

Russian Oil Production Outlook to 2020

Introduction

It is well known that Russia's economy is heavily reliant on its hydrocarbon industry,¹ and it is easy to track the progress of numerous economic indicators and see their close correlation with the oil price.² Indeed, it is indisputable that the collapse in the oil price since mid-2014 has been a catalyst for two years of recession in Russia,³ even if other factors such as sanctions and a lack of economic reform have also had roles to play. It is perhaps surprising, then, that against this volatile backdrop Russia's oil industry has been remarkably resilient. Oil production grew by over 2% in 2016 to reach an average of 10.96mb/d,⁴ and a peak towards the end of the year of more than 11.25mb/d,⁵ a level not seen since the highs reached in the Soviet era in the late 1980s.

Questions have been raised about the sustainability of this growth, mainly because of the financial constraints that are being felt across the global oil industry due to lower oil prices and particularly in Russia because sanctions have severely limited the ability of oil companies to raise capital on international markets. Furthermore, the rapid growth in oil production seen in the second half of 2016 has been interpreted as a short-term attempt to maximise output prior to an agreement with OPEC to cut, and as such the peaks reached in October to December were regarded as highs that could not be maintained through 2017 and beyond. Indeed the question of whether Russian oil production has peaked for the medium to long-term has also been raised.⁶

In April 2015 we produced a research paper arguing that Russian oil production would continue to rise despite the sharp fall in the oil price, driven mainly by projects already under development and helped by a flexible fiscal regime and a currency revaluation.⁷ Two years on we are now reviewing the analysis, in cooperation with the Energy Research Centre at the Russian Academy of Sciences (ERI RAS) in Moscow, to understand whether the growth that we have seen since 2015 can continue or whether we are close to a peak. There are clearly a number of uncertainties related to the assumptions one must make to reach an answer, but our overall conclusion is that the steady progress that has been seen in Russian oil progress over the past decade can continue at least until 2020.

¹ Hydrocarbon taxes accounts for 43% of budget revenues, 38% come directly from oil and oil products (author's estimates derived from data at www.roskazna.ru/en/)

² Wall Street Journal, 2 Sept 2015, "For Russia, oil collapse has Soviet echoes"

³ BBC, 25 Jan 2016, "Russian economy hit by oil price slide" at www.bbc.com/news/business-35398423

⁴ Interfax, 9 Jan 2017, "Russian oil production up 2.5% to 547.5 mln tonnes in 2016"

⁵ Interfax, 23 Nov 2016, "Oil and gas condensate production in Russia in Oct and for 10 months 2016"

⁶ OilPrice.com, 6 April 2016, "Is a permanent decline coming for Russia?" at <http://oilprice.com/Energy/Energy-General/Is-A-Permanent-Divide-Coming-For-Russia.html>, accessed on 2 Feb 2017

⁷ Henderson, J. (2015) *The Key Determinants for the Future of Russian Oil Production and Exports* WPM 58, Oxford Institute for Energy Studies (<https://www.oxfordenergy.org/wpcms/wp-content/uploads/2015/04/WPM-58.pdf>)

A quick review of 2016

Oil and condensate production in Russia grew by 2.2% in 2016, following an increase of 1.4% in 2015, and averaged 10.96mb/d, with a peak of 11.29mb/d reached in November. The growth in 2016 continued the underlying trends seen over the past few years, with the largest companies showing flat or slightly declining output while the increase was driven by some of the medium and small companies. As Table 1 shows, the top 3 producers combined for a small decline, while Gazprom Neft, Tatneft, Bashneft, Novatek and the smaller producers grouped in “Other” contributed significant percentage increases.

Table 1: Russian Oil and Condensate Production by Company (thousand b/d)

	2015	2016	% change
Rosneft	3800	3799	0%
LUKOIL	1721	1662	-3%
SurgutNG	1237	1239	0%
Gazprom Neft	689	757	10%
Tatneft	547	575	5%
Slavneft	311	300	-3%
Bashneft	400	428	7%
Russneft	148	140	-5%
Gazprom	341	348	2%
Novatek	95	161	70%
Other	1435	1556	8%
Russia Total	10725	10965	2%

Source: CDU TEK, Interfax

The overall outcome was, as always, a combination of two key factors – growth of production at new “greenfield” sites and the maintenance of decline at older “brownfield” assets. Not surprisingly, given its dramatic growth, Novatek operated the new field with the largest growth, bringing the Yarudeyskoye field online in December 2015 and seeing it reach its peak output of 3.5 million tonnes per annum (70kbpd) in early 2016.⁸ Gazprom Neft showed similar growth to Novatek in absolute terms, benefitting from continued growth in production from its Prirazlomnoye and Novy Port fields in the Russian Arctic, while also adding initial production from the Messoyakha field in the Yamal region (where it is a partner with Rosneft).⁹ Bashneft, meanwhile, saw production rise at its Trebs and Titov fields in Timan Pechora (where its partner is Lukoil),¹⁰ while Rosneft, despite its flat overall output, saw increases at a number of fields which are still in their growth phase (including Suzun, Uvat, and Labagan).¹¹

The performance of Tatneft, in contrast, reflects the second phenomenon of brownfield management, as the company has focused on increased drilling at its core conventional oil assets as well as the continued exploitation of the highly viscous oil deposits that are prevalent in Tatarstan. The company is using an increasing range of modern technologies to develop these difficult to recover reserves, and is being assisted by the significant tax breaks on offer. As a result, the growth seen in 2016 is expected to continue in 2017, albeit at a slightly lower rate.¹²

⁸ Novatek Press Release, 1 Dec 2015, “Novatek launches commercial production at Yarudeyskoye field”

⁹ Gazprom Neft Press Release, 26 Dec 2016, “Gazprom Neft Board of Directors reviews preliminary results for 2016”

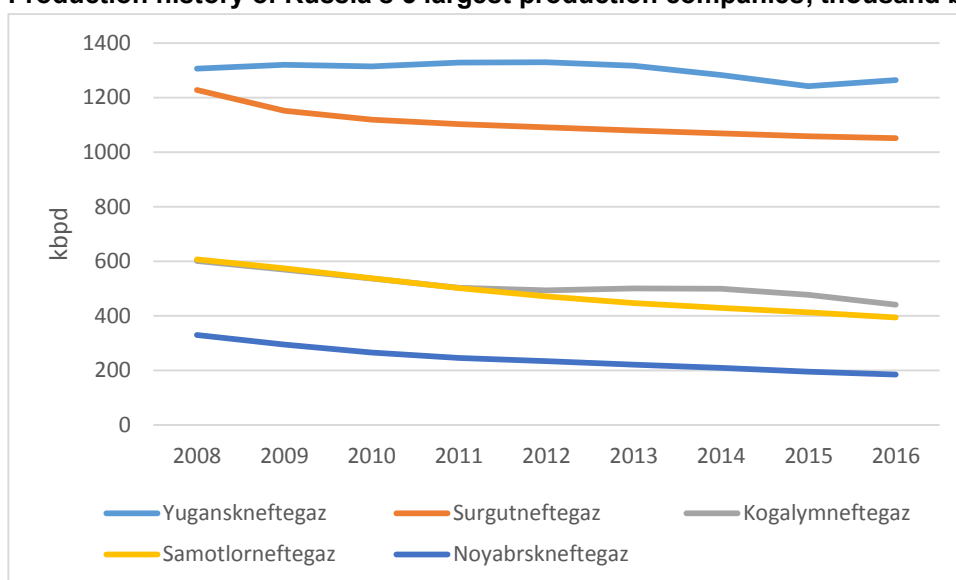
¹⁰ Bloomberg, 17 July 2016, “Russia’s Arctic Oil Rush”

¹¹ Rosneft Investor Presentation, August 2016, slide 11 (https://rosneft.com/upload/site2/document_file/pdf_30082016_en.pdf)

¹² Tatneft Presentation to Investors, Dec 2016, slides 9-12 (<http://tatneft.ru/for-shareholders/information-disclosure/presentations-to-investors/?lang=en>)

Elsewhere the management of brownfield assets is more focused on controlling decline rates rather than generating growth, but as can be seen from Figure 1 the largest production subsidiaries of the major companies are continuing to achieve impressive results. If left without intervention, oilfields in Siberia would naturally decline at around 10-15% per annum, but the average for the five production companies shown (which account for just under 60% of the country's liquids output) has been less than 3% per annum over the past decade. Indeed since 2013 the average rate has actually slowed to just over 2% per annum, and one of the companies, Yuganskneftegaz (owned by Rosneft) managed to turn round its long-term decline trend completely and show growth of 1.8% in 2016. This reflected the much greater effort being placed on maintenance of production at existing fields, which has been encouraged by the Russian government in response to the need to maintain tax revenues during a period of lower oil prices.

Figure 1: Production history of Russia's 5 largest production companies, thousand b/d

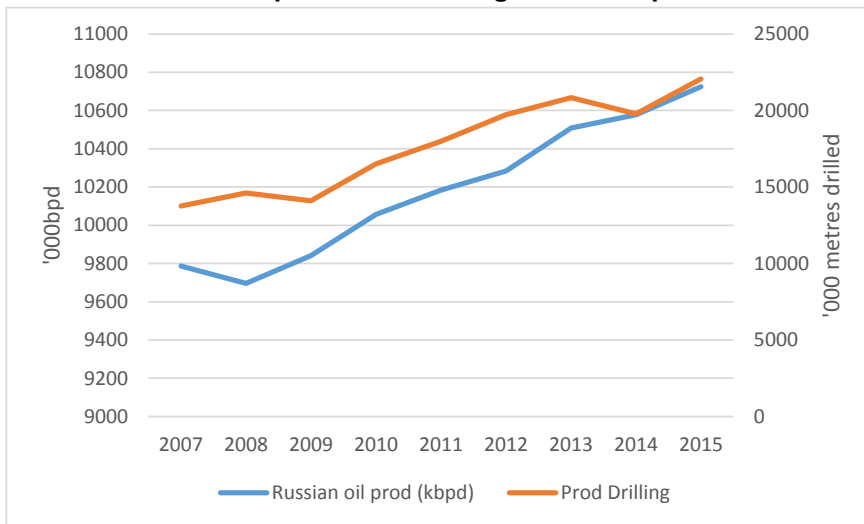


Source: CDU TEK data, authors' analysis

Results from 2016 also continued to underline the key driver of production at both new and existing fields in Russia – drilling. This is perhaps no surprise, given the clear link between new wells and more output, but the connection is stark, as shown in Figure 2. The R-square of the correlation between oil production and production drilling (in metres) since 2007 is 0.96, and it is clear from the graph that, other than one dip in 2014 as the oil price started to fall, drilling and oil output have increased at similar rates over the past decade. In 2016, production drilling reached 24,680 metres, a 12% increase on 2015 and almost 80% higher than the 13,750 metres drilled in 2007. As a result, one can conclude that, in a similar fashion to watching the well count in the US to estimate shale oil output, one should monitor the monthly drilling statistics in Russia to give a strong clue to future oil production.



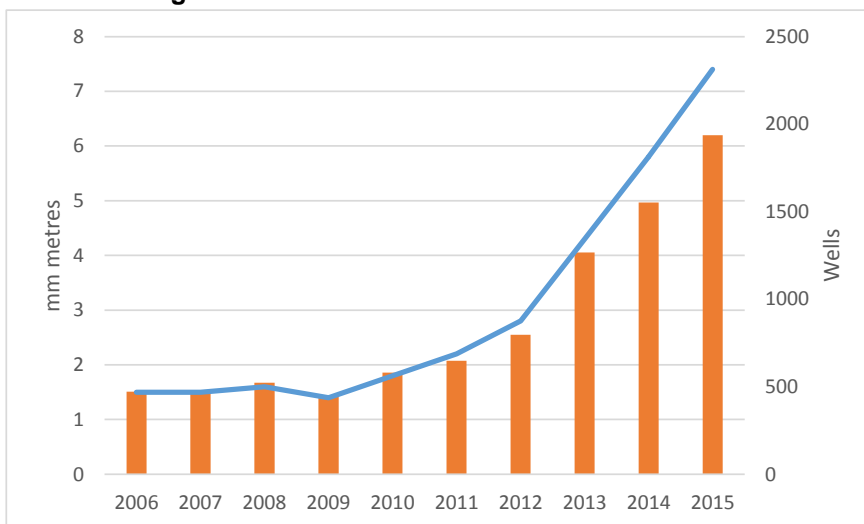
Figure 2: The correlation between production drilling and oil output in Russia



Source: Interfax data, authors' analysis

An added dimension to the drilling story has been the growth of horizontal wells to enhance reservoir productivity. Over the past decade the number of horizontal wells drilled in Russia has increased by a factor of four, while the total length has jumped by a factor of 5 (see Figure 3).¹³ All companies in Russia are now incorporating horizontal drilling into their development plans and their brownfield recovery operations,¹⁴ with Rosneft, for example, estimating that around 30% of its wells in the first nine months of 2016 were horizontal, while Gazprom Neft has stated that horizontals account for around half of all new wells.¹⁵ Indeed ROGTEC, the Russian oil industry journal covering technology issues, has estimated that by 2025 50% of all new wells in Russia will be horizontal, up from around 30% today, suggesting further upside potential from greater use of this technology.

Figure 3: Horizontal drilling in Russia



Source: ROGTEC, Deloitte

¹³ Deloitte, June 2016, "Oilfield services market conditions and trends 2016"

¹⁴ Interfax, 11 Oct 2016, "Rosneft produces 0.3% more oil, 7.4% more gas in Jan-Sept, daily output up 1.4%"

¹⁵ Sberbank report, Feb 2017, "Russian Oil and Gas Equities: Shedding Inhibitions", p.26

The impact of rouble devaluation on company finances and capital expenditure

All this extra drilling costs money, though, and in an era of lower oil prices it is perhaps surprising that Russian oil companies have the funds to spend on increased upstream activity, especially when sanctions have also limited their debt-raising capability.¹⁶ The answer to this question is to be found in three places. Firstly, oil companies have prioritised spending on oil production by delaying capital expenditure in their downstream operations. In 2011, President Putin encouraged the Russian oil industry to upgrade the country's refining system,¹⁷ and provided tax incentives to catalyse action in return for agreements made with various Russian ministries confirming the companies' investment plans.¹⁸ In particular, the government introduced a gradually harsher tax burden on lower quality oil products in order to incentivise Russian oil companies to invest in new refining equipment to reduce low quality fuel oil output and increase the production of higher value-added products.¹⁹ To an extent this has worked, and the quality of the Russian refining system has increased, but since 2014, when the oil price first started to fall, the priority for the Russian government and the oil companies has shifted towards the upstream, and permission has been sought to delay downstream investment.²⁰

More fundamentally, though, the Russian government's decision in 2014 to allow the rouble exchange rate to float freely and be set by market forces has had a dramatic impact on the finances of the Russian oil sector.²¹ As can be seen in Figure 4, since then the movements of the rouble and the oil price have tended to mirror each other very closely, with the rouble falling in value versus the dollar as the oil price declines. This has been of great benefit to all exporting companies in Russia, with the oil and gas industries the main beneficiaries, and has effectively meant that the cost base of the industry in dollar terms has almost halved since 2014 (allowing for some rouble inflation over that period). When this impact has been combined with the considerable pressure on the oil service sector to keep prices down, Russian oil companies have been able to maintain both profitability and cashflow for investment in the upstream sector.

Figure 5 shows the combined operating cashflow, capital expenditure and resulting free cashflow for five major oil companies in Russia.²² As can be seen, operating cashflow has exceeded total capital expenditure for the past three years, and failed to do so in 2013 only due to one exceptional event – the purchase of TNK-BP by Rosneft for \$55 billion. As a result it is clear that the Russian oil industry has been able to self-fund itself during periods of high and low oil prices, despite the imposition of sanctions since 2014.

¹⁶ Daily Telegraph, 3 Aug 2015, "Western sanctions are hitting Russia harder than anyone realised"

¹⁷ Kremlin web-site, 9 Feb 2011, Prime Minister Putin holds a meeting in St. Petersburg on the performance of Russia's fuel and energy sector in 2010 and its objectives for 2011" at <http://archive.government.ru/eng/docs/14105/>, accessed on 1 Feb 2017

¹⁸ Agreements were signed with the Russian Federal Anti-Monopoly Service, the Federal Service for Environmental, Technical and Nuclear Oversight and the Federal Agency for Technical Regulation and Metrology

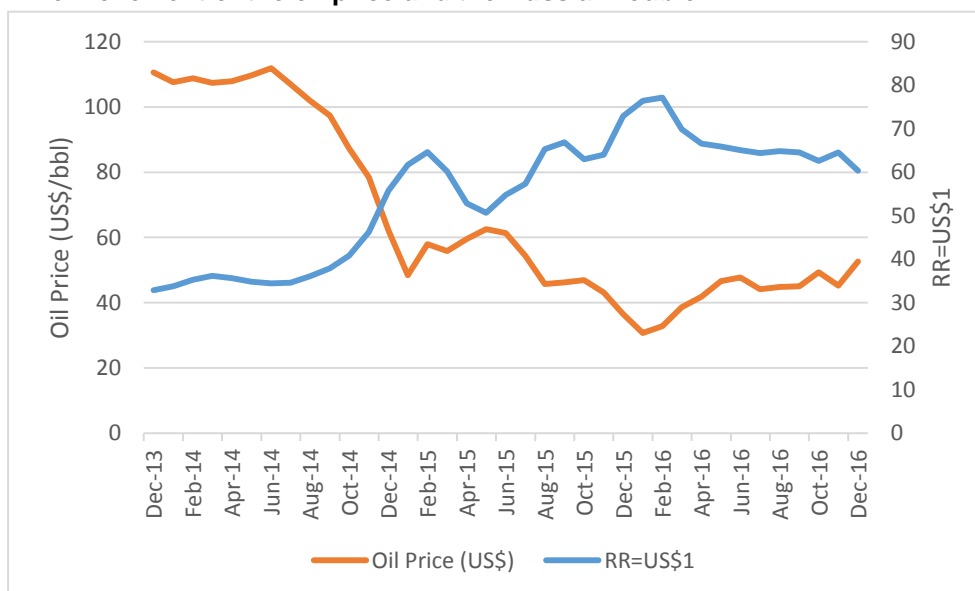
¹⁹ Ernst & Young, 2014, "Russia's downstream sector: sights set on modernization" [http://www.ey.com/Publication/vwLUAssets/EY-Russias-downstream-sector-sights-set-on-modernization/\\$FILE/EY-Russias-downstream-sector-sights-set-on-modernization.pdf](http://www.ey.com/Publication/vwLUAssets/EY-Russias-downstream-sector-sights-set-on-modernization/$FILE/EY-Russias-downstream-sector-sights-set-on-modernization.pdf)

²⁰ Reuters, 3 April 2015, "Russia refinery modernisation push slowed by sanctions"

²¹ Wall Street Journal, 5 Nov 2014, "Russia Central Bank take step toward allowing free float of rouble"

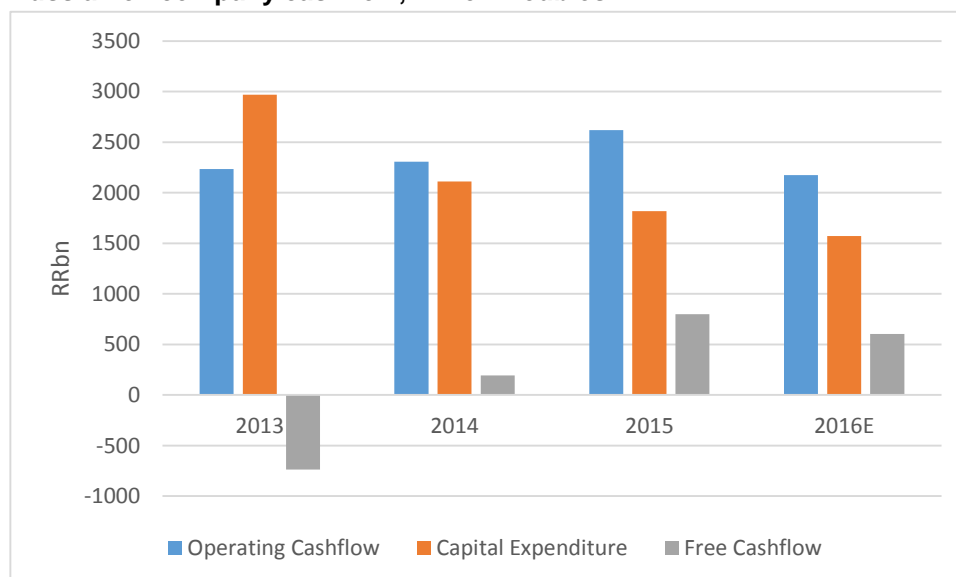
²² Rosneft, Lukoil, Gazprom Neft, Tatneft and Bashneft

Figure 4: The movement of the oil price and the Russian rouble



Source: Central Bank of Russia, Argus Media

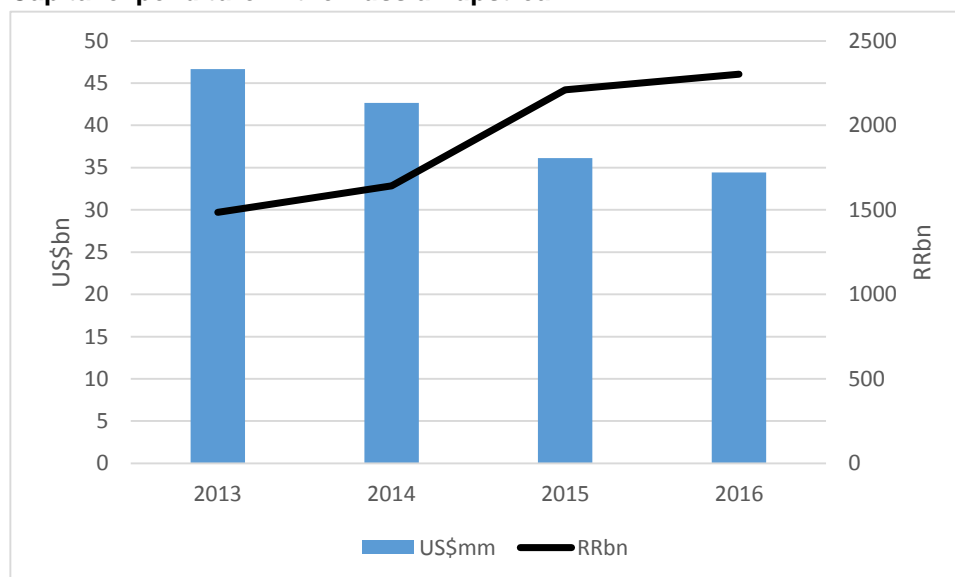
Figure 5: Russian oil company cashflow, Billion Roubles



Source: Company financial statements, Authors' analysis

The decline in overall rouble capital expenditure seen over the period is also clear, and reflects the obvious fact that revenues have declined due to falling oil prices. However, although this is reflected in overall capital expenditure, it is not reflected in spending on upstream activities, which have increased consistently, as shown in Figure 6. This emphasizes the point made above, that the Russian oil industry has focused its spending on the maintenance and growth of oil production over the past three years. The graph also underlines the impact of the devaluation of the rouble once again, as it is clear that although dollar spending has fallen very significantly, rouble spending has moved in the opposite direction.

Figure 6: Capital expenditure in the Russian upstream



Source: Barclays E&P Survey 2017, Central Bank of Russia, Authors' Analysis

The correlation between upstream spending in rouble terms and oil production is as close as that between production drilling and oil output shown in figure 2, perhaps not surprisingly, with an R-square of 0.96. However, companies would not spend their money on increasing output without some commercial incentive, no matter how much the Kremlin might urge it. As a result, the impact of a third driver, the Russian tax system, must also be noted. The key Russian taxes on oil production are a royalty on all output (Mineral Extraction Tax or MET) and an export duty on all oil sold to countries outside the Eurasian Customs Union.²³ Other levies such as property tax and of course corporation tax are also imposed, but it is really MET and Export Tax which have the biggest impact.²⁴

The key facets of both these taxes is that they are charged against revenues at a very high marginal rate (almost 90%) but are also calculated relative to the oil price and have a sliding scale. The rate of export tax, for example, changes when the oil price goes above \$15, \$20 and \$25/barrel. As a result, as the oil price rises the government take increases significantly, but when it falls it is government revenues that take the largest hit.²⁵ Another important factor over the past three years has been a rebalancing of oil taxation in what has been known as the "Tax Manoeuvre", which has seen Export Tax reduced and MET increased, and has also altered the balance of upstream and downstream taxes in favour of the former.²⁶ However, the key element of the tax system has remained, namely that companies are protected to a great extent as the oil price falls because of the high marginal rate and the sliding scale. As a result, company cashflow changes much less than government revenue.

When this factor is combined with the devaluation of the rouble, which has reduced costs in dollar terms, the breakeven price for Russian oil production becomes very low. This is shown in Figure 7, where the impact of taxation on the overall cost base at high oil prices is very clear. The overall conclusion, though, is that the average barrel of current production in Russia can breakeven at below \$10/barrel, underlining why companies have been prepared to invest increasing amounts of roubles in maintaining output from existing fields over the past three years. Indeed, with the development cost of new fields in Russia

²³ The Eurasian Customs Union currently comprises Russia, Belarus, Kazakhstan, Armenia and Kyrgyzstan

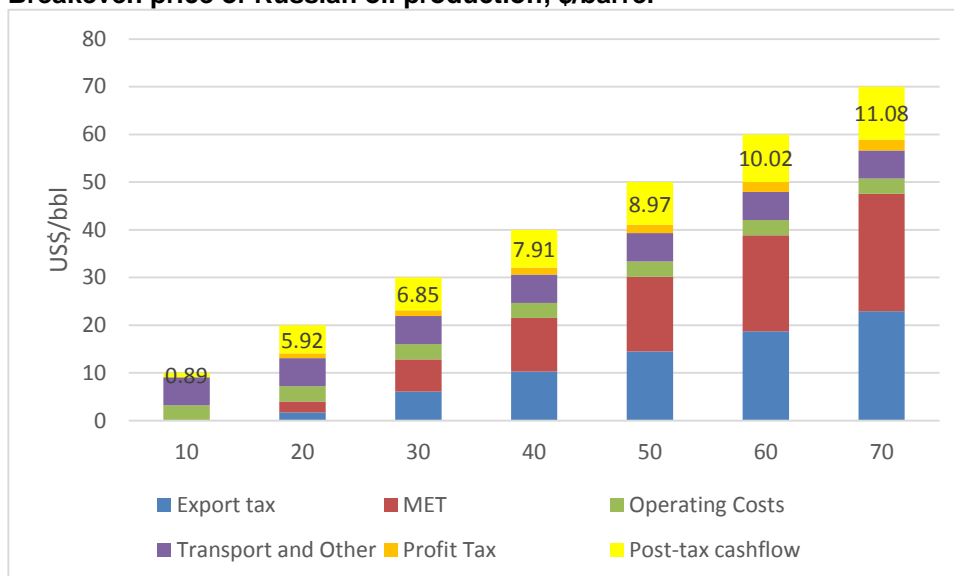
²⁴ Ernst & Young, 29 Dec 2015, "Fine tuning the big tax maneuver"

²⁵ US Energy Intelligence Agency, 20 Oct 2016, "Low oil prices have affected Russian petroleum companies and government"

²⁶ Platts, 4 Aug 2015, "Russian oil sector slowly adapting to new tax regime"

averaging approximately \$6/barrel, it can be seen that investment in new production can breakeven at around \$20/barrel, at which point sufficient cashflow is generated to finance this level of expenditure.

Figure 7: Breakeven price of Russian oil production, \$/barrel



Source: Authors' analysis

This analysis is supported by statements from Russian oil companies themselves. Rosneft have confirmed their belief that the company's production breaks even at \$10/barrel,²⁷ while Lukoil has stated that it would invest in new production (i.e. including capital expenditure rather than just existing production) at a price above \$24/barrel.²⁸ Furthermore Gazprom Neft CEO Alexander Dyukov has been quoted as saying that even the expensive Prirazlomnoye offshore field could survive an oil price of \$25/barrel, while the breakeven price of production at existing fields (equivalent to the analysis shown in Figure 7) could be as low as \$12/barrel.²⁹ The overall conclusion, then, is that Russian oil companies are incentivised to maintain and grow oil output at an oil price well below \$30/barrel.

The impact of the agreement with OPEC

For the Russian government, of course, the incentives are rather different. While naturally wanting to maintain production, the government also needs higher prices as it is the main beneficiary, and relies heavily on oil and gas tax revenues to finance the federal budget. Figure 8 clearly shows the impact of the decline in the oil price on the federal budget deficit since 2012. Prior to 2014 the share of budget revenues made up by oil and gas had reached 50%, with oil making by far the largest contribution (around 90% of the hydrocarbon revenues). However, by 2016 this had fallen to only 36% and is forecast to remain at this level until 2019.³⁰ It is no coincidence that in 2016 the budget deficit was forecast to reach 3.2% of GDP, and even with planned spending cuts will still be more than 1% of GDP by 2019. To date the Russian government has been able to finance this deficit from reserves built up during the boom years since 2010, with the Reserve Fund having been specifically allocated for this

²⁷ Interfax, 31 March 2016, "Breakeven oil price for Rosneft: \$10 per barrel – exec"

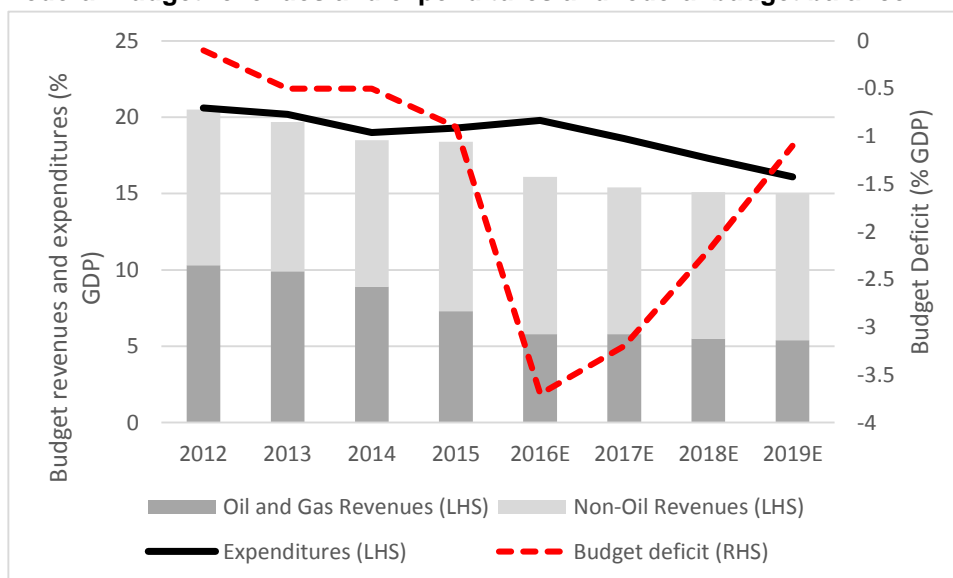
²⁸ RT.Com, 8 Sept 2015, "How Russia's Lukoil survives sanctions and cheap crude", sourced on 2 Feb 2017 from <https://www.rt.com/business/314702-lukoil-oil-russia-business/>

²⁹ Russia Beyond The Headlines, 19 Jan 2016, "At what point are oil prices too low for firms to survive" sourced on 2 Feb 2017 from http://rbth.com/business/2016/01/19/at-what-point-are-oil-prices-too-low-for-firms-to-survive_560695

³⁰ World Bank, November 2016, Russia Economic Report No. 36, pp.7-8

purpose.³¹ However, at current rates of spending the Reserve Fund could be exhausted by the end of 2017, on the government's original forecast of an oil price of \$40/barrel in 2017.³²

Figure 8: Federal Budget revenues and expenditures and federal budget balance



Source: World Bank, Authors' Analysis

As a result, action to encourage the oil price to move higher has been under discussion since early 2016 and, after the abortive meeting with OPEC members in Doha in April 2016, was finally brought to a conclusion when an agreement was reached with OPEC and non-OPEC in December.³³ Russia has agreed to reduce output by a maximum of 300,000b/d from the level seen in October 2016 (11.24mb/d), and Energy Minister Alexander Novak has confirmed that the Russian oil companies will be expected to take appropriate steps to meet the target.³⁴ However, a number of points need to be made about the potential impact on Russian oil production in the short and medium term.

The first is that the cut itself will actually have a very limited impact on 2017 production overall, for two reasons. Firstly, the cut itself is only being implemented in stages, with the full 300,000b/d only likely to be reached by the end of April 2017.³⁵ As the whole deal expires in June this means that the full cut will only be in place for two months. Therefore the total average impact on overall Russian production for the year as a whole is likely to be below 100,000bpd. This in itself would suggest that 2017 oil output will average around 11.15mb/d, at least.

³¹ Bloomberg, 6 Sept 2016, "Russian Wealth Fund has this year's biggest drop as buffers wilt"

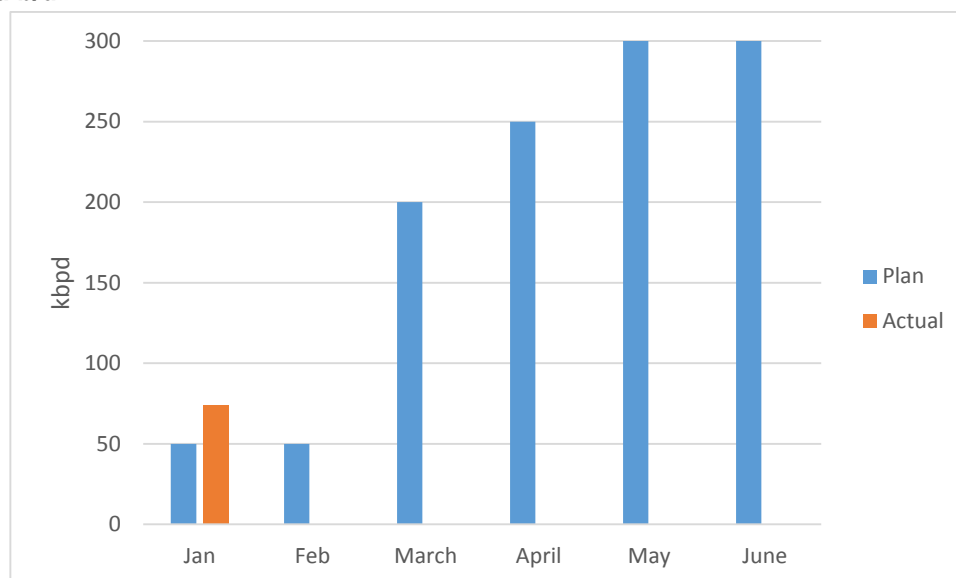
³² Independent, 17 Sept 2016, "Russia 'could run out of reserves over the next year'"

³³ Reuters, 10 Dec 2016, "OPEC, non-OPEC agree first global pact since 2001"

³⁴ Interfax, 31 Dec 2016, "Novak to discuss plans to Cut Russia oil production with oil producers on Dec 14"

³⁵ Interfax, 9 Jan 2017, "Russia starts cutting oil output under deal with OPEC"

Figure 9: Russia’s planned output cuts under the December 2016 agreement with OPEC, thousand b/d

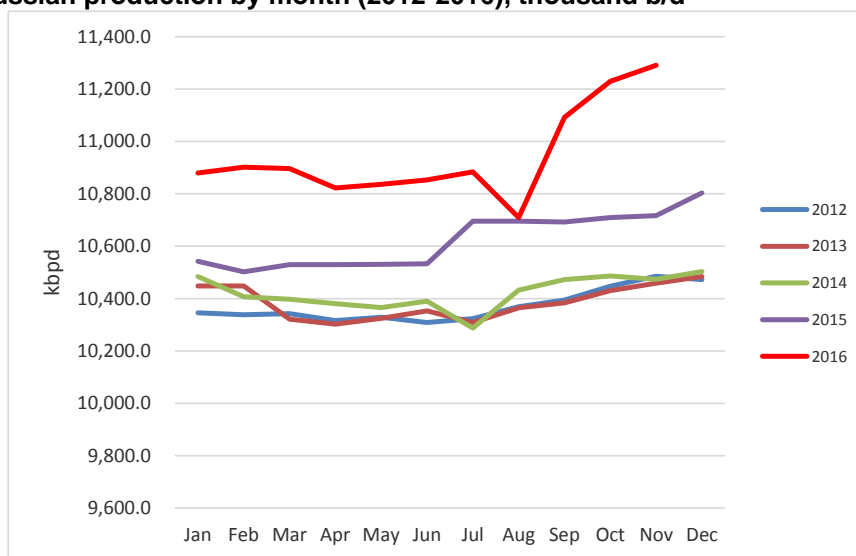


Source: Interfax, Authors’ Analysis

Secondly, the normal course of events in the first two quarters of the year is that Russian oil production is stable or declining, either because of the impact of the weather or because of maintenance work.³⁶ The weather impact can be seen in two ways. It can be extremely cold, leading to a shut-in of production to protect oil workers (the reason that production fell more than planned in January), or the impact of the winter thaw can also hinder production. As the ice melts, normally in the second quarter, the tundra becomes much more difficult terrain for transport of equipment and personnel. Large lakes and marshes appear and, as a result, it becomes more difficult to provide services and maintenance. This is why maintenance work normally takes place before the end of winter, but this again leads to shut-ins of wells as work is done. The overall result, as shown in Figure 10, is that production in the first and second quarters tends to be flat or slightly declining. Indeed in the past five years only one (2015) has seen production higher in the second quarter than in the first, and the average decline for the other four years has been just over 50,000 bpd. Clearly this is not as high as the cut Russia has promised to OPEC, but it is nevertheless the case that one quarter of the decline could have been expected to occur in any case (the average cut for the six months to June is just under 200,000bpd). As a result, the overall impact of the OPEC cut in itself is reduced, and in addition Russian production can be expected to rebound sharply in the second half of the year, as again this is a normal occurrence.

³⁶ Reuters, 10 Jan 2017, “General Frost to the rescue: cold helps Russia comply with OPEC deal”

Figure 10: Russian production by month (2012-2016), thousand b/d



Source: Argus Media, Authors' Analysis

Finally, it is not clear that all Russian oil companies will comply with the cuts for the entire period until June. The Energy Ministry has made it clear that the cuts will be voluntary and will not be aggressively monitored by the government, and even in January it is clear that performance has varied widely (Table 2). Although the overall result has been better than expected this was largely driven by external effects (the weather), and given that company outcomes have varied from a 4% decline by Gazprom Neft to a 2.4% increase by Bashneft it is not difficult to conceive of a situation in which companies that have made bigger efforts to cut start to resent the smaller contributions made by others. This could easily lead to cheating over time, and although we do not suggest that the agreement will collapse altogether it is not difficult to suggest that the full 300,000b/d cut may not be achieved.

Table 2: Russia production in October and December 2016 and January 2017, thousand b/d

	Oct-16	Dec-16	Jan-17	Jan - Oct	Change (%)
Rosneft	3871	3814	3796	-74	-1.9%
Lukoil	1676	1685	1668	-7	-0.4%
SurgutNG	1239	1254	1239	0	0.0%
Gazprom Neft	815	800	783	-32	-4.0%
Tatneft	595	615	592	-3	-0.5%
Bashneft	430	435	441	11	2.4%
Slavneft	297	298	293	-4	-1.4%
Russneft	144	148	142	-2	-1.1%
NNK	45	44	44	-1	-2.5%
Novatek	159	156	158	-1	-0.7%
PSAs	349	339	344	-5	-1.4%
Others	1585	1620	1612	26	1.7%
Total	11204	11208	11111	-93	-0.8%

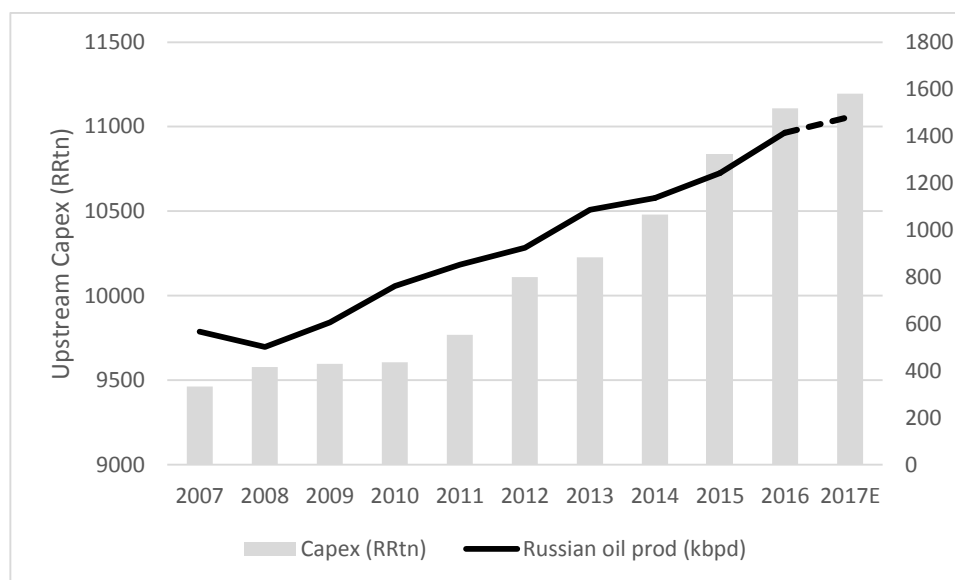
Source: CDU TEK

Russian oil production 2017-2020

Looking beyond the first six months of 2017, we have applied three methodologies to assess likely Russian oil production over the rest of this decade. Firstly, we have created a simple model to link capital expenditure plans to oil production for 2017. Secondly, we have conducted a bottom-up corporate analysis of brownfield performance and new field development. And finally, we have adopted a similar approach on a regional basis. We have deliberately kept our bottom-up analysis separate (the corporate analysis done by OIES, the regional analysis by ERI RAS) in order to avoid any bias in our views, and we present them for comparison and to provide a range of outcomes.

As far as 2017 is specifically concerned, we have replicated our analysis from 2015, when we used production and spending data from 2007 to the current day to create a simple regression analysis that can predict the outcome for future years for which spending estimates have been made. In early 2015 we predicted an overall outcome for the year of 2-3% growth in production, based on announced capital expenditure budgets, and the ultimate outcome was an increase of 1.4%. Our overestimate was largely caused by changes in spending plans as the oil price fell and as the rouble exchange rate fluctuated, but nevertheless the trend was directionally correct. For 2017 we use the data collected in the recent Barclays Global 2017 E&P Spending Outlook³⁷ to analyse the trends in capital expenditure and production for Russia's top six oil producers.³⁸ The results are shown in Figure 11, based on an exchange rate of RR62=US\$1 in 2017, and suggest total average production in 2017 of just under 11.1mb/d.

Figure 11: The link between Russian oil production and rouble capital expenditure



Source: Barclays Global 2017 E&P Spending Outlook, Authors' Analysis

This result needs to be treated with considerable caution, as the model is very simple and the assumptions on spending and exchange rate are variable, but nevertheless it does suggest the potential for further growth in 2017 and therefore that Russian oil production has not peaked. This conclusion is further reinforced by a more detailed examination of the underlying field data.

We have analysed the performance since 2008 of all the production subsidiaries owned by the major integrated companies in Russia as well as a number of smaller companies, PSA projects and gas companies with liquids output. From this we have been able to establish the decline trends of all the

³⁷ Barclays, 9 Jan 2017, "Global 2017 E&P Spending Outlook: Cleared for Takeoff as Spending Inflects"

³⁸ Rosneft, Lukoil, Surgutneftegas, Gazprom Neft, Tatneft and Bashneft

mature assets across the country, and have used these to forecast future performance while also using more recent trends and company plans to make adjustments where appropriate. To this analysis we have then added a review of greenfield sites, which we have classed as any asset that was in growth mode from 2012. Some of these have now gone into decline themselves (for example Rosneft's large Vankor field), others have only just started production and a third group is due to come onstream over the next few years. In the graphs below we define any new fields that are now producing as "existing greenfield" and any new fields yet to commence output as "new greenfield."

As examples of the brownfield analysis, conclusions from a number of the major production companies can demonstrate the various outcomes. Rosneft's largest production subsidiary Yuganskneftegas has shown an average production decline of 0.6% since 2008 and 1.3% since 2012, but in 2016 production grew by 2% and Rosneft has indicated that investment will be made to continue this trend until 2019.³⁹ As a result we have assumed 2% growth for the next three years, followed by decline at the average rate since 2012. In contrast Rosneft's Purneftegaz subsidiary has shown average decline of 6.8% per annum since 2012, and we have assumed that this rate will continue. Surgutneftegas' main producing company in West Siberia has shown a rather better performance over the past five years, declining at a rate of 0.9% per annum, and we have assumed that this can continue to 2020 and beyond given the company's historical focus on investment in maintaining production levels. More pessimistically we assume that Gazprom Neft's recent disappointing brownfield performance, which has seen an annual decline of 6% in 2016,⁴⁰ will continue. The overall result of the combined analysis is that Russia's brownfield assets will decline at an average rate of 2.1% per annum to 2020.

As mentioned above, greenfields comprise assets that have come into production more recently or which are due onstream in the next few years. Table 3 shows examples of some of the larger assets in both categories. Rosneft's Vankorskoye and Verkhnechonskoye are particular cases of fields that have now reached peak output but have not entered their full decline phase and so are still defined as greenfield here,⁴¹ while more obvious examples of recently developed assets are Gazprom Neft's Pirazlomnoye and Novy Port fields, both of which are still very much in their growth phase,⁴² and Lukoil's Filanovskoye, which started producing from the Caspian Sea in 2016.⁴³ Meanwhile brand new fields include Rosneft's Russkoye asset, in which Sinopec is negotiating to buy a share, its Yurubcheno-Tokhomskoye and Kuyumba fields in East Siberia and the Taas-Yuriakh joint venture, owned with BP and a consortium of Indian companies, where the second phase is due to come online in 2018.⁴⁴

³⁹ Interfax, 9 June 2016, "Rosneft expects Yuganskneftegaz to raise production soon"

⁴⁰ Interfax, 24 Jan 2017, "Oil and gas condensate production in Russia in Dec and in 2016"

⁴¹ Interfax, 24 Jan 2017, "Oil and gas condensate production in Russia in Dec and in 2016"

⁴² Gazprom Neft web site at <http://www.gazprom-neft.com/company/business/exploration-and-production/new-projects/>, accessed on 1 Feb 2017

⁴³ Interfax, 16 Feb 2016, "Lukoil to commission Filanovsky field in August-September"

⁴⁴ Financial Times, 16 March 2016, "Rosneft to sell major assets to Indian companies"

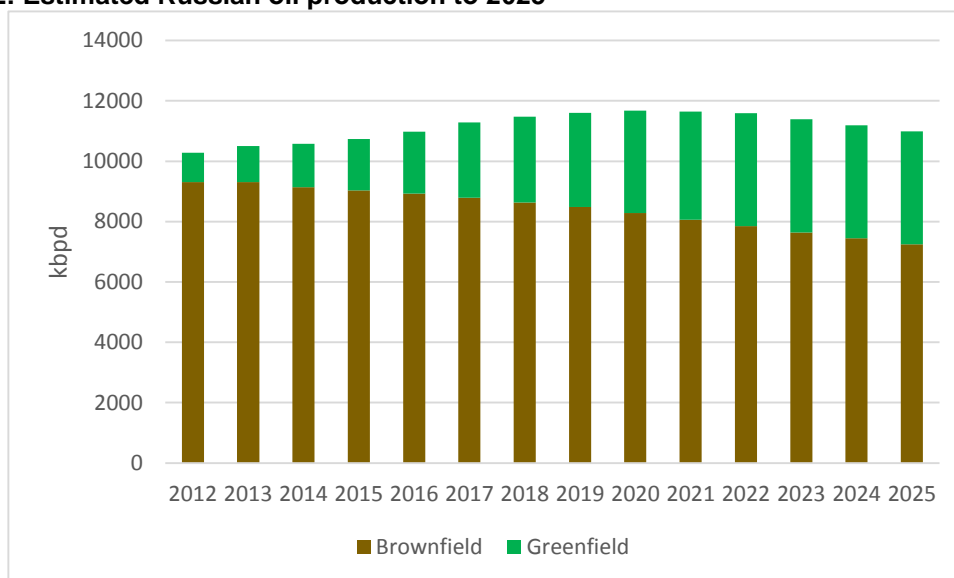
Table 3: Russia's major greenfield oil assets

Fields	Company (ies)	Peak Output (kbpd)	Launch Date
Vankor	Rosneft/ONGC/Indian consortium	440	2009
Verkhnechonsk	Rosneft/Beijing Enterprises	175	2008
Yurubcheno-Tokhomskoye	Rosneft	100	2017
Russkoye	Rosneft	130	2018
Naulskoye	Rosneft	20	2017
Lodochnoye	Rosneft	40	2019
Labaganskoye	Rosneft	23	2016
Kuyumba	Rosneft/Gazprom Neft	65	2019
Messoyakha Group	Rosneft/Gazprom Neft	130	2016
Suzun	Rosneft	90	2016
Tagul	Rosneft	100	2016
Filanovskoye	Lukoil	120	2016
Imilorskoye	Lukoil	100	2015
Pyakiyakhinskoye	Lukoil	50	2016
Prirazlomnoye	Gazprom Neft	110	2014
Novy Port	Gazprom Neft	170	2014
Trebs/Titov	Bashneft/Lukoil	100	2016
Yarudeyskoye	Novatek	70	2016
Taas Yuriakh (phase 2)	Rosneft/BP/Indian consortium	100	2018

Source: Sberbank, Company Reports, Authors' Analysis

When the impact of the brownfield and greenfield analyses are combined the outcome is consistent growth of Russian oil production to 2020, as shown in Figure 12. The total for 2017 reaches 11.25mb/d, although this does not take into account the OPEC agreement for the first half of 2017. If we assume that the impact is reduced output equivalent to 100,000b/d on average for the year, then the actual outcome in terms of total production would be around 11.15mb/d. However, we would not expect the OPEC agreement to undermine the country's long-term growth prospects, which could see production ultimately reach 11.65mb/d by 2020. Thereafter output goes into gradual decline, because the visibility of assets becomes less clear, but as we will discuss below there are good reasons to believe that production could be sustained at well over 11mb/d for a considerable time as new regions are developed.

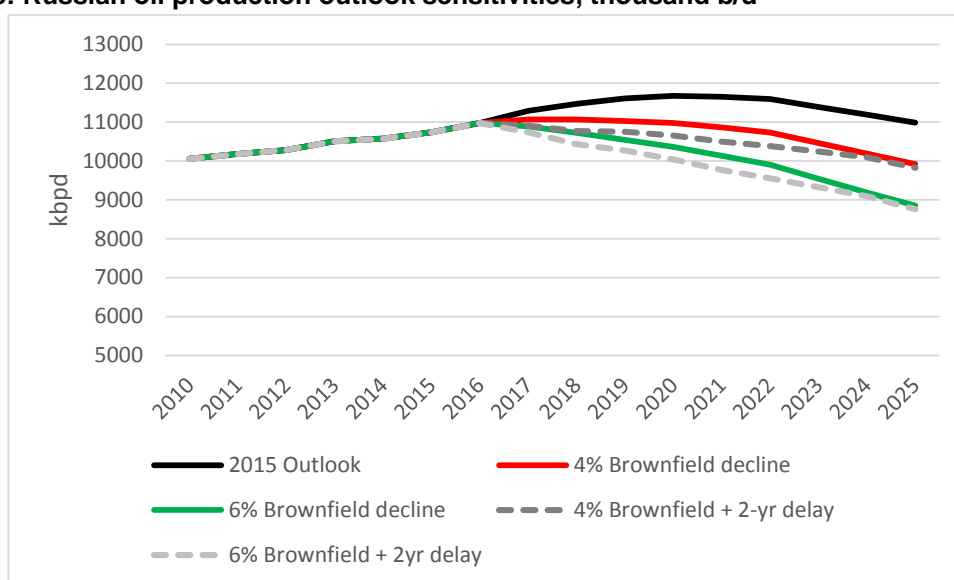
Figure 12: Estimated Russian oil production to 2025



Source: Authors' Analysis

The key sensitivities around this forecast are clearly the decline rate of the brownfields and the timing of new field developments. In Figure 13 we show a number of sensitivities, in particular for the decline rates, which we double and triple (to 4% and 6% respectively), while also delaying greenfield production by two years. The worst case scenario sees production declining to 10mb/d by 2020 and then to below 9mb/d by 2025, whereas under a more benign downside scenario (brownfield decline is 4% p.a. rather than 6%) output remains at or above 11mb/d to the end of the decade and then declines to 10mb/d by 2025. Based on this analysis we feel fairly confident in predicting that Russian oil production will be at least 10mb/d by 2020, and is likely to be above 11mb/d

Figure 13: Russian oil production outlook sensitivities, thousand b/d

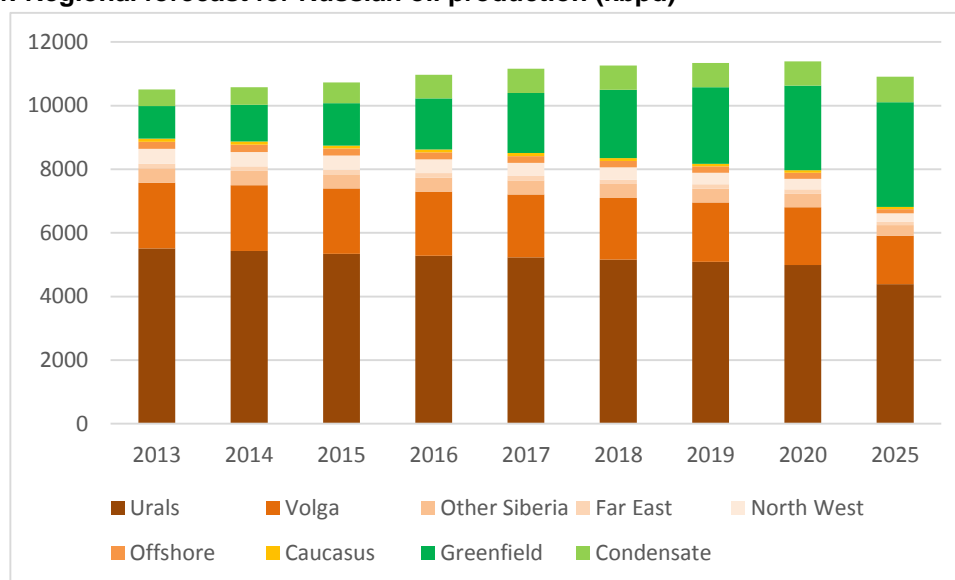


Source: Authors' Analysis

Regional analysis

As mentioned above, ERI RAS has carried out a regional analysis of the major brownfield production areas, while also looking at the new fields that will offset the declines in the older assets. It is perhaps not surprising, although nevertheless gratifying, that the overall outcomes are very similar to the corporate analysis carried out above, even though the work was done independently. Figure 14 shows the annual forecast to 2020 as well as the forecast for 2025, and the conclusion is that production in 2017 can reach 11.16mb/d, while in 2020 the figure can rise to 11.4mb/d, before declining to just below 11mb/d by 2025.

Figure 14: Regional forecast for Russian oil production (kbpd)

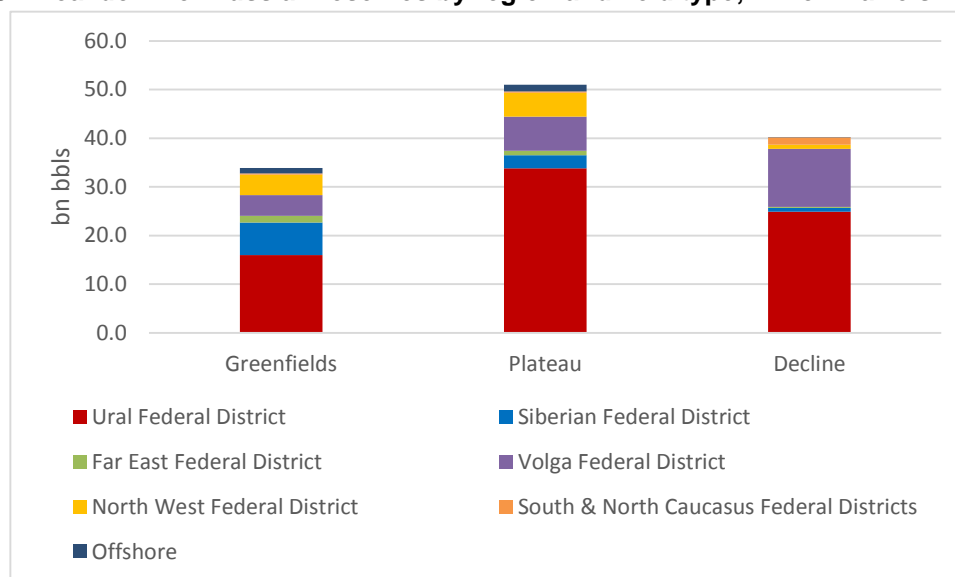


Source: ERI RAS

A number of interesting conclusions emerge from the analysis. The share of the core areas in West Siberia and the Volga-Urals region will fall from over 80% to just over 70% by 2025, while the share of production from East Siberia and the Far East will rise to 10% of the total. Production from offshore will also increase, although from a very small base, while the growth in output from the Trebs and Titov fields will see the Timan Pechora region in North-West Russia make a larger contribution. Output of condensate is also expected to increase, as Gazprom's gas output gets "wetter" and Novatek continues to focus on growing production of liquids as well as gas.

A final word on the regional analysis also emphasizes the huge potential that continues to exist in Russia's oil reserve base. ERI RAS have analysed reserves by region and by type of field – greenfield, on plateau production and declining. The results are shown in Figure 15. It is estimated that a total of 125 billion barrels still remains to be recovered from the fields under analysis, giving an overall reserve life for Russia of 31 years at current production rates. Of this 34 billion barrels is in greenfields, 51 billion barrels is in fields that are on plateau and 40 billion barrels is in fields in decline. In other words more than two thirds of Russia's reserves are still in fields that are in growth or plateau mode, underlining the scope for production increases over the next few years.

Figure 15: Breakdown of Russian reserves by region and field type, Billion Barrels



Source: ERI RAS

Longer term production opportunities

One final point to make about the future of Russian oil production is that although our regional and corporate forecasts both show a decline after 2020, in fact there are reasons to believe that a plateau above 11mb/d can be maintained or even increased. In particular, there are three regions that can contribute to medium and long-term growth. The first is East Siberia, which has already been mentioned above as an area of growing importance. In an earlier research paper for OIES,⁴⁵ one of this paper's authors has already highlighted the huge resource potential of the region and the fact that development of Russia's Eastern regions is a strategic government priority. With resource estimates of as much as 160 billion barrels and proved reserves of 10 billion barrels it is clear that there is plentiful oil to produce,⁴⁶ and with the major East Siberia-Pacific Ocean (ESPO) pipeline now in place and being expanded the infrastructure is available to move any output to the domestic and export markets.⁴⁷ Rosneft, Gazprom Neft, Surgutneftegas and Irkutsk Oil are all major players in the region with growth plans, and the increase in oil demand in China and the Asia-Pacific region provides an obvious incentive to invest. In addition, a considerable number of foreign companies, from China and India as well as more traditional players such as BP, are now participating in the region and will provide important financial and technical support.⁴⁸ Furthermore the Russian government is encouraging field developments with tax breaks, and it is possible that total production from the Russian East could reach as much as 2.5mb/d by the middle of the next decade.⁴⁹

Another region with significant conventional oil production potential is the Russian continental shelf, and in particular the Arctic. US and EU sanctions, imposed in 2014 after the start of the Ukraine crisis, have severely delayed progress with offshore exploration, as foreign companies, whose expertise,

⁴⁵ Henderson, J. (2011) *The Strategic Implications of Russia's Eastern Oil Resources* WPM 41, Oxford Institute for Energy Studies (<https://www.oxfordenergy.org/publications/the-strategic-implications-of-russias-eastern-oil-resources/>)

⁴⁶ Ibid. p.22

⁴⁷ Transneft web site at <http://en.transneft.ru/about/projects/current/1204/>, accessed on 3 Feb 2017

⁴⁸ For example, Rosneft Press Release, 17 June 2016, "Rosneft and a consortium of Indian investors signed agreements to affiliate the Vankor project"

⁴⁹ Henderson, J. (2011) *The Strategic Implications of Russia's Eastern Oil Resources* WPM 41, Oxford Institute for Energy Studies, p.60 (<https://www.oxfordenergy.org/publications/the-strategic-implications-of-russias-eastern-oil-resources/>)

technology and finance is badly needed, have been banned from participation. However, in the longer term, and assuming that the oil price recovers sufficiently to justify the investment, the Russian Arctic alone has the potential to contain as much as 50 billion barrels of oil resources (as well as an even greater amount of gas) that could produce multiple millions of barrels of oil/day. Indeed the first major discovery in the South Kara Sea, made by Rosneft and ExxonMobil just before sanctions were imposed, could contain as much as 9 billion barrels of oil, with the first well finding 750mm barrels.⁵⁰ Costs are high (one exploration well costs around \$750mm), but tax incentives have again been provided by the Russian government to ensure that developments can be profitable, with the breakeven price generally assumed to be in the \$60-80/barrel range. Realistically no oil will be produced from the Russian Arctic before 2030, but thereafter it could provide a significant boost to the country's oil output.⁵¹

The third potential growth opportunity is Russia's unconventional oil resources, including tight and shale oil and generally referred to in Russia as "difficult to recover" reserves. Again, US and EU sanctions have delayed progress, because they have banned the provision of technology and finance to develop Russia's shale resources, but both Russian and international companies are now exploring non-shale unconventional plays as momentum starts to build again to develop this huge potential resource base. The key initial work has been done in the Bazhenov shale, a resource that lies below the traditional West Siberian oil reservoirs and which could contain up to 75 billion barrels of oil resources, making Russia potentially the largest shale oil play in the world.⁵² The Russian Ministry of Natural Resources originally believed that as much as 1.5mb/d could be produced from these resources over time, and although estimates have since been lowered and sanctions have caused delays, the significant potential remains.⁵³ Domestic companies such as Rosneft, Gazprom Neft and Lukoil have spent considerable time reviewing the asset, and international companies such as Statoil and BP are now investigating other non-shale unconventional plays that can be explored without contravening sanctions.⁵⁴ Numerous problems still remain, not the least of which is likely to be the provision of adequate equipment to drill the many thousands of wells that will ultimately be needed, but again the government has offered tax breaks to encourage investment and is urging its major companies to continue exploration. Real progress will only be made once sanctions are lifted, but tight oil certainly provides a third source of future production growth.⁵⁵

Conclusions

Russian oil production accelerated rapidly towards the end of 2016 to reach a peak of almost 11.3mb/d, just before agreement with OPEC was reached to cut up to 300,000b/d in the first six months of 2017. Assuming that this reduction is implemented fairly rigorously, and evidence from January suggests that to date it is, then around 100,000b/d would be cut from average output in 2017 overall. Nevertheless, we would expect Russian production to average 11.1-11.2mb/d for the year as a whole, and then to continue growing to 2020, when the range of potential outcomes is 11.4-11.6mb/d. Confidence in this outcome is supported by the benefits of rouble devaluation and the flexible tax regime, which have protected Russian oil companies from the worst of the oil price fall. Furthermore, it would seem that there is continued commitment to maintaining upstream spending in rouble terms and also that there are sufficient new fields under development to offset declines in the older brownfield assets.

In the longer term East Siberia, the Arctic and offshore regions and Russia's tight oil resources offer further upside potential, which could keep overall production above 11mb/d during the next decade.

⁵⁰ Financial Times, 27 Sept 2014, "Rosneft and ExxonMobil strike oil in first Arctic well"

⁵¹ Henderson, J. & Loe, J. (2014) *The Prospects and Challenges for Arctic Oil Development* WPM 54, Oxford Institute for Energy Studies, pp.22-39 (<https://www.oxfordenergy.org/wpcms/wp-content/uploads/2014/11/WPM-56.pdf>)

⁵² US EIA, June 2013, 'Technically Recoverable Shale Oil and Shale Gas Resources: An Assessment of 137 Shale Formations in 41 Countries Outside the US'

⁵³ The most recent Energy Strategy has an estimate of 20mtpa (400,000bpd) by 2030

⁵⁴ Interfax, 31 Jan 2017, "Rosneft, Statoil start pilot drilling at tight oil blocks in Samara"

⁵⁵ Henderson, J. (2013) *Tight Oil Developments in Russia* WPM 52, Oxford Institute for Energy Studies (<https://www.oxfordenergy.org/publications/tight-oil-developments-in-russia/>)

Sanctions are currently inhibiting progress in the Arctic and in the development of shale oil, but should these be removed the resource bases available for exploration and development are enormous. Indeed domestic and foreign companies are already exploring ways to work on Russia's tight oil resources without contravening sanctions, which focus on shale oil only. As a result, it would seem that, barring another collapse in the oil price or a further tightening of sanctions, the longer term outlook for Russian oil production remains rather more positive than many would have imagined.

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