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Taking Shortcuts: Uzbekistan's Path to the Global Energy Market

—Simon Schmidt

Among the Central Asian states, Uzbekistan is mainly regarded as a second-tier energy player. Kazakhstan's vast oil resources and Turkmenistan's natural gas fields received primary attention by international energy companies. So far the double-landlocked country is characterized by high reliance on gas for domestic consumption, unprofitable energy trade agreements with its neighbors and high investment concentration. Despite these challenges, in May 2013, during the 17th Uzbekistan International Oil & Gas Conference that took place in the capital Tashkent, Uzbekistan's ambitious goal to triple natural gas exports by 2020 was yet again renewed by the country's political and business elite. Recent developments do indeed give reasons for a detailed and critical assessment of Uzbekistan's prospects and measures to become a major actor in the global energy market.

Natural Gas Export Ambitions: Looking East
Uzbekistan's proven natural gas reserves add up to 1.1 trillion cubic meters, ranking the country fourth among post-Soviet states. Production is above earlier levels but has been decreasing since the 2008 peak, amounting to 56.9 billion cubic meters, reflecting a marginal year-on-year decrease. The state-owned energy company Uzbekneftegas (UNG) reports that 47.9 billion cubic meters – 80 percent of produced gas – are consumed domestically. Uzbekistan heavily relies on natural gas to sustain heating and electricity supply, with 75 percent of electric power being generated in natural gas-powered thermal power plants. For end-consumers in Uzbekistan, natural gas is highly subsidized. For residential households, one cubic meter costs 139.8 soms (2150 Uzbek soms = approx. 1 USD) which is roughly USD 0.07. Despite a continuous increase of

gas prices in the recent years, this low level still prevents producers from making a profit on the domestic gas market, thus justifying their foreign orientation.

With only 20 percent of gas production remaining for trade, Uzbekistan is a modest energy exporter. Half of these exports are going to Russia with the rest flowing to neighboring states such as Kazakhstan, Kyrgyzstan, and Tajikistan. Gas trade with the latter two is yet unable to generate significant profits since Uzbek-Tajik and Uzbek-Kyrgyz gas trade is conducted through barter agreements that are renegotiated every year: Gas is exchanged for water and electricity. Tensions over Tajikistan's plans to construct the Rogun Dam, which could potentially curtail Uzbek water supplies and hurt its large cotton industry, even resulted in gas transfer cuts by the Uzbek side at the beginning of 2013.

Uzbekneftegas states to have been able to increase its energy exports by 81 percent in 2012, bringing in a total of USD 5 billion and leading to a national budget surplus of USD 2.23 billion.

Uzbekistan's strategic central location makes it a crucial transit country. The Central Asia-China Pipeline, which began operations in December 2009, connects Turkmenistan's eastern gas fields through Uzbekistan and Kazakhstan to western China and the interconnection with China's West-East pipeline. China National Petroleum Corporation (CNPC) recently announced that the pipeline's capacity will be increased from 30 bcm/y to 40 bcm/y. In August 2012, Uzbekistan commenced supplying gas through this pipeline, the same year when construction of a third line in the Uzbek section began. Uzbekistan is thus planning to

become a supplementary supplier to China, the world's largest energy consumer. Partly due to the Central Asia-China Pipeline, Uzbekneftegas states to have been able to increase its energy exports by

most companies from Russia, and to a lesser degree from China and South Korea.

Lukoil, the largest foreign energy operator in Uzbeki-



Figure 1: Existing and planned gas pipelines in Central Asia © U.S. Energy Information Administration 2012

81 percent in 2012, bringing in a total of USD 5 billion and leading to a national budget surplus of USD 2.23 billion. Prospects of expanded gas trade with China is thus of central significance for Uzbekistan's political elite.

Foreign Investment: Enough to Stop Depletion?

Heightened pipeline capacities alone do not guarantee a higher share of Uzbekistan in the global energy market. Proven gas reserves have decreased since 2010 and the country is facing depletion of natural gas fields unless big deposits are discovered or consumption can be decreased. The former challenge has virtually solely to be taken up by the country's state energy venture Uzbekneftegas and its few foreign partners. These are first and fore-

stan, recently announced its intention to produce 4.4 billion cubic meters of gas in Uzbekistan in 2013. The company's Vice-President Leonid Fedun also communicated plans to supply China with Uzbek gas at competitive prices. However, Lukoil seems to be more interested in milking the Uzbek cow instead of pumping money into costly exploration projects. Investments amounted to USD 149 million up to the end of the first quarter in 2013, marking a decrease of USD 96 million year-on-year.

Chinese and Korean state-owned energy companies have become increasingly active and have even teamed up with Lukoil in exploration and production projects. But optimistic estimations see production on some fields to start in 2016 with the rest being

expected to commence even later. Current exploration projects hold comparably low foreign investment and are also unlikely to yield any gas in the near future, thus being unable to stop Uzbekistan's

of other energy companies before. First, Zeromax GmbH, a Swiss private energy company, mysteriously shut down and ceased all business operations in 2010, after having been the first and one of the largest

Investor	Field	Start of production	Annual production	Investment
Lukoil	Khauzak	2007	3 bcm/y; 4 bcm/y starting from 2012	more than USD 4 billion
	Kandym	expected 2016	expected 8 bcm/y	
	Gissar	2013	expected 4.2 bcm/y	USD 1.2 billion
Gazprom	Shakhpakhty	2004	peak of 0.5 bcm/y	-
Lukoil, CNPC	Karakul	-	expected 1.5 bcm/y	estimated USD 650 million
KOGAS	Ustyurt	expected 2016	expected 4.5 bcm/y	USD 1.3 billion
	Surgil	-	expected 2.8 bcm/y	USD 1.8 billion

Table 1: Natural gas production projects with foreign investor participation

Investor	Field	Expected reserves	Investment
Lukoil	Kungrad	90 bcm	-
Lukoil, CNPC, KNOC	Aral	11 bcm	USD 110 million (26.6 % Lukoil, 26.7 % CNPC, 20 % KNOC, residual UNG)
Gazprom	Ustyurt	120 bcm	USD 400 million

Table 2: Natural gas exploration projects with foreign investor participation

gas depletion any time soon. Increased and more diversified foreign investment would be necessary to reverse this situation.

Uzbekistan is ranked 154th out of 186 countries in the World Bank's "Ease of doing Business."

The current concentration of investment activities has come on the heels of a continuous withdrawal

with UNG controlling most exploration, production, and downstream operations. Furthermore, Uzbekistan is ranked 154th out of 186 countries in the World Bank's "Ease of doing Business" report of 2013 – frightening off Western companies in particular. On paper, foreign energy companies are able to enjoy various tax exemptions when entering the Uzbek market through a joint venture or concession agreement. But the energy sector remains heavily centralized

with UNG controlling most exploration, production, and downstream operations. Furthermore, Uzbekistan is ranked 154th out of 186 countries in the World Bank's "Ease of doing Business" report of 2013 – frightening off Western companies in particular.

Promoting gas alternatives: Go green or go coal

As novel gas deposits will not be ready for full-scale utilization soon, decreasing consumption levels is the country's second leverage to unfold export potential. So far, Uzbekistan is one of the most energy inten-

sive countries with more than 60 percent of the primary energy mobilized being lost in processing and delivery systems.

As illustrated in Figure 2, Uzbekistan has already

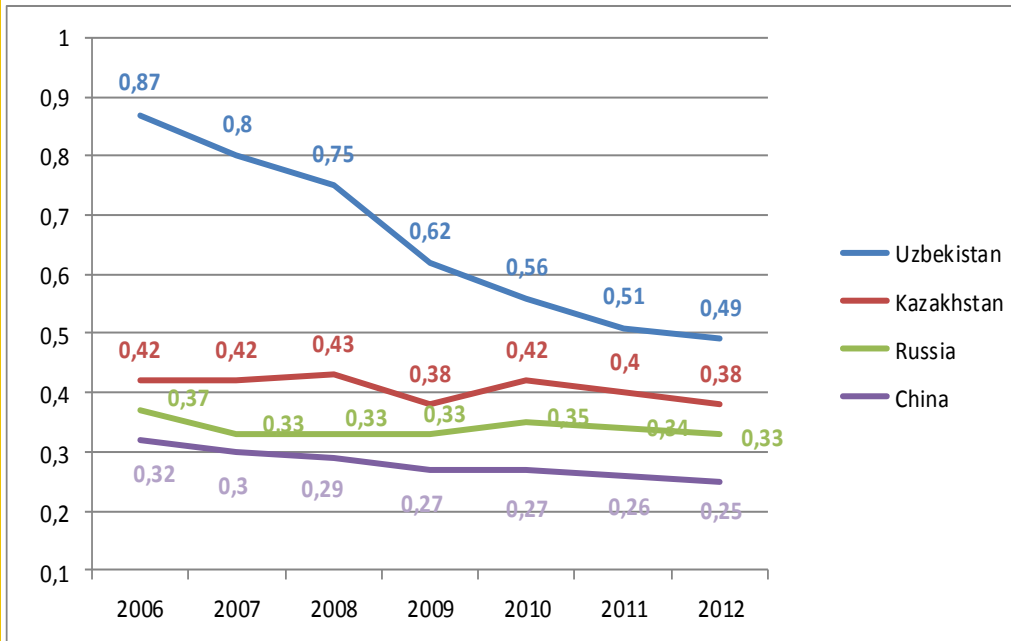


Figure 2: Energy intensity by country in koe/\$05p

been able to decrease its energy intensity over the last years. However, the country is still ranked significantly higher than the CIS average, which amounted to 0.34 koe/\$05p in 2012. In order to further decrease the economic costs of Uzbekistan's energy sector, it is necessary to foster efficiency programs. In this regard, the country conducts a number of measures together with international development banks. Together with the World Bank, the government is to introduce a series of energy efficiency measures designed to save the country more than USD 2 billion over the coming years through the implementation of the "Energy Efficiency for Industrial Enterprises Project". Upon completion of the initial project phase, 50,000 MWhs are anticipated to be saved. Next, the state-owned power generation company Uzbekenergo announced a tender to modernize electricity metering systems in three regions of the country, for which the International Finance Corporation will provide USD 180 million, and Uz-

bekneftegaz on its side is planning to spend USD 500 million on energy-saving technologies.

The Uzbek leadership also increasingly recognizes the need to develop alternative energy. In March 2013, Uzbek President Islam Karimov issued a decree that

aims at fostering research, pilot development and practical use of alternative energy sources in Uzbekistan. The country possesses considerable solar energy potential with climate conditions being among the best of CIS states for solar collector deployment. In June 2013, it was announced that Uzbekenergo will

construct a solar plant with the capacity of 100 megawatt in Samarkand Region of Uzbekistan, making it the largest in Central Asia after completion. Additionally, biomass potential amounts to approximately 3,500 MWh due to cellulose waste of 7-10 million tons resulting from enormous cotton production. Last, hydropower generation in Uzbekistan amounts to 6.3 billion kWh with available potential being two times higher.

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While green energy sources still need to be developed to have a pivotal impact, coal plants are already available. In July 2013, the Uzbek government issued a resolution directed at having Xorazm Region, with a population of 1.5 million people, use coal instead of natural gas. This development follows speculations that the country is already facing domestic gas shortages due to increased export and outworn networks. Several regions of the country reportedly experienced gas and electricity shortages during the 2012-2013 winter, causing the Uzbek government to redirect Russia-bound flows to households facing severe cold for 40 days. Increased coal supply is also anticipated for seven other regions and coal production is planned to be increased 2.9-fold by 2020 up to 2.4 million tons annually.

Target-oriented, credible political commitment to reforms in the energy sector and a favorable business climate can be regarded as the two main preconditions to attract crucial investment and technology for intensified resource development.

Uzbekistan's Outlook: Facing Trade-offs

As pointed out, Uzbekistan's energy sector is characterized by several structural flaws that make it hard for the political leadership to considerably raise gas export without accepting compromises. In the short-run, existing investment will hardly suffice to stop depletion and alternative energy sources will not start to pay off. Improved energy efficiency and modernization efforts can be credited with continuous decreasing energy consumption, but domestic liberalization and deregulation measures

are unlikely to be initiated by the political elite. While the Uzbek Ministry of Finance has approved a slight gas price increase for Uzbek end-users, a considerable lift of subsidies would mean the loss of a lot of political capital. One can rather expect the Uzbek leadership to vigorously pursue its goal of tripling gas exports until 2020. As the Uzbek leadership tries to transform its country into a recognizable energy player, supply cuts in rural areas are likely to reoccur in the upcoming winter periods and increased reliance on coal is to be expected. Prospects of energy trade with China outweigh concerns of power shortages inside the country and do not pose the threat of alienating the domestic population as a result of price increases.

Target-oriented, credible political commitment to reforms in the energy sector and a favorable business climate can be regarded as the two main preconditions to attract crucial investment and technology for intensified resource development. Efforts by companies from Russia and China will probably pump up production in the mid-run but in order to ensure the long-term steadiness of output levels, a deregulated energy sector and diversified sphere of investors are conditions under which innovation can thrive. A high natural gas price is currently the driving factor behind Uzbekistan's quest for shortcuts to the world energy market. Perhaps it can also lead to an increased willingness of Uzbekistan's decision-makers to engage in more fundamental reforms, thereby unfolding the country's potential.♦

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An Optimist's Take on Global Climate Change: Russia as a Winner

—Colin Chilcoat

Global climate change, or more specifically, anthropogenic global warming, is a topic as polarizing as it is nuanced. To date, much of the discussion has centered on whether or not it in fact exists. The scientific community is closer than ever to a consensus opinion that man-made climate change is real and dangerous, but the public perception is still very much divided. For the purposes of this article I will rely on the assumption that the climate change phenomenon is an unavoidable side effect of ever increasing global carbon emissions and other greenhouse gases (GHG). I am also of the belief that not all change is bad. These two assumptions form the basis of my article and lead me to believe that climate change will present winners just as it will losers. That is, climate change is not inherently bad for all, and for a select few, it presents some interesting possibilities. Among these “winners” I posit that the Russian Federation has perhaps the most to gain demographically and economically from such climate shifts. Agriculture will benefit from both an increased growing season and additional arable land. More importantly, easier access to Arctic hydrocarbons and the growing viability of the Northern Sea Route will provide sustenance for Russia's energy-focused economy. This is a cautious proclamation, however, as they will also face significant challenges, which will require careful planning and timely action to overcome.

Extent To Which the Climate is Changing

First, it is necessary to define climate change and outline the scope and significance of its reach. To a certain extent, climate change is natural; fluctuations of the climate system over long periods of time (centuries not decades) may occur as the balance between incoming solar radiation and outgoing infrared radiation ebb and flow. Continental

drift and changes in solar irradiance are but a few of the possible “forcing mechanisms” for natural climate change. Naturally occurring “carbon sinks”, like forests and oceans, act as a filter of sorts for harmful GHG's. Through a process known as carbon sequestration, carbon sinks remove carbon dioxide from the atmosphere thereby reducing the greenhouse effect. However, since the Industrial Revolution the amount of GHG's, specifically methane, carbon dioxide and nitrous oxide, expelled into the atmosphere has steadily increased beyond the manageable level of natural carbon sinks alone. Artificial means, such as reforestation and carbon capture with storage devices, exist but current international agreements and policies are too weak to spur sufficient sequestration. Burgeoning economies in Asia and a rising standard of living globally place additional burden on both natural and artificial carbon sequestration methods.

The Russian Federation has perhaps the most to gain demographically and economically from such climate shifts.

Recent headway in the development of renewable energy represents some positive momentum in regards to climate change mitigation. However, reliance on fossil fuels remains largely unaffected and the rising popularity of unconventional hydrocarbons, like shale oil and gas, likely means the prolongation of such carbon heavy activity in overall energy consumption. Barring a dramatic reversal, we appear destined for global temperature increases of approximately 2° C or more above pre-industrial levels in the relatively near future. What exactly does this mean though? A global rise in temperature of 2° C has long been considered the threshold, after which any further warming will have disastrous impacts on current climate systems and ecosystems. Consequently, this threshold has been the focus of previous climate treaties and international agreements regarding GHG emis-

sions. However, updated research from the Intergovernmental Panel on Climate Change suggests that even a 1° C increase poses similarly dangerous

genetic-caused emissions end up in the ocean. Decreasing pH levels pose serious threats to marine food chains, upon which a significant proportion of the

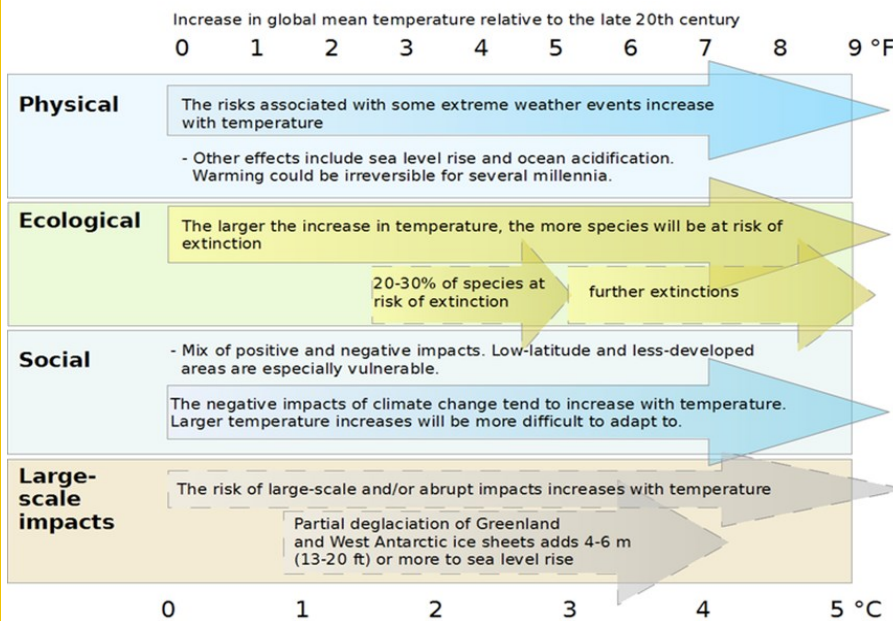


Figure 1: Summary of global warming impacts

environmental and social threats. The infographic above provides a brief summary of the impacts of climate change in relation to temperature.

Among the territories likely to be most affected by global climate change are those in the arctic and subarctic regions. Glacial melting is one of the most visible signs of global warming and consequently receives most of the attention. Deglaciation has already begun in earnest on the Greenland and West Antarctic ice sheets, posing real danger for island nations and low-lying coastal regions. Approximately 40 percent of the world's population lives within 100km of the coast and subsequent population shifts as a result of sea level rise present social dilemmas in addition to obvious logistical problems. Perhaps more important than what is above are the problems associated with ocean acidification taking place below the surface. As the largest and most active carbon sink, the ocean, and its ecosystems, feel the impact of increased emissions more than most; approximately 30% of anthropo-

genic-caused emissions end up in the ocean. Decreasing pH levels pose serious threats to marine food chains, upon which a significant proportion of the world's population, especially those in low-income countries, depend. Changes to the frequency of weather events are harder to predict, but it is largely hypothesized that changes to general weather patterns will result in fewer very cold days and more very hot days coupled with an increase of global average precipitation. The transmission of vector-borne diseases like malaria is highly subject to climate variables, but overall the combi-

nation of general warming and increased average precipitation presents conditions for more widespread distribution of these diseases. It should be noted, however, that the effects of global climate change are/will not be uniform. In general, they will be characterized by varying degrees of severity and localization.

On average, the warm period in Russia's grain zone may experience an increase of one month; southern regions could see an almost two month increase...

Climate Changes on Russian Territory

In Russia, the effects of global climate change are likely to be as diverse as the terrain itself. As the world's largest country, much of which is located in the arctic and sub-arctic regions, Russia possesses a wide array of climates, vegetation, and soils. Consequently, my brief assessment will avoid specific, though no less important, local changes and will instead focus on the

general trends and those changes, which will have the most impact. As Russia is also a very cold country, its crop yields are limited by long winters and the possibility of frost in nearly every month. A study from the Russian Federal Service for Hydrometeorology and Environmental Monitoring predicts warming and precipitation trends in Russia will exceed the global averages. The winter months in particular will experience warming almost double that of the spring and summer months. Precipitation is also up across

the board, with a majority of the new rainfall coming in the spring months. On average, the warm period in Russia's grain zone may experience an increase of one month; southern regions could see an almost two month increase allowing for the possible introduction of a second crop with a short-growth period. The Russian agricultural sector has still not fully recovered from the collapse of the Soviet Union and subsequent transition to a market economy. Accordingly, agriculture as a share of GDP has been relegated to an afterthought in Russia's energy driven economy. However, an increase in total arable acreage coupled with a general northerly shift of the grain zone has the potential to redefine the region and restore some geopolitical significance to Mackinder's "Heartland."

Warming Temperature Causing Problems For Existing Infrastructure

Climate change presents categorically more significant implications for Russia's energy industry, which comprises a dangerously high share of the country's GDP. Russia continues to struggle with diversification, especially in high-technology sectors, and as a result Russia's future is very much dependent on oil and gas. High market volatility suggests this is a high

stakes existence. Climate change does little to better the odds and in some regards may steepen the learning curve. Permafrost is a natural starting point for

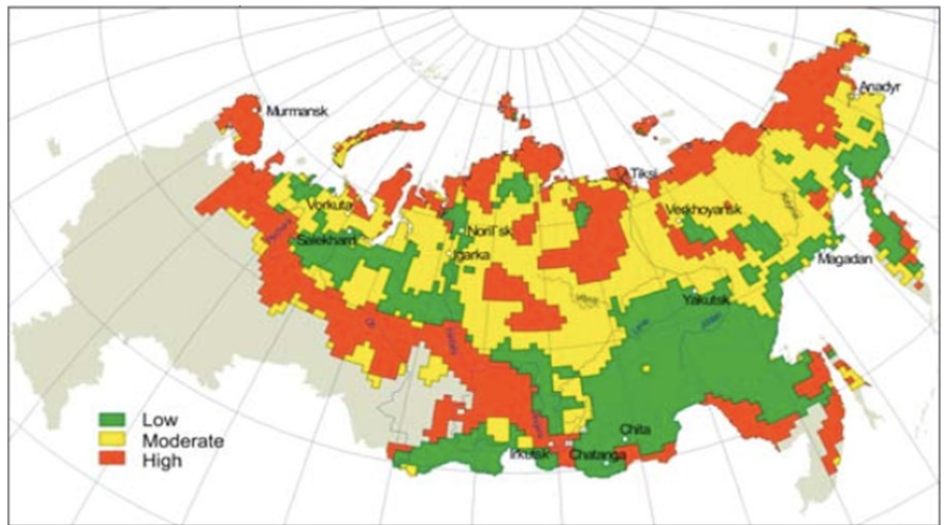


Figure 2: Hazard due to permafrost thaw

our discussion as its fate is of immeasurable importance to the oil and gas industry. Approximately 60 percent of Russian territory is covered with permafrost of varying depths. Some seasonal thawing is normal and is typically limited in terms of depth to the "active layer." Warmer temperatures in the Arctic, however, disrupt these seasonal patterns, increasing both the thaw period and depth of the "active layer," which sits above the permafrost.

...infrastructure maintenance associated with climate change and permafrost thaw is likely to cost the state of Alaska between \$3-6 billion from now to 2030.

This creates obvious problems for the man-made structures built atop the permafrost, including homes, hundreds of kilometers of pipeline, and other natural resource extraction related infrastructure. Construction standards in such areas have evolved to allow for minor seasonal thawing. However, keeping

up with the paces associated with global warming will be difficult and above all, costly. Figures 2 and 3 illustrate both the hazard areas for permafrost thaw

those 30-40 years from now. However, permafrost and arctic ice melt does not necessarily spell financial ruin. The opposite may in fact be true.



Figure 3: Oil and gas infrastructure; producing and prospective fields

and the oil and gas infrastructure associated with producing and prospective fields.

Ecological concerns surrounding compromised oil and gas infrastructure are not unfounded. The 1994 oil spill in Russia's Komi Republic, the worst ever on land, was the result of harsh conditions and poor pipeline management. Subject to worsening conditions another spill becomes less a matter of if, but rather when. Estimates for Russia are unavailable, but infrastructure maintenance associated with climate change and permafrost thaw is likely to cost the state of Alaska between \$3-6 billion from now to 2030. By mid-century, Russia's permafrost region is expected to decline by one third with associated costs far greater than those borne by Alaska. Identification of the hazard zones and affected infrastructure must become a top priority for not only the affected industries, but also the state. Mitigation efforts undertaken today will be far cheaper than

It is believed that 80% of Russia's remaining oil and gas reserves are located offshore.

Permafrost Thaw Means More Accessible Hydrocarbons and Arctic Sea Routes

Untapped hydrocarbons are lying in abundance in the far reaches of Siberia and below the waters of the Arctic seas. Drilling through permafrost is a difficult task and softer soil increases the accessibility of such northern positioned resources. In any case, onshore developments may be irrelevant as more exciting opportunities appear to be located offshore, where it is believed 80 percent of Russia's remaining oil and gas reserves are located. As with permafrost, considerable declines in both area and thickness are expected for ice in the Arctic by mid-century. In terms of development, less ice means fewer obstacles and



accordingly the Arctic has become a hotbed of activity involving the Russian “national champions,” Gazprom and Rosneft, and nearly every international major of note. Lacking significant offshore experience, Russia and Rosneft now have partnerships with Statoil, Eni, and ExxonMobil, who have long maintained offshore operations and desire access into the highly promising, though not yet lucrative, Arctic. The partnership between Rosneft and ExxonMobil has already yielded the Arctic Research and Design Center for Offshore Developments (ARC), which is tasked with handling all of the problems the companies will face when developing the shelf deposits.

In November of last year, three icebreakers from Rosatom’s fleet accompanied the Gazprom-chartered LNG tanker, Ob River, marking the first shipment of such gas supplies through the Arctic.

Tax regime changes are also underway; of particular note are the proposed changes to the Mineral Extraction Tax. New legislation seeks to lessen the tax burden borne by companies working offshore in an effort to stimulate development. The tax break, currently in the draft stages, works on a gradient and will offer lower rates to those who tackle greater risk. Despite several disruptions from Greenpeace, Gazprom looks positioned to begin the first commercial arctic production later this year in the Pechora Sea with their state-of-the-art ice-resistant Prirazlomnaya platform (approximately 30 of the environmental activists are still in jails around Murmansk awaiting charges for an attempted boarding of the platform in September). Retreating and thinning ice do not diminish the need for such specifically engineered platforms, but they do

allow for easier exploration and production. Just how much of a boost to Arctic production climate change will provide is impossible to quantify, but any lessening of capital expenditures is to its benefit.

Besides production, thinning Arctic ice also clears the way for increased distribution. The Northern Sea Route connects the Atlantic and Pacific Oceans by way of the Russian Arctic coast and through the Bering Strait. The route significantly reduces transit time compared to the traditional route through the Suez Canal. Historically, ice has made the route impassable for upwards of ten months per year. However, significant ice melt is extending the transit season; continued temperature rises could triple or quadruple the navigable period. In addition to increased shipping efficiency, Russia also stands to gain from the growing traffic. Traffic through the Northern Sea Route has increased every year this decade and the past two years have seen over 75 percent of the traffic carrying oil or gas. Icebreaker escorts are still required to safely pass, however, and Russia’s Rosatom is the primary supplier of nuclear-powered icebreakers for such purposes. The state-owned company is looking to establish itself as the premier provider of safe transport through the Arctic and recently signed a long-term contract with Russia’s leading independent gas producer, Novatek. In November of last year, three icebreakers from Rosatom’s fleet accompanied the Gazprom-chartered LNG tanker, *Ob River*, marking the first shipment of such gas supplies through the Arctic.

The evidence supporting anthropogenic climate change is now stronger than ever. That being said, it is not conclusive and several natural variables are similarly important and just as difficult to predict. This scientific discrepancy is an enormous hindrance to positive action and minimizing it in the coming years is of great importance. It is important to note that the above discussion, while based on the most recent scientific conclusions, does include assumptions and represents one of many possible outcomes.



Moreover, the side effects and/or benefits of climate change will not be known for several decades. Russia's status as a "winner" is not unconditional; rising sea levels and thawing permafrost present challenges that must be faced head on. However, increased agricultural capacity coupled with the treasures located in the Arctic provides optimism in a time of uncertainty. ♦

Colin Chilcoat is an MA candidate at European University at St. Petersburg. He recently completed his thesis titled, "Unconventionals in an Institutional Trap: Alternative Hydrocarbon Development in the Russian Federation."

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The Future of LNG Means More Pipeline Politics

—Lauren Bardin

The United States' potential as a major gas supplier has sent shock waves not only across state lines but also over oceans. As late as 2009 it was expected that the US would need to import LNG in major quantities in order to meet demand, yet almost overnight, import terminals became obsolete. Major producers like Qatar had been willing to meet US LNG needs, but since the shale gas revolution, this gas has not been necessary, leaving Qatar and other suppliers with excess gas. Even though the US has not yet begun to export its gas in the form of LNG, the effects of the revolution are already being felt around the world. Excess supply was one of the first effects the global energy market felt as a result of increased US gas production. Another has been the increase in European coal use. The US decreased coal consumption from 1,128 million tons in 2007 to 1,003.1 million tons in 2011, sending this superfluous coal to Europe. While the price of gas is fairly high for European customers, cheap coal has become much more appealing for power generation. This of course has decreased European demand for Russian gas, a consequence that Gazprom is having a difficult time confronting. Even though the gas market is not as vulnerable to price volatility as the oil market, the effects of one major actor can quickly lead to several impacts throughout the entire market.

Competing Pricing Formulas

The price of LNG is a major question in this growing market. Wood MacKenzie projected that LNG will increase by 49% or 5.7 tcf by 2020 and 22.2 tcf by 2025. LNG pricing is dominated by oil-indexation in Europe and Asia, meaning the price of imported LNG follows the global price of crude oil or petroleum products. This pricing mechanism, however, could see a radical change as incremental

volumes of US natural gas reach Asian and European shores. The US pricing formula stems from gas-to-gas competition, implying that gas prices are based on supply-demand balances. As the barrel price of oil rises, the price difference between oil-indexed contracts in Europe and Asia and gas-to-gas contracts in the US increases. Consequently, a new contract with an American company linking price to supply and demand at the Henry Hub looks very appealing to foreign companies currently paying higher oil-indexed prices. From 2008 to 2009, the volume of LNG sold at a spot price increased in Algeria, Egypt, Trinidad and Tobago and, most notably, Qatar. In the Russian Federation's recent publication of the Energy Forecast for the World and Russia to 2040, it was predicted that gas-to-gas competition will increase from 30% to 39%, while oil-indexation will decrease from 34% to 28%. This shift away from oil-indexation will be augmented when the US begins to export and gas-to-gas competition will become the dominant technique in the future of LNG pricing.

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This shift is primarily an issue for continental Europe, whose gas market originated from oil-indexation and long-term contracts. Now, continental Europe counts on two main spot hubs, which strive to achieve market liquidity similar to the Henry Hub. The Zeebrugge in Belgium (connected to the UK hub) and the Title Transfer Facility in the Netherlands are the main hubs. The UK developed a spot market similar to Henry Hub, known as the National Balancing Point, and it is the only European marketplace considered mature by the gas market because of its high level of liquidity. It greatly influences northwestern continen-



tal European prices because of two important pipelines that connect the UK and the rest of Europe: the Interconnector Pipeline and the BBL Pipeline. Although continental Europe is currently dominated by oil-indexation, the growing LNG market could guarantee that these spot hubs play an even more influential role in the region's gas market.

This change in the pricing formula will greatly affect exporters such as Russia, Indonesia, Algeria, and Malaysia that depend on gas revenues, thereby disrupting their state budgets and national security. A price change could affect energy security, dictate sustainability of future supply, and impact competitiveness. Lower selling price yields less revenue for the state budget and a weaker government, making the nation vulnerable to economic hardships, political disruptions, and social unrest. If profits were to become excruciatingly low, the exporter might not be able to sustain output. Its share in the market would shrink along with the overall competitiveness in the world market. Exporters so reliant on one source of national income could be confronted by a difficult situation if they do not recognize that a global shift in the pricing mechanism is approaching.

Role of the Asian-Pacific Market

Customers in the Asian-Pacific would like to switch from contracts based on oil-indexation to contracts based on the Henry Hub price. The region recognizes that its demand is growing rapidly and it must secure reliable and cheap sources of energy. It sees that Gazprom is adamant about keeping oil-indexation, take-or-pay provisions, and long term contracts in its deals with Europe and the Henry Hub appears to be a safer price foundation. Asian gas demand is led by the world's fastest growing economy and largest energy consumer, China. The main competitor of gas in China is coal, with 190 Mt imported and 3,471 Mt produced, but it is expected that growth in coal consumption will subside in 2020. It is forecasted that Chinese consumption of gas will double its 2011 level to 260 bcm

and its use in 2030 will equal what the European Union's use was in 2010. Share of gas in its total energy consumption will double and the country will become one of the largest LNG importers in the world. The government aims to cut carbon emissions by 17% from 2011 to 2015 and use natural gas imported as LNG as the means to do so. The government's Five Year Plan aims to have 87 million tons per year LNG receiving capacity by 2020, giving the nation the power to import almost seven times the amount it did in 2011. Due to its growing demand, desire for cleaner energy, and acceptance of spot-linked prices, China could be a willing and lucrative partner for US producers.

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The nuclear disaster at Fukushima in 2011 created a new demand for gas in Japan, bringing it to its status as the world's largest LNG importer, making up one-third of world LNG imports. Moody's Investors Service reports that Japan's Tokyo Electric Power Company will be one of the biggest benefactors of US LNG export. South Korea, the second largest importer in the world, will also be a major benefactor.

Recently, Taiwanese Premier Jiang Yi-huah has expressed the nation's desire to become a contractual partner with US gas companies to aid in Japan's attempt to decrease its use of nuclear power. Today, natural gas makes up 11.6% of Taiwan's energy mix. Nuclear makes up 8.7%, but the government plans to decommission all nuclear power plants by 2055. CPC is Taiwan's sole importer of LNG with two import terminals of 7.4 Mmtpa and 3 Mmtpa; construction of a third is probable. Taiwan's total LNG imports in



2012 rose 7% to 12.8 Mmt and if it were to enter agreements with the US, CPC would be ready to link prices to Henry Hub and leave behind volatile oil-indexation.

On the opposite end of the spectrum is Australia, the world's third largest LNG exporter in 2012, according to EIA. About half of the natural gas it produces is converted to LNG for export and in 2010 it exported 872 bcf of LNG, up from 714 bcf in 2009. In 2010, 70% of LNG exports from Australia went to Japan, its largest partner, followed by China, South Korea, and Taiwan. Australia's private gas sector recognizes the growing market and welcomes foreign investment; several new export facilities are planned or now under construction. US export will compete in the same market but Australia's existing resources and advanced experience in LNG will ensure that it stays competitive. Moody's Investor Service projects that although Australian companies like Woodside Petroleum and BHP Billiton Limited will experience competition in Asia, Australia is ready to overtake Qatar as the world's largest LNG exporter.

Geopolitical Game-Changer

The global impacts of US export are as geopolitical as they are economic. The increased coal consumption has added to tensions in the green-leaning European Union. It has made agreement between member states on environmental issues even more difficult; some nations find low coal prices more important than low carbon emissions. Now, the market is not only being controlled by environmental politics but is also balancing price changes made by the US shale gas revolution.

While American coal is being pushed into Europe, American LNG could counter coal's environmentally threatening consequences and pacify some EU members' climate change concerns. Helping the EU diversify its supply and lower carbon emissions could only improve the US-EU partnership. On the

other hand, this diversification will increase tensions between Russia and European customers and Russia and American competitors.

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Although not directly involved in gas production, OPEC is another important actor to consider. Oil will remain cheaper than natural gas, but many parts of the world are still trying to decrease dependency on oil because of political instability in exporting countries, price volatility, and damage to the environment. OPEC does not feel immediately threatened by the US shale gas revolution because it believes that there will always be demand for oil and oil will always be cheaper than natural gas. Fhalid al-Falih, head of Saudi Aramco, said that OPEC welcomes the US shale oil boom (America is also experiencing an increase in oil drilling and production thanks to technology and resources) because it eases countries' worries about over-reliance on Middle Eastern oil. He said that it cements what OPEC already knew: "Oil is going to be the fuel of choice, in terms of its overall performance, for an extended period of time, and we need to manage it, we need to invest in it." OPEC's role in the oil market will not be directly affected because demand for oil is likely to continue.

The geopolitical effects in Asia caused by US export are widespread. Ian Bremmer, president of Eurasia Group, has discussed what a Cold War with China could look like if US-China relations were to worsen. Another, more hopeful scenario, is that LNG trade



partnership could turn into an historical relationship between the two superpowers. The United States, though powerful, is threatened by the potential of Chinese economy and growth. China is America's largest holder of foreign debt, linking the two nations monetarily, politically, and militarily. US naval ships currently guide oil tankers from the Middle East through the Strait of Hormuz and the Malacca Straits to Chinese shores in order to ensure delivery and compensate for some of that foreign debt. Chinese businesses have also increased investment in American oil and gas, adding up to \$17 billion since 2010. But, improved energy relations between the US and China could go a long way in calming fears that the two powers will enter a cold war driven by economic rivalry. Those wary of American dominance could be pacified by the fact that the US could be a much more reliable and stable energy provider than other sources.

Although Chinese demand is rapidly growing and the country is greatly in need of more energy, China possesses the ability to greatly impact major gas providers. The previous discussion of US-China potential illustrates the importance of Chinese demand for the US, but perhaps the larger influence is held over Russia. Gazprom and China have been discussing gas contracts for several years; in 2004 Gazprom and Chinese National Petroleum Company signed the Agreement of Strategic Cooperation, but several factors have blocked them from making a concrete decision on volumes, schedule, routes, and price. Gazprom's Eastern Gas Program hopes to develop East Siberian fields, production centers, an East-West unifying pipeline, offshore fields, and LNG export from Vladivostok and Sakhalin, all to help meet China's massive demand. The Russian government has chosen Gazprom to head this program and it has invested heavily in its commencement and progress. The Asian market, particularly China, is a crucial market for Gazprom and Russia.

The international gas market is experiencing some

electrifying remodeling with anticipated American LNG export at its center. When the US does begin to export, some shockwaves will hopefully have subsided and nations and companies will be able to more appropriately react to the changes. But, to reach a conclusion on the future of a global pricing formula, the market will need mature spot hubs all over the world in order to facilitate liquidity. Europe will continue to discuss how to diversify its supply and explore a transition away from oil-linked contracts, while Asian nations will deal with their own burgeoning demand and hope for the lower Henry Hub prices. ♦

Lauren Bardin is an MA candidate at European University at St. Petersburg. She recently completed her thesis titled, "Shale Boom in America, Gas Leak in Russia: US LNG Export and Gazprom's Battle to Remain Relevant."

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