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Non-OPEC oil production to 2040: Is there enough?

Non-OPEC production is one of the key oil market factors, along with demand, in determining prices and the need for OPEC oil. The rapid rise in US output has been vital in balancing the market, but it is questionable how long it can continue. Some mature producers are in decline, while new and growing exporters are emerging. Meanwhile, the deal with OPEC states and key non-OPEC producers, particularly Russia, is a novel factor in the market, if it survives in the longer term. Technology and the exploitation of more difficult, remote and costly resources can sustain non-OPEC output, if prices and environmental goals permit it. Considering the divergent views on future non-OPEC output, and which countries will provide it, can guide views on ideal OPEC policy and whether investment levels are enough to meet demand.

P51 oil platform in Brazil (Agência Brasil / Wikimedia Commons)

Executive Summary

- Non-OPEC output is forecast by the main agencies to increase 2.3-5.1 Mbpd from 2017 by 2040. But most views are that non-OPEC output will peak in 2025-30 and decline thereafter.
- The IEA in particular has raised concerns of underinvestment, but it and the other forecasters all show strong non-OPEC growth in the early 2020s, mostly from the US.
- Production costs, price, OPEC strategy, technology, investment conditions and politics are key factors determining long-term non-OPEC output.
- The US is seen as the dominant contributor to non-OPEC production to around 2025, but declines thereafter. Russia grows, but only slowly.
- Mature producing areas, notably the North Sea and China, are likely to decline steadily.
- Tight oil production outside the US will become increasingly important, with 3.5 Mbpd by 2040 coming mostly from Canada, Russia, Argentina and Mexico. Brazil contributes from ultra-deepwater and Canada from oil sands.

Implications for leading oil and gas producers

- There are arguments that non-OPEC output could be than foreseen by the main agencies, due to new discoveries, and the extensive application of new technologies.
- To maintain or grow market share in a demand-constrained world, OPEC countries will have to keep prices reasonably low to avoid incentivising new output.
- Continuing cooperation of OPEC with Russia and other leading non-OPEC producers will be desirable, to prevent their increasing output .
- Non-OPEC output could be reduced by political problems and resource nationalism in the most promising countries, and by environmental pressures in OECD countries. Developments along these lines, with potential underinvestment, have to be monitored carefully.

Non-OPEC can now be divided into two: the OPEC+ countries and the others

The deal between OPEC and some non-OPEC countries of December 2016, the 'OPEC+' or 'Vienna Group', has divided non-OPEC countries into the adherents (Russia, Oman, Mexico, Kazakhstan, Azerbaijan, Bahrain, Brunei, Malaysia, Sudan and South Sudan) and the others, of whom the most important producers are the US, Canada, Brazil, China, Norway, UK and India.

Two of the original OPEC+ members have now formally joined OPEC: Equatorial Guinea and the Republic of the Congo (Congo-Brazzaville).

The outlook for non-OPEC production may be affected by commitments made by the OPEC+ group. This is particularly likely to affect Russia and Oman. Kazakhstan, in particular, has not shown an inclination to limit its output, though both it and Azerbaijan might come under Russian pressure.

FIGURE 01: **KEY OIL-PRODUCTION TECHNOLOGIES**

Key oil-production technologies

Enhanced Oil Recovery (EOR)
A suite of technologies to improve recovery from a reservoir from the 30-40% typical with secondary recovery to 60% or more. It can cover carbon dioxide (CO_2) or other miscible gas injection; steam injection and in situ combustion, usually for heavy oil; water-alternating gas, surfactants and polymers to improve waterflood efficiency, and; more speculative processes such as the use of microbes. CO_2-EOR is encouraged by environmental policies to reduce emissions, and by the 45Q provision of the US tax code.

Tight oil
The recovery of oil from shales and other low-permeability formations, by horizontal drilling combined with massive hydraulic fracturing. Effectiveness is improved by a range of new techniques including microseismic monitoring, nano scale reservoir characterisation, re-fracs, pad drilling and others.

Oil sands
Innovations applied to Canada's oil sands (extra-heavy crude) resource continue to reduce costs and improve environmental performance. Two recent examples include solvent-assisted gravity drainage; and carbon capture on upgraders.

Deep-water
The deepest offshore well was drilled in 3400 m of water off Uruguay in 2016. Oil development has steadily moved into deeper waters, supported by geological understanding of deepwater reservoirs, subsea production systems and remote operated vehicles.

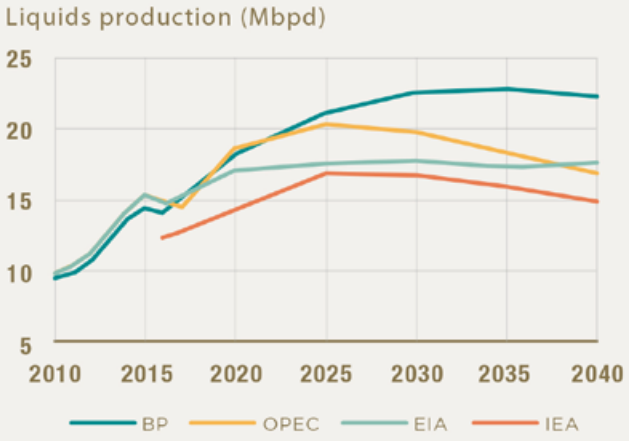
'Oil industry 4.0'
This group of IT-inspired technologies can transform new exploration, tight oil and mature field management. It covers 'big data' and analytics; automation; drones; 3D printing for components, and others.

Of course, in the period to 2040, other countries may join or leave OPEC, and the organisation itself might disband, split, or at least cease to have influence over production levels[1]. Nevertheless, countries such as Saudi Arabia, Iran and Iraq would continue to have large oil resources and the power to influence the market strategically, in contrast to smaller and higher-cost producers.

Most medium-term growth is expected in the US

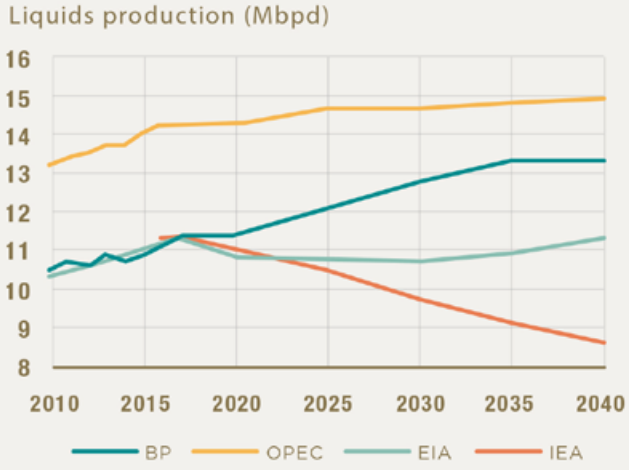
The major forecasting agencies all see strong growth in US output to 2025 (FIGURE 2). After that, BP forecasts a continuing rise to 2035, the EIA essentially flat output, and the IEA and OPEC a fall. Near-term growth is supported by a large resource base and continuing active development of wells and pipelines in the Permian Basin of West Texas in particular. The longer-term picture depends on whether continuing improvements in technology and recovery factors will outpace the exhaustion of the 'sweet spots' in the main shale formations. The 2040 range is from 14.9 to 22.3 Mbpd.

FIGURE 02: **FORECASTS FOR US TOTAL LIQUIDS PRODUCTION**[2]



Forecasts for Russian output are more divergent (FIGURE 3). Note that the OPEC forecast here is for Eurasia, including Kazakhstan, Azerbaijan and other producers.

FIGURE 03: **FORECASTS FOR RUSSIA TOTAL LIQUIDS PRODUCTION**[3]

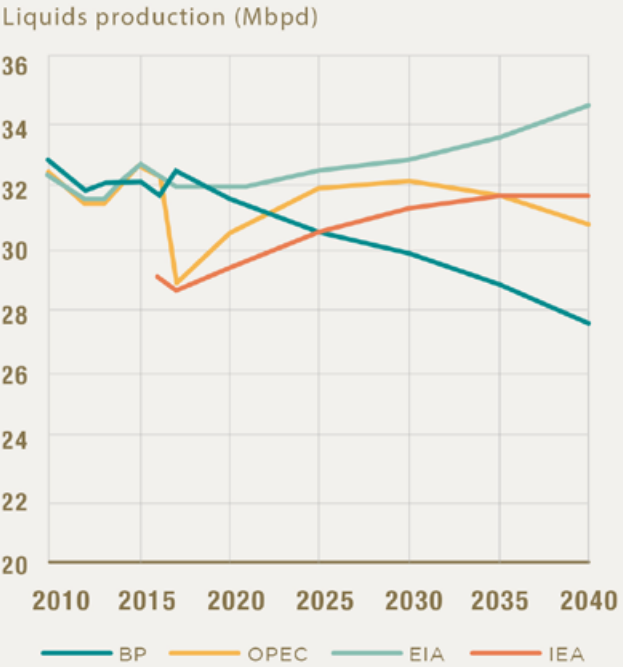


Historically, Russian production has grown steadily, except for the drop in 2016-17 as it complied with OPEC+ limits. The EIA and OPEC see a stagnation in Russian output from now on, the IEA a steady drop, and BP a continuing rise to 2035. The 2040 range is from 8.6 Mbpd to 14.9 Mbpd.

The future of Russian output will depend on improved / enhanced oil recovery operations in the mature area of West Siberia; the development of tight and shale formations such as the Bazhenov and Achimov, and; the opening-up of new production areas in the Arctic and East Siberia. Current US sanctions target advanced technologies required for deepwater and shale fields. The Russian government has been flexible in adjusting the tax burden on companies to allow continuing investment in higher-cost zones.

Finally, the agencies show a fairly narrow range of views for other non-OPEC (FIGURE 4). Note that the OPEC forecast here does not include non-Russia Eurasia. The EIA sees a continuing but moderate rise, BP a steady fall, with the 2040 range from 27.6 to 34.4 Mbpd.

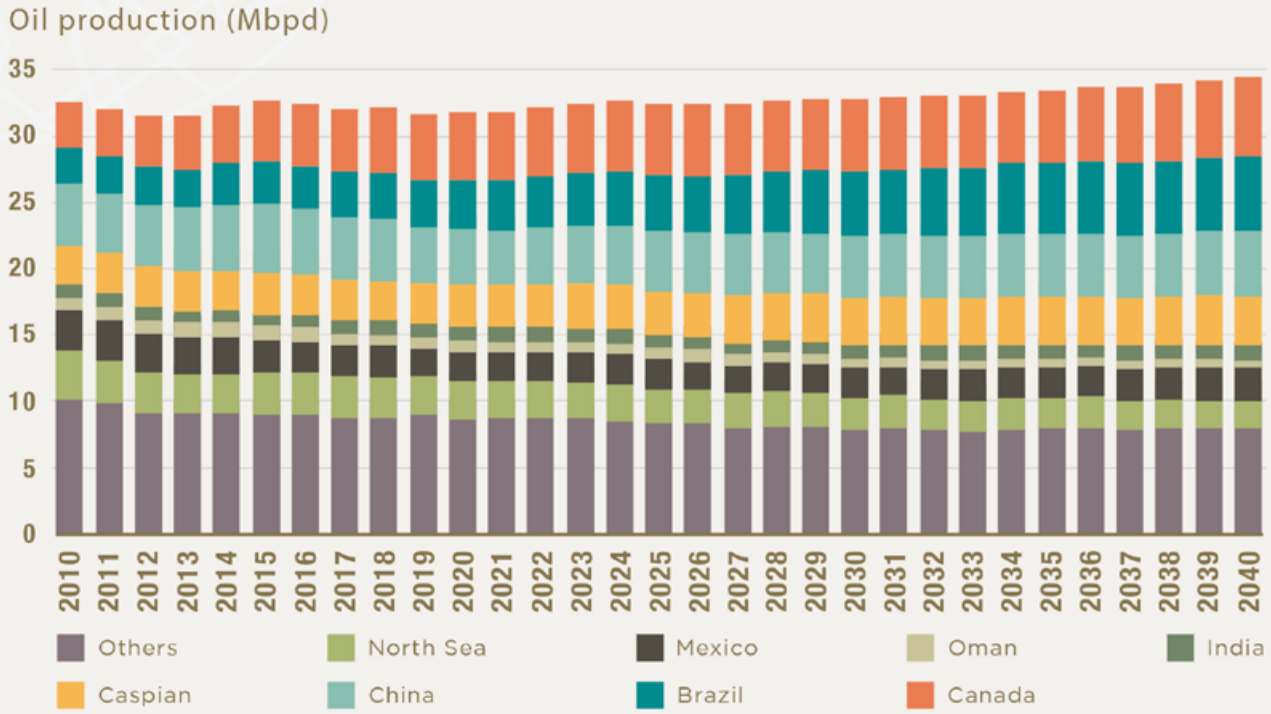
FIGURE 04: **FORECASTS FOR OTHER NON-OPEC LIQUIDS PRODUCTION**[4]



The IEA sees tight oil production outside the US gradually coming into play, with 3.5 Mbpd by 2040, mostly from Canada, Russia, Argentina and Mexico. Given the US's success, it is likely that other countries will also develop tight oil and, with sufficiently high prices, worldwide tight oil could be much higher. For instance, Bahrain is hoping to reach 0.2 Mbpd from a new offshore tight oil discovery[5].

The 'other non-OPEC' category includes both growing and shrinking countries (FIGURE 5). In the EIA's view, the North Sea, Mexico and Oman are set to fall in the long-term; the Caspian, China, Brazil and Canada to grow. Brazil will rely on the ultra-deepwater 'pre-salt' and Canada on its extra-heavy oil sands and on tight oil formations.

FIGURE 05: **NON-OPEC PRODUCTION FORECAST EXCLUDING US AND RUSSIA**[6]



However, there is room for divergent views on this. Mexico's opening to private companies and the development of deep-water and tight formations may keep output growing. The EIA's view on Latin America does not appear to include Guyana, which could be producing 0.75 Mbpd by 2025[7]. Conversely, China's production has been falling sharply since 2015 due to field maturity, despite extensive use of EOR.

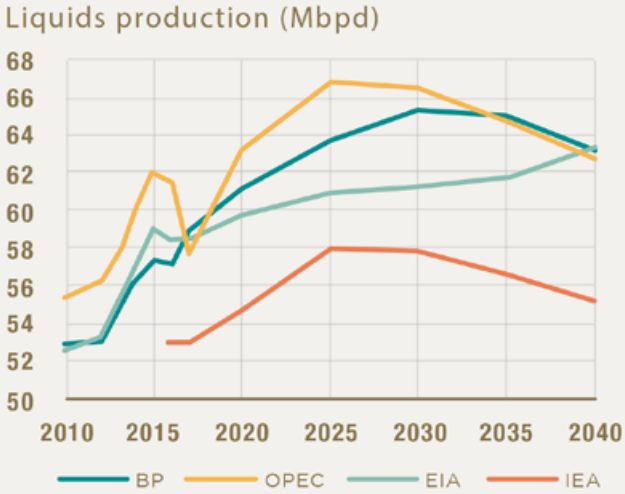
Combining the various forecasts gives the view for overall non-OPEC production (FIGURE 6). Note that the IEA's figures are much lower than the others because of differing definitions.

The EIA sees steadily rising non-OPEC output to 2040, while the three others have output peaking around 2025-2030 and then falling. But every forecast has higher output in 2040 than 2017. The increase ranges from 2.3 Mbpd in the IEA's view to 5.1 Mbpd in OPEC's.

The major forecasts do not show any of three plausible outcomes:

- A sharp drop in non-OPEC output as fields mature and shale sweet spots are exhausted;
- A steep fall in non-OPEC production because of environmental restrictions and divestment, or because of a breakthrough in non-oil technologies that leads to low demand and prices;
- Strong growth in non-OPEC production because of new discoveries and/or the application of shale techniques and other new technologies worldwide.

FIGURE 06: **FORECASTS FOR ALL NON-OPEC LIQUIDS PRODUCTION**[8]



Key factors affecting non-OPEC output include price, OPEC policy, technology, industry structure, investment climate and politics

Non-OPEC **production costs** tend to be higher than those of the core OPEC members, particularly for mature fields and new areas. However, oil companies in non-OPEC states are generally not burdened with supporting the government budget, and can be more flexible in expanding output and cutting costs. Non-OPEC output is thus very sensitive to oil price.

Price, of course, also depends on demand, which has its own uncertainties in the long term, including global economic growth, improvements in efficiency, environmental policies, and the uptake of non-oil technologies such as electric vehicles.

Price also depends on oil quality. Tight oil is predominantly light and very light grades, suitable for gasoline and for naphtha for the petrochemical industry. To produce diesel and jet fuel, in growing demand in Asia, medium and heavy crudes are required, at the moment largely produced by OPEC, Mexico, Canada and Russia.

Some **OPEC states** have the resources to increase production significantly in the long-term, notably Saudi Arabia, the UAE, Iraq, Iran, Libya and Venezuela. Some of these, though, will be hampered by political problems. The others can make a strategic decision to expand output, keeping prices relatively low and taking market share from non-OPEC. OPEC countries have recently announced major production expansions, totalling two-thirds of the 7.8 Mbpd extra output required in the IEA's view by 2025.

However, in the long run, companies in non-OPEC have proved good at reducing costs to remain competitive even if prices are relatively low, while governments tend to cut their tax take to encourage investment.

Technology has consistently allowed non-OPEC states to increase or sustain output despite higher costs and mature fields. This most obviously includes the combination of horizontal drilling and hydraulic fracturing which has produced the US shale revolution. It also covers important techniques listed in Figure 1.

Industry structure has changed with a reduction in independent oil companies, the withdrawal of North American firms to home territory, and the rise of 'international national oil companies' such as Petronas, Equinor (Statoil) and PetroChina. More recently, the supermajors, such as ExxonMobil, Chevron and BP, have expanded in US shale, and new private-equity backed independents have emerged in the US, North Sea and Africa[9]. Aggressive independents are important for discovering new frontier plays and shale formations outside North America.

Investment climate and **politics** affect non-OPEC production in developed and developing countries. Environmentalist opposition has slowed developments in UK shale, Norway's Arctic, Australia, Canada and some US states. International financial institutions and some major pension and endowment funds are divesting from fossil fuels. This pressure is likely to increase, and some governments, such as France's, will adopt policies banning or severely limiting hydrocarbon development as part of their climate change policies.

Meanwhile, some promising developing countries, such as Sudan and South Sudan, have been hampered by civil wars and other political problems. Sudan plans to reach 110 kbpd within 2-3 years from 77 kbpd today. Resource nationalism previously led to tax rises and limitations on international oil firms in Brazil, and could return in Mexico.

Given such issues, there are still concerns that investment is falling short of the annual $600 billion required to meet oil and gas demand over the next decade. Yet near-term forecasts for strong growth do not give cause for concern.

New supply sources can provide surprises, especially in the longer term

Forecasts from bodies such as the IEA, OPEC and EIA inevitably find it hard to allow for new and unexpected sources of supply.

Promising areas for non-OPEC supply include north-eastern South America (Guyana, etc.), north-west Africa (Mauritania, Senegal), East Africa (Kenya, Uganda), the West African Transform Margin (Ghana, etc.), and deepwater frontier areas of south-east and east Asia. The recent opening of the industry in Mexico has led to discoveries such as the Zama find with 1.4-2 billion bbl in place[10]. Brazil's new president Jair Bolsonaro has expressed interest in opening up the oil industry from the dominant role of Petrobras[11], which would likely lead to new finds in the pre-salt and in other areas such as the north-east.

If oil prices are sustained at high levels, Arctic and sub-Arctic areas such as Alaska, Russia, Norway's Barents, offshore Newfoundland (Canada), and perhaps Greenland will contribute. Even large finds have been made in mature areas, such as Norway's 2.1-3.1 billion bbl Johan Sverdrup field in the North Sea (2010), and Western Australia's 171 million bbl Dorado find (2018)[12]. Finally, as noted, global tight oil could grow much larger than the IEA's 3.5 Mbpd by 2040, under the right conditions.

Conclusions: Implications for leading oil and gas producers

Forecasts for 2040 output from the main agencies have a spread of 7.4 Mbpd for the US, 6.3 Mbpd for Russia and 6.8 Mbpd for the rest of non-OPEC. But on overall output, the increase from 2017 to 2040 is seen as quite modest, ranging from 2.3-5.1 Mbpd.

If non-OPEC output falls after 2025 or 2030, that will create space for OPEC countries to expand output, even if overall oil demand is flat or slightly falling.

Given the flexibility of non-OPEC producers, the potential for new discoveries, and the introduction of novel technologies, it is likely that 'business-as-usual' forecasts of non-OPEC output are too low. If oil prices remain reasonably strong, and environmental policy does not close off the most important areas, non-OPEC production outside the US and Russia could grow substantially above the views of the EIA.

Therefore, to win market share from non-OPEC in an overall demand-constrained world, OPEC countries would need to

keep prices reasonably low to avoid incentivising deepwater, Arctic, tight oil, mature and EOR output. But they will also need to deploy these technologies themselves where appropriate.

OPEC states have to monitor future investment carefully, since political challenges or environmental policies might reduce non-OPEC output well below potential.

Continuing cooperation with the willing non-OPEC states (Russia, Oman, Mexico, Azerbaijan and others) will be attractive to keep them from increasing output too rapidly.

References

1. https://www.wsj.com/amp/articles/saudi-arabia-opecs-anchor-ponders-a-future-without-the-cartel-1541703893

2. Qamar Energy analysis based on BP World Energy Outlook 2018, OPEC World Oil Outlook 2018, Energy Information Administration International Oil Outlook 2017, International Energy Agency World Energy Outlook 2017

3. Qamar Energy analysis based on BP World Energy Outlook 2018, OPEC World Oil Outlook 2018, Energy Information Administration International Oil Outlook 2017, International Energy Agency World Energy Outlook 2017

4. Qamar Energy analysis based on BP World Energy Outlook 2018, OPEC World Oil Outlook 2018, Energy Information Administration International Oil Outlook 2017, International Energy Agency World Energy Outlook 2017

5. https://energypolicy.columbia.edu/research/commentary/bahrain-shale-oil

6. Energy Information Administration International Oil Outlook 2017

7. https://www.thenational.ae/business/energy/guyana-may-be-the-next-big-beast-in-global-oil-1.778295

8. Qamar Energy analysis based on BP World Energy Outlook 2018, OPEC World Oil Outlook 2018, Energy Information Administration International Oil Outlook 2017, International Energy Agency World Energy Outlook 2017

9. https://www.thenational.ae/business/energy/new-wave-of-energy-independents-may-change-oil-landscape-1.785121

10. https://www.ft.com/content/79969c16-66bb-11e7-8526-7b38dcaef614

11. https://www.thenational.ae/business/energy/brazil-bolsonaro-and-oil-a-future-in-the-balance-1.790348

12. https://www.ogj.com/articles/2018/08/quadrant-touts-oil-find-as-one-of-largest-on-north-west-shelf.html

Johan Sverdrup field in the North Sea, a giant new discovery in a mature area (Equinor ASA)