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Energy security in Kaliningrad and geopolitics

Artur Usanov
Alexander Kharin

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Authors

Artur Usanov, Strategic analyst, The Hague Centre for Strategic Studies, The Hague, the Netherlands

Alexander Kharin, Associate professor, Immanuel Kant Baltic Federal University, Kaliningrad, Russia

1. Introduction

Russia is often seen as an "energy superpower" that is eager to exploit energy vulnerability of its customers for geopolitical goals. However, behind this façade of energy strength there are some vulnerable spots. One of such spots is Kaliningrad Oblast (or province).[1] This is one of the smallest regions of the Russian Federation with a population of about 960 thousand people. What makes Kaliningrad special is its exclave location on the Baltic Sea coast[2] – it has no land connection to the rest of the Russian Federation but has common borders with two European Union (EU) member states – Poland (to the south) and Lithuania (to the north and east).

Kaliningrad's exclave location means that it is very much dependent on the transit of goods and people through Lithuania. There have been some frictions between Russia and Lithuania (and, more broadly, between Russia and the EU) on the Kaliningrad transit issue before, in particular, in 2002 during final stages of Lithuania's preparation to join the EU. This year, however, the relations between Russia and the EU have deteriorated drastically. The EU along with the US and some other countries have imposed several rounds of economic sanctions against Russia because of Russia's actions in Ukraine. The Russian government retaliated by banning the import of many food items from those countries.

The current crisis in the EU-Russia relations has brought increased attention to Kaliningrad's transit-related issues once again. One particularly important area where the exclave location of Kaliningrad creates substantial challenges is its energy security. This brief will analyze the most important aspects of Kaliningrad's energy security and how geopolitics influences them. We start by describing energy resources in the province, trends in its energy production and consumption. In the following section we examine key weaknesses in Kaliningrad's energy system from an energy security perspective and describe plans and projects that aim to address these weaknesses.

2. Overview of the energy situation in Kaliningrad

Although Kaliningrad is highly dependent on external energy supplies it is not completely deprived in terms of energy resources. In fact, its fossil fuel resources can be described as rather substantial relative to its own energy consumption. The most important among these resources are crude oil deposits located both onshore and offshore. The Official Socio-Economic Development Strategy for Kaliningrad Oblast adopted in 2012 puts total recoverable reserves of crude oil in Kaliningrad at 55 million tonnes (Mt).[3] This would meet Kaliningrad's internal demand for oil (if it stays at the current level) roughly for 50 years. Other estimates of oil reserves in the region typically give lower numbers. For example, Russian oil company Lukoil, which accounts for more than 95% of all Kaliningrad's crude oil production reports that its proven oil reserves in the region are just 6.2 Mt or 46 million barrels.[4]

Oil production in the region got a boost in 2004 when Lukoil started production at the offshore Kravtsovkoe field located approximately 20 km from Kaliningrad's coast. Kaliningrad's crude production reached its peak of more than 1.4 Mt per year in 2006-2008 but since then it has been declining by 9-11% p.a. (see Figure 1).

Kaliningrad does not have an oil refinery although discussions about the costs and benefits of building one periodically pop up. All crude oil produced in Kaliningrad has been exported. Given its low sulfur content it is able to fetch a higher price on the international market than the main Russian export blend – Urals. Crude oil has been Kaliningrad's main export commodity. Oil production has been an important factor in Kaliningrad's economic development, and together with associated gas it has accounted for at least 97% of primary energy production in Kaliningrad in recent years. Yet its direct role in Kaliningrad's energy security is very limited: crude oil is not used directly to produce useful energy and all refined oil products have to be imported to the region.[5]

Future prospects for oil production in Kaliningrad are mainly associated with offshore fields. Untapped onshore oil fields in Kaliningrad are quite small and will not be able to offset the fall in production due to the depletion of existing larger fields. Even optimistic forecasts suggest that onshore oil production will decrease to 0.2-0.3 Mt in the next decade. The hopes of reversing the fall in oil production are pinned on further exploration and development of offshore fields in the Baltic Sea. It has been reported that 36 Mt of oil resources in the Russian sector of the Baltic Sea is prepared for development. Their successful development might significantly increase Kaliningrad's oil production again.[6]

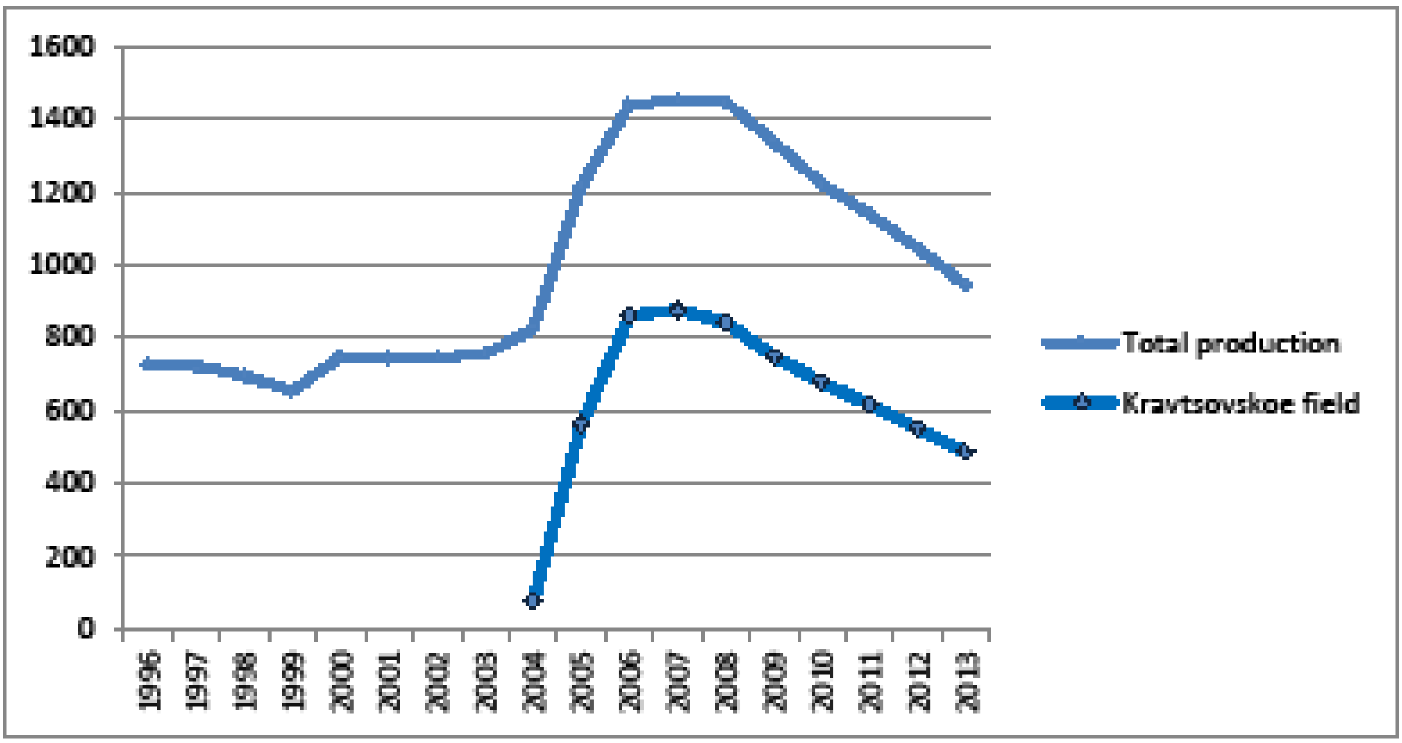
Other substantial fuel resources in the region include deposits of *brown coal* or *lignite* (approximately 80 million tonnes) and *peat* (more than 300 million tonnes). Brown coal deposits are not developed mainly for environmental reasons. Peat is extracted on a limited scale by several companies and is used in agriculture and for energy production at a few district-heating boiler stations.

With regard to renewable energy resources there has been some small scale use of *hydropower* and *wind energy*. Currently, the installed capacity of three existing hydropower plants is just 1.7 MW. However, the economic potential of local hydro resources is significantly bigger. In the first half of 20th century the province (part of East Prussia at that time) had more than 30 small and micro run-of-the-river hydropower plants, some elements of which survived to this day. The regional government estimates that the total capacity of all hydropower plants if they are restored and equipped with modern turbines can be expanded to 17-20 MW.

Kaliningrad has the oldest and, so far, the largest operating wind farm in Russia.[7] While it might be the largest in Russia it includes only 21 wind turbines and has the installed capacity of 5.1 MW, which is quite small by the European standards. It was built in 2002 with the assistance of the Danish government. There are plans to significantly expand wind energy capacity in coastal areas of Kaliningrad, which have strong enough winds. However, such factors as low fossil fuel prices, limited government support for renewables and high capital outlays per unit of electricity produced make these plans and, in particular, offshore ones more similar to "castles in the air" rather than to solid investment proposals.

Overall, once we exclude crude oil, since it is 100% exported, the internal energy production covers less than 2% of Kaliningrad's energy demand. Essentially all coal, natural gas and refined oil products have to be imported to the region. Most of them are shipped from Russia and has to cross two countries on their way to Kaliningrad – Be-

Figure 1. Oil production in Kaliningrad, kilo-tonnes. Source: Kaliningradstat, Lukoil.



larus and Lithuania. This obviously creates some additional risks of interruptions and has implications for Kaliningrad's energy security.

However, the most significant challenges to energy security in Kaliningrad are associated with the electricity sector.[8] Electricity is the backbone of the regional economy. Exact estimates are difficult to make because official statistical bodies do not publish a comprehensive energy balance for Kaliningrad but rather separate fuel and electricity balances. But our calculations show that the electricity and heat sectors together accounted for more than 57% of all fuel resources consumed in the region.

Kaliningrad's economy grew significantly faster than the overall Russian economy since 2000. As a consequence, Kaliningrad's electricity consumption grew 48% between 2000 and 2013 vs. 22% in Russia as a whole. Both in Russia and in Kaliningrad 1% growth in economic output has led on average to 0.4% growth in electricity consumption.

Sectoral structure of electricity consumption exhibits substantial differences between Kaliningrad and Russia. Kaliningrad looks much more like a post-industrial region compared to Russia. The share of industry in Kaliningrad is approximately half of that in Russia, while the shares of the residential sector and services are significantly higher (see Figure 2).

Until 2005 Kaliningrad produced less than 10% of electricity it consumed with the balance supplied by or through the Lithuanian grid. This situation worried policy makers both in Kaliningrad and in Moscow even before the break-up of the Soviet Union – the first government decision on the construction of a large power plant in Kaliningrad dates back to 1990, but the economic crisis of 1990s and lack of funds effectively ruled out any large scale projects in the energy sector. Active construction of the large combined heat and power plant (CHPP) on the outskirt of the city of Kaliningrad started only in 2002. Its first unit was brought online in October 2005, which was followed by the second one in December 2010. The plant is known as CHPP-2 and was one of the first in Russia based on a Combined Cycle Gas Turbine (CCGT) technology. The CHPP-2 has the installed capacity of 875 MW(e) and currently accounts

Figure 2. Electricity consumption by sector, 2012. Source: Rosstat.
Note: Commercial includes commercial and public services, agriculture, fishing and forestry.

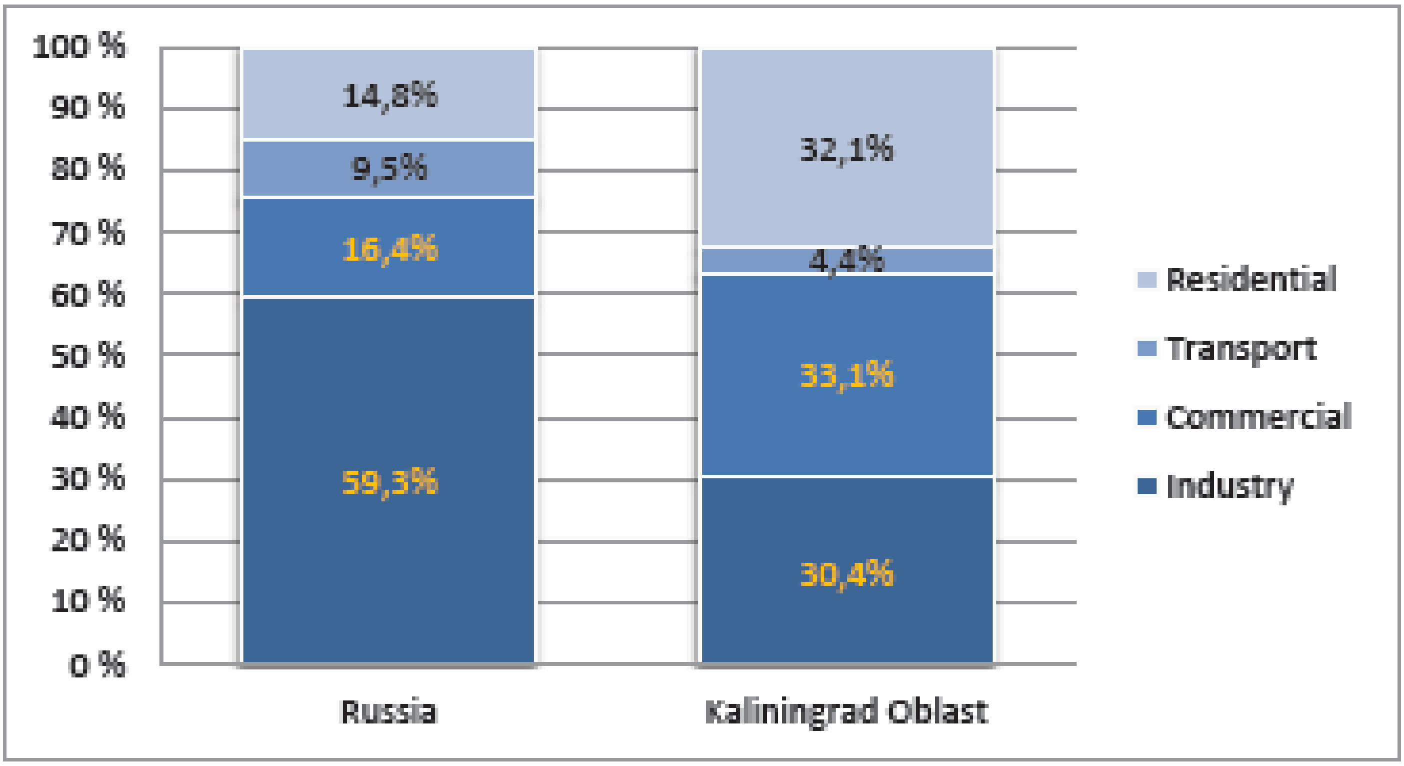
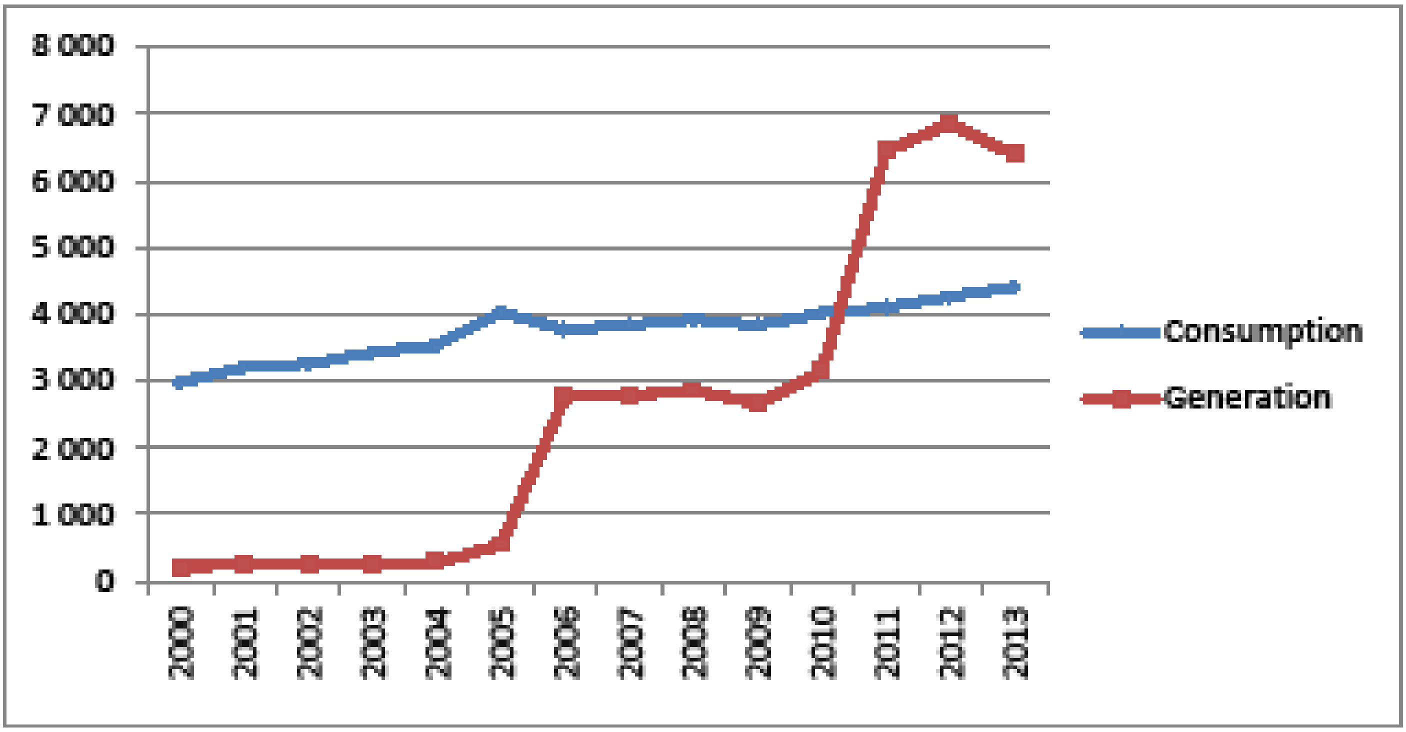


Figure 3. Electricity production and consumption in Kaliningrad, million kWh. Source: Rosstat, Kaliningrad Regional Government.



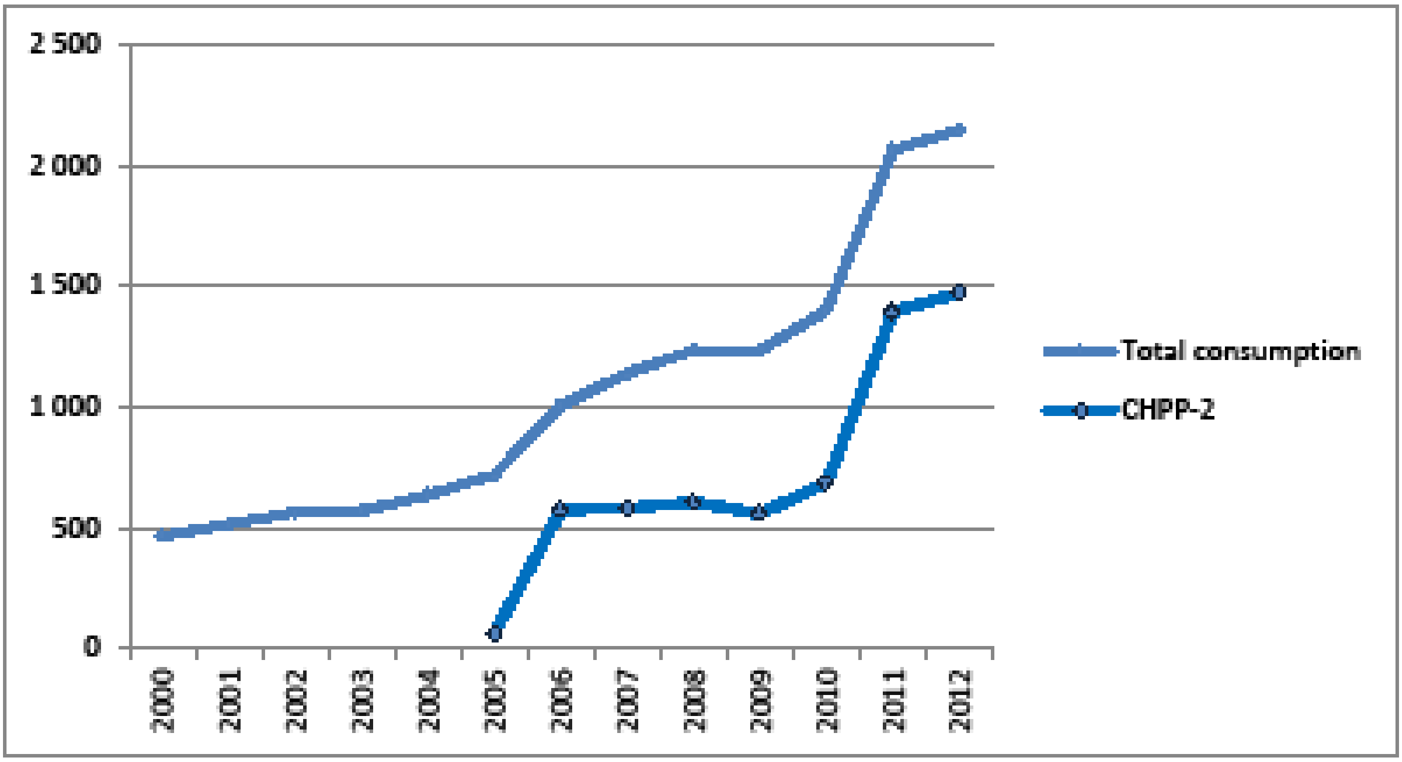
for more than 98% of electricity generation in the province. The plant made Kaliningrad self-sufficient in electricity generation and since 2011 the province has been able to export excess electricity to Lithuania (see Figure 3).

Another recent high profile project in Kaliningrad's energy sector – the Baltic Nuclear Power Plant – has been much less successful. In April 2008 Rosatom, Russian state nuclear corporation, announced that is going to build a nuclear power plant with two 1,200 MW reactors in Kaliningrad. The first reactor was planned to come online in 2016 and the second one – in 2018.[9] This announcement came as a surprise – the capacity of just one reactor would significantly exceed any potential electricity demand in Kaliningrad even excluding the CHPP-2 and other existing plants.

Yet the motivation behind the project was quite obvious. Under pressure from the European Union Lithuania had to finally close down its Ignalina Nuclear Power Plant in December 2009. The shutdown turned Lithuania from a significant electricity exporter into a net importer. Other countries in the Baltic Sea region including Poland and Germany were also viewed as potential markets for electricity generated by the Baltic NPP. To increase chances that electricity generated by the Baltic NPP will find its customers Rosatom offered foreign investors up to 49% equity in the project, which was a novelty in the Russian nuclear generation sector. Project's site works started in 2010 and first concrete was poured in April 2012. But soon after that, in June 2013, Rosatom suspended construction because it failed to find either investors or long-term customers for the project. Rosatom looked at the possibility to use small or medium-sized reactors at the same site but this idea has been also abandoned for now.

Construction of the CHPP-2 led to large increases in natural gas consumption (Figure 4). Additional factors that contributed to growth in gas demand included the expansion of the gas distribution system in the province ("gasification programme") that let residents of many towns and villages to switch to natural gas for cooking and heating as well as the conversion of many district heating boilers from fuel oil and coal to natural gas. One result of this is that natural gas has the

Figure 4. Natural gas consumption in Kalingrad, million cubic meters.



largest share among the all primary energy sources in Kaliningrad – it is accounted for 57% of fuel consumption in Kaliningrad (and slightly lower percentage in the total final energy consumption) – see Annex. For the electricity and heat sector it is, for all practical purposes, the only fuel that matters: in 2012 90% of fuel consumption in this sector (on energy basis) was represented by natural gas. The significance of natural gas in Kaliningrad's economy contrasts with the fact that the only supply option is a pipeline that goes through Belarus and Lithuania.

Summing up, we can say that although Kaliningrad has substantial fossil energy resources, in particular of crude oil, it is almost completely dependent on the external supplies of fuels. These supplies have to cross at least two countries – typically Lithuania and Belarus – on their way to Kaliningrad. This dependence creates some additional risks for Kaliningrad's energy security. The next section analyzes these risks in more detail.

3. Main energy security issues in Kaliningrad

3.1. Background

Before delving into detailed analysis of the major energy security risks in Kaliningrad it is worth describing one episode from recent history that highlighted Kaliningrad's exposure to energy security risks. On February 18, 2004 after negotiations regarding the price of natural gas for Belarus and the privatization of the Belarusian gas pipeline monopoly, Beltransgaz, broke off Gazprom completely cut off all supplies of natural gas to Belarus, including transit flows to Europe via Belarus.[10] Since Kaliningrad received natural gas via Belarus its supplies were also cut along with those to Lithuania and Poland.

The situation in Kaliningrad was exacerbated by cold weather and lack of any gas storage. The supply of hot water and heat to most of residential buildings was significantly reduced, population was warned to use as little natural gas as possible and many enterprises were on the edge of halting their operations.[11] The gas blockade lasted only for 19 hours – the next day Belarus agreed to a new gas price and Gazprom resumed the supplies – and its direct economic damages for Kaliningrad were rather small. But it clearly illustrated the extent of Kaliningrad's vulnerability to energy supply interruptions. Ironically, at that time Kaliningrad and Lithuania were in the same boat and experienced the same problems while currently it is the dependence on the Lithuanian transit that is considered as the main vulnerability in Kaliningrad.

Since then Kaliningrad has made substantial progress in improving its energy infrastructure and addressing some of the energy security weaknesses. As it was mentioned earlier the construction of a large power plant, the CHPP-2 made the province self-sufficient in terms of electricity generation. To ensure that the plant has sufficient fuel supplies the capacity of the natural gas pipeline Minsk-Vilnius-Kaunas-Kaliningrad was expanded to 2,500 million cubic meters (mcm) per year in 2009. Finally, in September 2013 Gazprom commissioned the first phase of the Kaliningrad underground gas storage facility, which is capable of storing 52 mcm[12] or approximately 9 days of consumption in the province.[13] Eventually Gazprom plans to expand the total storage capacity of the facility to 260 mcm. However, some substantial weaknesses in Kaliningrad's energy infrastructure still remain and we discuss them below.

Energy security can be a rather elastic concept and sometimes it is stretched in different directions. But at its core lies the idea of uninterrupted provision of energy services. The International Energy Agency's definition of energy security as "the uninterrupted availability of energy sources at an affordable price"[14] also highlights the fact the reliability of energy supplies often comes with a price. Energy security for any fuel or energy carrier can be influenced by a large number of factors but two of them deserve a particular attention. These are:

1) The cost and flexibility of transportation, and

2) The cost of storage.

The first factor limits the range of the potential suppliers to any specific market. If transportation costs are low and infrastructure is flexible then any geographic market can be supplied by producers from all over the world and prices in different regions will tend to converge to some global benchmarks.[15] Probably the best real world example approximating such a description is the crude oil market. If the opposite is true, one should see many regional markets with large price differences between them, sometimes measured in hundreds of percent. Flexibility of transport infrastructure is another dimension of the first factor and has particular importance for energy markets. Natural gas and electricity rely on a dedicated fixed infrastructure for their transportation – gas pipelines and electrical grids accordingly.[16] Crude oil and coal are more flexible in this respect and to a large extent rely on general use transport infrastructure, such as roads, railways, ports, etc.[17]

The second key energy security factor is the cost of storage. By keeping stocks of energy resources and releasing them during supply interruptions one can lower the impact of such interruptions. This also helps to reduce the power of energy suppliers to use interruptions for political or economic goals. On this metrics, electricity and natural gas are again at a disadvantage compared to oil and coal: they are much more expensive to store.

These two factors show that the supplies of electricity and natural gas are much more significant energy security concerns compared to that of coal and crude oil. This conclusion applies to Kaliningrad as well as more broadly (although in different geographic regions priorities might sometimes change due to the influence of other factors). If land transit to Kaliningrad is disrupted then coal and crude oil supplies can be rerouted to Kaliningrad through sea lanes relatively easily. This might require some additional investment in port infrastructure and might make the cost of transportation somewhat higher but it should not cause major economic problems in Kaliningrad. This is obviously not true in the case of natural gas and electricity. That is why main energy concerns in Kaliningrad focus on these two energy carriers. More specifically there are two major issues that pose difficult challenges for policy-makers in Kaliningrad and Moscow:

1) Expected break-up of the BRELL energy ring,

2) Alternative options for natural gas supplies.

This is obviously not a comprehensive list of energy problems in the province. In particular Kaliningrad's electricity transmission and distribution network has some important weaknesses and bottlenecks, often relies on outdated transmission substations and experiences large electricity losses. But these problems have more local character and require less significant investment compared to the two major problems mentioned above. We describe them in more detail below.

3.2. Break-up of the BRELL energy ring

BRELL is an agreement between the operators of electric grids in Belarus, Russia, Estonia, Latvia and Lithuania (hence its name), which was signed in 2001. This agreement links grids in the Baltic countries to the Russia-dominated IPS/UPS power system. Power generators in the BRELL countries operate at the synchronized frequency and time making them one wide area synchronous grid (or frequency area). Large synchronous grids bring many benefits including pooling of load (demand) that helps to smooth its variability, sharing reserve capacity and facilitating cross-border electricity trading. Being part of the BRELL ring Kaliningrad can balance its power system by selling excess electricity to Lithuania (or to other BRELL countries) or by receiving electricity from the BRELL ring when it experiences shortages.

However, this comfortable for Kaliningrad arrangement might not last long. The strategic goal of all three Baltic countries is to switch to the synchronous grid of Continental Europe by 2020. There are some doubts about costs and benefits of such a step for Lithuania and other Baltic countries. Study commissioned by the power system operators from three Baltic States and carried out by a Swedish consulting company Gothia Power AB concluded that while the goal of integration is feasible from a technical point of view, "no traditional technical or economic argument has been identified that can justify a change of synchronisation from the present IPS/UPS system to the CE [the Continental Europe synchronized power] system".[18] Yet political and strategic considerations proved to be more important for the Baltic countries than economic arguments. In June 2012 Lithuanian parliament adopted the bill on the integration of country's power system into the European grid.[19] To this end, two power interconnection projects have been initiated: LitPol Link (1,000 MW) between Lithuania and Poland and NordBalt electricity link (700 MW) between Lithuania and Sweden.

Withdrawing of Lithuania from the IPS/UPS synchronized grid will make Kaliningrad an energy island. Cross-border flows of electricity between Kaliningrad and Lithuania using existing transmission lines will become impossible. One option would be for Kaliningrad to integrate into the synchronized power system of Continental Europe together with the Baltic States.[20] The study by Gothia Power mentioned earlier concluded that this is technically feasible. This option has obvious advantages. First and foremost, it is much less expensive way to ensure the reliability of the power system. Additional investment required in this option, such as the recommended electricity link between Kaliningrad and Poland would be much cheaper than guaranteeing the reliability in the case of Kaliningrad as "energy island." Another potential advantage is that it could make the unfinished Kaliningrad nuclear power plant more attractive for potential customers and investors.[21]

This option has been seriously considered by the Russian government.[22] Moscow also indicated its interest in building a transmission link between Kaliningrad and Poland. It seems though that

Kaliningrad's neighbors are not particularly interested in this option and Lithuania prefers to isolate Kaliningrad.[23] Add to this the fact that the EU-Russia relations are currently at the lowest point since the end of the Cold War and Kaliningrad's future as an energy island looks like a predetermined outcome.

This immediately raises the issue of the security of electricity supply. As it was mentioned before Kaliningrad is currently self-sufficient in terms of electricity (see Figure 3). The total installed capacity of dispatchable (thermal and hydro) power plants in the province is 949 MW while peak demand amounts to 843 MW (it was registered on January 31, 2014).[24] These two numbers mean that the reserve margin in Kaliningrad's power system is 11%. This is rather small: the typical normative values used in Russia are around 20%[25] and for a small isolated region it should be even higher. However, this problem is rather insignificant compared to the overwhelming reliance of Kaliningrad's power system on a single source of power – CHPP-2, which alone accounts for 92% of the installed capacity.

The danger of such dependence was illustrated by a blackout that took place on August 8, 2013. After two high-voltage power lines were hit by lightning the automatic protection system at the CHPP-2 shut down both of its units.[26] This caused a widespread power outage affecting most of province's population. The blackout lasted for about 90 minutes and the supply of electricity was restored only with the help of power flows from Lithuania. In order to avoid a situation like this one of the standard reliability criteria for power systems is known as *N-1* meaning that the system should be able to withstand the loss of its largest component. This criterion implies that Kaliningrad needs at least 800 MW of the additional generation capacity (the installed capacity of the CHPP-2 – 875 MW minus the capacity of all other power sources – 79 MW).

Such large increase in the generation capacity would be difficult to achieve in a short time even under the most favorable conditions. And currently both economic and financial conditions are far from that: the Russian economy is balancing on the edge of a recession and western financial markets are essentially closed for Russian borrowers. Building 800 MW of the natural gas and/or coal-fired generation capacity will be expensive: the construction costs are estimated at approximately €1 billion,[27] which can be compared with roughly €1.5 billion of total fixed investment in Kaliningrad's economy in 2013. It should be noted though that the funds spent on the unfinished Baltic nuclear power project, which are estimated as RUR 50-60 billion (€1- 1.2 billion),[28] quite closely match investment required to expand the generation capacity in Kaliningrad.

Where this money will come from is not clear. The new generation capacity will be excessive under normal conditions. This will inevitably lead to a low capacity factor (a measure of the power plant utilization) and, as a consequence, will make new plants unprofitable. Unless the government provides some special incentives, for example, via higher administrative electricity prices or construction subsidies, private companies will not invest in new generation in Kaliningrad. One potential source that is often mentioned in this regard is Rosneftegaz, a state holding company that owns shares in Rosneft and Gazprom and receives dividends from them.[29]

New master plan for the power system development approved by the Kaliningrad regional government in April 2014[30] reflects this confusion about the future of Kaliningrad's power system. It develops two scenarios. The first one called "base scenario" foresees a small decrease in the installed capacity from 954 MW in 2013 to 940 MW in 2019. In the other scenario called "maximum (regional) scenario" the installed capacity is expected to double to 1,880 MW in 2019. This should be achieved by building five new gas and coal-fired power stations in different cities of the province (plus one additional wind farm). Nuclear power plant is, however, absent in the both scenarios.

Another potential option is to build transmission links to the IPS/UPS grid (to Belarus) using high voltage direct current (HVDC) lines[31] not connected to the Lithuanian grid. This however, brings back all transit-related problems and it will not be cheap either. The LitPol link mentioned earlier is estimated to cost €340 million[32] and the Kaliningrad-Belarus interconnector is unlikely to cost less. Some other interconnection options can be also discussed such as Kaliningrad-Poland HVDC link. However, they do not look likely at the moment.

3.3. New options for natural gas supplies

Potential expansion of the installed generation capacity in the region leads to the problem of additional fuel supply. The supply of coal, if new coal-fired power plant(s) is going to be built in the province, is unlikely to be a critical problem. Kaliningrad already receives roughly 300 thousand tonnes of coal from the mainland Russia by rail. Significant additional volumes might stretch the railway capacity but coal can be also shipped by sea supplementing the land route.

Natural gas supply presents a trickier problem. The most obvious and least expensive option to increase natural gas supply would be to expand the existing pipeline Minsk-Vilnius-Kaliningrad. But this option does not do anything to reduce the dependence on Lithuania, which is considered as the main energy security weakness of Kaliningrad. In particular, Russian decision makers are worried about Gazprom's ability to supply natural gas to Kaliningrad through this pipeline after the creation of the independent operator of Lithuania's natural gas transmission system, AB Amber Grid, in 2013 and the forthcoming expiration of the current gas transit agreement in 2016.[33] Although this option remains possible in the future two more expensive alternatives are under discussion now:

1) Branch from the Nord Stream pipeline to Kaliningrad,

2) LNG regasification terminal,

The idea to add a branch to the Nord Stream pipeline that would allow Kaliningrad to receive natural gas without crossing transit countries was proposed even before the construction of the Nord Stream began but it did not gain traction. In the last two-three years this idea has surface again and it has been actively lobbied by the Kaliningrad regional government. In 2012 Russia's President Vladimir Putin asked Gazprom to review the feasibility of such a project. Gazprom confirmed its technical feasibility but also indicated that it should be agreed by other Nord Stream's shareholders, which include E.ON, Wintershall, Gasunie and GDF Suez.[34] For them commercial attractiveness of this project is not obvious. Probably for this reason it looks that Gazprom abandoned this idea, and instead focuses on the LNG regasification terminal project.

In September 2013 Gazprom and the Kaliningrad regional government signed a letter of intent on the construction of a LNG terminal in Kaliningrad. The terminal is planned to be completed by the end 2017 to have the capacity of 9 mcm per day or 3,300 mcm annually, which is substantially higher than the current consumption in the province.[35] Currently Gazprom is conducting a feasibility study for the project. The main source of LNG supply for the terminal should be another Gazprom's project – the Baltic LNG plant near St. Petersburg that Gazprom is planning to commission in late 2018. Recently it was reported that the investment rationale for the Baltic LNG plant was completed.[36] Novatek's Yamal-LNG project, which should be completed by 2017 might also serve as a supplier.

The main problem with the Kaliningrad regasification terminal project and with other projects that aim purely at enhancing energy security in Kaliningrad is their commercial attractiveness. Natural gas delivered as LNG will be more expensive for Kaliningrad's consumers than pipeline gas. One analyst estimates annual operating loss for the project as US$400 million based on the difference between the cost of LNG and the existing tariff for gas in Kaliningrad.[37] The deadline for the project looks quite tight as well since even its location still has to be decided.

4. Conclusion

In 1990s discussions on the future of Kaliningrad were often formulated as a choice between Kaliningrad being a "fortress" vs. economic "gateway" (or Russian Hong Kong in the Baltic region). In the first decade of 2000s despite all problems and difficulties it seemed that Kaliningrad's pathway is much closer to the second option than the first one. However, in the last few years the direction has changed. At least in the energy field Kaliningrad is quickly becoming an energy fortress.

Our discussion of various issues related to the energy supply security in Kaliningrad is essentially a story of how geopolitics trumps economic benefits of trade and integration. A simple fact that Kaliningrad has to double its power generation capacity at huge cost just to keep the reliability of supply at about the same level where it is today clearly demonstrates the cost of "energy independence". On the other side of the border, the Baltic countries also undertake substantial investment often without clear economic benefits in order to avoid the dependence on Russia.

The main problem for energy security in Kaliningrad is a lack of trust and deteriorating relations between Russia and the EU that make Kaliningrad a hostage. Lack of trust forces both sides to reduce their dependence on each other leading to investments which only goal is to ensure that the worst case scenario does not happen. This creates a dynamics in the energy field similar to the security dilemma in international relations: if one side takes measures to strengthen its own security, the other side sees it as an indication of adverse intentions and undertakes its own measures that further escalate the situation. For both sides it would be beneficial to stop the escalation. In our case it would mean that Kaliningrad and its neighbors would work together on the ways to integrate the province in the common Baltic energy market but the prospects for this are dim at the moment.

Notes

[1] For brevity, we will call it Kaliningrad in this brief. When we talk about the administrative center of the oblast we will call it the city of Kaliningrad.

[2] An *exclave* is a portion of a state geographically separated from the main part by surrounding other state(s). Since the Kaliningrad Oblast is located on the Baltic coast it is, more formally, a pene-exclave or "practical exclave" (see http://en.wikipedia.org/wiki/Enclave_and_exclave).

[3] This estimate includes categories A+B+C1 of reserves according to the Russian classification scheme. These categories together roughly correspond to proven reserves in the western classification schemes. Report by the Society of Petroleum Engineers (SPE) provides more information on the correspondence between the Russian and Western reserve classification schemes: SPE, "Comparison of Selected Reserves and Resource Classifications and Associated Definitions", December 2005, http://www.spe.org/industry/docs/OGR_Mapping.pdf

[4] Authors' calculations based on the information in Lukoil, Analyst Databook, 2013, p.34 http://www.lukoil.com/materials/doc/DataBook/2014/DB_Book_eng.pdf

[5] In many cases, we will use the term "imports" to denote both imports from foreign countries as well as shipments from the mainland Russia. One reason for this use is that energy supplies to Kaliningrad using land transport have to transit through other countries. Therefore, they are subject to similar energy security risks as direct imports. Another reason is for succinctness of the text. The same applies to the term "exports". However, we will separate these categories when it is essential for analysis.

[6] Igorev, V. "The Oil of the Amber Land", Oil of Russia, No. 4, 2012, (http://www.oilru.com/or/53/1140/)

[7] According the database of wind energy projects: http://www.thewindpower.net/country_windfarms_en_59_russia.php (assessed 29/09/2014). There are currently a few larger wind energy projects at different stages of implementation elsewhere in Russia.

[8] Heat sector also plays a very important role because of region's reliance on district heating systems. Heat sector is closely connected technologically with the electricity sector because largest suppliers of heat in the region are combined heat and power plants. The main fuel in both sectors is the same – it is natural gas.

[9] World Nuclear Association, Nuclear Power in Russia, Updated October 2014, http://www.world-nuclear.org/info/Country-Profiles/Countries-O-S/Russia--Nuclear-Power/

[10] http://en.wikipedia.org/wiki/2004_Russia%E2%80%93Belarus_gas_dispute

[11] "They forgot about Kaliningrad", Nezavisimaya Gazeta, 20.02.2004 ("Про Калининград забыли", Независимая газета) in Russian, http://www.ng.ru/cis/2004-02-20/5_kaliningrad.html

[12] Gazprom, "Gazprom commissions Kaliningrad UGS facility", September 23, 2013, http://www.gazprom.com/press/news/2013/september/article172005/

[13] The maximum daily withdrawal rate of the facility is 4.8 mcm therefore it is not able to supply gas at the average daily consumption rate. Source: Ibid.

[14] See http://www.iea.org/topics/energysecurity/subtopics/whatisenergysecurity/

[15] Prices can still vary significantly between countries due to taxes and subsidies but accounting for these factors the difference in prices should be explained by the cost of transportation and differences in quality (so called "the law of one price").

[16] Liquefied natural gas gives more flexibility in choosing the transportation routes and destinations but it requires quite expensive liquefaction plants and regasification terminals.

[17] The transportation of crude oil (or refined products) and coal still requires a specialized infrastructure such as oil tankers, port terminals, railway cars, etc. However, these are typically easier, faster and cheaper to build and they provide more flexibility in terms of potential destinations than specialized infrastructure for natural gas and electricity.

[18] Feasibility Study BS/EU Interconnection – Executive Summary, 2013, http://www.ast.lv/files/ast_files/files/documents/Executive%20summary%20of%20FIS-BIS%20project.pdf

[19]http://www.litgrid.eu/index.php?act=js/synchronization&item=137

[20] Such a decision can be taken only by the Russian federal government rather than the Kaliningrad government.

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Annex

Kaliningrad's Fuel Balance, in kilotonnes of coal equivalent (ktcoe)

	2008	2009	2010	2011	2012
Production					
Crude oil	2,071	1,911	1,748	1,626	1,509
Natural gas	27	27	21	25	27
Peat	8.8	8.8	8.8	8.8	8.8
Other	17	17	18	18	18
Total Production	**2,124**	**1,964**	**1,796**	**1,678**	**1,563**
Imports					
Refined oil products	1,100	1,180	1,242	1,242	1,260
Heavy fuel oil	475	407	312	312	299
Natural gas (inc. LNG)	1,438	1,438	1,634	2,394	2,475
Coal	264	272	280	344	280
Total imports	**3,277**	**3,297**	**3,468**	**4,292**	**4,314**
Consumption					
Refined oil products	1,100	1,180	1,242	1,242	1,260
Heavy fuel oil	475	407	312	312	299
Natural gas (inc. LNG)	1,465	1,465	1,655	2,419	2,502
Coal	264	272	280	344	280
Peat	9	9	9	9	9
Other	17	17	18	18	18
Total consumption	**3,330**	**3,350**	**3,516**	**4,344**	**4,368**
Exports					
Crude oil	2,071	1,911	1,748	1,626	1,509
Total exports	**2,071**	**1,911**	**1,748**	**1,626**	**1,509**

Source: Kaliningrad regional government, 2013.

Notes: This is a balance of various types of fuel produced and consumed in Kaliningrad. A significant jump in natural gas consumption in 2011 is not an indication of a similar increase in internal energy demand but reflect increased consumption of natural gas by the Kaliningrad CHPP-2 after its second unit was brought online. However, most of additional electricity it produced was used for exports, which are not reflected in the fuel balance.

In Russia standard unit for energy statistics is 1 tonne of coal equivalent, which is equal to 29.3 GJ or 0.7 tonne of oil equivalent.

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