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Paris Accord – 2 years on: Consensus Forecasts of the Impact on Long Term Oil and Gas Demand

The Paris Accord, reached at COP21 in 2015, groups all the countries in the world in the aim of avoiding dangerous climate change, mobilising climate finance, and improving resilience. Despite the US's announced withdrawal, targets are likely to be toughened at each five-year interval. Progress since then has been real but limited, with emissions continuing to rise and most countries' pledges insufficient. To reach the aspiration of limiting temperature increases to no more than 1.5°C, sharp drops in coal, oil and gas combustion are required by 2030, although different scenarios yield widely-varying trajectories. Major oil and gas exporters need a multi-pronged strategy to protect their economies by cutting emissions at home; building diplomatic coalitions; and developing and deploying low-carbon fossil fuel technologies.

Plenary session at the COP21 for the adoption of the Paris Agreement (Arnaud Bouissou)

Executive Summary

- The Paris Agreement of 2015 was signed by all countries and now ratified by most of them, aiming to keep global warming to no more than 2°C, and ideally less than 1.5°C, compared to about 1°C experienced already.
- The contributions to reducing emissions are determined by each country individually: many are vague, they are non-binding and overall too weak to reach the 2°C goal, even if all achieved.
- It is likely that actions will be progressively tightened over time, even if some countries drop out of the accord or fail to deliver.
- A wide range of methods and pathways can achieve the Paris goals.

Implications for leading oil and gas producers

- Combustion of coal, oil and gas would have to fall substantially by 2050, and likely by 2030, to meet the Paris targets. Although this is unlikely to be achieved by 2030, nevertheless international business and civil society pressure is mounting.
- Large-scale development of carbon capture, use and storage (CCUS) is required in most scenarios, and especially those that feature continuing significant fossil fuel use.
- Major petroleum exporters need an intelligent strategy to protect their interests, combining diplomacy, domestic emissions cuts, international collaboration, and funding the research, development and deployment of key technologies, particularly in carbon capture.

The Paris Agreement commits signatories to reduce emissions, but gives them discretion over how and where to do so

The Paris Agreement of 2015 was signed by 195 countries (including the EU as a single party) and 181 have subsequently ratified it; those that have not ratified it yet include Russia, Turkey, Iran, Iraq, Oman, Libya and a few others. The US announced in June 2017 that it would withdraw.

Under the accord, the parties aimed to hold the increase in global temperatures to no more than 2 degrees Celsius above pre-industrial levels, and to attempt to limit the increase to no more than 1.5°C. (The increase to date is already about 1°C). In addition, they promised to direct investments towards low greenhouse gas and climate-resilient investments, with a target of $100 billion annually; and to increase the resilience of communities and businesses to climate change.

Each party promised 'nationally determined contributions' (NDCs) that it would make towards these goals, which included efforts such as increasing the use of renewables, reforestation and energy efficiency. These NDCs were not consistent, are non-binding and there is no enforcement mechanism. They will be revisited in 2020, and in December 2018, at Katowice in Poland, the parties will meet to discuss how to measure and verify progress.

Worldwide emissions in 2015 were about 52 billion tonnes of carbon dioxide equivalent (gigatonnes, Gt), including the CO_2-equivalent of other greenhouse gases such as methane. Current policies would lead this to rise to almost 60 Gt annually by 2030; implementation of all the NDCs would bring this down to about 53 Gt, still leading to about 2.6-3.1°C of warming by 2100[1], well above the Paris goals.

Therefore, it is likely that they will be toughened over time, but also probable that many countries will fall well short of their promised goals. Keeping temperature rise to 2°C is consistent with about 41 Gt of emissions in 2030; holding it to 1.5°C would allow 38 Gt[2].

Of course, the level and trajectory of emissions can vary substantially; temperature rise is determined by the cumulative addition of CO_2 to the atmosphere, and not by emissions in any one year. The level of temperature rise associated with a given amount of emissions is quite uncertain: the 2030 level for 2°C could be between 31-43 Gt. And there is no 'safe' level of emissions nor temperature rise; 2°C would be damaging but still preferable to 3.1°C, which is in turn preferable to 4°C or more.

Summary NDCs for selected countries

USA
Reduce emissions 26-28% below 2005 levels by 2025, following the Obama administration's Clean Power Plan and Climate Action Plan.
State-level policies on renewable/low-carbon energy and zero-emissions vehicles remain in place.

Russia
Reduce emissions 25-30% below 1990 by 2030 (an actual increase on current levels), including carbon absorption by forests.
Has not ratified.

Norway
Reduce emissions 40% below 1990 by 2030, mostly by electrifying transport, improving building energy efficiency and paying for international offsets.

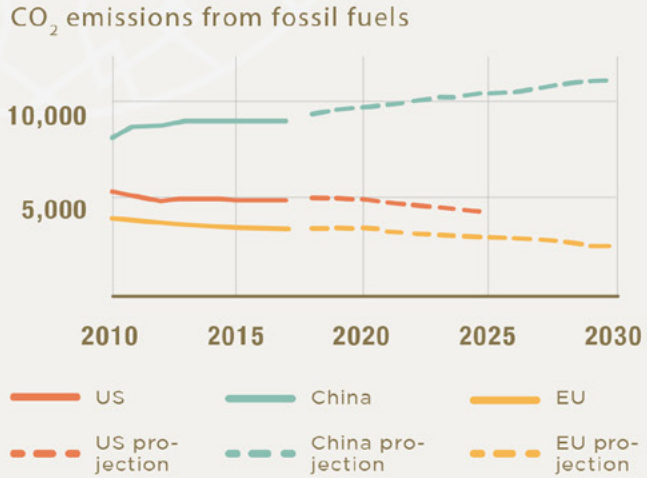
Saudi Arabia
Save 130 Mt CO_2 equivalent compared to 'business as usual' (not specified) by 2030 through renewable energy, efficiency, increasing gas use, methane recovery, CCS.

Morocco
Reduce emissions 17% below business-as-usual (BAU) by 2030, and 42% below BAU given international finance. Measures include boosting renewable electricity to 42% in 2020.

Progress to date is limited

If we consider the NDCs for the three largest emitters (China, the US and EU, FIGURE 1), we see that they are relatively unambitious. The estimated trends in emissions to hit their 2020/2030 targets are largely continuations of the 2010-17 trend. In fact, China's 2013-17 emissions were quite flat, but its NDC permits a resumed rise.

FIGURE 01: **EMISSIONS TRAJECTORIES UNDER CHINA, US AND EU NDCS[3]**



Nevertheless, after a fall in 2015, global emissions have risen again subsequently. The target of reaching $100 billion of climate finance annually by 2020 is reportedly being blocked by a group of wealthy countries, led by the US[4].

However, more progress has been made on strengthening future targets. Various countries have pledged to: reach zero net emissions by 2045-2050; ban internal combustion engine vehicles by 2030-40; build no new coal power stations without CCS; set ambitious targets for renewables; ban new oil exploration; reforest large areas; and enshrine the Paris targets in national laws. The International Maritime Organisation has agreed to cut shipping emissions by 50% by 2050[5].

The Paris goals imply sharp drops in combustion of oil and gas

The Intergovernmental Panel on Climate Change (IPCC)'s recent report assessing the impacts of limiting warming to 1.5°C presented four differing scenarios for achieving this. Scenario 1 features lower energy demand and lifestyle changes, with no carbon capture and storage (CCS); Scenario 2 has a balanced mix of sustainability and low-carbon innovation; Scenario 3 presents mostly improvements in energy production and use, with strong use of CCS; and Scenario 4 is a high-energy 'over-shooting' scenario in which atmospheric carbon dioxide and temperatures go above target levels before being brought down by massive use of CCS.

This drop in combustion is somewhat misleading, as it does not refer to all uses of oil and gas – it excludes non-combustion uses (e.g. feedstock for petrochemicals), as well as combustion where the resulting CO_2 is captured and stored.

For **oil**, most scenarios require sharp and continuing drops in combustion, with oil combustion falling to no more than 50 million barrels per day by 2050, about the level of 1972.

For **gas**, a rise in medium-term combustion is possible, if it is used to displace coal. The four scenarios involve drops in coal combustion of 59-78% as soon as 2030, which would open up substantial market share for gas (along with renewables and possibly nuclear). All four scenarios show a fall in gas use in the longer term, mostly to low levels. However in scenario 3, world gas consumption in 2050 could be about 5% above 2017 levels.

FIGURE 02: **OIL DEMAND IN 1.5°C SCENARIOS[6]**

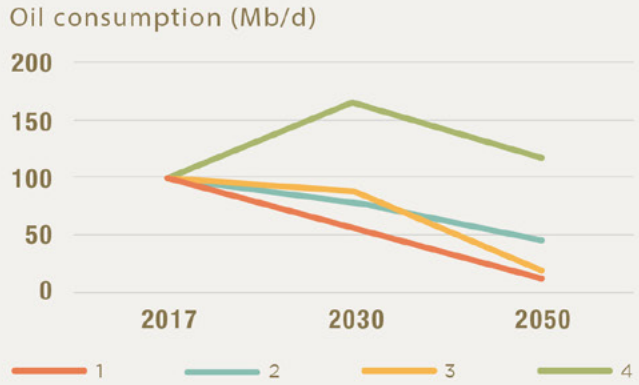
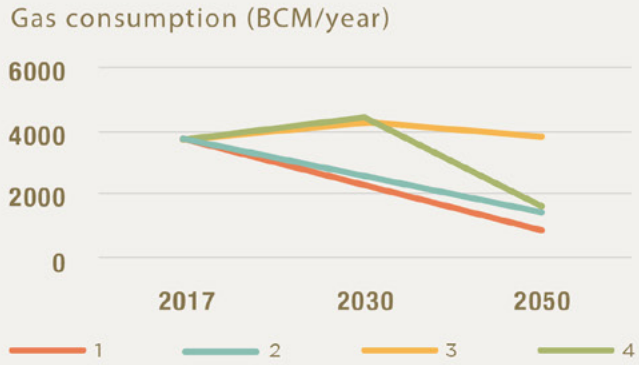


FIGURE 03: **GAS DEMAND IN 1.5°C SCENARIOS[7]**



As noted, total oil and gas consumption can be higher if CO_2 is not released to the atmosphere. It is unlikely to be practical to fit carbon capture systems to mobile oil-users – ground vehicles and aeroplanes – though it might be possible for ships. More likely, oil would be used to produce a zero-carbon fuel, such as hydrogen, with the waste CO_2 being stored. Or, mobile emissions could be 'mopped up' by direct air capture as described below.

Most countries are not meeting their Paris commitments

Climate Action Tracker, a consortium of research organisations, has assessed the progress of selected countries towards the Paris goals (FIGURE 4). Only two countries are consistent with the 1.5°C goal, and five with the 2°C goal, including India. Most leading emitters fall into 'insufficient' (the EU, Australia, Brazil, UAE), 'highly insufficient' (China, Canada, Indonesia, Japan), or 'critically insufficient' (US, Russia, Turkey, Saudi Arabia). Climate Action Tracker did not assess some other important oil and gas producers, such as Iran, Iraq and Qatar.

FIGURE 04: **CURRENT STATUS OF SELECTED PARIS SIGNATORIES**[8]

Some countries, notably the US but also Brazil and the Philippines, may weaken or even abandon their efforts in the near-term due to political changes.

Nevertheless, the impact of the Paris goals and the associated progress should not be ignored. The parties are meant to revisit and strengthen their contributions every five years. Improvements in technology, low-carbon costs and policy are likely to spread from the more committed adopters to others. Groups of 'climate leaders' may seek to impose costs, such as carbon border tariffs, on countries seen to be making insufficient efforts.

Large-scale use of carbon capture, use & storage is essential to meet the Paris goals

Of the scenarios outlined above, scenario 1 excludes CCUS, but the three others include large amounts of carbon dioxide captured and stored (or used), ranging from 151-1191 Gt by 2100, or about 2-15 Gt annually on average from 2020-2100. For comparison, current CCUS is about 0.03 Gt, and the future scenarios' level of ambition requires some 2000-15000 large CCUS projects, each on the scale of Abu Dhabi's Emirates Steel capture project. For another comparison, the global liquefied natural gas (LNG) business is currently about 0.4 Gt per year.

Of this capture, 151-1191 Gt is labelled Bio-energy with CCS (BECCS). This refers to using biomass crops (such as wood), which absorb CO_2 during growth, as fuel in a power plant, and capturing the resulting carbon dioxide. There is one currently active large-scale BECCS plant, the Decatur ethanol plant in Illinois, USA, which will capture about 0.9 million tonnes of CO_2 derived from corn per year[9].

The goal of CCUS does not have to be achieved by bio-energy. Given the very large areas of land which would have to be devoted to crops, it is more likely that it would not. Instead, carbon dioxide can be captured directly from the air (direct air capture, DAC) by mechanical-chemical systems, such as pioneered by Swiss-based Climeworks[10], powered by waste heat and renewable energy. Other approaches include using common minerals, such as olivine, found in large quantities in Oman, to react with atmospheric CO_2.

Climeworks' system has a reported capture cost of $600 per tonne of CO_2. Another startup, Carbon Engineering from Canada, has the ambition of reducing costs to $94 per tonne, equivalent to about $5 per MMBtu extra cost to burn natural gas, or $41 per barrel of crude oil[11].

Finally, the IPCC's latest report deliberately did not consider geoengineering – large-scale approaches to cool the Earth directly, for instance by spreading sulphate particles in the stratosphere to reflect some of the sun's light back to space. Given the limited progress made to date, and the increasing visibility of climate impacts, it is likely that pressure will grow to employ some kind of geoengineering later this century. This is probably economically and technically feasible but raises difficult problems of associated risks and side-effects, international coordination and ethics.

Leading oil and gas producers should avoid the temptation of ignoring the Paris targets

Major oil- and gas-producing countries and companies may consider they can easily ignore the Paris targets, given the lack of an enforcement mechanism.

However, required compliance is likely to become stricter over time. Major countries, such as the EU, may impose tougher requirements on their suppliers. Civil society and financial institutions, such as commercial lenders and the World Bank, are increasingly curbing finance to climate-unfriendly projects. The flow of investment and research into low-carbon technologies will make them increasingly competitive, and mandated by governments. Specifically for gas, there is growing pressure to reduce methane leaks.

Leading petroleum resource holders wish, of course, to gain maximum benefit from their oil and gas. A strategy to support this can include:

- **Gain climate credibility** by fully deploying low-carbon options at home. Middle Eastern oil and gas producers, in particular, have abundant opportunities in flared gas capture, subsidy reform, CCUS, energy efficiency and renewables (particularly solar), that can be deployed at low or even negative cost (i.e. cheaper than alternatives). Contributing to emissions reductions domestically leaves more room for continuing use of oil and gas in essential applications.

- **Engage proactively in climate negotiations.** Oil and gas producers need a clear approach, probably collective, for each five-year round of updates on the Paris targets. This could be based on the successful OPEC/non-OPEC cooperation in oil markets. Instead of seeking to obstruct or water-down targets, it should focus on areas where the interests of petroleum producers are favoured (e.g. coal-to-gas switching, CCUS) or at least neutral (reforestation). National oil companies can work with industry coalitions such as the Climate & Clean Air Coalition, and the Oil and Gas Climate Initiative (which already includes Saudi Aramco, Pemex and Petrobras alongside China National Petroleum Corporation, Shell and others[12]).

- Work with other countries on **win-win mitigation measures**. For instance, many developing countries in Africa, Latin America and South-east Asia have great potential for reducing deforestation at relatively low cost, but are short of finance and expertise. Coal-fired power can be converted to gas by developing gas pipelines and LNG import terminals. Non-CO_2 greenhouse agents, such as methane, black carbon and nitrous oxide, can be reduced by improving combustion practices, tightening up gas leaks, and changing land-use and agricultural approaches.

- Encourage research, development and deployment of **CCUS for gas**. Low-cost CCUS on gas-fired power and industry would allow large-scale continuing use of gas, compatible with climate.

- Develop **low-carbon pathways for fossil fuel use**, including conversion to petrochemicals and other materials, electricity and hydrogen.

- Support the testing and deployment of **BECCS and DAC**. Pilot projects can be deployed at relatively small individual cost.

Conclusions: Implications for leading oil and gas producers

Taken literally, the Paris targets imply a sudden, sharp and continuing drop in oil and gas use to 2030 and 2050. The NDCs that support these targets will fall well short of this aim, but will be tightened over time.

The gas industry can gain in the medium term by replacing coal. Beyond 2030, it increasingly needs to deploy near-zero carbon uses of gas.

Oil producers face a more challenging task. They can create 'carbon space' by encouraging emissions cuts in other sectors. They also need to cut the carbon footprint of their own oil production. Otherwise, they need to work on low- and zero-carbon uses for oil, while developing BECCS and DAC to mop up dispersed emissions.

Major petroleum producers cannot bet that the Paris pledges will continue to be weak and not adhered to. This would, in any case, have dangerous implications for climate. Instead, they need balanced, multi-pronged and proactive strategies to mobilise their diplomatic, financial and technological resources.

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