
Mix of Russian Liquid Hydrocarbons: Reasons/Sources for Change and Further Prospects

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Abstract

The article analyses the challenges that oil-and-condensate production in Russia is currently facing. Russia still has enormous resource potential to produce oil and other liquid hydrocarbons for many years to come. However, the quality and attractiveness of resources are changing quite substantially and rapidly. To sustain a high level of production and export, Russia needs to develop new remote oil fields and deeper layers of existing ones. The high level of production requires much more investment than before and the use of new technologies. This strategy requires a new institutional regime and much better investment conditions for private players. To diminish rising risks, Russia is developing the Eastern route for supplying oil and hydrocarbons. Nonetheless, in the foreseeable future Europe will continue to be the main market for Russian exports of hydrocarbons (as Russian oil companies own thirteen refineries across Europe), and all infrastructure is still oriented in this direction.

Key Words

Oil, reserves, Russian Central Bank, heavy oil, investments, European market, China.

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Russia's Place in Global Production of Liquid Hydrocarbons and its Role in Supplies to Europe

The Russian Federation possesses one of the world's largest mineral bases, and holds the leading position in a few key areas in the energy sector of the global economy. Russia's subsoil contains nearly 25% of the global natural gas and 10% of oil reserves. Russia is the largest oil producer in the world. The oil and gas sector in Russia has one outstanding feature in particular: despite the reforms which have taken place over the past 25 years, its dynamics and development still largely depend on those decisions and approaches that were introduced within the centralised planning system and by the administration of the former Soviet Union.

Other features (in the context of this article) include:

- A commitment to switching from one oil and gas province to another (first it was the Volga-Ural petroleum province, then Western Siberia and the Far East, as well as the shelf area of the Arctic and Far Eastern seas);

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- A main emphasis on locating and rapidly developing major and giant fields (a focus on economies of scale);
- The creating of capacities to produce hydrocarbons aimed not only at domestic consumption, but also at exporting to other countries;
- The formation of a single, tightly integrated infrastructure to deliver, process and transport oil, petroleum products and natural gas.

At the beginning of the 1960s, major oil and gas fields were discovered in Western Siberia. Since 1965 there have been discovered 11 largest deposits, of which five are named 'billionaires' for their original oil-in-place (Samotlor Field- 6684 Mt, Fedorov Field- 1822 Mt, Mamontov Field- 1349 Mt, Lyantor Field- 1954 Mt, and Priob Field- 1987 Mt). In the mid-1980s, 78 deposits in commercial development were producing 389 Mt of oil a year. Oil in the USSR was produced mainly on major deposits with recoverable reserves over 100 Mt.¹

A detailed analysis of how oil deposits were developed in the USSR as a whole and, first and foremost, in Western Siberia can be found in J. Grace's book.² As the author points out, although the USSR managed to take the lead in oil production, this success was achieved at a heavy cost. According to external evaluations, at the peak of production in the Soviet Union, real marginal costs of oil on a per-barrel basis surpassed the oil market price.

As a result of the reforms carried out in the 1990s- 2000s,³ Russia has managed to propel the oil industry economic indicators of field development to the nearly world-class level witnessed under the current conditions. At the present day, average oil production costs all over the world equal approximately US\$ 15/boe. It can be much lower in certain countries, for example, in Saudi Arabia it is \$5-7/boe and US\$ 5-10/boe in Russia. In Norway and Canada it amounts to US\$ 10- 15/boe. Russia has a significant resource base to maintain and even increase the production of liquid hydrocarbons: oil, gas condensate, as well as bitumen and heavy crude oil.

Western Siberia remains the main area of oil production (i.e. the main oil and gas province). However, that resource base of Russia, Western Siberia and other oil and gas provinces, has its outstanding feature: sharp changes in characteristics of deposits and qualitative peculiarities of produced liquid hydrocarbons.

All the major and giant fields previously discovered and brought into development are now in a declining state of production, while newly discovered deposits have much smaller reserves (per field). On the other hand, not only are sizes of deposits decreasing, but also conditions of oil production are changing: we notice a dramatic rise in the role of deposits with low reservoir characteristics and containing oil of high viscosity.

In Western Siberia- within its main area of liquid hydrocarbon production, the Khanty-Mansi Autonomous Okrug (Yugra)- the category of hard deposits includes 386 deposits in 96 fields with total original recoverable reserves of nearly 1.8 Gt of oil.

Subsoil in this area has enormous oil resources located in shale rocks (so-called 'Russian shale'), the Bazhenov Formation. The Bazhenov Formation's area on the West Siberian Plain accounts for more than 1 million km². Oil-in-place of productive sediments in the Bazhenov Formation is estimated to range between 100 and 170 Gt with original oil-in-place in Russia being 23- 30 Gt of oil. When developed by traditional methods, recovery factor of deposits in the Bazhenov Formation lies within 3-5%. Oil shale is abundant in more than 40% of the Khanty- Mansi Autonomous Okrug. According to expert estimates, recoverable oil reserves in the Bazhenov Formation reach over

3 Gt, oil-in-place amounts to 11 Gt. Currently the formation produces 0.5 Mt of oil.

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Besides heavy oils and complex fields, Russia does have a significant potential for natural gas liquids production (light and ultra-light oil and gas condensate). Production of the said hydrocarbons is related to development of gas condensate deposits in Northwestern Siberia, in the Yamal-Nenets Autonomous Okrug (YaNAO), as well as in the shelf area of Russia's Arctic seas, in the long term. Nowadays, increase in production of this type of liquid hydrocarbons is one of the factors to stabilise total oil production in Russia (natural gas liquids production currently surpasses 21 Mt). Nonetheless, this source should not be viewed as the leading one, despite its important role (3 to 4% of gross liquid hydrocarbon production).⁴

If we define the Russian potential in liquid hydrocarbon production briefly, it reveals the following trends:

- significant resource potential in liquid hydrocarbon production cannot both maintain and increase production in the foreseeable future (until 2030-2040);
- conditions of hydrocarbon production have become much more complicated: composition of liquid hydrocarbon mix has drastically changed towards heavy and highly-viscous hydrocarbons (which is associated with a need to use new technology, immense investment and, above all, a need to change the system of institutions, from taxation to encouraging new entrants into the sector);
- a need to search for a balanced strategy to develop liquid hydrocarbon production: i) further development of major existing fields, ii) exploration of new regions with a potential for 'fresh reserves' (Eastern Siberia and the Far East where fields close to ones in Western Siberia have not been discovered yet), and finally iii) increasing production of heavy and highly-viscous oil (Tatarstan, Bashkortostan, Western Siberia, the Republic of Sakha (Yakutia)). In terms of the fields previously brought into development, rates there of oil production have decreased as compared to their initial levels (e.g., the largest oil field in Western Siberia, Samotlor Field, has experienced a drop in production from 153 Mt in 1983 to 18 Mt in 2013).

It is quite obvious that current circumstances related to foreign policy- such as sanctions and the growing animosity between Russia and major industrial powers- make the solution process more complicated.

The dynamics of liquid hydrocarbon production in Russia, as well as their export to foreign markets, will largely depend on how well Russia copes with these challenges. It is quite obvious that current circumstances related to foreign policy- such as sanctions and the growing animosity between Russia and major industrial powers- make the solution process more complicated. First of all, it concerns exploration and development of the shelf areas and fields of scavenger oil (both heavy and residual), not to mention 'non-traditional' oil deposits. Such projects require not only a different institutional environment, but also modern technology and large investment. As of 2014, the proportion of traditional deposits in gross oil production amounted to ~85% (whereas shelf fields contributed less than 1%); new deposits (including 'non-traditional' ones) held a significant share, nearly 14%.

The Role of Hydrocarbons in Russia's Economy

The dynamics of hydrocarbon production in Russia is determined by

a series of various circumstances (apart from resource base, investment and technologies, see above):

- the existing engineering and manufacturing complex, which is too big and has too much capacity for the country's energy demand,
- the high and ever growing dependence of the Russian economy on the oil and gas sector (a significant role of hydrocarbons in GDP and tax revenue into the state budget), and
- solutions to internal and external economic issues on remote areas' development (mostly Eastern and Arctic regions).

At the same time, the role of liquid hydrocarbons seems to be the most important in sustaining the social-economic stability in many spheres of Russia. In April 2014, President Putin mentioned in his annual state-of-the-nation address that revenues for the state budget from oil production in 2013 accounted for US\$ 191–194 billion, whereas gas production provided only US\$ 28 billion.

The Federal government is concerned about the trend of the last 2- 3 years, in which revenues from oil exports have been steadily declining. Thus, in the first quarter of 2014, revenues of the Russian Federation from oil exports decreased by 9.9% according to the Federal Customs Service on the results of the first quarter in the Russian Federation.

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Between January and March of 2014, Russian oil export in value terms dropped by 9.9% to US\$ 38.824 billion. Oil export volume decreased by 7.9% and was equal to 52.611 Mt in the period under review vs. 57.143 Mt a year before. The main oil export turnover fell to non-CIS countries: delivery costs were US\$ 36.466 billion, which is 9.7% less than the corresponding index in the same period of the previous year (US\$ 40.395 billion in January- March of 2013).⁵

One of the ways to compensate the shortfall in income from oil export is exporting petroleum products. Thus, for January through March of 2014, Russia's revenues from petroleum products exports went up by 12.4% and reached US\$ 27.145 billion (as compared to the same period in 2013). Petroleum product export volume increased by 16.7% and equated to 37.025 Mt vs. 31.708 Mt in the period between January and March of 2013. In particular, during these three months in 2014, non-CIS countries received 33.012 Mt of petroleum products worth US\$ 24.339 billion. CIS nations imported 4.013 Mt amounting to US\$ 2.806 billion. However, the room for this manoeuvre is quite limited

because of the growing domestic demand for petroleum products, which should be satisfied in the first place.

According to the unanimous view of experts, the year 2014 shall be considered the last year that oil and gas revenues in the state budget (i.e. mineral extraction tax plus export duties on oil, petroleum products and gas) are notably growing. In concordance with “the main directions of Russian fiscal policy for 2015 and the 2016- 2017 planning period”, by the end of 2014 they will have increased by 14.5% and reached 7.48 trillion rubles, and over the years 2015- 2017 they will fall in the range of 7.5- 7.6 trillion rubles⁶.

The main reason behind these figures is not so much poor oil price forecasts on foreign markets, but the fact that oil production in Russia has stopped growing. According to forecasts by the Ministry of Finance, the taxable value of oil produced (without condensate) will drop from 465.3 Mt in 2014 to 436.2 Mt in 2017 (these projections were developed before the Ruble dropped almost two times and as oil prices reached the unpredictably low level of US\$ 40). Projections are giving the impression of priorities determined by the government and the role of oil-and-gas taxes in state budget receiveables. In 2013, this criterion amounted to 453.8 Mt (see Table 1).

Table 1: Main Parameters for the Federal Budget Project, 2015- 2017

	2013	2014	2015	2016	2017
GDP, bln rubles	66755	71493	76077	82303	89834
USD/ruble	31.8	35.5	37.0	38.0	38.8
Urals, USD/bl	107.4	104.0	100.0	100.0	100.0
Gas- average export price, USD/1000cum	342.3	351.3	317.7	259.9	292.1
Gas- export price Europe, USD/1000 cum	387.1	385.8	351.6	324.7	319.8
Taxable volumes: Oil, mln tonnes	453.8	465.3	455.8	444.3	436.2
Gas, bln cum	578.3	576.6	580.6	579.0	586.7
Gas condensate, mln tonnes	21.6	22.8	24.0	25.4	26.0
Taxable export volumes: Oil, mln tonnes	196.4	197.4	195.4	193.4	196.6
Gas, bln cum	128.7	143.2	148.6	148.7	148.7
Refinery products, mln tonnes	147.0	148.6	144.1	140.6	137.8
Federal budget tax receiveables, bln rubles					
Total	13019.19	14238.8	14923.9	15493.9	16272.9
Oil & Gas	6534.0	7480.2	7520.6	7516.1	7590.9
Mineral Tax	2514.5	2917.1	3052.4	3209.6	3251.5
Export Duty Tax	4019.5	4563.5	4468.2	4306.2	4339.4
Non-Oil & Gas Receiveables	6485.9	6758.6	7403.3	7977.1	8681.8

Source: The Ministry of Finance of the Russian Federation, “The Main Directions of Russian Fiscal Policy for 2015 and the 2016- 2017 Planning Period”.

As of April 2014, the budget funds of the Ministry of Finance of the Russian Federation had accumulated US\$ 175 billion (or 8.6 % of GDP). Nearly a half of these means is stored in the Reserve Fund, and the other half is in the Russian National Wealth Fund. The maximum proportion of reserves accumulated in these funds was reached in 2008 (almost 14% of GDP). Before 2008 (starting from 2004), the means were stored in a single fund named the Stabilisation Fund of the Russian Federation. Both creation of the funds and their splitting was an attempt to reduce reliance of state budget revenues on oil and gas revenues and save up for “unforeseen circumstances”. However, currently the deficit of the consolidated budget tends to grow (since 2012) due to a reducing share of oil and gas revenues, falling profit, and steadily increasing high government expenditures.

Such tendencies- low yield from the non-oil and gas sector of the economy combined with growing challenges in maintaining production in the oil and gas sectors- create a complex situation.

As can be seen in the table above, the government expects to sustain exports of hydrocarbons, primarily of oil and gas, at a high level (along with a certain reduction in exports of petroleum products). According to the International Energy Agency, in the next five years growth in domestic demand for oil in Russia will move ahead of growth of its extraction. Note that the energy

consumption of the Russian economy, i.e. energy input per GDP unit, is one of the highest in the world.

At the same time, export of hydrocarbons should not only keep a big share of tax inflows into the state budget, but also assure substantial income of financial resources to explore new (more complicated and less traditional) sources of hydrocarbons.

The main problem is that the Russian financial system is not large enough to satisfy financial needs of the biggest local oil and gas companies. Companies in the oil and gas sector previously invited necessary financial assets from foreign financial markets. One of the results is that the external debt of the corporate sector of the Russian economy has increased from US\$ 500 billion to more than US\$ 700 billion over a period of three years (2012- 2014).

At the same time, the ability of the largest Russian government banks to attract long-term debt financing from the US and the EU has decreased due to the sanctions imposed in 2014 (because they are the source of funds for the corporate sector).

Formally, oil production targets and the role of oil export are underlined in regularly updated versions of the Energy Strategy of Russia (the last one was the Energy Strategy of Russia for the period up to 2030, dated 2010; discussions are now on-going over the new version - up to 2035).

Due to this document, the main targets of energy sector development are the following:

- stable and reliable delivery of oil and oil products for the internal market;
- growth of energy efficiency in all sectors and spheres of the national economy;
- financial stability of the energy sector and its subsectors and stimulation of the productivity growth over the economy;
- environmentally sound behavior in all energy sector's subjects.

The biggest difference in the latest versions of the Energy Strategy is special attention to foreign economic relations and to Russia's participation in different energy markets. It underscores the growing importance of taking into account changes considering the EU in connection with the development energy market there.

As for oil sector development, special attention has been given to the following issues:

- stable and economically viable delivery of oil and oil products;
- stable financial flows of state budget receivables;
- formation and sustaining of high demand for the production of the supplies sectors of the economy.

Thus, to achieve the required rate of production and export of hydrocarbons from Russia to the countries of Western Europe, among others, there should be considered a number of important influencing factors:

Russia needs to maintain exports of hydrocarbons at a relatively high level, based, in general on data from the Ministry of Finance of the Russian Federation, which should not change in the next few years. Apart from revenues from energy exports (including those for the state budget), Russian oil and gas companies need to have access to foreign markets of financial resources and modern technologies to explore new, more complicated, and less traditional sources of hydrocarbons.

What are the characteristics of new sources of hydrocarbon production in Russia?

New Sources: Where Could New Oil Come From?

Over the past 20- 25 years, the dynamics of production and export of hydrocarbons are characterised by the following:

1980- 1990: A decrease in rates of growth, then absolute decrease in extraction;

2000- 2005: A dramatic increase in extraction rates (the fastest rate was 13%

a year in 2005) and, consequently, rapid accumulation of absolute oil production output.

2006- 2010: A decrease in rates of growth oil extraction rates and the beginning of the decrease of absolute production output of liquid hydrocarbons.

2011- 2014: A cessation in growth of oil production, with an increase in a few years due to new deposits, which, nonetheless, does not help to overcome the general trend of falling extraction rates.

One of the main reasons for the rapid growth of oil extraction in the 2000s has been the advent of new modern oil recovery methods, such as horizontal drilling and, first the foremost, hydraulic fracturing. In general, these are considered 'aggressive methods' to extract oil from formations in fields previously brought into development. On the other hand, those methods cannot be used in the same fields over extended periods of time. This is the reason why even now the said techniques do not give the expected results. To keep at least at the current level of oil production, companies should drill new boreholes and explore new deposits. However, this requires immense investment. The described strategy is not supported by the rather rigorous taxation of the Russian oil industry that does not motivate companies to invest more.

The oil and gas sector in Russia is currently facing a complex task to find

an effective combination of the following strategies:

- increasing extraction from fields previously brought into development;
- finding efficient solutions and approaches to exploring new sources: fields of heavy oil and non-traditional deposits (see above, ones like 'Russian shale');
- active geological prospecting and exploration in new regions: the Arctic, Eastern Siberia, and the Far East, along the sea shelf.

The first approach is attractive because when oil is produced with new innovative methods that increase the formation recovery factor in regions with developed infrastructure, oil production costs are 1.3- 1.5 times lower than in new capital-intensive fields in Eastern Siberia and continental shelf areas. The most typical example is OJSC Tatneft. The company develops mostly worked-out deposits with scavenger reserves of sour crude oil. In Tatarstan, the 'easy oil' had been completely recovered by the end of the 1980s. Over the period of 19 years (1975- 1994), production output in the Republic decreased from 103 Mt to 23.8 Mt of oil. Nowadays, there are more than 5.3 thousand wells with yields of less than 1 tonne per day, with a total of 22 thousand boreholes. Nevertheless, production rates in Tatarstan are growing; in 2013, they exceeded 33 Mt. The main focus of OJSC Tatneft is development of deposits with highly-viscous bitumen.⁷

Outside of the large fields, the unallocated subsoil reserve fund still has under-explored (and, consequently, high-risk) sites both near the ones that are being developed and far away from the infrastructure.

The majority of fields in Russia, regardless of their geological characteristics, are developed with traditional technology: by depletion and water flooding. Over the past 30 years, the projected oil recovery factor (ORF) has decreased from 40- 41% to 33- 34% due to the deterioration of the structure of reserves, i.e. the need to develop fields with scavenger reserves, including shale oil, highly-viscous and super-viscous oil and bitumen. The water flooding method is ineffective in fields with carbonate and fractured porous reservoirs, highly-viscous and shale oil where ORF amounts to 2- 15%. Around the world, in order to develop such fields, advanced technology is widely applied: thermal, gas, chemical, microbiological methods, their modifications, combinations, and integrations.

In support of the second approach is the fact that the proportion of scavenger oil reserves has increased by 70% over the past two decades. According to different estimates, global production of scavenger oil accounts for 19.4% of the total production; in Russia this figure is only 0.2%. As reported by the

Energy Information Administration at the IEA: Russia holds first place for the proportion of scavenger oil reserves (shale oil) which can be extracted with the help of existing technology- 75 billion barrels, or 10.3 Gt. The USA possesses 58 billion barrels; Chile has 32 billion barrels; and Argentina and Libya own 27 and 26 billion barrels, respectively. Nearly 65% of all scavenger reserves are located in the oil fields of Western Siberia and the Komi Republic. In the Khanty- Mansi Autonomous Okrug, only 64% of resources are considered to be commercially viable; the rest are not developed because of the high tax burden.

The third approach is followed by the oil and gas sector due to the following circumstance: as of 2013, according to the Federal Agency for Subsoil Use, the Russian unallocated subsoil reserve fund still has only three significant deposits. In total, the unallocated fund holds about 885 tonnes of recoverable reserves. Not long ago, the fund had nearly 614 deposits with total recoverable reserves amounting to 884.7 Mt, which is approximately 3% of all recoverable reserves. Currently, only three more deposits are left unallocated: Rostovtsevskoye (YaNAO, 61 Mt), Nazymyskoye (KMAO, 43 Mt), and Gavrikovskoye (40 Mt). They all are located on land. Private companies can also access those fields; while shelf deposits are closed for them. Outside of the large fields, the unallocated subsoil

reserve fund still has under-explored (and, consequently, high-risk) sites both near the ones that are being developed and far away from the infrastructure. We can positively say that the distribution of the mineral resources base established in the Soviet era is almost complete, and new large deposits will not soon be discovered. Prospective discoveries of new large deposits are associated with hard-to-reach regions of Eastern Siberia, and the Arctic and Far Eastern shelf areas. Although since 2006 reserves increment in Russia (according to the ABC1 category, Russian reserves classification) has exceeded production output, new fields only take about 80 Mt of oil, the rest is reserves additions resulting from revaluation of developed fields.⁸

Russia's leading oil and gas companies are trying to combine all three approaches. However, not every company has succeeded.

Thus, the strategy till 2030 of OJSC Rosneft, the leader in oil production, incorporates four steps of development. The first step involves 'ensuring extraction' from the existing fields owned by the company. The second one is to launch new projects in Eastern Siberia, first and foremost, the Vankor group: Suzun, Tagul, Lodochnoye, Yurubcheno-Tokhomskeye and Kuyumbinskoye oil fields. This same stage is assigned for planning to launch gas assets: Rospan, fields of Kharampur and Kynsko-Chaselsk groups. During the third step, there will be ensured

a significant production gain due to a massive development of scavenger reserves. The fourth step is aimed at developing deposits in shelf areas.⁹

Even if new sanctions are not imposed, but existing restrictions remain for a long time, it will greatly affect the investment climate in Russia and production figures.

Rosneft manages the largest projects on non-traditional resources, as well as projects on shelf areas exploration. The company needs US\$ 500 billion to develop the Arctic shelf alone, which holds resources of more than 35 billion of boe.¹⁰

According to another company, private OJSC Lukoil, Russia faced zero growth of oil production in 2014 and an inevitable drop in production thereafter. "Following our calculations, we expected a decline in oil production in 2016. However, now we are looking at our colleagues and can predict the depression even earlier, in 2015". Lukoil is planning to ensure growth of production by 5.7% up to 96 Mt in 2014. Another private company, OJSC Bashneft, is projecting to extract nearly 17.5 Mt (+8% as compared to 2013). In the next few years, the company plans to keep production in developed fields at 15 Mt and accumulate extraction in their new assets in the Nenets Autonomous

Okrug (Bashneft-Polyus) and Tyumen Oblast (Burneftegaz). A representative of Gazpromneft only noted that extraction growth rates reached in the first six months of 2014 had been maintained (+4.1% is the growth in production of hydrocarbons).¹¹ Although oil production in 2013 amounted to 523 Mt, having increased by 5.2 Mt as compared to the previous year, traditional oil and gas fields which produce 85% of Russian oil are exhausted and are showing worse results. We need increasingly more complex technology and equipment in order to explore scavenger fields (including shelf areas, Eastern Siberia and the Far East) and to recover shale Bazhenov oil (so-called 'Russian shale' oil).

Russian oil is in a situation in which manoeuvring options within existing fields are limited. Most of big fields are in a declining stage or will require additional investments to reach production capacity.

At the beginning of 2014, direct investment into new Russian deposits was evaluated at about US\$ 500 billion until 2030, these projects could have invited US\$ 300 billion more of investment into the economy of Russia. A reduced sovereign credit rating and less access to international financial markets are much

more destructive for Russian oil and gas companies than direct sectorial sanctions. According to Bloomberg, July of 2014 did not see Russian companies taking dollar-, euro- or Swiss franc-denominated loans. In the first half of the year they borrowed US \$6.7 billion from Western European banks, 3.9 times less than the previous year; this figure includes borrowing of mineral companies- US\$ 3.5 billion- which is the lowest it has been since 2009. No major companies have announced they are delaying or cancelling any specific projects due to the sanctions and funding problems; still, there is a chance for capital expenditures to be shortened and certain projects to be postponed in the future, and this could affect oil and gas production in Russia.¹² Following the forecast by Bank of America Merrill Lynch (BofA), even without sanctions, production would have been decreasing by 1.5% a year. Now it might drop by 25% in the next 10 years. The industry may not receive nearly US\$ 1 trillion of its due share of investment over the next 30 years, which, according to BofA, will lead to a decline in production and budget revenues by US\$ 27- 65 billion by 2020.

Even if new sanctions are not imposed, but existing restrictions remain for a long time, it will greatly affect the investment climate in Russia and production figures. The explanation for this can be found in the long term nature of the decision implementation process in the oil-and-gas sector - from exploration to

production usually takes from 8-12 years until the first received barrel of oil is produced. Currently, Russian oil is in a situation in which manoeuvring options within existing fields are limited. Most of big fields are in a declining stage or will require additional investments to reach production capacity.

Not only investment and technology hinder the maintenance and improvement of hydrocarbon production. No less important is the changing institutional system of the oil and gas sector. Development of the mineral sector in any country involves risks, and it seems clear that in Russia the risk is increasing. At the same time there are elements in the institutional framework, both in the taxation and licensing systems that are dysfunctional when it comes to risk-taking. But in addition to inadequate formal framework conditions it must be asked whether Russian oil companies have characteristics that make them inclined not to take risks. On a general level the Russian petroleum companies- state controlled as well as private- live under 'soft institutional constraints'. This is a wider term than 'soft budget constraints' coined by Kornai, denoting the ability of enterprises in the centrally planned economy to exceed budgetary limits and be compensated for over-spending. Soft institutional constraints imply that enterprises are able to manipulate their framework conditions to increase their

profit, be it from tax concessions or legal provisions or specific conditions for new development projects. The emergence of soft institutional constraints must be seen in connection with the political and economic system that has developed in Russia. The system is oriented towards support for big financial and industrial structures. Their leaders- who are fairly limited in number- interact with the authorities on a personal level, and the authorities participate directly or indirectly in many companies. Companies are to a large extent controlled by individuals, as opposed to publicly traded companies with many owners. Economically the system is oriented toward rapid pay- offs from investments and existing assets. We believe this combination of political and economic characteristics logically leads to a priority for large-scale projects with 'guaranteed' return and minimal economic risk. In most countries with a maturing petroleum sector, a diversified industry structure is usually regarded as a precondition for effective resources management. Small, specialized companies take care of tail production from fields no longer of interest to the big companies, and specialized exploration companies venture into new areas with particular challenges, turning discoveries over to regular production companies. Despite changes in the resource base, the Russian petroleum sector continues to be totally dominated by big vertically

integrated companies- and indeed this is in line with official policy. The five leading oil companies account for 85% of Russia's output. In all there are eight vertically integrated oil companies. There are also about 250 other, relatively small companies. They include companies with Russian as well as foreign owners, and mixed. But despite their numbers they are not playing an important role in Russian energy policy. Developments in the resource base call for pluralism in approaches and solutions to both exploration and production. The big companies can only offer a limited choice. Also the considerable unconventional oil resources might be easier to access with a more diversified industry structure, due to high risks as well as the need for specialized technological skills. In the U.S. such resources have typically been developed by relatively small, independent companies.¹³

In particular, it can be suggested that to bring value to the oil and gas sector, the following critical steps can be taken:

- create a competitive service sector. In this case, expenditures would reflect existing relative limits more accurately. It is possible that they would go down from the current level where they are used for various manipulations within major companies;
- improve the regulatory framework for licensing, which should encourage exploration and more balanced

development of the resource base;

- implement new large-scale projects based on transparent project financing by subsidiaries or joint companies;
- restructure major government-owned companies by dissociating them from auxiliary and secondary activities and providing an opportunity to concentrate on those spheres where they are particularly strong and able to take advantage of economies of scale.

At the same time, the matrix of property components and methods of operation of the companies were mostly developed during the second half of the 1990s, in the post-Soviet period when the country had a weak federal status and no policy to actually control its oil and gas resources.

An effective regulatory system should develop gradually. Moving in this direction does not mean liquidating large enterprises. In the foreseeable future, they will remain strong on international markets and a 'backbone' for the hydrocarbon production and processing sector. If these companies were somewhat reduced in size, it would allow them to become even stronger as it would improve their performance and

international competitiveness. So, the reforms could be considered acceptable even by a good many of those who are interested in the *status quo*.

Apparently, planning and management in the Russian oil sector relies on previously made decisions. The modern structure of the industry is rooted in the past, which impedes its further development. Speaking more specifically, what hinders it from making full use of market mechanisms is the technological structure, and main production assets formed during the centralised system of the Soviet oil and gas sector. At the same time, the matrix of property components and methods of operation of the companies were mostly developed during the second half of the 1990s, in the post-Soviet period when the country had a weak federal status and no policy to actually control its oil and gas resources. The current organisational structure and approach to regulating the sector does not satisfy the growing need to develop the resource base. This creates a problem that will become more and more urgent over time.

Diversification of Hydrocarbons Delivery Destinations and Supply Routes

As we have mentioned above, hydrocarbon export is not only related to the fact that the system of centralised

administration formed the oil and gas sector within the borders of modern Russia, with more capacity for producing hydrocarbons than Russia needed. The most important circumstances are as follows:

- a resource base located in Russia and the possibility to specialise its economy, i.e. to produce energy resources (not only to meet the need of the former Soviet Union, but also to export);
- previously established transport infrastructure to deliver hydrocarbons to Europe via port terminals, pipelines, and railheads.
- an urgent need for rental income to fund ever-growing government liabilities and heavy social expenditures.

At the end of the last century, an increase in export supplies gained momentum with an inflow of hard currency to address urgent social and economic problems. Insolvency of the domestic market participants also encouraged all oil and gas companies to increase export supplies of hydrocarbons. This period revealed a lack of port terminals and export routes for liquid hydrocarbons. To overcome these difficulties, there was proposed a set of improvements: increased capacity of port terminals in Novorossiysk and Tuapse, new terminals near St. Petersburg, and new facilities in Northern Russia, namely Murmansk, Arkhangelsk, and the Pechora Sea (Varandey oil terminal)

and others. While overcoming the flow capacity limitations in the west and northwest, Russia started to construct the Eastern Siberia- Pacific Ocean oil pipeline (ESPO pipeline) and develop port infrastructure in the Far East.

The share of medium distillate supply from the USA to the EU market is growing: in 2002, the US share in European import only accounted for 2%, in 2012 this figure rose to 17%.

To date, the overall shortfall in capacity in the western part of Russia has been overcome. As for the eastern region, infrastructure there is under active development. Expansion of supplies to the east is affected by a number of facts:

- a desire to diversify hydrocarbons delivery destinations, as the Asia-Pacific is one of the fastest growing regions in terms of economy and energy consumption;
- the development of oil and gas production in Russia directly within the territory near the Asia-Pacific countries (more than 10 years ago, new facilities on the Sakhalin Island Shelf started to operate, a liquefied natural gas plant (LNG) was brought into production, and a gas transmission infrastructure was constructed);

- a chance to attract a large amount of financial resources (for future oil and gas supplies), primarily, in the framework of intergovernmental agreements between Russia and China.

As a result, OJSC Rosneft holds significant contractual obligations to CNPC (China). A contract for the supply of 15 Mt of oil a year was signed in 2009 and is valid until 2030. In 2013, an additional contract was signed for the supply of 360.3 Mt over a twenty-five-year period valued at a sum of US\$ 270 billion. Under the last contract, the Russian company received US\$ 70 billion in advance. In 2013, OJSC Rosneft delivered to China 15.753 Mt of oil.¹⁴

The Vankor oil field is one of the main fields in Eastern Siberia. Nowadays, nearly 70% of oil from the field goes to China via the ESPO pipeline. Rosneft is building up the Vankor oil and gas cluster in Eastern Siberia, and it is planned that by 2020 its annual production will have reached 50 Mt. Besides the Vankor oil field, the cluster will comprise 17 licensed deposits, including the Tagul, Suzun and Lodochnoye fields, with an estimated 3 billion barrels of reserves. Production will start in 2017. Experts say that China may get a share in the Vankor cluster, but no more than 20%. At the end of the second quarter of 2014, total investment inflows into Vankorneft amounted to US\$ 17 billion. China is already producing oil in Russia: Sinopec

has a joint venture with Rosneft, namely Udmurtneft. In October 2013, Rosneft and CNPC signed a memorandum on establishing a joint venture (with 51% owing by Rosneft) to explore and recover oil in Eastern Siberia.

Prices on energy carriers in Asia are higher than in Europe: in the mean, gas prices are greater by one-third there, and oil prices are higher by an average US\$ 5 per barrel. For this reason Russian oil companies have long aimed to raise the share of supplies to Asia. In 2013, they decreased supplies to Europe by 6%, and increased those to the Asia-Pacific countries by 15.6%, up to 37 Mt. The biggest supplier on this route is Rosneft. Starting from 2011, it has been delivering 15 Mt of oil a year to CNPC via the Eastern Siberia- Pacific Ocean pipeline (ESPO). The company also aspires to make supplies to India. Other Russian companies would also like to increase their share of supplies through this pipeline. For one, JSC Gazprom Neft hopes to export oil to Vietnam.

Nonetheless, Europe is currently the main market for Russian oil and gas. In 2013, Russia produced 523 Mt of oil, of which 155 Mt were sold to Europe (about 40% of its demand). In 2013, Gazprom produced 487 bcm of gas, of which 165 bcm were exported to Europe (one-third of the EU demand). It is customary for many oil refineries in the EU to operate on Russian Urals crude. Rosneft, Gazprom Neft, Lukoil,

and Zarubezhneft all have their plants there. To switch to a different type of oil means to invest heavily in restructuring of the existing oil refineries. Russia is also not capable of transporting all oil from Europe to Asia, due to the limited export capacities in the eastern part of the country. Taking into account petroleum experts' plans, OJSC Transneft will have increased the flow rate of the ESPO pipeline up to the needed 80 MT only by 2020. There are reasonable arguments in favour of the supposition that China, given the necessary capacities, would be able to receive 155 Mt of oil redirected from Europe over the course of 3-5 years. However, it would decrease its price in the Asian market.

At the same time, Russian diesel fuel, the main goods for export to Europe today, may become useless in case of depleted supplies. In 2013, Russia exported half of all diesel fuel produced in the country, i.e. 35.9 Mt; by 2020 it will have increased by 16 Mt. Europe is gradually cutting down oil refining processes, and the rate of diesel fuel consumption is declining. At the same time, the share of medium distillate supply from the USA to the EU market is growing: in 2002, the US share in European import only accounted for 2%, in 2012 this figure rose to 17%. In China, for its part, there is no demand for diesel fuel. On the contrary, the country is building up export trade of its own petroleum products, turning into a

fuel supplier. Therefore, should deliveries to Europe stop, it may result in shutting down the processing plants on some Russian oil refineries.¹⁵

With respect to all the mentioned circumstances, we can claim that crude oil export in Russia will stabilize at the level of 230 Mt a year; at the same time, petroleum products export has reached its maximum point at 153 Mt in 2014 and will continue to decline.

Conclusion

The Russian oil and gas sector is facing many compelling challenges. The major one is depletion of large traditional hydrocarbon deposits previously brought into development. The country still has an immense resource base, but its qualitative characteristics (a small number of discovered fields, increasing role of deposits with heavy and non-traditional oils) are related to huge investments and stimuli for their inflow. Apart from investments, exploration of more difficult and complex fields is bound with the use of modern technology and advanced techniques. The described situation shows how much it is critical and valuable for Russian companies to integrate with foreign partners who possess relevant experience and technology.

On the one hand, focusing on attracting Chinese financial resources to implement large-scale projects in the east does give access to these resources. On the other hand, it does not solve the problem of collaboration with partners who have modern technology and practice with non-traditional sources of hydrocarbons. It is for this reason that between 2012 and 2013 Russia made a number of alliances with leading multinational corporations.

In general we may say that Russia has entered a period of stable oil production and zero growth. Whether or not production will be maintained at

Whether or not production will be maintained at current levels depends on how congenial the Russian investment climate will be to involve more middle-sized innovation-oriented companies.

current levels depends on how congenial the Russian investment climate will be to involve more middle-sized innovation-oriented companies. A particular focus on supporting the efforts and proactive attitude of large companies (the majority of which are partially owned by the state) does not seem productive in this situation. Russia's cooperation with Europe in the energy sector- not only in the form of energy supply, but also with access to technology, skills and investment- will keep its dominant position in the foreseeable future despite the fact that relations with China in the energy sector are actively developing.

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