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Energy in Russia, the subject of this issue of the *Oxford Energy Forum*, has this year returned to the forefront of debates among academics, policymakers, and those in the industry. Politics, never far from these debates, is a factor: as a result of events in Ukraine, the tension between Russia and the western powers has risen to its highest level since the Cold War. The editors have endeavoured to provide commentary on the political and economic context for energy developments, while also inviting recognized specialists to comment on the host of issues – from long-term upstream oil issues to Russia's domestic electricity market – that are sometimes neglected by big-picture analysis.

Simon Pirani comments on the likely long-term effect of the Ukraine crisis both on Ukraine and on Russia itself. The results of the political and military crisis, he argues, will be to push ahead the decoupling of Ukraine's energy sector and economy from Russia's still further; for Russia, this is part of a centrifugal process that has pulled almost all the other former Soviet states out of its economic orbit. Far from displaying Russian strength, on a longer view the crisis highlights its role as a supplier of raw materials and energy to the world economy – hardly the basis for superpower status.

Chris Weafer also writes about the likely outcomes of the crisis, focusing on Russia's energy exports and how their changing profile will affect investment decisions. He considers the construction of extra gas supply capacity to Europe to be a 'dangerous game' for Gazprom, while the blocking of new pipelines is also 'short sighted' from the European Commission's standpoint. The cross-border gas industry will grow substantially in the next decade, he argues; the opportunities to coordinate the supply side have passed and some sort of free-for-all may ensue.

Readers should note that the *Forum* was at an advanced stage of production when the most recent round of EU sanctions on Russia was announced on 29 July, and these are therefore not dealt with explicitly.

Tatiana Mitrova considers the changing corporate landscape of the Russian energy sector since the turn of the century. Having surveyed the shifts between state and private sectors, she concludes that, in the face of the cooling of political relations with the west, interest in market reform will recede. Mobilization and centralization in response to external enemies will be the watchword; the liberal bloc's time in government has passed and conservatives will guide policy; further shifts in the balance of state and

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Energy in Russia

private capital will not increase real competition but simply re-divide power within the state.

Maria Sharmina deals with the great elephant in the rooms in which Russian energy policies are decided: climate change. While government, big business, and the state-dependent population all benefit from a thriving oil and gas sector, a shift to a low-carbon economy would have tremendous benefits for Russia, she argues. A 'dramatic' transition away from fossil fuel dependence would inevitably mean a technological and infrastructural overhaul and would provide international leadership.

After these four articles on general political and economic issues, there are two that focus on Russia's energy exports. In the first of these, *Jonathan Stern* and *Katja Yafimava* review the pricing, transit, and regulatory issues, before concluding that – despite political hand-wringing about Russia's annexation of Crimea – Russia will remain the largest source of European gas imports: the buyers' contractual obligations, to say nothing of the lack of alternative supplies, making any substantial reduction in gas flows to Europe very unlikely over the next decade.

Russia's gas exports to Europe may not grow, but, *Michael Bradshaw* argues, the agreement on gas exports finally signed with China in May will be the start of a long-term and expanding gas export trade with Asia. Ninety per cent of future gas demand growth between now and 2050 is likely to be in Asia, he writes, and so the deal should open a new chapter for the Russian producers. Among the wild cards is the role that Rosneft, the state's flagship oil company, may play at Gazprom's expense.

The articles in the final, and largest, group look more closely at the main energy producing sectors.

Arild Moe, in the first of three articles on oil, considers the likely trajectory of upstream development now that the largest fields developed in Soviet times are in decline. The corporate structure of the industry, which is dominated by large companies, means its options for developing new resources are constrained. But even the large new greenfield developments contemplated may work better if the Russian companies cooperate with international partners with the relevant experience; the degree to which such an approach will be adopted remains to be decided, Moe argues.

The potential for some medium-term boost to output from unconventional oil resources is discussed by *James Henderson*. He concludes that while the resource base appears to be very significant, a number of logistical and commercial challenges remain. In particular, it remains unclear whether the service industry will be able to cope with a rapid increase in drilling, and also whether the corporate landscape in Russia, which is dominated by a few key state-owned players, is suitable for the entrepreneurial development of shale oil. He also points out that the tax system is yet to be fully adapted to the commercial realities of unconventional oil investment.

Julia Loe's subject is Russia's Arctic resources. Their true potential remains an open question, she argues: only very sizeable discoveries would justify the heavy up-front investment necessary to develop oil fields in such a harsh environment. She raises the intriguing possibility that joint Russian–Norwegian development of resources in the Barents Sea may be the first entry point into the massive but expensive-to-access resources available.

James Henderson's second article reviews the domestic gas sector. He notes that the Russian domestic gas price has reached an equilibrium level allowing for competition between suppliers. The continued dominance of Gazprom remains an issue, he argues, despite the fact that its export monopoly has begun to be loosened – and it seems unlikely that this will change, at least until its new infrastructure projects, including the Power of Siberia pipeline, are completed. Nevertheless, the prospect of a fully liberalized market being in existence by 2020 is becoming more of a realistic option than might have been envisaged even three years ago.

Liudmila Plakitkina assesses the position of Russia's coal industry and its prospects up to 2030. The commanding position enjoyed by relatively cheap gas in the thermal power station market has constrained coal demand in Russia, Plakitkina points out, and she enumerates reasons why this is unlikely to change substantially. She is also cautious in her view of possible export growth up to 2030: the 'shale gas' revolution, environmental considerations, and technological change may counteract much of the effect of demand growth in Asia.

Sylvia Beyer, in the final article in this edition, reviews reform of the Russian electricity sector over the last decade and the current (2013–15) measures. She gives a detailed account of Russia's introduction of a capacity market and compares it to the experience of other countries. Beyer discusses how investment in new capacity, and in the no less tricky challenge of decommissioning old plants, might be managed from here: options include introducing a competitive energy-only market, with regulated capacity mechanisms phased out, or using capacity payments targeted at modernization. The wholesale electricity market, she concludes, needs no revolution but an evolution towards greater transparency and efficiency.

The Ukraine crisis: another crossroads on Russia's downward path

Simon Pirani

The energy aspects of the crisis in Ukraine are viewed by many western observers in terms of the energy security of European countries whose gas imports might be affected, and the perceived danger that Russia will use its energy resources to enhance its geopolitical position. Such starting points obscure vital questions for both Ukraine and Russia. The most pressing energy security issue – that millions of Ukrainians may face serious shortages of gas, electricity, and heat this winter – is downplayed, along with the long-term advantages that this crisis could produce for Ukraine if it reduces its dependence on imported gas. As for Russia, the obsessive focus on its government's geopolitical aspirations obscures larger issues: that its economic influence over (and energy trade with) Ukraine and other neighbours is declining, its own economy is becoming more and more one-sidedly a supplier of oil, gas, and other raw materials to world markets, and its own development in the broadest sense is suffering as a result.

'… MILLIONS OF UKRAINIANS MAY FACE SERIOUS SHORTAGES OF GAS, ELECTRICITY, AND HEAT THIS WINTER …'

For Ukraine, the immediate energy issue is that since 16 June deliveries of Russian gas have stopped, due to unpaid debts – stated by Gazprom as $5.4 billion. For many years, commercial negotiations, however fraught, were usually resolved with the help of parallel political talks. But now there is no meaningful political communication and, consequently, the danger of a lengthy cut-off looms. Ukraine should be able to hobble through the summer, especially if the European Commission comes good on vague promises to help finance refilling gas storage facilities. (About 6 bcm is needed in July–September to reach the normal pre-winter level.) But it cannot get through the winter without Russian gas.

Alternative supply arrangements

Much is made of the potential of 'reverse flow' deliveries from central European countries. But no more than 15 bcm/year of capacity (and probably less) will be available this year, while Ukraine's gas import requirement stands at 30 bcm/year. The gas will still almost all originate from Russia and will need paying for. If supplies stop during the winter, a secondary set of energy-related hardships – including widespread power, heating, and gas cuts and industrial shutdowns – could add to the humanitarian disaster caused by near civil war in eastern Ukraine.

In the longer term, this crisis seems sure to accelerate the decoupling of Ukraine's energy system from Russia's. In the gas trade, where two decades ago Soviet-era internal transfers gave way to commercial relationships underpinned by intergovernmental agreements, a new transition seems inevitable. When Naftogaz's current import contract expires in 2019 – and quite possibly before then – Ukraine is likely to move to a new, market-oriented system, in which the political underpinning is removed, and gas is sold at Ukraine's eastern border to any buyer. The post-Soviet arrangements, under which Gazprom's gas for Europe was transported through Ukraine and sold on contracts at its western border, are also being dismantled: Gazprom is seeking alternative export routes, and both Ukraine and the European Commission want to integrate its transport network and substantial storage capacity with markets further west. Politicians who talk about these changes as potential solutions to this year's crisis are putting the cart before the horse – but they are possible over the longer term, as a result of the crisis.

Prospects for future energy demand

In the course of such a transition, Ukrainian dependence on Russian gas might be reduced not only by 'reverse flow' and sourcing other alternative supplies – although realistically these could only come from increased domestic production – but also by destroying some gas demand altogether through the employment of energy efficiency and conservation measures. Ukrainian specialists have often said that straightforward, economically rational measures could halve the country's gas import requirement within five years. The prospect of progress towards a less inefficient and less wasteful energy system – one that is also less under the control of small political and business interest groups and less dependent on Russian supplies – seems to be not only welcome but also a fairly likely outcome of the crisis.

From Russia's point of view, the start that has been made in decoupling from the Ukrainian energy system are part of a larger centrifugal trend in energy and the economy. Its ties with other former Soviet states have progressively loosened over a quarter of a century. The mountains of commentary about how the Russian government seeks to use energy resources for political ends – together with the more modest, but still significant, phenomenon of it actually having done so – tend to obscure the fact that energy dependencies based on Soviet-era infrastructure have been reduced, and economic relationships between former Soviet states have

contracted, as each of those states integrates into the international economic system. Ukraine, starting its painful disentangling from gas and gas transit arrangements with Russia, is joining the Baltic states which have also been seeking alternative energy supplies.

Energy supplies from the Caspian and central Asia

In the Caucasus, beginning in 1993 and thanks to both the ACG oil project and the Baku–Ceyhan pipeline that diversified transit via Russia, Azerbaijan developed as a significant oil exporter. From 2007 onwards, it was further transformed from being an importer of Russian gas, to being the supplier of not only its own market, but also of Georgia's and some of Turkey's. The unravelling of energy and economic relationships between Russia and central Asian states has been still more dramatic. China has replaced Russia as central Asia's most significant trading partner (not only in energy), and its most significant destination for hydrocarbons exports. In Kazakhstan, China financed the construction of an oil pipeline for direct exports (commissioned in 2003–5) and has invested heavily in the upstream; western companies have invested in the three major oil projects (Tengiz, Karachaganak, and Kashagan); Russian companies trail far behind in terms of investment and off-take. The completion in 2009 of the Central Asia–China gas pipeline means that most of Turkmenistan's substantial, and rising, gas output will be exported for two decades (and probably for much longer) to China, in quantities that already dwarf its sharply reduced exports to Russia, which no longer needs these supplies.

Russian energy's place in world markets

Russia's own trade pattern, in energy and other sectors, has correspondingly shifted away from other former Soviet states and towards the rest of the world. Its production is increasingly financed via international markets; its largest oil and gas companies (such as Rosneft, Gazprom, and Lukoil), have become international players, able to compete with western-based IOCs. Western politicians may fret about Russia's geopolitical aims, but economists observe its integration into the world market primarily as a supplier of oil, gas, coal, and other raw materials – an unlikely basis for 'great power' status.

The Ukrainian crisis has exposed some of Russia's economic frailties. Its recovery from the 2008 recession has, despite strong oil prices, been extremely sluggish. The economy was doing badly even before the limited sanctions agreed on by the divided western powers, and these may be sufficient to push Russia back into recession this year. The nationalistic jolt given to Russia's political life by the annexation of Crimea is likely to divert public and political attention from such problems, and further postpone discussion of how to reduce Russia's dependence on energy export revenues.

'THE UKRAINIAN CRISIS HAS EXPOSED SOME OF RUSSIA'S ECONOMIC FRAILTIES.'

Ultimately, judgments of the impact of the Ukraine crisis on Russia's energy economy depend on the starting point. In geopolitical terms, this looks like success: Crimea has been annexed; the west has been too divided to react; and Europe's unwillingness to disrupt energy imports has constrained those who want tougher sanctions. But if Russian achievement is measured in terms of its own human or economic development, then this is another episode in a story of decline.

There are many ways to measure development. The Russian government, and many economists, consider that investment in non-energy sectors – to diversify away from reliance on oil and gas – is key. Such diversification has been shown to be fiendishly difficult to achieve, but in Russia's case, lamentably little progress was made during the pre-2008 oil boom when, it is argued, it had the chance. A recent World Bank report (*Diversified Development: Making the Most of Natural Resources in Eurasia*) argues that asking 'how to reverse the trend toward export specialisation and sector concentration' is the wrong question. It argues that infrastructure (such as roads, telecoms, schools, and hospitals, rather than Olympics-related projects), and investment into 'healthier and more skilled people' matter; institutions and governance count; clearer distinctions are needed between windfall gains from high commodity prices and better economic performance. But in these ways, too, progress has disappointed, while both before and after 2008, indicators of resource dependence (such as oil and gas's share of GDP or budget revenues) have risen inexorably. A recent summary of arguments on Russia's economy can be found in the May 2013 edition of *Europe–Asia Studies* ('Russia's Response to Crisis: the paradox of success' by Neil Robinson).

On average, living standards did improve during the boom, partly because of rising state sector wages and pensions. But inequalities of all kinds (between rich and poor, between oil-rich regions and others, in health care and housing) multiplied; Russia's demographic crisis deepened; its brain drain continued unabated; and on climate change, perhaps the longest-term human development issue, it remained stubbornly stuck in the 'do-nothing' camp. In all these respects, the Ukraine crisis is another crossroads on a long-term downward path. These issues, rather than geopolitical ones, deserve more public attention.

The geopolitical crisis may trigger changes in energy strategies

Chris Weafer

Gas: the game of two halves

Whatever the eventual geopolitical consequences of the Ukraine–Russia crisis, it has already had a significant impact on the way both gas producers and their customers plan their respective futures. The event has been the catalyst for an intensifying debate over energy security – not just regionally between Europe and Russia but globally – and it is expected to eventually change the way gas is sold and transported. It is not that the crisis has thrown up any new issues or risks; most of the topics now grabbing energy market headlines have been known or subject to negotiation for years. But the events of the last few months do at least seem to have injected a greater sense of urgency to 'get on with it'. Europe was not particularly concerned that 30 per cent of its gas came from Russia and Moscow voiced no worries than 80 per cent of its gas export revenues came from European customers. Now both are very focused on the concentration of risk and the contagion is spreading to others in a similar supply or customer dependency situation. Projects to rectify perceived supply and customer risk are likely to proceed at a faster pace than was expected only six months ago.

To some extent the gas industry is now facing the proverbial game of two halves. The producers have the upper hand in the first half as supply sources are limited – justifying them in building more infrastructure to supply existing and new customers, But the second half – coming into the next decade – may be quite different if all of the planned infrastructure spending is completed. Then the pricing power may quickly shift to the customer side.

The European wish list is for more LNG loading facilities, more pipelines from anywhere other than Russia, and a big move into shale gas production. The Russian wish list is to build more pipes to Asian customers and to take a bigger share of the global LNG market by building more processing plants and commissioning more LNG tankers and ice-breakers to take the gas across the Arctic route. Several of these projects have already been approved since the start of the Ukraine dispute. The Asian buyers, especially the Chinese, are happy to build pipelines (so long as they are exclusive to them) and LNG terminals, as that will give them a more secure supply mix. A greater choice of sources and delivery mechanisms also potentially allows China a more favourable position in terms of pricing in the next decade. The Caspian countries, including Iran, think that they are also finally in a very favourable position as a source of new gas to Europe and Asia, while Turkey's location has already made it a critical part of the energy corridor between Russian/Caspian sources and western consumers. That will definitely increase its bargaining power with Europe in the years ahead.

Rush to supply demand for gas

The clear risk of this expected, and uncoordinated, rush to add more supply sources and infrastructure is that there will be a glut of gas looking for customers in five to seven years, together with a very high risk of competitive pricing which will, with the benefit of hindsight, severely undermine the viability of current and expected investment projects. In other words, investors are either taking an optimistic view of long-term price trends to justify current spending, or governments are deliberately taking decisions rooted in a political, rather than an economic, bias. Supply and price worries may actually help curb some enthusiasm for new mega projects in the industry and then moderate any price pressures later. But in the current politically charged climate – made even worse following the Malaysian Airliner tragedy in East Ukraine – there is no evidence of the sort of consultation required between the major producers to craft a more viable plan to better balance future supply and to protect pricing power. It is a case of 'build, baby, build' and the customers have every incentive to encourage it.

Oil and other energy sources

The oil industry is rather more straightforward, even if forecasting the oil price is still guesswork most of the time. But relationships between suppliers and customers in the industry are well developed, and future pressure points are also relatively better understood. The nuclear industry is likely to remain under pressure and the industry will almost certainly lose global market share as opposition grows in Europe, although Japanese reactors are expected to re-start after safety modifications. Amongst the renewable energy sources, solar is by far the most promising and, with the expected advances in technology, should become a more commercially viable and reliable part of the energy mix coming into the next decade. Still, the global demand for gas is expected to grow steadily, as both overall energy demand rises and usage of coal, timber, and other polluting fuels is reduced. The problem is that if all the potential supply sources, together with

the announced development plans for shale, for LNG, and for new pipelines, are aggregated, a supply surge is created which will be greater than the expected growth in user demand.

Power shifts in supply–demand balance

GAS-OPEC was a good initiative but it failed, not least because of the surge in US shale gas production and the expected growth in US LNG exports over the next decade. US producers would never work within any structure resembling a cartel so, in the meantime, there is no incentive for other gas producers to do anything other than to try and grab market share and long-term supply contracts, preferably with fixed pipeline links. It is a strategy which all producers will inevitably regret, as major customers will have the choice between LNG or pipeline volumes and the deciding factor will be price. Hence it is in the best, longer-term, interest of the consumer countries to encourage more LNG spending and more pipelines from Russia, central Asia, Iran, and other gas locations. Typically it is the supplier country which bears the bulk of the capital investment, and even when the customer country pays for a large part of the pipe (for example, China's 7,000 km pipe from Turkmenistan) the price formula reflects a payback for that cost over time. So, in reality, it is the suppliers who are taking a huge risk in the gas market and while that looks very attractive today, and over the medium term, the game will change coming into the next decade.

Pipeline and LNG

First, let's look at planned new pipelines. South Stream will get built despite objections from Brussels. That is because over the first half of the energy game it represents supply security for those countries connected to it. They have all learned the lesson from Germany that the energy risk is not from Russia but from the transit route across Ukraine. Completing the exclusive Nord Stream link from Russia into Germany made South Stream, with an eventual capacity of 60 bcm, inevitable. The existing trans-Ukraine pipe will remain in place and be available both for Russian gas transit and for possible new supply from Caspian sources and Iran in the future. Meanwhile, the TAP and TANAP pipes are under construction and will deliver about 15 bcm of Azeri gas to Europe in 2018 under phase 1. Phase 2 is likely to depend on gas from Iran, and that prospect is no longer fanciful, as western countries adapt to the latest shifts in Middle East politics. It is possible that even Nabucco could get gas from Iran eventually, although this is still more likely next decade.

China and India are trying to tie up gas from the eastern side of the Caspian. China recently signed a deal with Turkmenistan to more than double its current 25 bcm import deal by 2020, while India is pushing the TAPI pipe to bring gas across Afghanistan and Pakistan. China currently only imports 50 bcm of gas annually so the expanded pipe will cover all of that, while the recently signed deal to import almost 40 bcm of gas from Russia, with an allowance to increase that in the future, should cover much of its increased demand growth. Japan has talked for years about a direct gas link to Sakhalin, and this is expected to be one of the issues on the table at the next summit between the two countries, possibly later this year. Russia's recent decision to cancel $10 bn of North Korean debt was, reportedly, on condition that Pyongyang removes any objection to the building of a gas pipe to the South. What all this means is that projections of rising demand for LNG from these three big consumers may not be as large as previously expected and, unless regional demand for gas surges way beyond current projections, customers will certainly be the ones dictating both the price and the choice of import route.

'… CUSTOMERS WILL CERTAINLY BE THE ONES DICTATING BOTH THE PRICE AND THE CHOICE OF IMPORT ROUTE …'

That's why it doesn't make sense for the EU Commission to try and block the South Stream pipe. If that new pipe is built to full capacity and the EU works with Ukraine to upgrade the existing transit pipe to take in gas from the Caspian and, later, Iran, it is very likely that there will be an excess supply of gas coming into the European market in about five or six years, especially if the current projections for LNG supply, and even some shale production forecasts, are realized. The only valid reason for the Commission to fear an increase in Russian dependency would be if other energy sources failed or if other gas routes were not developed. As it stands, it is Gazprom which is taking the greater gamble as it is running the risk of competing in a crowded market and of eventually having to compromise on price.

Certainly Gazprom is hoping that having a fixed gas line into as many countries as possible will both help it keep its current market share in an expanding market and also to enable it to get a better price than might be available if it were to sell in the spot market. The theory being that the fixed pipeline binds the customer just as much as the supplier as it deteriorates the economics of alternative sources for the customer, especially in the short to medium term.

New sources of gas

Such arrangements could be fine for several years, but if there are other viable sources offering cheaper long-term gas supplies (such as Iran, LNG, or shale) then the economics change with a longer time-line. Building huge extra supply capacity to Europe, while ignoring potential competitive

supply sources and routes, is a dangerous game for Gazprom. Equally, blocking any new pipelines into Europe is a short-sighted strategy for the Commission. One of the main reasons for the robust revival in the US economy since 2009 has been the plentiful supply of cheap energy. In the USA, this has mainly come from shale gas. Europe is most unlikely to be in a position to replicate the US experience, because of the density of populations and the much more active environmental lobby groups. But Europe may replicate the cheap energy conditions by allowing as many pipeline routes as suppliers wish to build. The pipeline builders and suppliers are the ones taking the medium- to long-term risks. Not the customers.

Future control over gas markets: suppliers or consumers?

The cross-border gas industry is relatively new and small, relative to the oil markets. But it is going to be substantially bigger and more valuable coming into the next decade. As previously mentioned, there was a short-lived attempt to coordinate the development of the industry, at least from the supply side, several years ago. That opportunity has now passed and we seem to be entering some sort of a free-for-all in terms of supply. The Chinese and other Asian countries understand this and are encouraging or funding as many supply routes as possible. They know that this will both enhance supply security and give them pricing power in the years ahead, as supply volumes increase from a large number of sources. Both the EU Commission and Gazprom, from different perspectives, are allowing political motives to cloud their strategic view. The Ukraine–Russia conflict has only served to add more political emotion into the debate and further crowd out economic pragmatism. One of these parties will live to regret decisions they are making today.

The corporate landscape

Tatiana Mitrova

The Russian energy sector has experienced a dramatic transformation in its corporate structure during the last two decades with, rather surprisingly, the different branches of the energy sector – oil, gas, coal, and electricity – undergoing changes that differ markedly from each other in nature.

The oil and coal sectors were privatized and deregulated in the early 1990s, according to the concept of 'market reforms' promoted by the liberal block in the government. By the end of the twentieth century they had already become quite competitive markets with many players. In contrast, the infrastructure-dependent gas and electricity industries – regarded as 'natural monopolies', critical for the energy security of the country – were consolidated in large-scale country-wide state-controlled holding companies (Gazprom and RAO UES) in order to turn them round and provide them with protection in the painful period of non-payments and vast investment deficits. Reform of the electricity market took place later – generating companies were privatized, the market liberalized, and non-payments were tackled – while the gas industry was still monopolized by Gazprom.

In the last five to seven years, however, new trends have begun to emerge, with the oil sector gradually becoming increasingly dominated by state-controlled companies (above all by Rosneft). This process started in 2003 with the Yukos case when, for the first time, the government showed its increasing interest in controlling growing oil revenues. Introduction of the 'strategic fields' concept in 2008 marked a new era in the Russian oil sector, with state-controlled companies getting priority access to the most attractive hydrocarbon resources. Industrial performance supported this paternalistic trend: all major investments are carried out by state-controlled companies, justifying the state's perception that private companies are focused solely on their profits, rather than on supporting the economy of the country as a whole. This strategy was also strengthened by the personal ambitions of Rosneft's CEO Igor Sechin, who has been consolidating assets in Rosneft since 2004, turning it into Russia's national champion.

A similar move towards an oligopoly of state-controlled companies can be seen in the electricity market; this trend is driven both by market logic (large diversified generating companies have a better competitive position in a turbulent market than small independent companies) and by the state's desire to remain in charge of this strategically and socially important sector. Conversely, the gas sector – which has already demonstrated all the disadvantages and inefficiencies of state monopoly power – is seeing increasing competition mainly driven, amazingly, by Rosneft.

Oil

By the late 1990s/early 2000s, following a very contradictory transitional period, all the key Russian oil production assets

found themselves concentrated in the hands of private corporations such as Yukos, Sibneft, Lukoil, and Surgutneftegaz – which had become world-class vertically integrated oil companies (VIOCs). All regional markets were divided between these private VIOCs, while state-controlled Rosneft accounted for less than 5 per cent of the country's production and an even lower share of the oil products market. In the course of the last decade, however, oil production has started to become concentrated in the hands of state-controlled companies such as Rosneft and Gazprom Neft, while just two major private companies (Lukoil and Surgutneftegaz) remained by the end of 2013.

After a series of acquisitions (initially assets from Yukos, then from TNK–BP) Rosneft's share of total Russian production reached 40 per cent in 2013 (excluding Slavneft, half of which also came under Rosneft's control after its acquisition of TNK–BP). Rosneft is not the only state-controlled asset in the Russian oil sector, however. Since 2007, Gazprom's oil assets have been consolidated in Gazprom Neft, which provides about 6 per cent of Russian oil (again, excluding Slavneft's share). Following Rosneft's acquisition of TNK–BP, Slavneft itself may also be considered to be a completely state-controlled asset, as it is now half owned by state-controlled Rosneft, and half by state-controlled Gazprom Neft. As a result, the proportion of state-controlled production (Rosneft, Gazprom Neft, and Slavneft) has increased more than 13-fold to 50 per cent in the course of the past 10 years.

According to the Russian Energy Ministry, production of oil and gas condensate in Russia in 2013 was carried out by approximately 300 companies (including eight VIOCs, each combining exploration, production, refining, distribution, and retailing – about 110 subsidiary companies in total) which provided 87.4 per cent of total Russian liquid fuel production. Four out of these eight companies – Rosneft, Lukoil, Surgutneftegaz, and Gazprom Neft – were responsible for about 70 per cent of total output; 180 independent companies accounted for 9.9 per cent of total oil production; while three consortia working under production sharing agreements (PSAs) – Sakhalin-1, Sakhalin-2 and Kharyaga – provided about 2.7 per cent of Russian oil production.

Private companies currently provide about half of total liquid fuel production in Russia, but this share will probably decrease in the medium term as Gazprom Neft and Rosneft are likely to be the main engines of oil production growth in the coming years. All major new investment projects and the majority of oil production growth is provided by state-controlled companies. Therefore today, when oil accounts for the largest share of the country's federal budget revenues – 35 per cent in 2013 – and the state needs this money badly, it is reasonable to expect that the state will continue to use this powerful tool to control such a key industry, generating a 'multiplication effect' for other industries.

Gas

Gazprom, the state gas concern, was formed in 1989 on the basis of the Soviet Gas Industry Ministry. This huge holding (including gas exploration and production, pipeline transportation, and gas sales in domestic and external markets) initially controlled 94–95 per cent of total Russian gas output. There were several independent gas producers (Itera, Novatek) in the 1990s, but their role in the market was insignificant.

The situation began to change after the global financial crisis of 2008, with Russian gas producers being compelled to limit production volumes due to lower domestic and external demand. Gazprom has had to fundamentally dampen down its activities and has gradually started to lose ground to independent suppliers (Novatek and vertically integrated oil companies, primarily Rosneft), who increased their share in Russian production from 15 per cent in 2008 to 27 per cent in 2013. There has been a huge increase in the number of contracts awarded to producers other than Gazprom by major industrial gas consumers. The rise in production from independents has been assisted by a more favourable regulatory and taxation environment, which includes the right to sell gas at non-regulated prices: in recent years these companies have been offering a 3–10 per cent discount on prices set by the Federal Tariff Service (FTS), while Gazprom is obliged to sell gas at regulated prices without any discounts. Rosneft and Novatek have also managed to do away with Gazprom's gas export monopoly, though so far only for LNG.

'GAZPROM HAS HAD TO FUNDAMENTALLY DAMPEN DOWN ITS ACTIVITIES AND HAS GRADUALLY STARTED TO LOSE GROUND TO INDEPENDENT SUPPLIERS.'

In total, in 2013 there were about 260 companies producing natural and associated gas in Russia. This figure includes: 16 Gazprom subsidiary companies (providing 71.3 per cent of total Russian production); 97 companies belonging to the eight VIOCs (11.4 per cent); two companies affiliated to Novatek (7.9 per cent); 140 independent gas companies (just 5.3 per cent); and three PSA operators (4.1 per cent).

The growth of production by gas producers other than Gazprom does not necessarily imply the formation of a competitive market – they are, in fact, creating regional monopolies. For example, Novatek accounts for nearly 100 per cent of gas supplies to Russia's largest industrial area, the Chelyabinsk

region. Rosneft, through its acquisition of Itera, has also secured the position of 100 per cent gas supplier for the Sverdlovsk region. As was the case in the oil industry in the 1990s, the companies are dividing up the market.

Electricity

As for the electricity sector, an electric energy holding company, Unified Energy System of Russia (RAO UES), was established in 1992. Most of the state-owned electric energy assets – such as thermal and hydroelectric power plants, transmission lines, and state-owned shares in power, research and engineering, and construction companies – were transferred to RAO UES, with the exception of any assets related to nuclear energy. Only four regional energy systems – Bashkirenergo, Tatenergo, Novosibirskenergo, and Irkutskenergo – did not joint RAO UES. The Russian Federation directly or indirectly owned over 52 per cent of shares in RAO UES, while Gazprom owned 10.5 per cent, and Norilsk Nickel 10.5 per cent, the remainder being held by minority shareholders.

The industry was facing numerous challenges, above all, aging and deteriorating assets and a chronic lack of investment. Market reform was initiated in 2006 in order to overcome this, and by 2008 all subsidiaries of RAO UES had been spun off. This was a massive privatization of generation assets. As a result, RAO UES ceased to exist after its merger into the Federal Grid Company. Altogether, six private wholesale generation companies (OGKs), 14 territorial generation companies (TGKs), state-controlled RusHydro and Rosatom, the Federal Grid Company, the System Operator, RAO UES of the East, and Inter RAO UES started to operate as independent entities.

However, within a few years of the splitting up of RAO UES, the sector started to consolidate again: non-stop changing rules of the market and remaining non-market mechanisms (like Power Supply Agreements) gave the companies significant lobbying power, which represented a much stronger competitive advantage then their economic efficiency. Currently just four generating majors provide 55 per cent of national power generation. This trend towards the sector being concentrated in fewer hands is likely to intensify as generation margins become narrower and an oligopolistic system evolves in which two state-controlled companies, Gazpromenergoholding and InterRAO (of which Igor Sechin is Chairman, combining this position with the role of the President and Chairman of the Management Board of Rosneft) hold a dominant position.

'THIS TREND TOWARDS THE SECTOR BEING CONCENTRATED IN FEWER HANDS IS LIKELY TO INTENSIFY AS GENERATION MARGINS BECOME NARROWER AND AN OLIGOPOLISTIC SYSTEM EVOLVES.'

Coal

The coal sector was also initially consolidated into a state corporation, Russian Coal (Rosugol), in 1991. However, with the deregulation of coal prices and faced with numerous challenging issues (such as lack of modern mining equipment, closure of unprofitable mines, and exposure to global markets) further development of the industry would have required higher state subsidies, which the Russian government could not afford, and the decision was therefore made to reform and privatize the Russian coal industry.

More than 150 coal producing companies were closed down during restructuring between 1993 and 1997. In 1998 the state-controlled Rosugol was liquidated, while all profitable coal mines were privatized. During the last decade, therefore, all coal in Russia has been produced by private companies, with 11 large companies currently accounting for roughly 70 per cent of Russian coal production. The main producers are: SUEK, with 27.4 per cent of total coal production, and Kuzbassrazrezugol, producing mostly steam coal and focusing mainly on exports, with 12.8 per cent. Coking coal is mainly controlled by vertically integrated metallurgical holdings; these produce 90 per cent of the total, with the main groups being Evraz, Severstal, and Mechel.

Conclusion

The Russian energy sector is experiencing contradictory trajectories in the transformation of its corporate landscape. Only the coal sector, with its low margins, can be regarded as being more or less competitive, while the oil and electricity sectors, which experienced massive privatization, are becoming more concentrated under state control. Meanwhile the gas sector, the most monopolistic of all, is demonstrating a different pattern. But these battles between the state-controlled giants (Gazprom and Rosneft) should not mislead: this situation is not about increasing real competition, it is about division of power within the state itself.

Increasing opposition between Russia and the West due to the Ukrainian conflict and Crimean reunification, together with, in particular, the threat of new sanctions against Russia (especially in the energy sector), are pushing the Russian government towards further mobilization and centralization of the economy, with an increasing role for the state 'in the face of external enemies'. The era of the liberal block in its government is over, the conservative block holding out for strong Keynesian policy is now in power. The Russian energy sector might therefore see a further increase of state involvement, together with further consolidation.

Opportunities for decarbonization in Russia

Maria Sharmina

Russia's national and global climate commitments

Russia's stance on climate change action is ambivalent. On the one hand, the country has both signed up to relevant international treaties and introduced domestic legislation. The Climate Doctrine 2009 and the Climate Action Plan 2011 outline a general framework and measures for addressing climate change by sector, albeit with no quantitative emission reduction targets included, and with much focus on adaptation. Russia has also expressed its intention to develop renewable energy sources; indigenous renewables could provide significant emission reduction, given that their technical potential exceeds the country's energy needs by at least 30 times (according to the Krzhizhanovsky Energy Institute's estimates). On the other hand, the government continues to support the hydrocarbon industry. Most recently, tax breaks for shale oil have led to a series of new exploration contracts with international investors. A gas supply deal with China has been fast tracked and signed after a decade of negotiations.

The Russian president has decreed a national emission reduction target. However, the intended 25 per cent 'reduction' by 2020 (cf. 1990) implies an emission increase from present levels as, due to political and economic collapse, Russia's emissions fell dramatically in the 1990s and are still a third lower than they were at their peak in 1990. As a result, the 25 per cent national target is in line with the country's current, rising, emission trajectory. It bears little relation to either climate science or the global 2 °C objective which is a commonly accepted characterization of 'dangerous climate change'. The ongoing failure to achieve any reductions in absolute emissions globally has left the world with a diminishing chance of staying below this threshold.

Russia officially signed up to the 2 °C target in 2009 and has since confirmed this position in a number of international agreements. However, in its recent communication to the United Nations Framework Convention on Climate Change (UNFCCC), the government attempts to dismiss 2 °C as a starting point for allocating emission reduction obligations among countries. The apparent reason is to avoid a 'top-down' approach to allocations without accounting for such national circumstances as geography, economic development, and capacity.

'RUSSIA'S STANCE ON CLIMATE CHANGE ACTION IS AMBIVALENT.'

These developments indicate that, at the 2015 Conferences of the Parties to the UNFCCC, Russia is likely to hinder the negotiation process. At the same time, closer scrutiny reveals that the country's weak commitment to emission reductions goes against its own interests. Strategically, there is little rationale for Russia not to go low-carbon. This commentary discusses several of the many reasons and opportunities for the country to decarbonize.

Technology and existing infrastructure

Various technological, geo-climatic, and socio-economic characteristics of Russia present unique opportunities for both destabilizing the status quo and building a low-carbon economy. To begin with, Russia's potential for developing renewable energy is significant. Pavel Bezrukikh, of the Krzhizhanovsky Energy Institute (ENIN), currently estimates the economic potential at 370 Mtoe per year, which would increase if incentives were introduced. For comparison, the country's energy use in 2012 was around 730 Mtoe.

According to Bezrukikh and colleagues, the technical potential of renewable energy in Russia exceeds 24,000 Mtoe per year. The sources with the largest technical potentials are: geothermal, solar, and wind energy, in that order. Russia's geothermal energy is particularly underutilized, in comparison with that of other countries with abundant geothermal resources (such as the USA, the Philippines, and Indonesia). Apart from large-scale hydropower, Russia has barely started exploiting its renewables. Were the technical potential utilized even partly, the country could become a key exporter of renewable energy.

Similarly, Russia's technical potential for energy efficiency is high. The country could save more than 280 Mtoe by implementing energy efficiency measures. The elimination of natural gas flaring would take the savings up to nearly 300 Mtoe. This is comparable to the energy efficiency technical potential of 340–570 Mtoe for the EU27 countries combined. In other words, Russia's economy is highly energy-inefficient and is in need of wholesale modernization. If this (inevitable) modernization followed a low-carbon route, the country would solve two problems at the same time.

One of the most significant issues facing Russia's economy in general and its energy system in particular is a large proportion of 'used up', inefficient capital stock and equipment. This is aggravated by a low renewal rate of the ageing industrial infrastructure,

particularly in the strategically important oil and gas sector. Stop-gap measures – such as extending the service life of capital stock through maintenance – have been implemented. For example, the initial 30-year operational lifetime of Russia's nuclear power plants has been extended by 15 years. Without this extension, 18 plant units with a combined installed capacity of 11.2 GW (representing nearly half of the existing capacity) would have already been decommissioned. Even with the extended service life, 11 plant units (4.8 GW) are to go offline by 2020. This would both jeopardize national energy security and increase the carbon intensity of the economy, unless energy demand is curbed accordingly and/or supply is replaced by other low-carbon energy sources.

'WERE THE TECHNICAL POTENTIAL UTILIZED EVEN PARTLY, THE COUNTRY COULD BECOME A KEY EXPORTER OF RENEWABLE ENERGY.'

An additional threat to energy security and infrastructure is the changing climate. Climate change impacts are expected to put extra pressure on the energy system, with intensified disruptions to permafrost-based infrastructure, overhead power transmission lines, and the pipeline network. Such impacts would have serious implications for those dependent on Russia's energy supplies both within and outside the country.

Socio-economic and political aspects

Within Russia, there are three main power groups that benefit from a thriving oil and gas sector: the government, big business, and the state-dependent population. These groups are bound by a so-called 'social contract' through the funnelling down of resource rents. The 'no-change', or business-as-usual, political course suits most actors as it promises relative stability. It is likely that the decarbonization process will only gain momentum if the system fails to satisfy one or more of the power groups.

In the current decarbonization debate, the emphasis is often on what could trigger the decline of the existing system, rather than on more 'positive' opportunities (for example, how the foundations for a low-carbon transition could be established), although the two are often difficult to separate. The current situation is socially unstable and unsustainable, and Russia's politico-economic regime is increasingly susceptible to both external and internal shocks. For example, a sharp increase in the domestic price of energy or a drop in the global oil price could result in a breakdown of the social contract. As history shows, seemingly small-scale events can instigate large-scale change in Russia.

However, the decline of the current system is a necessary but not a sufficient condition. Some of the unique characteristics of Russia provide opportunities for not only undermining the status quo, but also for building a new, low-carbon, system. For example, the country's dilapidated energy infrastructure will need to be replaced in the next 10 to 20 years regardless. Similarly, modernization of the manufacturing sector is one of the government's declared priorities. These opportunities, however, may lead to policies with competing objectives, unless the co-benefits of decarbonization are considered from the start.

To decarbonize or not?

A particularly compelling, if paradoxical, incentive for urgent decarbonization in Russia is that the country might not have the means to do so in the future if fossil fuel trade wanes. If this were to happen, Russia would struggle to finance even its basic national needs, given that about half of its federal budget revenue comes from the oil and gas sector. Europe's strategy to wean itself off Russia's fossil fuels offers a preview of such a future. To this end, the EU is hoping to increase LNG imports from the USA and is exploring its own shale gas reserves; this, however, is not a sufficiently strong threat, as Russia's flows of fossil fuels could be re-directed to industrializing countries. This diversification of energy demand is already evident, with both Russia's natural gas and crude oil increasingly flowing towards Asia.

A complete halt to Russia's hydrocarbon trade seems unlikely at the moment. Yet if the world is to avoid 'extremely dangerous' climate change, 60–80 per cent of global reserves of fossil fuels would need to stay in the ground. Russia, together with other major emitting nations, is essentially choosing between two prospects: first, an 'unlikely' future without fossil fuel trade and, second, a practically unliveable future of extreme climate impacts. The urgent nature of 2 °C indicates that there is no middle way.

The consequences of both decarbonizing and of not decarbonizing are stark. To deliver a fair contribution to the global 2 °C commitment, Russia's carbon dioxide emissions would need to decrease rapidly and dramatically (in contrast to its current 25 per cent emission 'reduction' target). Following a genuinely low-carbon path would involve major changes to the country's infrastructure. The government's existing modernization agenda is a start, but the scale of transformation needed goes far beyond that.

A refusal by Russia to decarbonize would have similarly far reaching, but qualitatively different, consequences. If the rest of the world stays on the high-carbon path, devastating climate impacts would become all but inevitable. If the rest

of the world chose instead to become low-carbon and stop importing Russia's hydrocarbons, the country would lose its main source of income and, with it the means to invest in decarbonization.

If an internal or external shock leads to a breakdown of the 'social contract' in Russia, both the population and the government are likely to have other prime concerns. Therefore, as decarbonization is not currently seen as an immediate issue, it is important that it is at least viewed as a significant and strategic 'co-benefit'. For example, legislation on land, agriculture and forests, water, and especially energy could explicitly account for climate-related issues or it could even be integrated with climate legislation. Such policies could be directly linked to Russia's national priorities, such as creating a more stable investment environment, attracting a highly skilled labour force, and reducing Russia's dependence on the global demand for fossil fuels. Although some of these 'priorities' may not be regarded as such by the current government, the process of decarbonization will not necessarily happen solely as a consequence of a government's actions. It could be taken up or, at least, prompted by non-governmental actors. The engagement of the Russian public is likely to snowball as climate change impacts intensify. The combination of potential 'shocks', shifting agency, and opportunities for re-industrialization may create a springboard for a low-carbon transition.

A stark choice

Keeping the global temperature rise below 2 °C is becoming extremely challenging. However, a slim chance of staying within the carbon budget associated with this 'dangerous climate change' threshold remains, if industrialized nations start an extensive decarbonization programme within the next few years. As an industrialized country, Russia shares the responsibility to make a fair contribution to emission reductions.

'AS AN INDUSTRIALIZED COUNTRY, RUSSIA SHARES THE RESPONSIBILITY TO MAKE A FAIR CONTRIBUTION TO EMISSION REDUCTIONS.'

The international climate negotiations are in need of leadership. This need was evident when recent headlines hailed the US plan to cut emissions from power plants by 30 per cent by 2030 (compared to 1990), despite this level of reductions falling far short of the 2 °C commitment. Genuinely low-carbon and science-informed policies would receive even more recognition and, it is hoped, followers. This is an opportunity for Russia to become the leader it aspires to be.

Russia's stance matters, both for the global climate and for the global climate change negotiations. Each year, the country emits hundreds of millions tonnes of greenhouse gases, having retained its place among the five highest emitters globally for the past several decades. Russia is still influential both politically and economically, and an aggressive *domestic* emission reduction strategy could both reduce *global* emissions and nudge the international negotiations towards a meaningful climate deal. The urgency of the 2 °C target leaves Russia with a stark choice: it can either embrace sweeping decarbonization in the near future, or face potentially destructive impacts of climate change.

Further reading

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Russian gas exports to Europe: unravelling the misconceptions

Jonathan Stern and Katja Yafimava

Russian gas exports to Europe, and Soviet exports before them, have been controversial since they started, in the late 1960s. As the largest single component of European gas supply, they are the subject of ongoing security and geopolitical controversies. However, much of the commentary on these controversies is subject to misconceptions which, in the 2010s, have been compounded by growing regulatory complexities, particularly in relation to pipeline infrastructure.

Volume issues

One important misconception is the idea that the majority of European countries have become increasingly dependent on Russian gas. Russian exports to Europe exceeded 100 bcm in virtually every year in the 1990s; they rose to more than 160 bcm/year in the mid-2000s and fell below that level only in the late 2000s, before recovering to

pre-recession levels in 2013. *(Data in this article refers to all gas sold in Europe as reported by the Gazprom Group and includes the Baltic countries in Europe.)*

However, all of the increase in volumes has been in (to use Cold War terminology) western Europe; not only did central and east European countries import less Russian gas in 2013 than they did 10 years previously, but the 2013 figure was also less than that seen in the early 1990s. Much of the 'west' European increase stems from the inclusion of two countries – Turkey which imported relatively small quantities of Russian gas prior to 2000, and the UK which had imported none. Turkish volumes increased to 27 bcm in 2013, making the country Gazprom's second largest European customer after Germany where volumes had plateaued over the previous decade, only increasing significantly in 2013 (back to 2004 levels). The UK is recorded as receiving 17 bcm of Russian gas in 2013, but it is unlikely that any Siberian molecules were physically delivered (rather this was, most likely, gas of varied origin acquired and resold by Gazprom's UK-based marketing subsidiary). Aside from these countries, only Italy and Poland imported significantly more Russian gas in 2013 than they did a decade earlier.

'ONE IMPORTANT MISCONCEPTION IS THE IDEA THAT THE MAJORITY OF EUROPEAN COUNTRIES HAVE BECOME INCREASINGLY DEPENDENT ON RUSSIAN GAS.'

Also misleading is the generalization that Europe is dependent on Russia for 26–30 per cent of its gas demand. The figure changes from year to year – 2013 was a record year for Russian exports, while European demand levels remained depressed. Countries such as Spain and Portugal import no Russian gas, while the Baltic countries and many in central and south-eastern Europe are completely dependent.

Commercial and price issues

Another misleading designation relating to Russian gas exports is that their motivation is overwhelmingly 'political'. While there are undoubtedly political motivations, recent history suggests that their principal motivation – certainly in Europe – is commercial and aimed at revenue maximization. When recession hit Europe in 2008 and energy demand collapsed (coinciding with a gas supply glut and increasing competition) Gazprom resisted changing the price basis of its contracts from the traditional oil linkage to hub prices. The result was a fall in Russian gas exports, substantial and protracted renegotiation of the majority of its long-term contracts, and international arbitration with many of its major European customers. At the beginning of 2013, Gazprom's prices in the competitive markets of north-west Europe came into line with hub prices, resulting in an increase in exports of more than 20 bcm compared with the previous year. To summarize the period 2008–13, Gazprom resisted lowering its export prices for four years and lost market share as a result; once it accepted lower prices it regained market share. This was an overwhelmingly commercial – rather than a political – decision.

However this is not the end of the price story. In 2012, the EU Competition authorities opened proceedings against Gazprom to investigate anti-competitive practices relating to exports to eight central and east European countries (where Gazprom has a monopoly or an overwhelmingly dominant market position). By early 2014, all issues had been resolved with the exception of pricing, where Gazprom was apparently refusing to agree to give up oil-linked prices. If the two sides fail to reach agreement, the Commission will issue a Statement of Objections which the Russian government will probably appeal to the European Court of Justice.

Transit issues and transit avoidance pipelines

Far more problematic during the entire post-Soviet period has been the question of transit of Russian gas to Europe across western CIS countries, particularly via Ukraine. There have been periodic transit crises – linked to lack of payment by Ukraine for Russian gas, and disagreements over pricing – of which the most recent have been 2006 and 2009. The 2009 crisis, when no Russian gas was delivered to Europe across Ukraine for two weeks in winter, was the most serious European gas security crisis; some south-east European countries suffered a humanitarian emergency. Ukraine's reputation as a reliable transit state was destroyed and Gazprom suffered huge reputational and financial damage. In mid-2014, in the aftermath of the Ukrainian political crisis and the Russian annexation of Crimea, Europe was on alert for another interruption of deliveries. On 16 June 2014 Gazprom cut supplies to Ukraine following a breakdown of negotiations over debts and prices brokered by the European Commission; its exports to Europe continued in full into early August.

Transit conflicts seriously affected Gazprom's export strategy: it resolved to end non-payments and unauthorized offtakes, but finding its existing instruments ineffective, it intensified the development of alternative export pipelines – Yamal Europe, Blue Stream, Nord Stream, and South Stream. Gazprom built the Yamal–Europe pipeline (across Belarus and Poland to the eastern border of Germany) to lessen its dependence on Ukraine and to demonstrate that,

unless it changed its behaviour, Ukraine would lose lucrative transit business. However, not only did this have little impact on Ukrainian policy, but periodic Belarusian transit crises caused Moscow to conclude that diversifying transit between Ukraine and Belarus was insufficient to solve its problems, and that export pipelines avoiding both of these countries were required. The Nord Stream consortium (Gazprom, E.ON, Wintershall, Gasunie, and GDF Suez) built two pipelines (each with a capacity of 27.5 bcm) to transport Russian gas from the St Petersburg region to northern Germany across the Baltic Sea; the first line started to operate in November 2011, followed by the second line a year later. The Blue Stream consortium (consisting of Gazprom and ENI) built a pipeline across the Black Sea to Turkey, which went into operation in 2003. The South Stream consortium (consisting of Gazprom, ENI, Wintershall, and EDF) intends to build four pipelines (each with a capacity of around 15.5 bcm) to transport Russian gas to Bulgaria across the Black Sea); the first pipeline is scheduled to go into operation in late 2015.

Regulatory issues

The major advantage of such pipelines for Gazprom, is that they deliver gas directly to Europe. Yet this gas still has to be transported across multiple borders and over long distances inside Europe before it reaches contractual delivery points, the geographical location of which goes far beyond the Russian border. Such transportation is governed by the EU Third Energy Package (TEP) adopted in 2011. This mandates regulated third-party access (TPA) to pipeline capacity based on published tariffs (or their methodologies) approved by national regulatory authorities (NRAs), unbundling of transmission assets, and certification of transmission system operators (TSOs) – unless an exemption is granted by an NRA and approved by the European Commission (EC). Although transit avoidance pipelines potentially establish a transit-free geography of Russian gas exports to Europe, thus resolving a problem of insecure transit, they face another big problem of complying with the changing regulatory environment both in respect of existing and new pipeline capacity.

Until mid-2014 Gazprom has been unable to utilize the full capacity of the onshore extensions of the Nord Stream pipelines – OPAL and NEL. Although the German regulator granted an exemption allowing Gazprom to use 100 per cent of OPAL, the EC has capped it at 50 per cent, following which Gazprom and the EC negotiated for more than a year, and reached a solution allowing Gazprom to utilize 100 per cent of capacity unless wanted by a third party. The EC was expected to approve the exemption by March 2014 but delayed the decision, citing technical issues and linking it to the worsening EU–Russia relationship over Ukraine.

Given its negative experience with OPAL, Gazprom did not apply for an exemption for South Stream pipelines but based the project solely on a set of intergovernmental agreements signed with host countries. The EC deemed these agreements in breach of the TEP and called for their re-negotiation or renouncing, otherwise threatening infringement procedures against member states concerned. The EC's willingness to resolve the South Stream regulatory issues with Russia bilaterally has waned following the latter's annexation of Crimea, and also following Russia's request for consultations under the WTO – which alleges the TEP is discriminatory. Unless a mutually acceptable regulatory solution for South Stream is found, the supply security of south-eastern European countries will remain at risk, as Gazprom might be prevented from using sufficient capacity in South Stream if Ukrainian transit is partly or completely halted.

'… THERE IS VERY LITTLE LIKELIHOOD OF ANY SUBSTANTIAL REDUCTION OF EUROPEAN IMPORTS OF RUSSIAN GAS OVER THE NEXT DECADE.'

Reduction of Russian gas to Europe, or phasing out gas in European energy balances?

Despite a great deal of European and American hand-wringing, following Russian annexation of Crimea, there is very little likelihood of any *substantial* reduction of European imports of Russian gas over the next decade. The contractual situation alone, quite aside from the lack of alternative non-Russian supplies, prevents this from happening. The main immediate question is whether the Ukrainian transit pipelines will continue to be used to transport Russian gas, and if not whether the EU authorities will permit Gazprom to use the full capacity of Nord Stream and South Stream (if and when it is built) to fulfil its contracts with European customers. If not, the European Union may find itself in the position of accusing Russia of being an insecure supplier, while preventing Gazprom from supplying through pipelines which have been built for this exact purpose. The longer term question is whether Europe will be able to reduce its dependence on Russian gas, or whether the lack of realistic alternative sources will either mean more reliance on Russian gas, or phasing the fuel out of the energy balances of individual countries.

This article uses data and summarizes arguments in Chapters 3 and 4 of The Russian Gas Matrix: how markets are driving change *(eds. Henderson and Pirani, OIES/OUP, 2014).*

The pieces in Russia's eastern gas puzzle start to fall into place

Michael Bradshaw

Deal between Gazprom and CNPC

On 21 May a 30-year $400 billion dollar gas deal was reached between Russia's Gazprom and China's National Petroleum Corporation. The details of the deal remain clouded in commercial secrecy, but the agreement is to deliver 38 bcm of gas a year by pipeline to China beginning at the end of this decade (2018–20). Gazprom's website states that: 'The mutually beneficial contract contains such major provisions as the price formula linked to oil prices and the "take-or-pay" clause'. Specific details on the starting price are unavailable, but the consensus in the media is that the agreed price is in the range of $350 per thousand cubic metres ($9.38–9.80 MMBtu), probably lower than the Russian side had hoped for, but higher than the Chinese had wanted to pay. It should be remembered that China already gets pipeline gas from central Asia and Myanmar, it has significant domestic production (including shale gas potential), and is building a significant LNG import capacity, it is thus in a strong position to negotiate price. The price allegedly agreed is close to the average price that Gazprom expects to charge its European customers: $370–380.

President Putin has promised $55 billion in investment on the Russian side (by Gazprom) towards development of the necessary gas fields at Chayanda (in Sakha–Yakutia) and eventually Kovykta (in Irkutsk) and construction of the 4,000 km 'Power of Siberia' pipeline (with an eventual capacity of 61 bcm). The Chinese side will provide $25 billion as an advance payment for gas deliveries (this is not an interest free loan) to help finance the project. The Chinese partner will also be responsible for building any pipelines on Chinese territory. Both governments have promised tax relief to improve the economics of the agreement. However, this is first and foremost an agreement to deliver gas and Gazprom has not relinquished any ownership of the upstream resource base. In fact, Gazprom has been at pains to state that it alone will provide gas for the pipeline, much to the chagrin of Rosneft (see below).

The long lead up to the deal

Beyond the bare facts, many in the Western media have portrayed the agreement as finally being necessitated by Russia's actions in Ukraine and Gazprom's problems with the European Commission. But even before the crisis in Ukraine, those who had been watching the negotiations had identified 2014 as the 'year of decision'. For the last three years at the Sakhalin Oil and Gas Conference (an annual event held on the Island every September) Gazprom's Alexander Medvedev had stood up and announced that a deal would be reached by year-end. Last September we were once again told that agreement had been reached on everything but price and that agreement would be reached by year-end, but that date soon became May 2014, to coincide with President Putin's visit to China. The reality is that a deal had to be reached – not only because changes are afoot in the global gas industry, but also because there are geostrategic challenges in Russia that are far more enduring than Moscow's reaction to hardening attitudes in the EU. Furthermore, the deal has been more than a decade in the making and the volume of gas is less than that stipulated in previous inter-governmental agreements, when a volume of 68 bcm was mentioned as being delivered via two pipeline routes, one through the Altai and one further east.

'… THE DEAL HAS BEEN MORE THAN A DECADE IN THE MAKING AND THE VOLUME OF GAS IS LESS THAN THAT STIPULATED IN PREVIOUS INTER-GOVERNMENTAL AGREEMENTS.'

Gas exports to east and west

In the end, both sides have got most of what they wanted. On the one hand, the Chinese have got a dedicated field supplying a pipeline via the eastern route. For the time being at least, this field will not be connected to the pipeline system that moves gas west to Europe. The reason that China did not favour the Altai route is that they did not want to find themselves vying with Russia's European customers for the same gas from West Siberia. Thus, concerns in Europe that the deal will mean less gas for Europe are misplaced. Not only does Gazprom have sufficient gas in its newly developed fields on the Yamal (when one adds the production of Novatek and the oil companies) but Russia actually has a surplus of gas to meet domestic demands and exports to Europe. In fact, what Gazprom faces in Europe is a stagnant and falling market. Nonetheless, exports to the EU were in the region of 160 bcm in 2013.

On the other hand, Gazprom has a major export deal to anchor its Eastern Gas Programme that includes the construction of an LNG plant at Vladivostok, the development of its Sakhalin-3 acreage offshore of Sakhalin, and the expansion of the Sakhalin-2 LNG plant at Prigorodnoye in the south of the island. The Sakhalin-2

plant, in which Shell is a major partner) already has a capacity of 10.8 million tonnes (15 bcm) and expansion could take total capacity to 15 million tonnes (19.5 bcm). The eventual capacity of the Vladivostok plant, which will initially be supplied from Sakhalin via the new Sakhalin–Khabarovsk–Vladivostok pipeline, will be 15 million tonnes, creating a significant LNG export capacity to balance the risk of building a pipeline to China. This mirrors the strategy pursued with the East Siberia Pacific Oil Pipeline (ESPO) that was extended to the Pacific coast at the same time as building a spur to China. In addition, following the limited liberalization of Russian LNG exports late in 2013, both Novatek's Yamal LNG project and ExxonMobil and Rosneft's Sakhalin-1 project are developing their own LNG plants, 16.5 mtpa (21.5 bcm) in the case of Novatek and a modest 5 mtpa (6.5 bcm) in the case of Sakhalin-1. However, none of this has happened overnight, and again it would be wrong to paint Russia's eastern interests as a new project that has been undertaken in response to developments in Europe.

Development of the Russian Far East

Any student of debates concerning regional development in the Soviet Union in the late 1970s and early 1980s will know that the notion that the Russian Far East should base its economic development on the complementarity between its resource wealth and the growing resource demands of north-east Asia is nothing new. In fact, the Sakhalin projects owe their origin to an agreement struck between the Soviet Union and Japan in the wake of the energy crisis in the early 1970s. At the time, there were also plans to build an LNG terminal based on Yakutia's natural gas. The real question is: why has it taken so long for those plans to materialize? In the 1990s the Russian Far East suffered greatly from the collapse of the Soviet system, as it had been supported by massive subsidies from Moscow. The economy collapsed and the population fell dramatically, once over 8 million it is now closer to 6 million and most of them are concentrated in the southern regions of Khabarovsk, Vladivostok, and Sakhalin.

Russia fears that its effective occupation of this vast territory is challenged by its overpopulated southern neighbour, and in his third term President Putin has identified the economic development of the Russian Far East as a challenge of national significance. We now have a Ministry in Moscow dedicated to the task and yet another economic development programme. Gazprom's Eastern Gas Programme and the ESPO, both planned in the early 2000s, are earlier parts of the same old plan to build transportation infrastructures to promote the development of the region's resource wealth. In the 1970s the Baikal–Amur Mainline railway (BAM) was built with the same logic, but failed to have much impact. That said, it was very useful when building the ESPO, and no doubt will be used for the Power of Siberia. The problem is that these resource projects do not create a lasting multiplier, as there is an initial boom while the infrastructure is being built (and even then most of the profits will end up elsewhere) and then limited subsequent industrial development. The Chayanda field is complex and helium rich and will spawn a gas-chemical industry. Likewise, the Vladivostok LNG plant might be linked to a gas-chemical complex, but the vast hinterland in between will see little benefit. And, if the Sakhalin experience is anything to go by, most of the State's take will also end up in Moscow. Nonetheless, the construction boom will bolster the level of industrial activity, while the significantly expanded level of gas exports will go a long way towards realizing the targets of Russia's Energy Strategy.

The long view – the pieces falling into place

The latest version of Russia's Energy Strategy to 2035 states that the share of overall exports of oil and oil products to the Asia–Pacific Region (APR) should rise from 12 per cent to 23 per cent (including 32 per cent for crude oil) while exports of gas should rise from 6 per cent to 31 per cent by 2035. According to the latest analysis by OIES (*The Russian Gas Matrix: how markets are driving change*, eds. Henderson and Pirani, OIES/OUP), if you add together all the current and planned LNG projects plus the 38 bcm pipeline deal, you reach a figure of 95 bcm (including sales from Yamal LNG for five months per annum). According to the same analysis, in 2013 Gazprom's exports to Europe and the CIS were 235 bcm, meaning that exports to the APR could constitute 29 per cent by 2020–25. However, there are good reasons to think that in the following decade they could rise to meet and even exceed the 31 per cent target. First, Gazprom still wants to develop the Altai route and expand pipeline exports to 60 bcm plus, and second, Rosneft harbours its own eastern gas ambitions. Most recently, Rosneft has argued that because Gazprom is building a pipeline as a monopoly, this means under Russian law that it should provide third-party access. Furthermore, it argues that without doing so it will constrain the rate of gas development by other companies in the region – mainly Rosneft – who wish to market their gas for the benefit of the development of Siberia and the Far East. We must wait and see, but if Rosneft were to succeed it might also allow Sakhalin-1 to send its gas by pipeline to China, something that it is permitted to do under the terms of its PSA.

'… THE CURRENT DEAL SHOULD MARK THE BEGINNING OF A WHOLE NEW CHAPTER IN THE STORY OF RUSSIA'S ROLE IN THE GLOBAL GAS INDUSTRY.'

In the mid-2000s, I can remember being at a meeting at Chatham House organized by TNK–BP to discuss the development of the Kovytka gas field. At the meeting, an eloquent spokesperson from Gazprom unveiled the Eastern Gas Programme and explained what was going to happen. I pointed out that Gazprom did not control any of the gas fields in the region, including Kovykta. Less than five years later Gazprom controlled them all, with the exception of the Sakhalin-1 project where they were effectively blocking the gas phase. Looking back at that map, and looking forward 10 years, I can see all of the pieces falling into place, but with a few wildcards – the most significant being the role that Rosneft will play in the future. However, it is not inconceivable that as Russia's role in Europe's gas market stagnates over the coming decade, this role will be matched, if not exceeded, by the rising share of Russian gas exports to the east. After all, if 90 per cent of future gas demand growth between now and 2050 is to be in Asia, the current deal should mark the beginning of a whole new chapter in the story of Russia's role in the global gas industry.

Russian oil – challenges and possibilities

Arild Moe

After Russian oil production had fallen to a low of 303 million tonnes per year in 1996–8, production picked up rapidly – some years showing an increase exceeding 10 per cent – until 2004 when it reached 459 million tonnes. Among observers of the sector there had been a debate about Russia's ability to sustain the output level, sceptics arguing that the impressive growth was caused mainly by forced exploitation of existing fields with the use of new technologies, with Yukos in the forefront, and that this could not continue due to exhaustion of the fields. In fact the rate of growth fell drastically after 2004, growth continued, however, with output reaching 523 million tonnes in 2014, getting close to the record levels of the mid-1980s.

Declining recovery rate

Clearly it was possible to produce more from existing production regions, especially in West Siberia, since few major new fields have been put into production. In that sense the most alarmist prognoses have been proved wrong. The question of sustainability nevertheless remains, but the focus has shifted from volumes to revenues. The Russian oil sector may not face an imminent decline, but the cost of keeping up production is soaring. And production in West Siberia – the mainstay of Russian oil production, with 60 per cent of total output – is now declining.

'THE RUSSIAN OIL SECTOR MAY NOT FACE AN IMMINENT DECLINE, BUT THE COST OF KEEPING UP PRODUCTION IS SOARING.'

The average size of fields that have been discovered in recent years is just a fraction of what it was in the 1980s, the composition of the reserves in the fields is more complex than in earlier ones, and many of them are located far from existing infrastructure. All this spells increasing production costs. Another indication of underlying problems is the falling recovery rate (the share of the resources in a field that will ultimately be extracted) which is now under 30 per cent. This means that two-thirds of the resources will remain in the ground. This rate of recovery is considerably lower than in other mature oil producing countries. It is also uncertain if a large share of reported reserves is commercially recoverable.

Even if Russia has enormous resources in the ground, it takes a considerable time to explore them to a level where production can start. A common estimate is that it takes between 10 and 15 years from identification of potential areas to the start of production. For many years, exploration in Russia was neglected. Thus Russia faces the dual challenge of making exploitation of existing fields more efficient while also exploring in new areas.

Role played by taxation

Efficiency is related to framework conditions as well as to industry structure. The Russian taxation system is dysfunctional for resource management; prescribing a flat tax rate on revenues, it discourages production of the marginal resources in a field. It is easy to see that a more flexible, income-based taxation system, one which could incentivize better utilization of resources, could be designed. This is also acknowledged by the resource authorities, in principle. However, the present system, which has a purely fiscal approach, also has its merits. It is easy to administer and secures government revenues in a predictable way. A more sophisticated system would be more prone to manipulation, and the Finance Ministry fears a shortfall in tax revenues, at least in the short term. Nevertheless, the government is preparing pilot projects for income-based taxation. The most striking feature of taxation policies over the last few years, however, has been the special agreements and tax exemptions to encourage development

of new provinces. In that sense, it is fair to call the system negotiable.

Structure of energy industry

The industry structure is changing, but not in the direction one would expect given developments in the resource base. In other mature petroleum producing countries, notably the USA, a more heterogeneous resource base with smaller fields has been accompanied by a diversification of the industry structure. Not so in Russia. The share of smaller independent companies has been decreasing and production is now totally dominated by a group of vertically integrated companies, Rosneft alone accounting for 37 per cent. This concentration means that there is less flexibility and creativity in tackling small and complicated deposits, but the development is in line with Russian policy which never has attributed a special role to smaller companies, relying instead on majors – increasingly dominated by the state.

Much has been said about the opening of new regions, particularly East Siberia and the Arctic continental shelf. An important attraction of this line of thinking is that it fits with the industry structure – big projects, big companies. Proposals for developing oil in East Siberia have been put forward over many years, based on geologists' assessment of a very rich resource base. Resources are definitely there, but not in the concentrations earlier anticipated. The huge Vankor field, which started commercial production in 2009 and is expected to reach a plateau level of 25 million tonnes annually, is geographically in East Siberia, but geologically it belongs to West Siberia. Many smaller projects are under development, but the challenges are substantial, with vast distances and a harsh climate. Recent estimates downplay the potential of this region in the next few decades, estimating an annual output not above 45 million tonnes between 2020 and 2030, up from about 35 million tonnes today. The Russian Far East may provide some 30 million tonnes, up from 14 million today, mainly from Sakhalin offshore.

Arctic fields

The Arctic – and especially the offshore – has been touted as being Russia's resource base in the twenty-first century. Geological indications of huge resources in big concentrations would seem to offer an attractive solution to Russia's search for new production capacity. Geological surveys have been carried out from the 1970s and some exploration drilling from the 1980s, but the region has only really been promoted in policy documents since 2000. Nevertheless, development has been slow. Whereas reference is often made to a total of 70 billion tonnes of oil equivalent on the Russian continental shelf, only 10 per cent of this has actually been discovered. The biggest concentrations are in the Barents and Kara Seas, and most of this is natural gas. One important reason for the slow development is that the Arctic offshore has a more pressing need for cooperation with foreign companies than the traditional onshore areas. This fact collides with a perception among Russian policy makers that the region is strategically important, and that it is especially important to keep activities tightly under Russian control. This view was reflected in the 2008 legislation which granted a monopoly on offshore operations to the state-dominated Rosneft and Gazprom, which was followed by generous licensing of offshore acreage to the same companies. But both Rosneft and Gazprom were busy onshore and had little or no offshore experience. They were not inclined to take big risks launching costly Arctic projects, despite exhortations from the Ministry of Natural Resources, which has a responsibility for resource development. With monopoly positions enshrined in law they could safely regard the Arctic offshore as a longer-term option. However, political pressure to see some developments offshore increased, and a formula was eventuallyfound making it attractive for foreign companies to take minority positions in joint ventures with the Russian licence holder – in practice, Rosneft.

'THE ARCTIC – AND ESPECIALLY THE OFFSHORE – HAS BEEN TOUTED AS BEING RUSSIA'S RESOURCE BASE IN THE TWENTY-FIRST CENTURY.'

Collaboration with foreign companies

Recent Russian offshore licensing practice involves huge areas, rather than selected blocks as the custom is elsewhere, and leaves resources management to the licence holder. Rosneft has set out to explore these licence areas with the help of foreign companies.

The first deal was made between Rosneft and BP for a licence area in the Kara Sea, but this fell apart due to the conflict between BP and its partners in TNK–BP, and the project was taken over by ExxonMobil. The final agreement was only signed in April 2012 after then Prime Minister Putin had promised substantial tax concessions (which were written into law in the autumn of 2013). Shortly after that, Rosneft signed deals with ENI to explore and subsequently develop resources in the southern part of the previously disputed area with Norway in the Barents Sea; a few weeks later, a similar agreement was made with Statoil for the northern part, as well as for three blocks in the Okhotsk Sea. In 2013 the agreement with ExxonMobil was extended to include licences further east in the Kara Sea as well as in the Laptev and Chukchi Seas. Altogether, about 850,000 square kilometres of Russian Arctic offshore acreage is now included in these cooperation agreements, 760,000 with ExxonMobil

alone. The deals offer Rosneft a free ride for a few years, since the foreign partner will cover all the costs in the geological prospecting phase (seismics) and for a certain number of exploration wells.

Future investment priorities

A strange interdependence has emerged. Russia has admitted that it is very dependent on foreign companies for development of the Arctic offshore. The foreign companies which have been invited in are contributing vast sums, but will be dependent on the investment priorities of Rosneft, and Russia, if discoveries are made.

'RUSSIA HAS ADMITTED THAT IT IS VERY DEPENDENT ON FOREIGN COMPANIES FOR DEVELOPMENT OF THE ARCTIC OFFSHORE.'

But what could those priorities be? Russia's dependence on oil revenues is already very high and is likely to increase with the ongoing political turmoil, with its reverberations for the economy. The outlook for gas exports is bleaker than before and the promise of a broad modernization of the economy, as envisaged by former President Medvedev, does not look imminent. In such circumstances, Russia may no longer be able to afford to choose high-cost projects – attractive for political and prestige reasons – when higher state revenues could be secured by reforming resource management policies and consumption. The political problem is that large-scale reform – which would imply more competition and transparency – could threaten the present Russian power structure, with its close connections to the giants in the energy sector. While the economic logic points in the direction of reform, the tense international situation is also used as an argument by others, such as Igor Sechin, for the opposite. This would mean more centralization, more limitations on foreign investors, and an even more dominant role for Sechin's company, Rosneft. Although a few years of economic decline could change this, it seems that Sechin's arguments are carrying the day so far. This could mean that large offshore projects are postponed while Rosneft concentrates on lower-hanging fruits, including perhaps some unconventional oil. Radical reforms, with the creation of new policies and institutions that both satisfy political interests and produce better economic results, are not on the horizon.

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Shale oil in Russia – commercial catalyst required

James Henderson

Decline of conventional oil

As Russia enters a period when oil production from its traditional heartland in West Siberia has plateaued and could go into decline, the search has begun for new sources of output that can help to maintain the country's output above 10 million barrels per day (mmbpd). It is vital that this level is maintained, in order to allow crude oil and oil product exports (which contribute around 45 per cent of Russia's budget revenues) to remain as a vital bulwark of the country's economy. To this end, the Russian authorities have been encouraging the country's major oil companies to explore new greenfield regions – such as East Siberia, the Black and Barents Seas, and the Arctic offshore – in the hope that major new production areas can be developed. These prospects are relatively long term, however, with major increases in oil production unlikely for a decade or more, meaning that a medium-term solution still needs to be found. Unconventional oil would appear to be just such a solution especially as, in a recent assessment, the United States Geological Survey (USGS) estimated that Russia has the largest potential shale oil resources in the world, with its 75 billion barrel estimate being almost equivalent to the country's current proved conventional oil reserves. The Russian authorities have also been expressing growing confidence in the potential from tight and shale reservoirs located in West Siberia and European Russia, with production expectations set as high as 1.5mmbpd by the Ministry of Natural Resources. The key question, of course, is whether this potential can be realized. It is becoming increasingly clear that the answer to this will be less to do with geology and technology than with the commercial environment in Russia and the corporate mind set of the companies that currently control the majority of the relevant licences.

'THE UNITED STATES GEOLOGICAL SURVEY ESTIMATED THAT RUSSIA HAS THE LARGEST POTENTIAL SHALE OIL RESOURCES IN THE WORLD …'

Moves to exploit shale oil

The need for both an alternative corporate outlook and an increased

level of experience in the development of unconventional resources has been exemplified over the last two years by the number of partnerships that have been formed between Russian and international companies to begin initial exploration. In 2012 Rosneft, the leading Russian player in terms of licensed acreage, started the process by forming a joint venture with ExxonMobil to conduct a pilot project in West Siberia to develop the Bazhenov reservoirs beneath existing fields owned by its subsidiary Yuganskneftegaz. The Bazhenov shale oil resource is the most documented and researched of the Russian unconventional plays, covering an area of 1 million square kilometres across West Siberia; the Rosneft–Exxon JV plans to conduct a pilot project that will see 30 wells drilled at a cost of $300 million over the next three years. The project will be entirely funded by Exxon, and will test the reservoir using the horizontal drilling and multi-stage fracturing techniques that are common practice in the US shale industry.

Rosneft has also formed an additional unconventional oil JV with Statoil to investigate tight oil and shale prospects in the Stavropol region of European Russia, and is also exploring 'difficult-to-recover' reserves in the Yamal Nenets region. Gazprom Neft, another state-owned company, is also making significant efforts to develop new reserves: in partnership with Shell at its Salym JV, and with oil services company Schlumberger at a number of prospects in the Khanty-Mansiisk region. Its efforts with Shell are of particular importance because a significant pilot project, comprising six wells, is being undertaken; Gazprom Neft CEO Alexander Dyukov suggests that if successful, the reservoirs at Salym could produce up to 100,000 barrels per day of shale oil by 2020.

Most recently, the French company Total has entered the race to exploit Russia's shale reserves. Total acquired three licences in an auction in West Siberia, and then formed a joint venture with the private company Lukoil to develop both these licences and additional assets brought by Ritek, Lukoil's unconventional oil subsidiary. Again, the venture is at a very early stage of development, with both companies remaining cautiously optimistic about the prospects for production but refusing to commit to any detailed forecasts of future output.

Geological issues

The key reason for this reluctance to say anything significant about future output is that it remains very unclear whether it will be commercial to develop shale oil in Russia. There are a number of underlying factors behind this uncertainty, the first of which is geological. Although the Bazhenov reservoir and other tight oil and unconventional plays have been known about in Russia for many years, the key problem with their development to date has been the heterogeneity of the rocks; it is possible for one well to produce in abundance, while there is almost no flow from a well only a kilometre away. Indeed Surgutneftegaz, the most active driller into the Bazhenov to date, estimates that only one in three wells can be counted as successful. Furthermore, the significant presence of kerogens as well as light oil in the reservoirs means that production costs can also be very high, if heating is required to ensure that liquid hydrocarbons will flow.

Taxation

The lack of certainty over well performance, both initial flows and decline rates, and well cost means that estimating the overall economic outcome is a precarious process, but this problem could be reduced if the tax regime allowed costs to be offset pre-tax, with profits being shared with the government. Unfortunately Russia's current tax system is primarily revenue-based, with both the Mineral Extraction Tax (MET – essentially a royalty on production) and the export tax being taken from overall sales, before allowance for any costs. This leaves the majority of the risk with the developers, meaning that their incentive to spend the billions of dollars that will be needed to increase output to any figure which is close to government forecasts is severely limited. The Russian authorities have appreciated this fact to some extent – reducing the MET royalty on output from specific reservoirs (including the Bazhenov) to zero and effectively reducing the tax bill by approximately $20 per barrel – but nevertheless the economics of shale oil production remain very sensitive to changes in operational performance. For example, at an average well cost of $9 million, a change in initial well output from 75 tonnes per day (c.500bpd) to 50 tonnes per day (c.375bpd) could change the IRR of a well from a healthy 24 per cent to an unacceptable 7 per cent (assuming a $100 per barrel oil price).

'… THE ECONOMICS OF SHALE OIL PRODUCTION REMAIN VERY SENSITIVE TO CHANGES IN OPERATIONAL PERFORMANCE.'

This combination of geological and economic uncertainty effectively means that the pilot projects currently underway in the Rosneft, Gazprom Neft, and Lukoil joint ventures will be exploring not only the productivity of the shale oil reservoirs but will also be establishing the commercial parameters that will be needed to make them work as investments. It is now anticipated that once the preliminary exploration work has been done, all the companies and their international partners will come back to the Russian authorities in order to negotiate a set of tax terms that will encourage capital

expenditure to be committed and new business technology to be brought to bear. A similar negotiation took place concerning the Arctic, with Rosneft and ExxonMobil essentially insisting on the return-based sliding scale royalty system that has now been adopted to allow exploration to commence; it is likely that tax concessions will also be required if Russia's shale oil resources are to be exploited in a timely fashion.

Technical issues

The issue of business technology is also an important one, as it implies the application of business practices which have not been prevalent in Russia and which are arguably not suited to the current corporate landscape. Russia has been using the operational technology needed to develop unconventional oil (such as horizontal drilling and multi-stage fracturing) for many years, thanks to the involvement of multinational service companies such as Halliburton and Schlumberger since the 1990s. However, entrepreneurial risk-taking and adaptive planning – key features of the US unconventional oil industry – are much less prevalent in Russia, due to the history of traditional development of conventional fields in its oil industry. Two key elements of this US environment have been the proliferation of small companies and the abundance of financial institutions willing to provide capital to back them; neither of these is present in Russia. The stark contrast is clearly seen when comparing the 89 small companies operating in the Bakken region of the USA alone, with the three or four major Russian companies that dominate the Russian unconventional industry.

As a result, although the potential unconventional resource base in Russia is enormous – suggesting that a production target of 1.5 mmbpd is not unreasonable – a number of factors combine to make it unlikely that such an outcome will be realized in the short term. Importantly, the geology is difficult, but this is true of many oil basins in the world. More crucially, the tax system has yet to be fully adapted to provide adequate incentives for the huge capital expenditure that will be needed to develop the industrial process essential to profitable shale development. Finally, there is as yet no proof that Russia's model of large NOC joint ventures with IOCs can be as successful as the multi-company model used in the USA. It is likely to take many years before the experiment can be completed and a significant change in Russian corporate culture may be required; this means that shale oil in Russia may be no more of a short-term fix to the country's production issues than the development of the Arctic offshore.

Russia's Arctic offshore opportunities

Julia S.P. Loe

Russia holds the largest share of estimated Arctic offshore petroleum resources, and is set to lead the way in the region. This summer's planned drilling in the *Universitetskaya* structure in the Kara Sea by Rosneft and ExxonMobil is this year's most high-profile petroleum event in the Arctic; it is attracting great interest due to the high resource estimates for the area. However, only a large oil discovery will be sufficient to justify the costs of development and of necessary infrastructure in the harsh weather conditions of the ice-covered Kara Sea. There is also potential for Arctic petroleum development in the previously disputed area between Norway and Russia, in the Barents Sea; this could contribute to the fulfilment of Russia's Arctic offshore ambitions.

'RUSSIA HOLDS THE LARGEST SHARE OF ESTIMATED ARCTIC OFFSHORE PETROLEUM RESOURCES, AND IS SET TO LEAD THE WAY IN THE REGION.'

Strategic offshore reserves

Global focus on the Arctic increased substantially in 2008, when the US Geological Service (USGS) published an assessment of potential resources in the region, estimating that up to 22 per cent of the world's remaining, undiscovered, technically recoverable oil and gas may be located in the Arctic. Approximately 84 per cent of the resources are expected to be offshore, most of it on Russian undisputed continental shelf.

Russia still has substantial resources in its core production areas, pumping up approximately 10 million barrels of oil (mmbpd) a day on a total, national level. Strong pressure to maintain petroleum production volumes, as onshore reserves are in decline, however, has switched attention to the offshore.

Despite other options – such as increased recovery from existing fields, investing in petroleum development in the Far East or in unconventional resources – Russia's President Vladimir Putin has made it clear that *'Offshore fields – especially in the Arctic – are without any exaggeration our strategic reserve for the 21st century'* (quoted in a

Financial Times article of 13 April 2012). A draft version of the Energy strategy for Russia until 2035 reveals ambitions that up to 5 per cent of Russia's oil production, and up to 10 per cent of its natural gas production, is intended to come from the Arctic offshore by 2035. If these production goals are achieved, the Arctic will play a significant role in compensating for any decline in production levels in traditional oil and gas producing regions.

Russia determined to succeed

Russia seems determined to succeed with Arctic offshore petroleum development. Gazprom neft shelf, after many years of delay, started the first production from a Russian Arctic offshore oil field in December 2013 – the Prirazlomnoye field in the Pechora Sea. Although the field is small in a Russian context, with recoverable oil reserves amounting to approximately 71 million tonnes, it is nevertheless a prestigious achievement for the project operator Gazprom neft shelf to have pioneered Arctic oil extraction in this way. Large-scale offshore development of the Russian Arctic is, however, likely to require international cooperation to bring in the necessary technological know-how, and to bring down the costs of export infrastructure, oil spill response, and search and rescue.

In 2011 and 2012 the state-controlled Russian oil company Rosneft signed partnership agreements on joint development of the Arctic with the US oil company ExxonMobil in the Kara Sea, Italian ENI in the Barents Sea, and with Norwegian Statoil in the Barents and Okhotsk Seas. The Rosneft–Exxon partnership, which has received the most attention, involves spending approximately $3.2 billion on geological prospecting and development of three licensed sectors (the east Prinovozemelsky blocks) in the Kara Sea and one area in the Black Sea. Initial 2D seismic work was conducted in the three Kara Sea blocks (the to-be-drilled *Universitetskaya* structure lies in the first block) by state organizations in the Soviet era; the current estimated recoverable resources in the three blocks stand at 6.2 billion tonnes of oil (45 billion barrels) and up to 20.9 billion tonnes of total hydrocarbons (150 billion boe) (information taken from 'Russia's Arctic seas', Rosneft website). Research available from the Soviet Union in 1988 estimates the recoverable oil resources in the Kara Sea as a whole at approximately [19.9 billion barrels] ('The Kara Sea', CIA Research Paper March 1988), and Igor Sechin, head of Rosneft, has expressed that *'I dream to drill exploration wells in the Kara Sea and discover a unique field with reserves of 3.5 billion tonnes in liquid hydrocarbons and 11.4 tcm of gas.'*

Limited fiscal incentives from the Russian government have long been considered a hindrance for Arctic offshore development, and improvements related to tax and licensing policies are still to be made.

However, following oil company demands – of tax reform as a prerequisite for carrying out investments – new tax legislation on offshore projects in the Arctic has been approved, in order to stimulate petroleum exploration. Within certain conditions, this includes reduction of the mineral extraction tax, exemption from export duty taxes, and abolition of value added tax on imported technology.

Exploration of the Kara Sea will continue over the next years – but high expectations may be followed by disappointment if no substantial oil discoveries are made. The region is very gas-prone, being an extension of the Yamal peninsula where Gazprom's giant Bovanenkovo field sits, and the initial prospects are known to have a high probability of gas being present. The hope is that the fields are so large that they have a significant oil rim – large enough (perhaps 7 billion barrels in the case of Universitetskaya) to justify a stand-alone development. If this is not the case, however, then the huge drilling cost (up to $700 million for a single exploration well) could be wasted, as Russia already has an oversupply of gas and does not need more in such a remote, high-cost region.

'… NEW TAX LEGISLATION ON OFFSHORE PROJECTS IN THE ARCTIC HAS BEEN APPROVED, IN ORDER TO STIMULATE PETROLEUM EXPLORATION.'

Beneficial Barents Sea conditions

Apart from the Kara Sea, the Barents Sea is the most likely area for the Arctic's first large-scale petroleum development. While the Kara Sea is ice-covered for most of the year, the Barents Sea's southern part is warm enough to keep the sea almost ice-free. There is harsh weather and almost complete darkness in winter, but the lack of ice, proximity to land, and shallower water makes parts of the Barents Sea technologically realistic to develop in the relatively short to medium term.

Following the indefinite shelving of the natural gas and condensate field Shtokman in 2012, the focus on the Russian part of the Barents Sea has been limited. The Shtokman field, with estimated reserves of 3.8 tcm, was planned to provide LNG to the USA, but the shale gas revolution resulted in significant changes to global gas market dynamics; this, in combination with increasing development costs, added to existing concerns that the project was not commercially viable. In the longer term, Shtokman may still be developed if technological solutions appear to allow costs to be lowered, or if fiscal conditions improve and gas prices rise again.

However, following the maritime delimitation agreement between Norway and Russia in the Barents Sea in 2010 (after almost 40 years of dispute) new opportunities have emerged in a different part of the Barents Sea. The delimitation agreement involves a compromise between the original Norwegian and Russian claims, dividing a previously disputed area into two equally large parts. Prior to the agreement, there was a moratorium on exploration activities in this area of overlapping claims. With the delimitation agreement in place, this has changed.

In Norway, oil production has halved since 2000, but gas output has increased. In order to compensate for maturing of large fields in the North Sea, the petroleum industry is increasingly turning its focus north, to the Norwegian and Barents Seas.

Norway already has Arctic production of LNG from the Snøhvit field in the Barents Sea, operated by Statoil, and start-up of the nearby Goliat oil field, operated by ENI, is expected in 2015. Currently, there is also significant exploration activity in the Norwegian part of the Barents Sea. Several discoveries have been made over recent years, but there are still uncertainties related to commerciality of development. To date, insufficient gas has been discovered in the Norwegian Barents Sea to justify investments in new transport infrastructure.

Nevertheless, the bids for blocks included in the twenty-third licensing round on the Norwegian Continental Shelf (NCS) show substantial interest for the south-eastern part of the Norwegian Barents Sea, bordering Russia. Nominations received in January 2014 include 160 blocks, of which 140 are located in the Barents Sea and 20 in the Norwegian Sea. In total 40 companies bid for licences.

The delineation agreement between Norway and Russia includes an Annex on the unitization procedures for the area. If a large cross-border discovery is made, development will require cooperation between Norway and Russia (with or without joint development).

At the moment, the prospects for Norway–Russia joint development remain highly speculative, but if sufficient resources are found, then the incentive to find a solution to the infrastructure and other logistical issues will increase. During the early 1980s the Soviet Union conducted some seismic surveying which has served as the basis for initial Russian estimates for the area, with various sources suggesting that yet-to-find recoverable resources could be as high as 6,400 million cubic metres of oil equivalent (c.40 billion boe). Reinforcing these claims, the Russian Ministry of Energy has suggested that the previously disputed area holds an estimated 48 billion barrels of oil equivalent, and although the US Energy Information Agency has a lower estimate, it still assesses the potential of the area at 12 billion barrels of oil equivalent.

'IF A LARGE CROSS-BORDER DISCOVERY IS MADE, DEVELOPMENT WILL REQUIRE COOPERATION BETWEEN NORWAY AND RUSSIA.''

Even if these estimates are only directionally correct, significant discoveries on either side of the now agreed boundary could be enough to justify joint development of one or more fields. Common infrastructure between Norway and Russia may turn out to be a reasonable solution, justifying what are likely to be high development costs, as both countries can benefit from new production. At the same time, there may also be opportunities for LNG development. If the price difference between the European and Asian markets remains, while the Arctic ice melting continues and opens up the Northern Sea Route for a larger part of the year, Arctic LNG may become more attractive. While Russia has other options for oil and gas exploitation, Norway has few other regions to turn to – and may thus be a driving force for development. Assuming that: the current political disputes between Russia and the West don't escalate, energy prices remain high, and framework conditions are in place, *Russian–Norwegian cooperation in the Barents Sea may turn out to be key for developing the first large-scale offshore petroleum region in the Arctic*.

The domestic gas sector in Russia – gradual progress towards a competitive market?

James Henderson

In the mid-2000s the Russian authorities were firmly in control of the country's gas sector; their influence was primarily reflected in their right to set the regulated price for gas sold by the dominant producer, Gazprom. This regulated price was on an upward trajectory, growing at around 15 per cent per annum, as the government

attempted to balance Gazprom's needs for more funds with the desire of domestic industry and the population for low gas prices. However, demand was rising across all the markets for Russian gas at that time, with increasing exports to Europe and the FSU, mainly for use in power generation. Meanwhile, economic growth at home was catalysing annual gas demand growth of 2–3 per cent per annum as gas retained its position as the most important fuel in the energy economy by far, accounting for 50 per cent of primary consumption. The key issue, therefore, appeared to be the need to incentivize the development of Gazprom's new Yamal fields, in order to secure sufficient supply to meet anticipated demand. With this in mind, President Putin stated in 2006 that domestic gas prices should reach export netback parity by 2011; this meant a doubling of the tariff to reach a level of approximately $120–130/mcm, given the prevailing oil price of $50 per barrel at the time he spoke. This price would have allowed Gazprom's new Bovanenkovo field on the Yamal peninsula to break even in the Moscow market.

Impact of US shale gas

However, a combination of global and domestic factors have combined to alter this growth picture and to change the supply and demand balance for Russian gas fundamentally; this has significant implications for gas price formation in Russia and for the control that the government can realistically have over the sector. The first important catalyst was the shale gas revolution in the USA, which caused LNG to be diverted away from North America (where it was no longer needed) towards Europe, where it caused an oversupply of gas and a decline in spot prices. This fall in spot prices coincided with a rise in the global oil price to over $100 per barrel, meaning that Gazprom's oil-linked contract prices to Europe also jumped, with the result that Russian gas became increasingly uncompetitive and export volumes were reduced to minimum take-or-pay levels.

Reduced demand for gas

This pricing environment was then exacerbated by the 2008/9 economic crisis which caused a sharp decline in energy (especially gas) demand in Europe, which in 2014 still remains 10 per cent below its 2008 level. As a result, demand for high-priced Russian gas fell even further, with impoverished European utilities insisting on contract renegotiations to reduce prices and volumes.

This decline in demand for Russian gas in Europe coincided with a fall in demand from FSU countries, which were also reacting to the economic crisis and to the increasing price of Russian gas. Furthermore, the consistent growth of gas demand in Russia also came to a halt due to the recession in 2008/9, and although some growth later recommenced, consumption has fallen in 2012 and 2013, meaning that all the markets for Russian gas have essentially stagnated or declined over the past six years.

'… ALL THE MARKETS FOR RUSSIAN GAS HAVE ESSENTIALLY STAGNATED OR DECLINED OVER THE PAST SIX YEARS.'

Bovanenkovo and the rise of independent producers

Unfortunately for Gazprom, just prior to this coincidence of events, it had committed to the full development of the Bovanenkovo field, with its potential 140 bcm/year of output, meaning that the company now has production capacity of 600 bcm/year or more, while it produced only 487 bcm in 2013. At the same time Russia's 'independent' gas producers, such as Novatek and the oil companies, have increased their output by almost 60 per cent since 2008 to 180 bcm, with the implication that Russia now has a significant potential oversupply of gas in its domestic market.

These production statistics also indicate that independent producers have been able to increase their market share in comparison to Gazprom (they now produce almost 30 per cent of Russia's gas), and the main reason for this is because they do not have to price their gas at Gazprom's regulated level. The regulated price continued to rise at 15 per cent per annum between 2008 and 2013, despite the increasing burden this placed on the Russian economy, and by 2013 it had reached the level of $115/mcm. While this price was close to the original target set in 2006, it was still far from netback parity due to the doubling of the oil price since that time.

During most of this period independent producers would offer their gas at a premium to the still relatively low regulated price, thus confining their potential market to customers who wanted surplus gas. However, from 2012 the regulated price reached a level at which the independents could profitably offer their gas at a discount for the first time, transforming the psychology of the domestic gas market. Gazprom's regulated gas shifted from being the preferred option for customers to being the less desirable option, as buyers opted to sign new contracts with Novatek, Rosneft, and others. Suddenly the regulated price became a burden not a subsidy and Gazprom was put at a competitive disadvantage, with the result that it has had to cut back production while the independents continue to grow their output. Indeed the level of contract switching means that this trend is set to continue for the rest of this decade, with non-Gazprom output set to reach a level of 250–300 bcm by 2020 while Gazprom's production may be no

higher than 500 bcm, a level 50 bcm below its recent 2008 peak.

In this new situation, where independent producers are now marketing to all Russian gas consumers rather than just to a premium segment, the relevance of the regulated price and the government's role in setting it are called into question. Gazprom itself has requested the right to offer gas at a discount, and has been granted the right to sell within a band 20 per cent below or above the regulated level, implying that all producers can now sell gas either above or below the government-set price. In effect, then, the regulated price has become a guide price around which trades can be agreed, rather than a specific level at which the majority of sales are made.

Pricing structure and the role of government

This change in market dynamics has some potentially significant implications for both producers and consumers. In the near term, the government now appears to have accepted that a price level has been reached which represents an equilibrium of sorts between supply and demand, albeit that it has forced Gazprom to re-assess and cut back its potential production levels. The regulated price will not increase in 2014 (a 15 per cent increase had been planned for 1 July) and future growth is unlikely to exceed the rate of inflation (forecast to be around 5–7 per cent per annum). As all the discounts that have been offered by the independents are set relative to the current and future regulated price, this means that the revenues for all producers will be constrained and consumers will be protected from sharp increases in price. However, given the theoretical oversupply situation in Russia the suspicion is that if the regulated price were to be removed altogether the gas price would actually fall rather than rise, meaning that producers are also being protected by the continuation of government regulation. As such, the government does appear to have a continuing role as a definer of the price range as both consumers and producers adjust to a more competitive market place.

'… THE SUSPICION IS THAT IF THE REGULATED PRICE WERE TO BE REMOVED ALTOGETHER THE GAS PRICE WOULD ACTUALLY FALL RATHER THAN RISE …'

An important question, however, is how long this government influence will, or should, remain relevant. A sensible answer would appear to be: until other elements of the gas supply chain have been reorganized to allow a balance between supply competition and state control over a strategically important sector of the economy. An important first step has been taken in the adjustment of the gas tax royalty (MET), which has been shifted from a fixed rate payment to an adjustable rate based on the gas price (domestic or export) received by any producer. This means that one important element of the netback margin for suppliers is now comparatively stable relative to the gas price, providing some comfort for suppliers as they invest in upstream gas projects.

A second step has been the initial loosening of the export monopoly that has historically been enjoyed by Gazprom, with LNG exports now allowed for specific third parties. This has started the process of allowing all gas companies to compare opportunities in the domestic and export markets, although until this ability is fully extended to pipeline sales, it will have little impact on the domestic gas price.

The third and final step would be the separation of Gazprom's transport business away from its upstream and downstream operations, to create a model of government control of the trunk pipeline system (as in the oil sector) with full competition between producers in the domestic, and ultimately even the export, market. In this scenario the government could cease its role as a price regulator and could control the gas sector through its setting of transport tariffs, as envisaged in the 1999 Gas Law. This outcome is not imminent, in particular because Gazprom is still engaged in a number of large pipeline construction projects – such as South Stream and Power of Siberia – but the increasing level of discussions about independent producer involvement in export sales via these new pipelines suggests that the issue is now at least on the Russian government agenda. As such, the prospect of a fully liberalized domestic gas market by 2020, with state regulation of domestic prices being replaced by a more market-oriented gas price formation system combined with greater access to export markets via a state-controlled gas transport sector, is becoming more of a realistic option than might have been envisaged even three years ago.

'THE PROSPECT OF A FULLY LIBERALIZED DOMESTIC GAS MARKET BY 2020 … IS BECOMING MORE OF A REALISTIC OPTION THAN MIGHT HAVE BEEN ENVISAGED EVEN THREE YEARS AGO.'

The status of the Russian coal industry and its prospects in the period to 2030

Liudmila Plakitkina

The development of coal production in the Russian Federation, 2000–13

Russia is currently the sixth coal producer in the world after China, the USA, India, Indonesia, and Australia. Industrial reserves of Russia's currently operating coal enterprises are around 19 billion tonnes (more than 550 years' production at the current level); this figure includes coking coal reserves of around 4 billion tonnes.

'RUSSIA IS CURRENTLY THE SIXTH COAL PRODUCER IN THE WORLD.'

In 2013, coal production volumes amounted to 352 million tonnes (representing growth of 36.2 per cent compared to 2000, when 258.5 million tonnes was produced). In 2013, coking coal accounted for 22 per cent of the total and thermal coal for the remainder. The growth of coking coal production in Russia in 2013 compared to 2000 was 29.7 per cent, while for thermal coal it was 38.2 per cent.

Around 70 per cent of coal in Russia (71 per cent in 2013) is produced by opencast mining, with the remaining 30 per cent from subsurface mining. There are 22 coal basins and 129 separate coalfields in operation; most production is in the Kuznetsk Basin, East Siberia, and the Far East.

Development of Russian coal supplies by usage, 2008–13

In 2013 Russian coal supplies amounted to 321.9 million tonnes (The difference between coal production (352 million tonnes in 2013) and supply (321.9 million tonnes in 2013) is losses in processing and transport, and producers' stockpiles.); only 55.6 per cent of this was consumed domestically, down from 68.1 per cent in 2008. Electric power stations accounted for 27.4 per cent of total Russian coal supplies in 2013 (down 7.6 per cent from 2008). Taking imported coal into account, the volume of coal supplied to power stations in Russia in 2013 came to 117.6 million tonnes (down 9.8 per cent from 2008). The reduction in levels of electricity consumption between 2008 and 2013 led to a fall in the volume of deliveries of coal to Russian power stations.

The trend for domestic coal demand – for both thermal and coking coal – is in long-term decline. The volume of coal supplied for coking in 2013 fell to 40.9 million tonnes (1.4 per cent lower than 2008) due to a general decline in demand for coking coal, brought about by developments in ferrous metallurgy. As of 2008–9, demand for Russian coking coal did not change substantially, remaining at around 37–39 million tonnes per year. There has been a significant tendency to reduce the specific consumption of coke in metallurgy and to switch to more modern production methods.

'THE TREND FOR DOMESTIC COAL DEMAND – FOR BOTH THERMAL AND COKING COAL – IS IN LONG-TERM DECLINE.'

In 2013, 27.8 million tonnes of coal (1.8 million tonnes more than in 2008) were supplied for general household needs and the agricultural sector.

The negative dynamic of domestic coal demand is making the Russian coal sector less stable, and is increasing its dependence on external market conditions. The main reason for the fall in domestic coal demand has been competition from gas, the price of which is regulated – although even in conditions where gas prices are deregulated, coal is incapable of competing with gas. Technically it is possible to increase the level of demand

Supplies of Russian coal by type of usage (%)

	2008	*2009*	*2010*	*2011*	*2012*	*2013*
Coal supply – total of which:	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Coal supplied to Russia (domestic market)	**68.1**	**65.5**	**67.4**	**65.0**	**59.7**	**55.6**
to power stations	35.0	31.5	32.4	31.2	30.7	27.4
for coking*	14.1	14.6	14.4	13.8	12.7	12.7
for general household needs, the agricultural sector	8.7	8.8	8.4	7.8	7.7	8.6
other consumers**	10.3	10.6	12.3	12.2	8.5	6.9
Export – total	**31.9**	**34.5**	**32.6**	**35.0**	**40.3**	**44.4**
to non-CIS countries	28.9	32.4	29.8	32.2	37.2	40.6

* including coal supplies for smelting

** Ministry of Internal Affairs, Ministry of Defence, small-scale industrial boiler facilities, cement and brick works and others

for coal by converting fuel oil or gas-fired boiler plants to run on coal instead. On the other hand, it is entirely possible that coal would be capable of competing with gas, should natural gas prices increase. At present, coal and gas prices on the domestic market are approximately the same. According to our calculations, in order to bring about an economic motivation for power stations to use coal instead of gas, it is necessary for the price ratio of gas to coal to be not less than 2.5:3.0–3.1, expressed in units of fuel content. This would possibly give rise to the basic conditions necessary for more active development of coal-fired power generation.

With the stagnation of domestic coal demand, increasing the supply of coal for export is the main factor driving rising coal production. Coal exports accounted for 44.4 per cent (143.1 million tonnes) of all deliveries of Russian coal in 2013, which is 49.7 per cent more than in 2008. More than nine-tenths of total Russian coal exports (91.5 per cent) went to non-CIS countries. Seventy-four Russian coal companies delivered coal products to the international market in 2013; for half of these, exports accounted for more than half of their total sales of coal. The main consumers of Russian coal in 2013 (accounting for around 75 per cent of all Russian exports) were Cyprus, Great Britain, Ukraine, South Korea, Turkey, Japan, the Netherlands, Switzerland, Poland, and China, among others.

'… INCREASING THE SUPPLY OF COAL FOR EXPORT IS THE MAIN FACTOR DRIVING RISING COAL PRODUCTION.'

The Russian Federation's coal imports in the period 2008 through 2013 grew by 14.7 per cent to 29.6 million tonnes by the end of the period. Of total Russian coal imports, 95.9 per cent came from Kazakhstan and 4.5 per cent from the USA; 93.6 per cent of these imports were thermal coal.

Predicted production and consumption levels of Russian coal to 2030

ERI RAS is continuously monitoring the long-term development of coke and thermal coal production, both by individual companies and at the various locations. As a result, the most likely outlook for the development of coal production by the various companies, at all locations, can be determined with maximum and minimum possible levels of development. The maximum outcome assumes that companies acquire all the necessary licences for mineral resources development, and presupposes successful realization of innovative projects and favourable prices for energy resources on external and domestic markets. The minimum outcome presupposes unfavourable energy price levels, which will have a negative impact on most of the new projects undertaken.

With the aid of simulation models developed by ERI RAS, we have obtained forecasts of the maximum and minimum possible levels of development of coal production across all coal companies and locations. It was established that, given the maximum outcome, Russia could produce annually more than 700 million tonnes of coal in the period to 2030, of which 183 million tonnes would be coking coal. The minimum outcome would mean a reduction in overall annual coal production levels in Russia in the period to 2030 to 295 million tonnes (59.8 million tonnes of coking coal).

Having predicted the maximum and minimum possible outcomes for coal production, it is possible to work out how coal production in the forecast period might develop in any scenario resulting from changes in the Russian economy and energy consumption, by using simulation models.

In accordance with Russia's new energy strategy for the period to 2035, approved by the Russian federal government, the table on the next page shows the predicted volumes of production and supply of Russian coal to 2030.

Regardless of the predicted growth of coal production in the Russian Federation in the period to 2030, ERI RAS's predictions show a possible decline in Russian coal production to 344–349 million tonnes in 2014.

The main reason for declining coal production in Russia is the changing conditions on the global coal market; these changes particularly relate to gas having gained the upper hand in the domestic American market as a result of the 'shale revolution', which led to sharp structural shifts in the market: record low prices for gas and the replacement of coal by gas in power generation. While five years ago the USA was a significant coal importer, 2011 saw a fundamental turning point, and in 2012 the output levels of gas and coal generation were more or less equal. Demand for coal in the USA declined, 114 million tonnes of surplus coal were sent for export in 2012, of which 25 million tonnes went to Europe (1 million tonnes of this went to Russia – which had received 1.5 million tonnes in 2011). In all, around 6–7 per cent of total global supplies of coal were redirected. In 2013 deliveries of American coal to EU countries grew to 65 million tonnes (compared to 28.4 million tonnes in 2009), while deliveries to Asia–Pacific increased to 38 million tonnes (compared to 5.8 million tonnes in 2009).

Australia, Indonesia, and Colombia now had spare volumes of coal that had previously been destined for the American market. In addition, the growth rate of the global economy had slowed down and there was clearly no need for such volumes of spare coal. Supply exceeded demand, and slowly but steadily, coal prices began to fall.

Considering the long-term nature of increasing shale gas production in the USA and coal exports to EU countries, many coal-exporting companies,

Predicted volumes of production and supply (in million tonnes) of Russian coal to 2030					
	2013	*2020*		*2030*	
		minimum projection	*maximum projection*	*minimum projection*	*maximum projection*
Coal production in Russian Federation	**352**	**392**	**425**	**410**	**460**
coke	80	105	112	112	120
thermal	272	287	313	298	340
Supply of coal, total	**315**	**351**	**383**	**369**	**415**
To the domestic market, total	**175**	**193**	**203**	**199**	**210**
for electricity generation	92	106	110	115	123
for coking	38	40	40	40	40
for household needs, agriculture	23	22	24	19	17
others	22	25	28	25	30
For export, total	**140**	**158**	**180**	**170**	**205**
coke	19	23	29	35	40
thermal	121	135	151	135	165

including Russian ones, will, in the near future, experience increased downward pressure resulting from the efforts of coal exporting companies in the USA.

According to ERI RAS's forecast, global production of shale gas could amount to around 700 bcm/year in the period to 2030, with 400–500 bcm from the USA, 70–80 bcm in Europe, and 110–140 bcm from China. In terms of coal equivalent this is quite impressive, and will result in additional energy resources in Europe of 120–130 million tonnes a year, and 190–230 million tonnes a year in China. This will substantially reduce potential European and Chinese coal imports and increase the risk to coal exporters to these regions. The first exports of shale gas to EU countries could happen in 2015.

The additional energy resources that could appear on the global market by 2030, in terms of coal equivalence, amount to 650–800 million tonnes a year. At present, total global coal exports are around 1–1.2 billion tonnes a year. So the expansion of a competitive gas market will, by dint of the inclusion of shale gas in economic turnover, intensify competition in the global gas market in Europe and Asia and will impinge on the possibilities open to coal exporters.

Account should also be taken of such factors as the advance of energy conservation, and the gradual replacement of coal in the energy mix by renewable energy sources, which are currently underway internationally, including in Russia.

Nonetheless, according to ERI RAS's predictions, it is possible that there will be an increase in Russian coal exports to 150.4–153.5 million tonnes in 2014, depending on coal production volumes.

Main challenges and threats to the development of coal production and export

The Russian coal industry confronts a range of external and domestic factors that lead to reduced consumption of coal, including:

- Increased competition between different types of energy resources on external and domestic markets resulting from a possible fall in oil prices;
- Declining global prices for primary energy resources (oil, gas, coal), accompanied by a slowdown in growth rates of the global economy;
- The need of many countries to change to an innovative way of developing the fuel and energy sector, including the Russian coal industry;
- Increasing energy conservation and the gradual reduction of coal in the energy balance together with its replacement by renewable energy resources, a process which is already underway in most of the world's developed economies;
- The issue of shale gas, brought about by the intense development of shale hydrocarbons in the USA, which will make itself felt in the development of the coal industry (and in the international coal balance) by 2020–30 including in Russia;
- The anticipated wave of technological changes which will accentuate the role of innovation in social and economic development and the declining influence of many traditional growth factors;
- The exhaustion of the potential for raw material exporting models of economic development based on increased fuel

and raw material exports as well as the production of goods for domestic consumption due to the low costs of factors involved in manufacturing, such as labour costs, fuel, electricity.

Forecast of coal consumption volumes, and measures to stimulate market development

In 2012 global coal demand came to around 7.7 billion tonnes (61.2 per cent higher than the level in 2000). Between 2000 and 2012, coal consumption increased in Asia by 2.4 times, in Latin America by 1.5 times, in former Soviet countries by 25.2 per cent, in Africa by 17.8 per cent, and in Australia and New Zealand by 7.6 per cent. It declined by 16.2 per cent in North America and hardly changed at all in European countries (where there was 0.2 per cent growth). However, in recent years there has been a very slight increase in coal consumption in EU countries (consumption in 2012 was 7.3 per cent higher than the figure for 2009), which can be explained by high gas prices and the changeover to greater use of renewable energy sources that was planned to take place by 2018–20, particularly in Germany. The main gas-consuming countries in the world are: China (whose share in 2012 was 47.6 per cent), the USA (10.7 per cent), India (9.8 per cent), Russia (3.4 per cent), Germany (3.1 per cent), South Africa (2.4 per cent), Japan (2.4 per cent), Poland (1.8 per cent), Australia (1.8 per cent), Ukraine (1 per cent), and Indonesia (0.8 per cent).

According to ERI RAS's predictions, there may be a reduction in global annual average growth rates in coal demand in the period to 2020. While this growth rate was 5.6 per cent in 1990–2010, it is predicted that it will fall to 1.2 per cent by 2020, with growth rates declining from 10.6 per cent to 2 per cent in China, from 6.3 per cent to 1.9 per cent in India, from 2 per cent to minus 1.5 per cent in Japan, and from 1.1 per cent to 0.2 per cent in Russia.

Despite the combined influence of the factors outlined above, which will serve to make the position of coal exporters more difficult in the global market, the implementation of measures such as those listed below could stimulate the development of both domestic and external markets for Russian coal. Such measures may include:

- Increased labour productivity and reduced production costs in the coal sector;
- Stimulation of the creation, implementation, and dissemination of fundamental innovations in production, deep processing, and coal usage by coal companies;
- Regulation of rail transportation costs so that they do not grow at a higher rate than inflation. Rail costs should also be flexible and not exceed costs for oceangoing freight;
- Improving tax policies (restoring the cancellation of interest rates for credits at Russian banks upon the completion of investment projects);
- Expanding the practice of public/private partnership;
- Implementing aspects of indicative planning in the coal sector;
- Extending existing legislation for the stimulation and support of investment projects in the Far East and in East Siberia which allows for discounts or exemptions from mineral extraction taxes to be provided for the development of new fields;
- Switching over to long-term contracts for coal supplies for electricity generation, the public and utilities sector, and the metallurgical industries;
- Increasing the quality of coal supplied and reducing transportation costs;
- Stimulating the creation of domestic machine tool manufacturing, which will serve to reduce ongoing manufacturing costs;
- Establishing coal/generating hubs.

Russia's power market reforms at the crossroads

Sylvia Beyer

A decade of efforts were made to reform and liberalize the Russian electricity sector, with the unbundling of electricity networks and generation, the creation of an institutional governance framework and a wholesale electricity market, together with the privatization of generation assets. These changes attracted national and foreign investment into new generation capacity. In 2013, the government decided to launch a process to reform the Russian electricity market; this was planned to last until 2015. In 2014, discussions were still taking place over the ideal market design. Looking ahead, this reform is crucial for the modernization of the power sector, notably for the renewal of Russia's large fleet of thermal power plants which were built 50 to 70 years ago. Up to 2035, around 80 per cent of nuclear capacity will reach the end of its lifetime and 78 per cent of hydropower plants will be in need of refurbishment. The *IEA World Energy Investment Outlook 2014* estimates that the electricity sector in Russia will require investment of $411 billion in generation and $202 billion in networks by 2035.

The International Energy Agency (IEA) recently released *Russia 2014*, an in-depth review (IDR) of Russia's energy and climate policies. The report examines the Russian electricity market, its achievements, shortcomings, and challenges, and provides recommendations for the future direction of reforms with regard to energy networks and retail and wholesale markets. The IEA has been following Russian electricity market reforms since 2002. This article reflects on the latest findings from the IDR and the challenges of wholesale power market design.

'… THIS REFORM IS CRUCIAL FOR THE MODERNIZATION OF THE POWER SECTOR, NOTABLY FOR THE RENEWAL OF RUSSIA'S LARGE FLEET OF THERMAL POWER PLANTS …'

Creation of the OREM

The creation of the wholesale energy and capacity market, the OREM (in Russian, *Optovyi Rynok Electroenergii i Moshchnosti*), with a separate energy and capacity market, is a major achievement, as is the creation of the Russian day-ahead-market; the day-ahead-market covers 95 per cent of the supply in two price zones in Europe and Urals, and Siberia. Russia has chosen to remunerate capacity in two separate markets, while avoiding price spikes in the energy market. The capacity market has two main elements:

- a targeted out-of-market capacity contract to secure new capacity up to 2018 on the basis of preselected projects (in Russian, *Dogovor o Predostavleny Moshnosty* or DPM) and
- annual capacity auctions for existing capacity.

Capacity prices are capped in the areas where there is market concentration. The market is fragmented in 23 free-flow areas, with regulated price caps in 18 free-flow areas. Currently, capacity auctions are carried out on an annual basis, taking a conservative approach on grid stability and medium-term supply/demand outlook by the system operator. There is no dedicated deep and liquid financial market for energy in Russia. To some extent, financial derivatives (futures contracts of electric power) can be traded on the Derivatives Market of Moscow Energy Exchange by participants in the OREM and retail electric power market.

Much attention in the reform debate is focused on the capacity market. The options discussed include: moving to an energy-only market with 100 per cent bilateral contracts, extending the current capacity auctions to a longer-term horizon (four to five years), or the introduction of a new DPM. Other reform options include the introduction of a capacity-balancing market to hedge volume risks, in the absence of a deep and liquid financial market.

Experience of other countries

Other jurisdictions around the world have faced similar challenges with regard to modernizing the electricity sector and have decided to introduce capacity payments. For example, in the UK around 12 GW of old coal- and oil-fired plants are to be retired by end of 2015 and almost all nuclear capacity in the coming decade. The UK Electricity Market Reform gained much international attention as it introduced a wide range of regulatory measures to secure investment and renewal. By the end of 2014, the UK is to launch a capacity market and so-called contracts for difference. These contracts are designed to secure investment in renewables, new nuclear, or carbon capture and storage over the next 15 years through a kind of feed-in tariff which remunerates the difference from the regulated strike price. As a second element, capacity auctions are to be introduced for all generation units, including renewables, electricity storage, and voluntary demand reductions; these provide payments for a one- to three-year period and include penalties for non-availability. In addition, environmental regulation and emission performance standards for coal-fired power plants have been introduced.

Experience in other jurisdictions shows the benefits of a longer term horizon for capacity auctions. In North America, PJM, the largest wholesale electricity market in the world (covering 13 states and the District of Columbia), launched a new Reliability Pricing Model (RPM) with a three year auction period, amid decreasing reserve margins and short-term markets. Experience from the first auction shows diversity of ownership, new investors (including financial investors), and a focus on investment in new gas-fired power plants. The RPM auction has been successful in the procurement of energy efficiency and flexible demand response.

Possible direction for reform

PJM is the world's biggest power market and relies on a highly competitive wholesale design which guides market players by strong competitive price signals. Ten years after liberalization, however, Russia is far away from having a fully competitive wholesale market. Instead, Russia has chosen a strong regulatory approach which has one inbuilt characteristic – it necessarily leads to more regulatory arrangements. The day-ahead-market is only partly competitive, as electricity trade dynamics largely reflect inflexible unit commitment, and while Russia has a sophisticated balancing system with around 8,400 nodes, it is far from using this potential through locational signals or nodal pricing, let alone demand-side response. Russia has a market-based renewable support system which can be easily integrated into a more competitive and open capacity market.

What do the recent changes mean for the future direction of reforms in the Russian electricity market? Should Russia maintain its current design, move towards a competitive energy-only market and phase-out regulated capacity mechanisms, or target capacity payments to modernization?

'TEN YEARS AFTER LIBERALIZATION, HOWEVER, RUSSIA IS FAR AWAY FROM HAVING A FULLY COMPETITIVE WHOLESALE MARKET.'

The market – exit and entry

The UK example brings us to the short- to medium-term priorities of Russian power sector reform. This relates to effective exit and entry into the market. A well-functioning Russian electricity market can ensure competitive and affordable energy supplies, in particular to Russia's large energy-intensive industrial sector and households. Russia is competing with Asia and the USA, and electricity prices drive global competitiveness.

First, power demand outlook and securing required investment. Russian electricity market fundamentals have changed over time. During the 2000s, electricity demand was growing rapidly at a 6 per cent average rate per year and expectations were equally high for the future. However, in the coming decade, power demand growth is likely to stay flat at 2–3 per cent per year. Future demand may not drive investment into the retirement of around 149 GW of gas, coal, and nuclear generation capacity (out of a total installed capacity of 223 GW in 2012) up to 2035 (IEA's 2013 *World Energy Outlook*).

Second, the difficulty of decommissioning old thermal power plants used in combined cycle. Currently, the Russian government restricts generators' decommissioning – considering constraints in system operation, congestion, a lack of longer-term visibility of electricity network expansion, and the primary need for heating, rather than electricity availability during winter periods.

We understand that the Russian power market will need to secure both sufficient entry and exit capacity. Can the current market design unlock those investments needed for modernization?

Decommissioning

For the decommissioning of old plants the government may consider setting emission performance standards or other environmental regulation to mandate renovation or closure in a specific timeframe. However, to avoid the problem of premature closure, before a new plant comes online, the government may indeed need to order plants to stay online if they are system relevant, but reduce their hours for the period where capacity constraints and heat demand are important.

The government should ensure that locational signals can encourage modernization and renovation at the right time and location – this would include generation, grids, and demand-side response. Generation and network adequacy, together with grid investment, will need to be coordinated across the price and non-price zones between the grid companies, the system operator, and market participants in order to remedy network constraints. There is good potential for the electricity market to become this coordinator, by increasing the transparency from nodal pricing at its 8,400 nodes. With the exit of old capacity there is a chance for the market to choose a cost-effective combination of new grids and power plants.

Capacity increases

The DPM mechanisms were considered as being transitory, to secure incremental capacity by 2018; they should be phased out when no longer needed. They attracted investors who committed themselves to investments in new plants in return for privatization. There are several disadvantages: the mechanism is costly, it is inflexible to adjust capacity to the changing market, and the market dynamics have changed with a lower demand outlook. The DPM is closed to new entrants, if it is a list of pre-selected projects. It also ignores renewable capacities.

Prospects for Russia's capacity market

During the modernization period, the capacity market should be reformed to remunerate the renewal and maintenance of capacity on the basis of competitive tenders – in, for example, a three to five year competitive capacity auction of new and old capacity. As network congestions are being lifted between market areas, free-flow areas should be further merged into larger capacity trading zones to encourage competitive entry. It should be especially noted that Russia has a large potential for market-based demand-side response. Instead of forced load shedding, voluntary demand-side response can secure flexible balancing services. At the same time, Russia should continue efforts to develop a financial market, for market participants to hedge their risks.

At the wholesale market level, there is no need for a revolution in Russian electricity market design, but an evolution towards a more competitive, transparent, and efficient electricity market is definitely needed.

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