GLOBALIZATION AND EURASIA'S ENERGY SECTOR

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Abstract:
In this article, it is argued that globalization, as interplay of relationship between the products, markets and the nation states, has thrown opportunities as well as challenges to the energy sector. While the former has been beneficial to humanity in different respects, the latter has triggered unprecedented malice and heart burning among the energy stakeholders in Eurasia due to changing geo-economic and geo-political scenario. For their constantly growing energy demand, many countries have included Eurasian energy in their foreign policy agenda, and have started protecting their respective trans-national energy companies with all sorts of security and logistics. There are other challenges to the region's energy sector in the foreseeable future: oil and gas resources are speedily depleting, their refinery capacity is shrinking, climatic change is badly affecting their locational deposits, major global powers are inspiring the funding agencies to sponsor alternative energy transportation corridors to scuttle monopoly of traditional energy buyers, and, above all, China is significantly factoring in region's "energy production consumption trade structure," to the detriment of other regional stakeholders, which is quite alarming.

As an alternative thereof, Fredholm suggests massive exploration and use of non-conventional energy resources to strike a balance between supply and demand improve energy efficiency and facilitate regional economic organization to play a proactive role in maintaining energy relationship between producers and buyers.

Keywords:
Russia, Central Asia, Globalisation, Energy, United States, Caspian Sea.

Introduction: Energy Scenario:

A) Russia and the Global Energy Market

Globalization has brought new vulnerabilities and opportunities in Eurasia's energy sector. In the transition from the command economy of the Soviet period to the market economy of the present, the Russian energy industry gradually changed its strategy. Market relations entered the picture and with them the understanding of the need for mutual economic development. Yet competition and geopolitical rivalry remain, in particular with regard to the final destination of the energy produced in the region. China, the European Union, and the United States all have interests to safeguard. Even so, globalization is changing the global market, making the energy sectors of these actors more interconnected than in the past.

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The effects of globalization are felt throughout Eurasia, including in Central Asia. Globalization is of itself neither good nor evil – but is a fact, akin to a force of nature. Globalization has been described as representing a coin with two faces, one bright and another dark. The one symbolizes economic prosperity and the other, social conflicts. Globalization can neutralize inter- and intra-state conflicts, but the phenomenon will also change social patterns and alter traditional ways of life.[1] Globalization brings changes, and for the Eurasian energy sector, the forces of globalization are changing what some believed were constants of the energy market.

The key energy relationship in contemporary Eurasia is that between Europe, in particular the member-states of the European Union, as a consumer and Russia as a producer. Production and trade volumes speak its own language, and in this, the energy trade between Europe and Russia dwarfs those between Russia and other markets. In production figures alone, Russia in 2010 produced 505.1 million tonnes of crude oil, as compared to 81.6 million tonnes by Kazakhstan and 50.9 million tonnes by Azerbaijan. In the same year, Russia produced 588.9 billion cubic metres (bcm) of natural gas, in comparison to 59.1 bcm by Uzbekistan and 42.4 by Turkmenistan. Russia dominated in trade volumes as well. Taking the trade in natural gas as an example, Russia in 2010 exported no less than 199.85 bcm, of which 186.45 bcm went to Europe and 0.51 bcm to China, as compared to 19.73 bcm by Turkmenistan (to Russia, Iran, and China in descending order) and 11.95 bcm by Kazakhstan (all of which went to Russia, mainly or entirely for re-export to Europe).[2]

Russia has the world's largest natural gas resources and often, including in 2010, produced more crude oil than Saudi Arabia.[3] Russia is also the fourth largest producer of electricity in the world. By 2010, the Russian energy sector supported approximately 12 per cent of the global trade in oil and coal and more than 20 per cent of the global trade in natural gas.[4] Russia in the same year supplied more than a third of natural gas imports to the European Union, which meant that Russia supplied almost a quarter of the European Union's total gas needs, and

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1 Mushtaq A. Kaw, "Globalisation and Central Asian Space: Costs &Benefits," Journal *of Central Asian Studies*, 19(1), 2010, 41-54.

2 BP, *Statistical Review of World Energy,* June 2011.

3 BP, *Statistical Review of World Energy,* June 2011.

4 *Kommersant,* 14 December 2010, citing Russian President Dmitry Medvedev on 13 December 2010.Medvedev described Russia's share in the natural gas trade as "a fourth" of the total. BP, *Statistical Review of World Energy,* June 2011, calculated Russia's share of the global trade in natural gas as 20.5%. While different sources employ differing calculations and statistics, Russia's share is of global significance.

Russia's share of the European Union's gas imports has tended to grow. Other natural gas imports derived primarily from Algeria and Norway. Natural gas forms more than a quarter of the European Union's total use of energy.[5] Besides, while the European Union produces the bulk of its electric power, this production is to a large extent based on imported resources such as natural gas and oil.[6] Russia also supplied approximately 30% of oil imports to the European Union.[7]

The energy sector is of key importance to Russia. Russian President Dmitry Medvedev in December 2010 noted that the energy sector contributed a third of Russia's GNP and that revenues from oil and natural gas formed 40 per cent of the state budget.[8] In fact, the oil and natural gas sector was then even more important to Russia than suggested by Medvedev. Of Russian federal budget revenues in 2010, no less than 46% derived directly from oil and natural gas revenues (a figure, it should be noted, that only included extraction taxes and export duties, not gains taxes, value added tax, and other taxes which contributed additional revenues).[9]

While Russia is dependent on revenues from its energy exports, many European countries are equally or more dependent on Russia as a supplier of in particular natural gas. Oil and natural gas can be transported by pipeline, sea, rail, or road. When it comes to natural gas exports, more than two thirds of international exports are still transported through pipelines. Natural gas is shipped as liquefied natural gas (LNG) to several important markets, including those in Japan and South Korea. Following a massive increase in LNG shipments from Qatar, LNG has reached the position of accounting for 30.5 per cent of the global gas trade. Unlike natural gas, the global trade in crude oil is primarily transported by oil tanker. Even so, very significant volumes are exported from Russia through pipelines.[10] This is not likely to change in the near future, nor should it.

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5 BP, *Statistical Review of World Energy*, June 2011.

6 Eurostat (European Commission), *Energy, Transport and Environment Indicators*, Luxembourg: Publications Office of the European Union, 2011; Eurostat (European Commission), *Panorama of energy: Energy Statistics to Support EU Policies and Solutions*, Luxembourg: Publications Office of the European Union, 2009, *http://ec.europa.eu/eurostat*.

7 *Energeticheskayastrategiya Rossiina period do 2030 goda* ("Energy Strategy of Russia to the Year 2030"), Government of the Russian Federation Decree 1715-r, 13 November 2009, 8; Eurostat, *Energy, Transport and Environment Indicators,* 40. Both rely on statistics from 2008.

8 *Kommersant*, 14 December 2010.

9 *Vedomosti*, 20 January 2011.

10 BP, *Statistical Review of World Energy*, June 2011.

Pipelines are environmentally sounder than other types of transport. While the European Union approves of liberalized markets, market liberalization in itself will not reduce the risk of an unfavourable impact on the environment. Oil, for instance, is already being sold on the global market, and while the environmental threat from shipwrecked oil tankers has been reduced through better ships, it has not been eliminated. Natural gas too can be shipped in tankers as LNG, but this leads to increased tanker traffic. With current levels of demand, such huge volumes of energy are needed that oil and gas pipelines are still required, and they are both cheaper and environmentally safer than other modes of shipping.

However, when an expensive pipeline has been built, it cannot be moved. To invest in a pipeline leading to a single customer makes the supplier vulnerable to demands from the customer to re-negotiate the price of energy or cancels imports, after the investments have already been made and the project is committed.

In the transition from the command economy of the Soviet period to the market economy of independent Russia and Central Asia, the Russian energy industry gradually changed its strategy towards the energy-producing regions of the latter. Central Asia was no longer seen merely as a source of cheap energy; market relations entered the picture and with them the understanding of the need for mutual economic development.

The main drive in the command economy was not consumer demand or choice but the appropriate plan drawn up by government in which the national resources were allocated to fulfill political and social policies. Although Russia and the Central Asian republics upon independence reverted to market economic conditions, the thinking and mind-set of the command economy continued to affect their energy sectors. In particular natural gas, tied up in extensive pipeline infrastructure projects, remained closely connected to government policy. Likewise, energy pricing policies have only slowly caught up with market economy drives.[11]

Russia has repeatedly stated its ambition to become a regional leader in the sphere of Eurasian energy security. This ambition includes the provision of stable and predictable energy prices and long-term stability of energy demand and supply in Eurasia. From the outset, Russia wanted a full-scale economic and technological integration with the Eurasian system of energy communications in order to provide what

[11] Michael Fredholm, *The World of Central Asian Oil and Gas: Power Politics, Market Forces, and Stealth Pipelines*, Stockholm University: Asian Cultures and Modernity Research Report 16, 2008.

it termed rational energy flows in Eurasia.[12] From the point of view of existing infrastructure, this made sense. In the Soviet period, the region's energy infrastructure was connected. To a certain extent, it would be rational to integrate new projects as well.

Yet competition and geopolitical rivalry remain, in particular with regard to the final destination of the energy produced in the region. China, the European Union, and the United States all have interests to safeguard. Besides, Russia's long-standing energy relationship with Central Asia should no longer be taken for granted. Turkmenistan since 1997 exports small volumes of natural gas to Iran and from late 2009 exports yet smaller, but growing, volumes to China. In particular the latter would have the potential to become a major destination for Central Asian energy, although the gains realized so far remain small.

Besides, transportation bottlenecks remain and infrastructure often remains insufficient for Central Asian gas and, to some extent, oil exports even to gain available market share in European markets. For exports elsewhere, such as to China or India, transportation bottlenecks still pose even greater problems.

B) Central Asia and the Global Energy Market

Since the Central Asian gas and oil resources are landlocked and there is no obvious access to consuming countries, much of the debate has been devoted to geopolitical conditions, on the one hand, and cost-benefit analyses, on the other. Political scientists have investigated the former, while the industry has been more interested in the latter. A combined approach is needed. Transportation distances are undeniably long and at times difficult. Yet it is dangerous to separate the two questions of production and access. A pipeline built for political reasons may remain idle, if no oil or gas is produced to load it. On the other hand, there is little point in developing a field for production if political conditions preclude the construction of transportation infrastructure to carry the produce. It would for this reason often make better commercial and political sense to regard the various export routes as connectors, that is, extensions of the production field, instead of separate, politically driven projects. And it should be admitted, many projects are politically driven.

Besides, the Caspian Sea and Central Asia form a region rich in energy resources but geographically, it presents a number of unusual problems for oil and gas prospecting, exploitation, infrastructure development, and transit.

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12 *Energeticheskayastrategiya*, 2009, 97.

First, there are logistical constraints. Land transportation infrastructure is not always well developed, and railways and highways are limited. With regard to the Caspian, the only way to bring in heavy equipment by sea is through the Volga River. Even so, certain types of floating oil production platforms for deep-water exploration and exploitation are far too big to move into the Caspian. Such equipment hardware is generally not available locally, since production platforms usually are built with parts from different countries. This means high costs for rigs and vessels. There are thus significant logistical constraints, and cycle times in exploration and exploitation are long.[13] This affects transportation as well. There are only some seventy oil tankers in the Caspian, and most are over-aged.[14]

Second, the often unstable relations and external agendas among the various countries of the region, and the fact that the issue on how to decide the legal status of the Caspian remains unresolved, hamper both prospecting and exploitation as well as the transit of energy resources.

Third, and of lesser importance, there are natural complications such as deserts and wilderness in Central Asia, recurring ice in the north of the Caspian, extreme depth differences at sea (from 5 to 1,000 m in the Caspian), and a high level of earthquake activity throughout the region.

Apart from these, there are more general problems, not unique to the Caspian and Central Asian regions. Many would argue that a sustained hydrocarbon export growth would mean that the states of the region run the risk of falling victim to "Dutch disease." This is an economic phenomenon (named after conditions in the Netherlands of the 1960s) in which increased exploitation of a nation's natural resources ultimately decreases its non-resource exports through the rise in value of the national currency, which makes its manufactured goods less competitive, thereby increasing imports, and decreasing productivity. Dutch Disease ultimately leads to de-industrialisation of a nation's economy.

The sustained export growth, and in particular the expectation of yet more impressive future growth, has led to surplus pipeline capacity with regard to oil (but not yet gas). The amount of locally produced oil in the region is much lower than the total oil pipeline network capacity.

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13 Hugh McDowell, "Upstream and Downstream Oil and Gas Industry Potential in Turkey,"*Caspian & Black Sea Oil & Gas Conference 2004*, Istanbul, 26-27 February 2004.

14 Peter Reiniger, "Caspian Oil & Gas Transportation," presentation, Caspian Oil & Gas, Baku, 8-9 June 2005.

This causes much rivalry for oil among importers and pipeline operators.[15]

On the other hand, production costs in Central Asia for both oil and gas are significantly lower than in, for instance, Siberia. A key reason for the Russian natural gas producer Gazprom's long-standing interest in Central Asian gas is that the necessary investments for gas production in Central Asia are substantially cheaper (three to five-fold) than the investments needed for corresponding Siberian projects.[16] This will indeed make Central Asian gas a viable proposition for Gazprom even when the firm can no longer buy cheap gas directly.

However, there is also the domestic need for oil and gas to take into consideration. Domestic demand tends to grow, at least whenever the economy is growing. However, energy efficiency is a sadly neglected field throughout the former Soviet space. At times, domestic demand is growing faster than production can be increased. This is a particular problem for those economies that depend on the export of energy resources to bring in revenues. Due to the wasteful practices inherent in the Soviet system, all Central Asian energy producers need to improve energy efficiency, so as to allow more energy for export.

Among the Central Asian states at least Kazakhstan, Uzbekistan, and Turkmenistan have the capacity to produce more oil and gas than they need for domestic consumption. Kyrgyzstan and Tajikistan have important energy resources in particularly hydropower but lack substantial oil and gas deposits. Azerbaijan is an important energy producer in its own right as well as a potentially important transit country for Central Asian energy. The remaining states of the Caucasus, Armenia and Georgia, have insignificant and only small oil and gas reserves, respectively.

Unlike oil, which in Russia, Kazakhstan, and Azerbaijan was privatised soon after the dissolution of the Soviet Union and due to the existence of a global market proved easier to market under commercial conditions, natural gas remained the concern of governments. Throughout the post-Soviet period, natural gas exports were in the former Soviet republics generally conducted under bilateral intergovernmental agreements. These provided a framework for sales, transit volumes, and prices. At times, other issues such as storage and establishment of joint ventures in production were included as well. Within the framework of such intergovernmental agreements, the firms

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15 Igor Tomberg, "Energy Policy and Energy Projects in Central Eurasia," *Central Asia and the Caucasus*, 48,2007,42.

16 David Preyger and Vladimir Omelchenko, "Caspian Dilemma: How to Deliver Blue Fuel to the European Market," *Central Asia and the Caucasus*, 33, 2005, 125.

involved in the trade negotiated commercial contracts. These were usually supplemented by annual agreements that specified exact prices and volumes for the following year. This was particularly true for the special relationship between the Central Asian producers, Russia, and Ukraine but to some extent applied to most natural gas exports within the post-Soviet space.[17]

The Central Asian oil sector, although taken together still perhaps best described as semi-privatised, has been moving steadily into the global market. Transportation bottlenecks remain, as well as some political considerations with regard to export routes, yet pricing mechanisms and price levels have converged with those of the global market. A similar although slower process has been ongoing with regard to natural gas. Russian and Central Asian gas prices are moving in the direction of European price levels. In March 2008, the heads of the gas export monopolies of Russia, Kazakhstan, Uzbekistan, and Turkmenistan indeed jointly declared that from 2009, they would all sell gas at European market prices.[18] The subsequent financial crisis delayed but did not halt this development.

In addition, the Central Asians have been negotiating gas exports with China since 2006. In January 2008, they finally reached an agreement on pricing, confirming that a gas pipeline from Turkmenistan to China would be built and be in operation already in 2009. Many media reports concluded that the Chinese had outmanoeuvred Russia's Gazprom and would now acquire the gas supplies desired by Russia. Not so. Gazprom supported the Chinese deal, and a key company within the Gazprom group would build part of the pipeline to China. And why not? The Chinese pipeline would be loaded with gas from fields only then being taken into production, with Chinese investments, while the Russian pipeline system remained adequate for existing exports to Europe. The opening of the Turkmenistan-China gas pipeline in December 2009, in a ceremony attended by Presidents Gurbanguly Berdymuhammedov of Turkmenistan, Nursultan Nazarbayev of Kazakhstan, Islom Karimov of Uzbekistan, and Hu Jintao of China[19], thus did not necessarily imply less gas for Russia or indeed for Europe as a whole.

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17 *Natural-Gas Trade between Russia, Turkmenistan, and Ukraine: Agreements and Disputes*, 2008.

18 Gazprom Press Release, 11 March 2008.

19 *Caspian Investor* 12(10), 2009, 19-24. Later in the same month, the second segment and final part of the Turkmenistan part of the new Dowlatabad-Salyr Yap gas pipeline to Iran also opened.

C) Russia and China

China has a great and growing need for additional energy imports. In 2010, China surpassed the United States as the world's largest energy consumer.[20] Diversification of oil and natural gas exports away from European markets to China is already underway, and both Russia and the OPEC member states of the Middle East intend to increase energy exports to China—at the West's expense.

China does not mind investing in dictatorships; countries such as Burma are already willing suppliers to China. However, for geostrategic reasons China is concerned about how to safeguard the transportation of imported resources back home. China regards Central Asian and Russian energy as particularly important in this respect since there is no need for transportation by sea, and thereby no need for protection by a blue-water navy. In case of a future crisis with the United States, China would be hard pressed to sustain imports through the existing sea lanes, since these would be exposed to and likely under the control of the United States Navy.

Even so, China and Russia still perceive each other as geostrategic rivals and potential strategic enemies.[21] Russia has been unwilling to accept the construction of an oil pipeline that would lead only to the Chinese market. To build such a pipeline now would, in case of future conflict, be a tremendous waste of resources. Although China and Russia signed a framework agreement in March 2003 to build an oil pipeline from Angarsk in East Siberia to Daqing in Heilongjiang province, northeastern China, the Russian political leadership realised the political risk in such a solution. Far better is then to build the oil pipeline from Siberia along a route, as proposed by Japan which offered to finance part of the project that would bypass China and terminate at Russia's Far East port of Nakhodka or somewhere in the vicinity of this port. While a pipeline terminating in Daqing in effect would be a hostage to Russo-Chinese relations, a pipeline to Nakhodka or thereabouts could be used as a means to export Russian oil by tanker not only to Japan but also to other foreign buyers in the Asia-Pacific region, including China. In June 2004, the director of the Russian Federal Energy Agency, Sergei Oganesyan, went so far as to suggest that the Daqing pipeline might eventually be built, but only as long as the Nakhodka pipeline was constructed first and then only in parallel with this pipeline.[22] In the end,

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20 BP, *Statistical Review of World Energy*, June 2011.

21 Michael Fredholm, *The Shanghai Cooperation Organization: The Latest Chapter in the History of the Great Game or the Guarantor of Central Asian Security?*Stockholm: Team Ippeki, 2007.

22 Dow Jones, *International News*, 4 June 2004.

both destinations would be implemented. The Eastern Siberia–Pacific Ocean (ESPO) oil pipeline would be built, as would a branch from Skovorodino to Daqing. Construction of the ESPO began in 2006.[23] Work on the branch to Daqing began in 2009 and the pipeline was inaugurated in August 2010 by Prime Minister Putin, with regular flow set to commence in January 2011.[24] However, almost immediately upon the opening of regular supplies a dispute arose over the pricing policy of the oil exported through the Daqing branch.[25]

The perceived strategic threat from a pipeline terminating in China was not only geostrategic but also economic. To invest in a pipeline leading to a single customer leaves the supplier, as noted, vulnerable to demands from the customer to re-negotiate the price of energy, after investments have already been made and the project is committed. Even so, Russia's 2009 energy strategy makes it clear that there will be an emphasis on export diversification to the Asia-Pacific region, in particular China, Japan, and South Korea. Russia hopes eventually to increase the eastern direction's share of its energy exports from 6 per cent to 22-25 per cent for crude oil and oil products, and from zero to 19-20 per cent for natural gas, explicitly to reduce Russia's dependence on exports of energy resources to Europe.[26]

Similar problems and concerns were seen in the natural gas market. The quest for exporting Russian natural gas to China began in March 2006, when then President Putin on the first day of a visit to China signed a joint declaration with his Chinese counterpart on energy co-operation and announced a number of agreements on energy supplies and joint ventures with the Chinese National Petroleum Corporation (CNPC), including one by Gazprom. A member of Putin's delegation later elaborated to the media: a natural gas pipeline would be built from Russia to China, to be commissioned in 2011. Putin himself told the press that the first stage of the project was the construction of a new gas pipeline, named Altai, from West Siberia to China's western border. This route had been chosen because deliveries from West Siberia seemed "easier to carry out and faster." In a second stage, another gas pipeline would be built from East Siberia. Exports from each project would total 30-40 bcm per year.[27] Gazprom President Miller later explained that

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23 *Kommersant*, 18 April 2006.

24 *Russian Petroleum Investor* 19(8), 2010, 7-10.

25 *Asia Times*, 5 May 2011, www.atimes.com; www.transneft.ru.

26 *Energeticheskayastrategiya*, 2009, 10.

27 RIA Novosti, 21 March 2006, "Meeting with Russian Journalists Following the Ceremonial Signing of Russian-Chinese Documents," 21 March 2006, *www.kremlin.ru*. A Chinese newspaper explained that the Altai pipeline would run via Novosibirisk to the Russo-Chinese border and then onwards to Urumchi in

annual exports would total 68 bcm, with a projected throughput capacity for the western route of 30 bcm per year.[28] As for Putin, he later suggested that in ten to fifteen years, no less than 30 per cent of Russian energy exports would go to Asia—an ambition which Russian experts believed would be hard to realise.[29]

Russia and China have since repeatedly attempted to conclude major gas supply deals. They have not been successful because of the key issue of pricing. Simply put, Gazprom wants its natural gas sales to China to be comparable in profitability to the sales to Europe, while China wants to pay less, wishing to see imported natural gas close in effective price to domestic coal. With the rise of prices for the oil-linked natural gas for Europe, the gap between what Gazprom and its Chinese counterparts desire will widen.[30]

The Altai pipeline project remained on the Gazprom web site but was in time quietly put on hold until at least 2015-2018.[31] The project was not mentioned among important infrastructure projects in Russia's 2009 energy strategy.

In China, coal accounts for roughly 80 per cent of the overall domestic energy production. China has also made significant investments in renewable energy sources, in particular wind power which has grown 36-fold since 2005 and in 2010 contributed more than four times electric power than China's nuclear power plants, yet less than five per cent of China's total electric power production. Thermal power plants still produce the bulk (close to 80 per cent) of China's electricity production.[32] Domestic coal thus continues to provide the benchmark for what China is willing to pay for imported natural gas.

D) Globalization, Climate and Technological Innovation

Since the energy sector answers to and depends on the demands of both technology and politics, it is characterized by a rapid and often dramatic pace of change. Globalization forces the issue and is a powerful cause of

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Xinjiang, where it would link up with China's West-East gas pipeline. The second pipeline would run from Sakhalin to Vladivostok and thence into China's Heilongjiang province. *Wen HuiBao* (Shanghai), 21 March 2006, *www.whb.com.cn*. Several details given by *Wen HuiBao* have since been proven wrong; however, the Altai pipeline project as fundamentally described here was later posted on the Gazprom web site, *www.gazprom.com*.

28 Miller at the Gazprom annual shareholders' meeting, 30 June 2006, *www.gazprom.ru*.

29 *Nezavisimayagazeta*, 14 September 2006.

30 Julian Lee, "Russia and China Fail to Reach Gas Supply Deal," *FSU Oil & Gas Advisory*, June 2011.

31 *www.gazprom.com*; RIA Novosti, 24 August 2010.

32 "China's Future Energy Prospects," *Quarterly Oil Demand*, July 2011.

transformation. At present, there is a sharp rise in demand for energy from newly industrialising economies. The supply side suffers from declining reserves in many countries, which makes it less responsive. There is a widely acknowledged need for environmental protection, which makes new infrastructure projects increasingly difficult and expensive. Globally, infrastructure is ageing. In some areas, there is weather-related damage previously not foreseen. There may also be attacks on existing energy infrastructure by terrorist groups, in particular in volatile regions such as the Middle East and parts of Africa but attacks could take place anywhere.

Unconventional oil and gas deposits are sometimes assessed to have the capability to change the global market for oil and gas, since they, like coal, are expected to be far more evenly distributed worldwide than conventional oil and gas reserves.

Unconventional oil deposits include, among others, tar sands and shale oil, while unconventional gas deposits can be found as, for instance, shale gas and coal bed methane (CBM), the latter in existing coal mines. Major shale gas deposits are believed to exist in several European countries. Major deposits of unconventional oil and gas have also been found in India, China, and other countries.

However, development and production costs still remain high. Drilling costs are significantly higher. In addition, the insufficient pipeline infrastructure in Europe and the high population density cause further problems in developing the deposits. Moreover, the environmental impact of production is very high compared to conventional oil and gas production, since it is often close to strip mining.

Even so, the appearance of unconventional oil and gas reminds us that the energy sources in current use today may not necessarily be the sources of choice for energy forever. A half-century from now, renewable sources of energy or even completely new ones may well prove to be of higher importance than present ones, in the same way that first oil and then natural gas replaced coal as the energy of choice in many industries.

The development of unconventional gas in China will be a significant factor in the energy exports from Russia and Central Asia. The potential for both coal bed methane (CBM) and shale gas is high in China. However, the projected production of 5 bcm per year of CBM in 2010 reached only a quarter of the planned level.[33] As for shale gas,

[33] Julian Lee, "Russia and China Fail to Reach Gas Supply Deal," *FSU Oil & Gas Advisory*, June 2011.

commercial exploration in China can only be said to have begun in mid-2011 when the first round of shale-gas licenses was issued. A further problem is that shale gas production requires large volumes of water, which is not easily available in promising regions such as the Tarim deserts in Xinjiang.[34]

The ongoing climate change will bring implications for China's deserts. Its effects will also be visible elsewhere. The melting of the Arctic ice brings the prospects of the Arctic being ice-free, and thus navigable, during the summer months. This would open up a number of Arctic sea routes, including between China and the Far East and the North American east coast and between China and the Far East and northern Europe, including Russia's resource-rich Arctic territories.[35] These routes would be significantly shorter than the present sea routes through the Suez and Panama canals. However, the dynamics of climate change make it difficult to estimate when such routes would become commercially viable.

On the negative side, the warming of the hitherto frozen Arctic tundra will create problems in the construction and maintenance of land-based energy infrastructure. The ground, unstable if ice-free, may not be able to support overland pipeline infrastructure. This particularly applies to already existing infrastructure, which was constructed without adequate safeguards against this, at that time poorly understood, phenomenon.

High energy prices will eventually no doubt generate new technologies to develop energy resources in the Arctic. However, current prices remain too low to justify such technological developments. New technology is needed to enable drilling in deep water, as well as equipment that can withstand ice flows. Ice-capable technology of all kinds will be required, so as to allow access over time despite seasonal and year-to-year ice fluctuations, in gear for drilling and in anything from transportation infrastructure to refueling depots. Oil prices will have to rise and be expected to remain high enough over time to justify new, expensive infrastructure projects in an environment as hostile as the Arctic. This will particularly affect major projects the investment costs of which would take many years to amortize, that is, exactly the projects most needed to fulfill future demand for energy.

Proven oil and natural gas reserves are mostly concentrated in politically unstable regions and geologically challenging areas such as the Arctic. Coal can be found almost everywhere, but its use in energy

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34 *Shanghai Daily*, 11 July 2011.

35 Linda Jakobson, "China Prepares for an Ice-free Arctic," *SIPRI Insights on Peace and Security* 2, 2010.

production, like oil and natural gas, leads to the emission of greenhouse gases which causes environmental problems and climate change. Hydroelectricity, where available, can be used to offset some of these problems but harms the environment in other ways. Two quite different paths would seem to lead out of this conundrum: nuclear power and renewable energy. Renewable energy sources include energy generated from solar, wind, geothermal, hydro, ocean, and biomass (biofuels) resources. Although few would compare nuclear power to the currently favoured renewable energy sources, both types of energy have in common that they can minimize the need for fossil fuels. However, either type of energy poses additional problems.

The use of nuclear power became increasingly distrusted after the 1979 Three Mile Island, the 1986 Chernobyl, and the 2011 Fukushima disasters. As major disasters go, comparatively few people died, yet the media impact was significant. A cool-headed (or cold-hearted) analyst may argue that the safety record of nuclear power is not so bad after all, yet for political reasons the future use of nuclear power is in doubt in several countries, which means that other sources of energy will be needed.

On the other hand, with the exception of hydroelectricity, energy production from renewable energy sources remains insignificant in the energy balance of most countries including Russia and those in Central Asia, accounting for at most a few per cent of total production.[36] Renewables, when introduced, are primarily the result of direct policy tools like subsidies and regulatory measures. Pricing alone is insufficient to promote a switch to renewable energy. The same pattern can be seen in many other types of new energy developments. High energy prices and subsidies and regulatory measures have driven investments in, for instance, coal, biofuels, and coal-to-liquids, yet without significantly increasing efficiency.

Although the surviving residue of the old Soviet command economy, in the form of state control if nothing else, thus might, in fact, be ideal to enforce a move away from environmentally unfriendly oil and natural gas towards more wholesome renewable energy sources, this seems unlikely in the short term for two reasons. First, Russia and Central Asia already have substantial energy reserves in the form of oil and gas. Second, as long as the sustained exports of oil and gas continue to bring in very substantial revenues to the state budget, it seems unlikely that the political mood would encourage quite different and indeed alternative energy sources. As for Russia, the 2009 energy strategy

[36] BP, *Statistical Review of World Energy*, June 2011.

concludes that Russia is in practical terms absent from the global renewable energy market, yet asserts that Russia will develop this sector and has the scientific potential.[37]

The global energy market faces challenges of an equally important but less spectacular kind as well. Refinery capacity is becoming a limiting factor in many parts of the world, with the potential drastically to affect the global trade in oil products. No more oil refineries are expected to be built in Europe, where there is a surplus of gasoline. Yet demand for middle distillates such as diesel fuel is expected to outperform that of gasoline.

In Europe, there is already a shortage of diesel fuel. Europe currently imports diesel fuel from Russia, the Middle East, and the United States. Most diesel fuel consumed in Europe comes from Russia. Besides, the volumes imported from the United States can be expected to decrease further. Imports from the Middle East might increase, but Middle Eastern diesel fuel exports to Asia are also expected to grow rapidly, which might leave Europe dependent on Russian imports. Europe thus sees a growing diesel fuel deficit. The opposite is true for gasoline. There is a surplus of gasoline in Europe, and this surplus is likely to increase. Gasoline is currently exported from Europe, Asia, and the Indian Ocean region to North America. In particular the United States imports much gasoline from Europe. However, should the United States see major growth in the use of diesel fuel, then there will be a diesel fuel deficit not only in Europe but elsewhere as well.[38]

Unfortunately, Russian refineries are frequently old and substantially behind global standards. Russia will have to expand and modernise its refining facilities, which is also evident from the 2009 energy strategy.[39] Another problem is that current policies instead of encouraging investments in new refinery capacity have led to the construction of often illegal mini-refineries. Although sometimes necessary for the supply of oil products to major industries within their region, regulatory means such as domestic pricing policies and existing export duties on oil products in this case failed to encourage needed investments. Instead these policies resulted in inferior refinery capacity with an output that failed to meet technological and legal standards.[40]

These dynamics will affect Central Asia as well. There are few refineries in Central Asia, and the existing ones are old. Azerbaijan has

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37 *Energeticheskayastrategiya*, 2009, 9.

38 Michael G:sonLöw, Presentation, NOG Seminar on "Energy Supply Changes, Trends, and Prospects for the Future," 18 May 2011, Stockholm.

39 *Energeticheskaya strategiya*, 2009, 3-4.

40 *Russian Petroleum Investor* 19(3), 2010, 5-7.

two refineries, both near Baku, the Azerineftyag refinery and the Heydar Aliyev refinery. There are two refineries in Turkmenistan, the Seydi (Charjew) and Turkmenbashi. Uzbekistan has three refineries, at Ferghana, Alty-Aryk, and Bukhara. Kazakhstan has three refineries, at Pavlodar, Atyrau, and Shymkent, but still must import oil products for its own needs from Russia, especially middle distillates such as diesel fuel. Kazakhstan makes a good case study to illustrate the Central Asian refinery situation. In striking contrast to the upstream sector, the refining sector remained largely in the possession of the state and never received as high levels of foreign direct investments (FDI) as other parts of Kazakhstan's energy sector. As in Russia, regulatory means such as domestic pricing policies and existing export duties on oil products hampered new investments. Domestic prices for refined products remained low, offering little incentive to produce refined products for the domestic market. The total capacity of all three oil refineries in Kazakhstan remains limited and all indeed operate far below capacity, in part because foreign oil companies prefer to export crude oil rather than to sell the oil within the country at low domestic prices.[41] Besides, the refineries are old. The Atyrau refinery, for instance, was built at the end of the Second World War.[42]

Conclusion:

The energy trade predominates Russia-European Union energy relationship over the last few years. Russia needs the European Union as a market, and the European Union needs Russia as an energy producer. Both will have to come to an understanding with China's need for energy and her priorities in international relationships and environmental policies.

As for China, infrastructural bottlenecks still preclude Russia and Central Asia from increasing energy deliveries to China as per her growing demand. The same handicap holds back Russian and Central Asian energy supplies to other energy consumers in the Asia-Pacific region. Russia is indisputably correct in its assessment that stability in prices and demand will be necessary to justify the very substantial investments needed to develop and ship new energy reserves. Unfortunately, current trends in the industry move in the opposite direction. Issues such as the little known costs and potential of unconventional oil and gas and renewables play havoc with any attempts to predict the future of the oil and natural gas industry.

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41 Vladimir Babak, "The Oil and Gas Sector in Kazakhstan," *Central Asia and the Caucasus* 40, 2006, 50-51.

42 *APS Review Gas Market Trends*, 24 July 2006, *http://goliath.ecnext.com*.

For Eurasia as a whole, energy efficiency should be improved—but countries with aged heavy industry, including parts of Russia and most of Central Asia, will face problems. For similar reasons, the share of nuclear power in the energy supply should be increased as well. Public concerns over safety issues may preclude this development in some countries.

The rapid pace of technological and political change that characterizes the energy sector may cause analysts and policy makers to lose sight of the imperative to guarantee modern society's need for energy in a sustainable environment. Globalization creates new vulnerabilities and opportunities in the quest for energy and security in contemporary Eurasia. Globalization brings the innovative means to create economic prosperity but also changes what some believed were constants of the Eurasian energy market.