

# A bridge, not a destination

Abundant gas reserves are here to stay. But can the world afford to burn them all?

**T**HERE are no longer any doubts that the world has vast untapped reserves of gas. But does it really make sense to use it all?

The answer depends on whom you ask. Soaring natural gas production has been a transformative force in the US, helping to fuel an economic revival. Low-cost, cleaner burning gas, combined with wider energy efficiency initiatives, has also helped cut out more carbon-intense coal-fired power, thereby lowering the US' carbon dioxide (CO<sub>2</sub>) emissions. That said, coal from the US is instead exported and burnt elsewhere, negating any net potential global emissions reduction. But as US gas prices climb again, so do emissions.

Gas can be used as a bridge to a lower-carbon world. Some representatives of the oil and gas industry, however, see it as more than that: a destination fuel. Such a view doesn't see any need for the world to move past gas on its course to a lower-carbon economy. And if that doesn't happen, the world's carbon budget – which places a limit on the amount of CO<sub>2</sub> that can be safely released into the atmosphere – will be blown.

The proponents of natural gas – which emits up to 60% less CO<sub>2</sub> than coal when used for power generation – argue the fuel is environmentally friendly. The message echoes throughout industry gatherings across the globe, where capital-intensive plans, conceived in the expectation that fossil fuels will continue to dominate the energy system, are unveiled.

That's a problem, says Jonathon Porritt, founding director of independent non-profit sustainability consultancy Forum for the Future. Gas only works as a transition fuel to a low-carbon economy if it really does kill off coal – and if policy makers ensure the world moves quickly to peak gas burn, thereafter planning for a rapidly descending trajectory, he argues. If this does not happen, the numbers needed to maintain the carbon budget do not add up, Porritt told *Petroleum Economist*.

The Intergovernmental Panel on Climate Change (IPCC), a United Nations panel of climate experts, concludes that the world has a maximum global CO<sub>2</sub> emissions budget of 1,133 gigatonnes (Gt) from 2012



onwards. This budget gives us a 50% chance of limiting global warming by no more than two degrees Celsius this century. Scientists believe that economic and ecological damage will become unmanageable if long-term average global temperatures rise beyond the two degrees threshold from pre-industrial levels.

### Rising emissions

Based on the IPCC's estimate and the International Energy Agency's (IEA) baseline new policies scenario (NPS), 74% of the available CO<sub>2</sub> emissions budget will be consumed by the energy sector alone by 2035. Fossil fuels are projected to make up three-quarters of primary energy demand based on policies being pursued today. Under this analysis, energy-related CO<sub>2</sub> emissions rise by 20% to 37.2 Gt, putting the world on track for a long-term average temperature rise nearer four degrees.

Coal, which is forecast to make up 25% of the energy mix in 2035, remains the largest source of energy-related CO<sub>2</sub> emissions throughout the period. But, in 2025, coal emissions should stabilise at around 15.7 Gt. More than 45% of the expansion in global emissions from 2012 to 2035 is expected to come from gas, despite its lower level of emissions per unit of energy, the IEA says. By 2035, when gas makes up 24% of primary energy demand, its combustion releases over 9.1 Gt of

emissions, while oil, which makes up 27% of the mix, releases 12.5 Gt.

However, unless environmental regulations are introduced or gas prices fall, it's not a forgone conclusion that gas will make major market penetration, especially in energy-hungry Asia. There, cheaper coal-fired power is making significant inroads, Fatih Birol, the IEA's chief economist, told *Petroleum Economist*.

Even in a world where gas makes up more than 25% of the energy mix – displacing more carbon-intense coal and to a lesser extent oil – as envisioned in the IEA's golden age of gas scenario, total energy-related CO<sub>2</sub> emissions in 2035, at around 35 Gt, are only slightly lower than those in the agency's NPS, thereby still charting a course for a global warming above 3.5°C.

It seems the only large-scale use of fossil fuels that could possibly be compatible with a stable climate involves carbon capture and storage (CCS), which buries emissions underground. Yet CCS development has been embryonic, at best.

Predicting what will happen in 20, 30 or even 40 years time is particularly tricky – long-range forecasting has always been something of an inexact business.

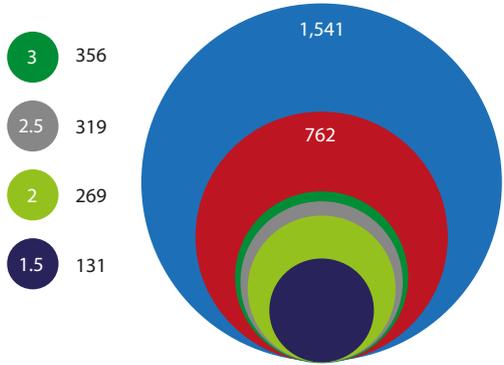
Nevertheless, the predominant, self-soothing view reverberating across the industry is a business-as-usual outlook, that charts fossil fuels' continued domination, with

The burning question: Has gas had its day?

**Figure 1: Comparison of listed reserves**

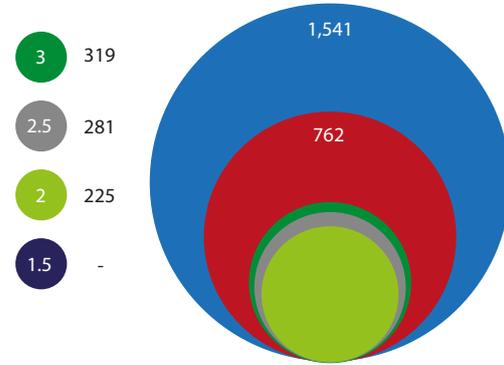
Comparison of listed reserves to 50% probability pro-rata carbon budget

Peak warming (°C)  
50% probability



Comparison of listed reserves to 80% probability pro-rata carbon budget

Peak warming (°C)  
80% probability



● Potential listed reserves ● Current listed reserves

Source: Carbon Tracker

gas billed as the environmentally friendly solution.

But given the world's shrinking ability to absorb carbon – the budget gets smaller every year – such sentiments seem a touch naïve. Despite some of its benefits, gas on its own cannot provide the answer to climate change. “We still need other technologies, such as CCS, renewables, nuclear, efficiency and others,” says Birol.

Even in the IEA's 450 scenario, which offers an energy pathway limiting global warming within two degrees, average emissions from the power sector would need to come down to 120g CO<sub>2</sub> per kilowatt hour by the 2030s, almost one-third the level that could be delivered by the most efficient gas-fired plant in the absence of CCS technology.

In the more optimistic 450 scenario, rising primary energy demand is increasingly met by low or zero-carbon sources. Looking across the fossil fuels, gas demand edges up 0.7% per year on average, oil decreases by 0.5% per year and coal declines by 1.8% per year to less than half 2010 levels. Policies promoting energy efficiency, recently dubbed a new fuel by the IEA, become central in mitigating emissions. According to this outlook, total primary energy demand compared with the NPS is 17% less, at 14,908 million tonnes of oil equivalent in 2035.

So rather than focusing attention

on promoting gas as a long-term environmental solution and locking the energy system into a new pattern of fossil fuel use, it's probably prudent to “discuss how the energy sector could supply energy within the carbon budget”, James Leaton, research director at London-based think-tank Carbon Tracker, told *Petroleum Economist*.

Gas would still be a winner as it offers a more carbon-efficient way of generating centralised power than coal. It is also seen as a back-up fuel to maintain some baseload power when conditions are not good for renewables. If unconventional gas technologies do not solve the associated fugitive emissions problem it may not provide the climate change benefit needed, adds Leaton.

Some studies show that hydraulic fracturing – a technique used to extract unconventional gas reserves – releases more methane into the atmosphere than conventional production methods, but more scientific evaluation needs to be done.

However, a new analysis published by *Science* concluded that more methane – a potent greenhouse gas – is leaking from gas wells and pipelines in North America than the federal government has estimated. Researchers – from Stanford, MIT and elsewhere – found that actual methane emissions are 25-75% higher than estimates from the

Environmental Protection Agency. It's a big deal, because “methane as a molecule is a very potent greenhouse gas – about 30 times more potent than carbon dioxide on a 100-year basis, and much more so over a shorter-term basis,” Francis O'Sullivan of the MIT Energy Initiative, one of the study's authors told The Energy Collective.

Politics will play a part in this. More extreme weather around the world in recent years – whether linked, as some scientists say, to man-made climate change, or just a good example of what climate change will do, may force governments to start restricting CO<sub>2</sub> emissions. It seems not a question of if, but when – leaving gas to play a supporting role to zero or low-carbon energy sources rather than the main act in a future energy system.

Otherwise, unless the science is very much mistaken, we will have cooked our planet long before we can burn through the earth's total technically recoverable gas resources – which, at around 810 trillion cubic metres, are four times larger than proven reserves and could sustain today's production for well over 200 years.

This explains why shareholders are working with Carbon Tracker to question blindly pouring money into replacing reserves regardless of soaring costs or potential demand erosion, says Leaton. **DE ●**