lower load factors vs. thermal power, capacity growth will far exceed any other form of electricity generation. Energy storage technologies will come to the fore, with 780GW installed globally by 2040.



# Key questions

CO2 emissions will decline to 2040, but not far enough to meet the trajectory said to be needed to prevent the worst impacts of climate change (below 2 degrees, and preferably capped at 1.5 degrees). This presents energy market players with a new set of questions:

- Will consumers and policymakers demand more, or are the steps needed to radically decarbonise the world steps just too far?
- As energy technologies rapidly evolve, will policy makers be able to adapt market rules?
- How will the “high hanging fruit” of heavy industry, non-vehicle based transport, agriculture, heating and building be picked once the relatively “low hanging fruit” of power and vehicle-based transport transform?
- How do coal producers manage a market in long-term decline – and what can oil producers learn from them once peak demand arrives in by 2031?
- Can gas producers rely on growth in power markets, or will cheap renewables-plus-storage be its nemesis?



# Towards a 2- or 1.5-degree world

The carbon-constrained scenario describes a challenging future, but it's one based on risks we consider clear and present today, and technologies we can foresee being provable and commercial.

The energy transition will also be complex and driven by many knowns and unknowns. Changing an established energy system is not easy and a unique challenge. What could spring from technology or policy that could accelerate the pathway? Some of these include:

- **Breakthrough in cost, and change in willingness to deploy CCS, at the rate required**
- **Significant policy and cost structure change in nuclear to reverse almost decades-long policy of it being sidelined in many markets**
- **An alignment of global carbon pricing policy directives, resulting in high prices that incentivise inter-fuel competition and promote investments in low-carbon technologies**
- **An accelerated battery cost reduction pathway with alternative storage and battery breakthroughs occurring early enough to not disrupt the metals-supply chain**
- **Renewables plus storage delivering cost and deployment breakthroughs early, reducing the need for peaking and baseload gas plants in Asian economies**
- **Significant breakthroughs in decarbonized heating, with widely available and deployable heat-pumps**
- **A full-blown hydrogen economy with electrolyzed hydrogen produced cheaply and abundantly**

**We'll continue to issue insights on the themes above as we evolve our offerings in the Energy Transition space**





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