North-West Russia as a gateway in Russian energy geopolitics

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This paper examines Russian energy development and plans and their geopolitical implications around the turn of the new millennium. Argumentation is founded on the interpretation of the impacts of stakeholders' interests on geopolitics under new societal conditions and the legacy of past energy production and logistics. Empirical evidence consists of material from the projects of Russian companies and the plans and politics of the Russian Government for developing the energy sector.

The redefined borders and the geographical shifts of energy production have brought about the orientation of Russia's energy development and interests towards the north. The former empire's parts bordering on Russia in the west, Belarus and first of all Ukraine, have become problematic due to transit payment conflicts. Consequently, Russian companies develop ports in North-West Russia as well as plan the construction of new oil and gas pipelines through the Baltic Sea Region. On the other hand, the northern location of the infrastructure plans is a geographical necessity, in the way that new oil and gas deposits lie in northern high-latitude zones. Energy stakeholders' market-oriented interests greatly influence the country's economic orientation to the advanced economies and the global economy. Thus, Russia's new energy geopolitics means economic integration and networking with partners (companies, nations and economic areas) that are able to co-operate successfully in the economic sector. In all, the energy projects and plans in Russia are derived from these restructured, pragmatic and market-led economic interests, which have led to the growing significance of gateways in North-West Russia.

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Aims and research area

Tracing new energy geopolitics

This paper analyses Russian energy development and its geopolitical implications in the recent past, from Soviet times to the post-1998 growth period. The geographical focus of the paper is on North-West Russia and its adjacent areas in the European North. The hypotheses of this study are that the current energy development is explained both by the past Soviet legacy, including its geographical dissolution, and the interests of the stakeholders in the new Russian market-oriented economy. Furthermore, these corollaries have bearing on Russian geopolitics. First, there have been locational changes in energy production and changes in accessibility to the export market that influence Russian business and power interests, as well as current geopolitics in Russia. The study shows the geographical shifts in energy production and the changing importance of regions and logistic gateways in Russia. Secondly, the market-led interests of the export sectors influence the new geopolitics of Russia. For instance, energy producers may have considerable influence in policy-making. Furthermore, this paper evaluates Russian energy plans and trends up to 2030 and aims at assessing their repercussions on Russian energy integration with advanced countries.

This article looks more closely at the new configurations of the Russian energy system and the geopolitical aspirations boosted by energy interests. The study consists of 1) scrutinising the main

locational developments in energy production, 2) elaborating on the new market-led economic environment and foreign trade relations in the energy sector, and 3) examining the changes in Russian geopolitical thinking, partly as the result of points 1 and 2. All these factors bring about a new geopolitical situation in North-West Russia and the Baltic Sea Region. From a practical viewpoint, this paper helps to understand the significance of the Baltic Sea transport routes for Russia, the question of Baltic oil transport safety in the contexts of Russian oil transport, the development of northern gas pipeline systems as a part of the Russian energy apparatus, and the nature of the linkages of the Russian economy to the world geo-economy.

North-West Russia's position

The major research area is North-West Russia. To present North-West Russian energy development as part of the Russian energy system, which consists of the country's energy production and energy transport, this paper refers in many cases to energy production, logistical solutions, plans and projects elsewhere in Russia and in the former Soviet Union. There are many definitions of North-West Russia or North-Western Russia (e.g. Blakkisrud and Hønnesland 2001, 9). In 2000, all Russian regions were grouped to form new macro-regions, Federal Okrugs. The North-West Federal Okrug consists of the Northern and North-Western Economic Regions and the enclave of Kaliningrad Oblast (Andreev & Olsson 2002, 1, 5). The Northern Economic Region includes the Republic of Karelia, Murmansk Oblast, Arkhangelsk Oblast (including the Nenets Autonomous Okrug), the Republic of Komi and Vologda Oblast. Five million people reside in this Region, and the area of the territory is equal to the five Nordic countries and the Baltic States together. This region stretches as a 800 kilometre-wide belt from the borders of Finland to the Ural Mountains. The significant oil, gas and coal producers of the Northern Region are located in Arkhangelsk's Nenets Okrug, bordering on the Barents and the Kara Seas, and in the Republic of Komi. The North-Western Economic Region includes St. Petersburg, Leningrad Oblast, Pskov Oblast and Novgorod Oblast. More than half of the region's eight million residents live in St. Petersburg. There are several important ports in St. Petersburg and Leningrad Oblast.

North-West Russia's location relative to the centre has changed. The dissolution of the Soviet Union led to the Russian energy sector being allowed to operate in part under the rules of international business. Furthermore, when the Soviet Union shrank and became just Russia, both the geographical centre and population centre shifted northwards, 333 and 389 km respectively (Lynch 2002, 41). Large energy production and infrastructure systems have been constructed during the last decades. Coal, gas and oil have been extracted from various locations, and considerable shifts in the geography of energy production have taken place in the past few decades. The changes in the expanse of territory and the development of energy production (based on the location of reserves) are physical factors, and they have impacts on geopolitics in addition to new actors, technology and institutions.

Theoretical and methodological arguments

Formation of geopolitics and geo-economic competition

Geopolitics considers that the constitution of international relations is bound to geographical space. It is also bound to time. Theories based on a static world-view or the perpetual fundamentals of geopolitics are hardly explanatory because institutional restructuring occurs at all times. Many events, such as the collapse of the Soviet bloc, the socio-economic integration of many nation-states into larger economic areas, the growing dominance of global economic relations, the emergence of regionalism and separatism, the rise of multinational business and communities and the global war against terrorist organisations, show that the everyday geopolitics can change rapidly. There are new contents and new reasoning why conflicts emerge. The actors are changing as well. It is no longer self-evident and valid that the premise of geopolitics (denoting a fundamental actor and its borders) is a nation-state where the political elite of the state alone determines international relations based on a national ideology. The world has become more complex, networked, interdependent and fragmented. New interests and coalitions emerge. Agnew (2001, 13) says that world politics "is the outcome of sociological praxis based on rules, practices, and ide-

as that are not set for all time but change as a result of the contingencies of world history." Contents and actors change. Political turns, tensions and controversies in Russian geopolitics give rise to new interpretations. It is relevant to say that the geopolitical elite in Russia – and in many other countries – is a formation of diverse actors situated in various economic, political, ethnic and ideological networks, and geopolitical decision-making consists of a sequence of time-bound decisions made in evolving economic, societal and political contexts. Thus, to understand the decision-making and geopolitics dealing with Russian energy, the analysis is justifiably based on historical development and the influence of the new power structures in Russia.

If energy is the main source of foreign currency, as it is in Russia, it is certainly in a central role in geopolitics. Energy commodities constitute a geopolitical instrument. Under monopolistic circumstances an energy-producing country can use energy as a regulative instrument, as happened during Soviet times. In market-economy conditions the abundant supply of energy leads to a situation where customers can, to a great extent, select from whom they buy, which kind of commodities and which quantities. Under the global market economy, suppliers have to compete in the market, and Russia is clearly a partaker in this respect.

It is in the interest of a Russia recovering economically that domestic companies earn more foreign currency by selling energy. To boost economic growth, the Russian Government is eager to improve the institutional framework for promoting investments and benefits obtained from production sharing and joint ventures. The importance of institutional modernisation has increased, because it has become clear that many energy projects have not progressed as fast as expected. For instance, during the 1980s and 1990s Norway succeeded in developing its offshore hydrocarbon production and logistics to Europe and the world market more efficiently than Russia. Investments did not flow to the Russian energy sector in the 1990s, and now the country attempts to attract investments more actively. Russian energy companies are also anxious to develop their production chains by investing abroad. The country must compete and have good relations with customer countries. Russia has lost its power, former Soviet states, and ideological and political arguments for carrying out the old politics of supremacy, but it strives to operate as a part of the integrating global and sub-global trade systems. Geo-economic competition on markets amidst companies and governments prevails.

Russia's future geopolitical status is challenged by various political groups and movements. The main divide is between Atlanticists and Eurasianists. Yeltsin adopted Western principles and sought to make Russia a part of the West (Huntington 1993, 43). Putin's regime is more pragmatic in searching for Russia's economic interests, but the geopolitical outcome is similar. A new and emerging factor is the war against terrorism that unites many Russian and Western politicians. For the Russians, the fundamental ideological issue is whether Russia should be a Eurasian power with its own mixed identity between the East and the West, or should it be a European nation amalgamated to European culture and traditions (Tsygankov 2003). Both opinions have support in Russia, although the Eurasian superpower concept appears to be more unrealistic due to economic and cultural reasons (cf. Huntington 1993).

As seems apparent, the new semi-capitalist order will prevail in Russia for a long time. That clearly means new economism in Russia, in the sense that economic interests steer the development of society. It is evident that the energy business, as the most important source of foreign currency, will influence the contents of geopolitics. Geopolitical thinking and boundaries are socially constructed. Thus, if taking into account this fact and its implications, the Russian geopolitical orientation can be explained and anticipated as a function of the interests of energy companies and Russian energy apparatus. Nevertheless, the course of geopolitics is the result of political decisions. Tsygankov (2003, 103) says, "the post-Soviet geography [Russia's spatial thinking] is being reconstituted as a result of discursive strategies chosen by Russian intellectual and political elites, rather than of some fixed or 'natural' geopolitical interest." This paper does not go into in-depth discussion of Russian geopolitical thinking, but attempts to analyse the geographical interests of the stakeholders of the energy (and export) sector and transmit this viewpoint into academic geopolitical discourse.

Methodology: unravelling the key structures, processes and actors

The methodological principles of this study are based on a holistic approach applying different

methods and data material. The starting point is very much inspired by findings that a proper analysis of essential geo-economic phenomena demands process-based analysis grounded in the multifaceted mix of methods and tracing important actors involved in the process (Yeung 2003). The empirical study attempts to trace the geo-economic structures, processes and actors that resulted in the late-transitional (post-1998) energy development and geopolitics based on energy interests. It is clear that Russian geopolitics as a whole is a much broader and more complex issue than the outcome of the nation's energy interests, but at least in order to understand geopolitics rooted in energy interests, it is important to unravel the linkages between geopolitics and energy. On the other hand, energy practices, programmes and plans represent more than just the policy of the energy sector, because of the country's resource-based economic structure. The Russian economy is largely based on the processing of natural resources, the production of which is operating in a world market comparable to that of energy commodities. Nevertheless, in a strict sense, the validity of this research is restricted to energy geopolitics.

The process-based approach has given the freedom to design tailored in-depth inquiries into various data sources. The flexibility of methods is a necessity because of the complexity of the web of causal powers, liabilities, contingent conditions, structures and human choices. This study is primarily based on secondary data focusing on the historical development of the energy sector and energy plans and outlooks. Furthermore, the study utilises the databases, reports and pages published on the Internet. Most large companies publish their reports and plans on the Internet, and these data sources have been used to apply data triangulation. The pages published in printed form have been considered reliable as such, and the data of unprinted sources have been confirmed through several sources.

Energy and Russia's transition in the 1990s

Decline, recovery and global geography

In the economy of Russia, as well as in that of the former Soviet Union, energy production has been of primary importance. This is not unique when compared with other parts of the world, but Russia's low population density, long distances, energy exports and challenging natural conditions add to the importance of the energy sector (i.e. industries producing energy). The vast expanse of territory and the principles of economic development inherited from the post-revolution years caused energy production and its logistics to become large-scale projects already during the socialist era (Eronen 1999). The significance of North-West Russia as a gateway has increased since the dissolution of the Soviet Union. Much of the energy is conveyed through North-West Russia via pipes and ports and much of it is consumed in the region's large industrial enterprises and in St. Petersburg.

The Soviet economy collapsed at the beginning of the 1990s, after which the economic situation deteriorated year after year through 1998. The question whether Russia is changing from a modern society to an anti-modern one was raised when Russian economic development and material welfare were observed to decline, barter exchange to replace trade and the economy to disintegrate (Rose 1998). As for the energy sector, however, the issue is more ambiguous. Part of the energy production rests solely on outdated industrial capital, i.e. worn-out machinery and equipment and obsolete transport networks. Many actors of the economy were being left in a disintegrating and redundant state. On the other hand, part of the energy sector was capable of being developed, and its top companies strove to invest in new businesses, modernise the old industrial capital and explore for energy resources.

Russia was ranked third in the world after the USA and China in energy production in 2000 (IEA 2003a, 48–57). Russia's standing as a big energy producer rests on its abundant natural resources, e.g. gas, oil, coal, hydroelectric power, and uranium. In addition, there are great quantities of wood and peat in the coniferous forest zone in the north, though they are not utilised to any significant extent as sources of energy. Until recently power production based on bio-fuels (such as wood and peat) has not been competitive under Russian conditions. Large-scale production and specialisation explain the technical and commercial properties of the energy system. Russia's energy consumption can be explained by the country's degree of industrialisation, specialisation in processing natural resources, and its northern and continental location. Energy is greatly needed

Table 1. Energy consumption in million tonnes of oil equivalent (Mtoe)[2]. Source: World Bank 2000, 292-293; IEA 2003a, 50, 52, 54, 56.

	1990	1997	2000	Change in %, 1990–2000
Russia	906	592	614	–32
USA	1926	2162	2300	19
China	867	1113	1142	32
Japan	439	515	525	20
India	360	461	502	39
Finland	29	33	33	14

both for production and the maintenance of transport, housing and communal services.

After the late 1980s, Russia's importance as an energy consumer weakened. The collapse of the Soviet economy deteriorated the entire energy system. Energy consumption[1] fell at the same rate as the activities of the energy-utilising sectors slowed down. By country comparison as of 1990, the United States was the world's largest energy consumer. Still in 1990, the economic area of the present Russian Federation was the world's second-largest energy consumer (Table 1). All the Russian figures in Table 1 refer to the present area of the Russian Federation.

The rapidly growing Asian economy has changed the global division of energy consumption. Nowadays China is the world's second-largest energy consumer. Russia's declined energy consumption has primarily been caused by the economic transition in the 1990s, when production fell to half of the level of production at the beginning of the decade. In the majority of countries, however, economic activities increased, thus also increasing energy demand.

The comparison of energy consumption changes taking place in 1990–97 illustrates the deep economic recession in Russia (Table 1). Despite this, Russia is still a very large energy consumer. If the country will be hit by economic turmoil again and India's and Japan's energy consumption continue grow as in the 1990s, Russia may end up behind these countries in energy consumption. By 2000, energy consumption in Russia had grown by 3.7% from 1997 indicating economic recovery. The respective figures for the USA were 6.4%, China 2.6, Japan 1.9% and India 8.9%.

Russia's production structure, regional energy demand and transport needs determine energy consumption. Measured by energy intensity (tonnes of oil equivalent per capita), energy consumption in Russia is not particularly high and has even decreased during the economic transition. Consumption per capita, i.e. the energy intensity, in Russia decreased from 6.1 toe per capita in 1990 to 4.0 in 1997 (World Bank 2000, 293) and recovered slightly to 4.2 toe per capita in 2000 (IEA 2003a, 55). The level of carbon dioxide emissions also decreased. The energy consumption per capita in the USA (8.4 in 2000) and Canada (8.2) was clearly higher than that in Russia (Fig. 1). In 2000, northern Europe's energy consumption was also higher, being 5.4 toe per capita in Sweden and 5.7 toe per capita in Norway. Finland's energy consumption was also higher than Russia's and it grew from 5.8 toe per capita to 6.4 toe per capita during 1990–2000. At the turn of the millennium Russia's energy consumption per capita matched Europe's average level, and was lower than that in North America and northern Europe but higher than that in southern Europe. The environmental pollution caused by the energy sector in Russia was reduced due to the reduction in energy consumption and structural changes in the 1990s (Fig. 1). In China, the energy intensity was much lower, 0.9 toe per capita, than in Russia in 2000 (IEA 2003a, 51).

The comparison of countries roughly speaking reveals that the higher the energy consumption the better the standard of living. On the other hand, high figures indicate that such economies are largely based on material consumption or are hubs of resource-processing industries. Such economies also can be inefficient and poorly sustainable. Thus, the welfare impacts of high energy consumption are not self-evident. Although the volume of energy consumption in Russia is at the European level, the living standard of the population clearly falls behind that of the developed industrial countries (IEA 1995, 44–45). In this regard the Russian economy could be more efficient, sustainable and post-industrial.

The share of energy exports from the total Russian exports increased in the 1990s (European Commission 2001, 164), and over one-third of all Russian energy production was exported in 2000 (IEA 2003a, 54). Energy became more important than ever as a source of hard currency, because out of all the production of the Soviet Empire, mainly oil and gas production remained competitive. The dissolution of the control of the command economy enabled the Russian companies that had become prosperous through energy ex-

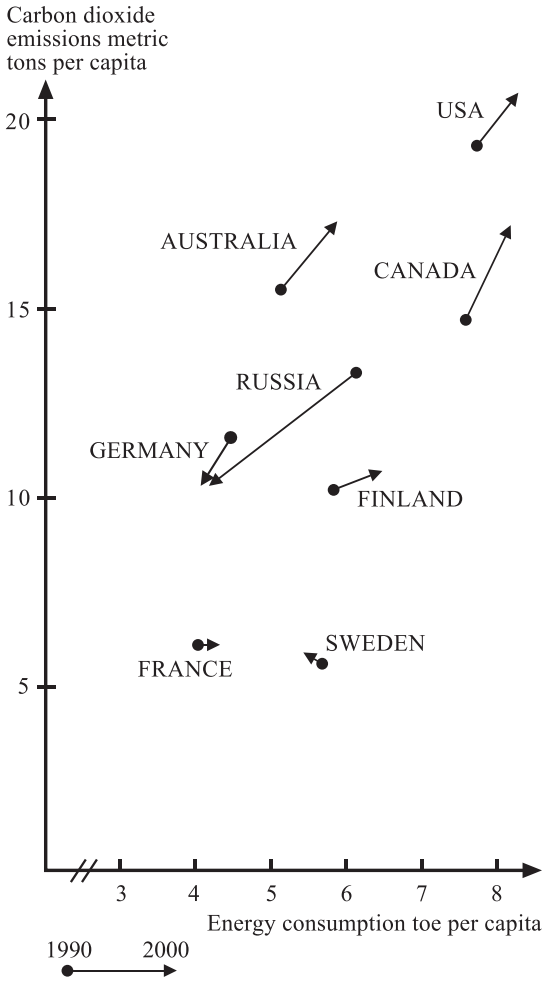

Figure 1. The dynamics of energy consumption and carbon dioxide emissions in 1990–2000.
Source: World Bank 2000, 292–293; IEA 2003a, 48–57.

ports to consolidate their positions in the economy. Although the losses suffered during the recession of the transition period are still clearly visible in the energy sector, energy production has increased during the past few years and the development prospects in the energy system rest on its anticipated growth.

Russia is a leading energy exporter. At the beginning of the millennium it was the largest gas exporter, third-largest crude oil exporter and sixth-largest coal and electricity exporter in the world (IEA 2003a, 13, 11, 15, 27). Whereas many other industrial countries are net importers of energy, Russia is a net exporter of energy. In this regard Russia is a developing country rather than an industrial one, because its own industrial production is only partly able to utilise the energy supply. Thus energy is being sold abroad. Russia produces especially natural gas for the European market. Around the turn of the millennium the country produced 20% of the gas utilised in the European Union and 15% of the oil imported by the European Union (Liuhto 2002, 4). According to the import statistics of the European Union, Russia was the largest natural gas supplier and the second-largest oil supplier (after Norway) to EU countries. On the other hand, Russia's hard currency income, as well as citizens' welfare, depends greatly on revenues coming from energy exports (Rautava 2002). The positive talks in Russia and the EU about the economic co-operation between each other are very understandable in this context.

The spatial configuration of the Russian energy cluster (i.e. energy-producing industries, supporting industries and services, energy transport, enterprise structures and institutions), distances and borders, the size of the European market and built infrastructure bring about favourable conditions for exporting energy to Europe. The pipeline and power cable networks enhance the dependence on European exports. The former CMEA's[3] oil and gas pipelines transport energy westwards to the EU-integrating East Central Europe and further to the core of Europe. The production of oil and gas for export was significantly invested in already during the Soviet period. While the geopolitical circumstances have changed, this legacy still matters.

The impacts of the growth and decline of the Russian energy cluster are geographically uneven, being very scattered and creating pockets of development or decline. Lynch (2002) warns that without state intervention the Russian geo-economy is not competitive and refers to poor accessibility and huge distances. Many will agree that there are numerous declining localities and uncompetitive plants and factories, but there are signs of long-term growth and development as well. Investments take place under liberal economic auspices, but their geography is less anticipated than in the former command economy. Population growth in the Khanty-Mansi Autonomous Okrug beyond the Ural Mountains in the 1990s (when other northern regions of Russia suffered population losses) is a good example of the spin-offs from successful energy companies (Hele-

niak 1999, 172). Energy companies operating in the export markets have been able to modernise their production and utilise foreign technology and capital, as well as be competitive in world markets. This restructuring in production is not in any way unexceptional: companies have to adapt during economic transition, and only the most competitive sections of the economy will grow and develop. The rouble devaluation of 1998 (and the high price of energy) brought economic growth and new wealth to Russian export companies. These funds were transformed into investment in equipment, pipelines and transport facilities at the beginning of the millennium. The outcome is geographically uneven but the total sum of investments has grown.

Russian energy decline in comparison

Table 2 presents the main developments of the Russian energy sector in the 1990s' declining phase in a comparative setting. Energy production declined, and Russia's share in global primary energy production decreased from 14 to 11 per cent (Table 2). Energy production bottomed out in 1997. In the subsequent years energy production grew slightly; in 1998 it was 0.7% higher than in 1997, and production in 1999 was 2.4% higher than the previous year (IEA 2002a, 275).

Natural gas is clearly the most important energy resource in Russia, and it became even more significant over the 1990s. It has not always been that way: the Russian gas sector has been devel-

Table 2. Russia's energy sector during the 1990s' transition. Primary energy production in Russia, the USA, China and Finland; the countries' share in global primary energy production and consumption. Source: United Nations 1996; United Nations 2000; United Nations 2001.

Country – Year	Primary energy production, million tonnes of oil equivalents, (Mtoe)	Country's share in global primary energy production, %	Proportion of natural gas production of primary energy production, %	Proportion of energy consumption of primary energy production, %
Russia				
1992	1107	13.8	44.5	64.9
1993	1036	12.9	46.7	67.3
1994	945	11.3	50.3	63.0
1995	999	11.6	54.3	64.6
1996	978	11.1	54.1	61.7
1997	956	10.7	53.1	60.9
1998	965	10.8	54.5	60.2
USA				
1992	1604	19.9	28.9	119.6
1993	1555	19.3	30.2	124.6
1994	1708	20.5	29.1	121.7
1995	1720	20.0	29.2	122.6
1996	1753	19.8	29.2	123.8
1997	1755	19.7	29.3	124.6
China				
1992	726	9.0	2.0	93.8
1993	749	9.3	2.1	94.5
1994	800	9.6	2.0	95.6
1995	866	10.1	1.9	94.6
1996	896	10.1	2.3	95.8
1997	890	10.0	2.6	95.1
Finland				
1992	7.6	0.09	0	303.9
1993	7.1	0.09	0	335.3
1994	8.2	0.10	0	318.9
1995	8.2	0.09	0	317.1
1996	8.3	0.09	0	333.4
1997	9.1	0.10	0	291.3

oped during the past few decades. The stagnation of the Soviet Union's economy in the 1980s did not affect the energy sector greatly; on the contrary, energy production grew year by year in the 1980s. Primary energy production in the Soviet Union was 1590 million toe (converted from Russian fuel equivalents to oil equivalents) in 1989 (Bater 1996, 224).

Industrial development during the socialist period expanded the oil and gas production networks to Siberia and northern Russia, and also made Gazprom the most important company in Russia. The role of the economic elite, such as the leaders of Gazprom, in Russian politics of the 1990s was significant, reflecting that which was considered important in society. The network of the gas pipelines is of the same importance for Russia as the Autobahn motorways are for Germany.

As seen in Table 2, Russia and China are self-sufficient in energy use whereas the USA is a net importer of energy. China is dependent on coal, and it was a growing economy in terms of primary energy production during the Russian transition of the 1990s. China's oil demand outstripped production in the 1990s and the same will happen to natural gas. China will become a large energy buyer in the coming decades as strong economic growth drives up energy demand and imports, which impacts on Russian energy plans (IEA 2002b, 237–268).

Russia's strengths in energy production are clearly visible when energy figures are compared with Finnish ones, and the 1990s transition did not alter this relation between Russia and Finland significantly. Finland is dependent on imported energy, because its domestic energy production compared to energy consumption is very small. Nevertheless, Finland's location near to Russian energy reserves and energy transport routes is advantageous. Finland can buy Russian energy produced relatively close to Finnish consumption sites. For Russia, Finland's energy market is not very large, but Finland's location along the energy routes is notable in a geopolitical sense.

Energy production and consumption

Coal

Coal was the backbone of Russian energy production until the 1950s. At that time the share of coal in all fuels utilised in Russia accounted for 60% (Bater 1996, 224). By 1980, the share of coal as a primary source of energy decreased to 25% (Sagers & Green 1986, 91), and it continued to fall until the latter part of the 1990s. Production volumes started to decrease significantly already in the early 1980s, and continued to decrease in the early and mid-1990s and by 1998 it was only 56% of the production of 1990 (IEA 2002a, 153). Inefficient mines have been closed. For instance, 140 coalmines were closed by 2000 (IEA 2002a, 154). Loss-making and marginal mines still exist.

The coal exports of 1990 (59 million tonnes) decreased by half in 1993 (27 million tonnes; IEA 2002a, 167). Since 1998, export activity has recovered significantly. Coal export has grown strongly at least up to 2002 (Hernesniemi & Dudarev 2003, 52). The share of coal in Russian energy exports is negligible. The share of solid fuels (in this case, coal) in the energy consumption (TPES) of Russia accounted for 17% in 1997 (IEA 2002a, 183), and even less in the total primary energy production. Brown coal (lignite)[4], which is not as valuable as anthracite, makes up one-third of coal production. The majority of the mines (65%) are open-pit mines (IEA 2002a, 183).

As a result of the collapse of socialism, almost half of the former Soviet Union's coalmines were lost to the newly-formed independent republics. This loss concerned mainly coal production, and oil and natural gas production only marginally. In 1992, Russia's coal production yielded 337 million tonnes, while Ukraine produced 134 million tonnes and Kazakhstan 127 million tonnes (Bater 1996, 228). According to the data for the coal production of 1992, only 56% of the former Soviet Union's coal production remained in Russia (Bater 1996, 228).

In the early 1970s, the Donets Basin of Ukraine was the largest coal-producing area where, in 1970, one-third (216 million tonnes, i.e. 34.6%) of the Soviet Union's coal was extracted (Sagers & Green 1986, 92). Since the beginning of the nineteenth century this region has played the main role in coal and steel production. Anthracite and other coals have been extracted from underground mines. When the reserves in the Urals and the European part (the Moscow Region and the eastern parts of the Donets Basin) had run low, coal production was increasingly developed in Siberia. As a result of the Soviet Union's collapse, the coal-producing regions of Kazakhstan and Central Asia were lost. In the European part

of Russia, only in the coal-producing Pechora region (Inta and Vorkuta) coal production was increased in the 1970s and 1980s.

The Kuznetsk Basin (Kuzbass) of Western Siberia is the most important coal-producing area and the mines there produce most of Russia's coal (44.6 per cent in 2000; IEA 2002a, 151). These coal reserves and production areas are situated southeast of Novosibirsk (south of 55˚N) and stretch towards the northern parts of the Altai Mountains along the border with China and Mongolia. The growth of coal production in the Kuznetsk Basin was initiated in the period of railway construction in Siberia and continued during Stalin's industrialisation period. In the 1970s, Siberian coal production left the Donets Basin's production behind. Coal is transported by rail, and the largest volumes of coal move towards the production plants in the Urals and the European part of Russia. The volumes of transported coal are significant and the transport distances long. During the Soviet period, the average distance of coal transport was 800 km.

Coal fields to the east of the Urals, the Kuznetsk Basin together with Kansk-Achinsk in Central Siberia (15.7% in 2000), the coal fields of Eastern Siberia (14.2%) and the fields in the Russian Far East (11.1%) produced 85.6% of Russian coal in 2000. Out of these production areas, Kansk-Achinsk, also known as KATEK, lies closest to Europe. Brown coal, or lignite, is extracted in quarries and open mines around Krasnoyarsk situated 500 km northeast of the Kuznetsk Basin. The most significant resources and reserves of coal are located in Siberia and the highest consumption potential is on the European side. The most efficient mines are located in southern Yakutia (the Republic of Sakha-Yakutia) and in Kansk-Achinsk. Out of the most important coal-producing areas, only the Pechora coal basin (7.2% of the country's total coal production in 2000) lies in the European part of Russia. Coal lost its former significance for the country's economy as gas production, with its network of gas pipelines, expanded, and the Russian economy has had to adapt to the current situation.

Gazprom has been attempting to persuade the Russian Government to change the relative prices of gas and coal in the way that coal would become more utilised in domestic power stations (IEA 2000, 184; Moe & Jørgensen 2000, 125). In such an eventuality, more natural gas could be exported. However, the problems of coal production and logistics and the poor ability of the coal sector to attract investments prevent the implementation of such plans. Similar aims to increase coal production with a view to decrease crude oil consumption emerged in the 1970s, but with meagre results (Sagers & Green 1986, 91). Although there are some efforts to increase the utilisation of coal as a primary source of energy, its usage has clearly declined.

Coal production bottomed out in 1998. In 1999, the share of coal in the energy consumption of Russia reached 19% (IEA 2002a, 275), having left the production figures of the previous year behind. New mine constructions are planned for Siberia and the Russian Far East. More cost-efficient quarry-type open mines are planned. If the Russian economy developed more intensively in the direction of Siberia and the Russian Far East, which abound with coal, the growth of coal consumption would be possible and even probable. The future of coal utilisation is highly dependent on the price development of not only coal but also other primary energy commodities and on the logistics of supplying the commodities to the market.

Oil

Crude oil production is clearly more dynamic than coal production. Oil production has increased over the last decades. It played a growing and increasingly central role in the Soviet economy as the source of hard currency from the early 1970s onwards (Considine & Kerr 2002, 138). The geography of the oil industry has greatly changed over the last thirty years. At the same time as oil production in the European part of Russia decreased, in Western Siberia it increased tenfold. The Khanty-Mansi Autonomous Okrug has become the main oil production area. The Khanty-Mansi Autonomous Okrug[5], lying on the eastern side of the Urals (523,000 km^2; 1,358,000 inhabitants in 1998; Heleniak 1999, 172), is situated on the same latitude as southern Finland. The capital of the Okrug, Khanty-Mansiysk, lies at the junction of two rivers: the Ob and the Irtysh. The geographical co-ordinates of the city are 61˚00′N and 69˚06′E, and the great circle distance from the easternmost point of the EU border is 1943 km. The estuary of the River Ob is on the Arctic Circle, and the journey along the Ob from Khanty-Mansiysk to the Arctic Ocean is about one thousand kilometres. The most important cities,

besides the capital, are Nefteyugansk, Surgut and Nizhnevartovsk.

During the post-socialist economic crisis, Russian oil production remained a significant source of foreign income for the country. Since the late 1990s, the high price of oil and the devalued exchange rate of the rouble brought high profits to companies and benefits to communities where oil production took place. In 2000, the Russian companies Lukoil and Yukos yielded the largest profits in Russia, 3400 and 3200 million US dollars respectively (Statistics Finland 2001, 98).

Russian oil production came into being in the Caucasus. Baku and Grozny in the south were the centres of oil production before the Second World War. In the 1950s, oil production rapidly increased, expanding from the Caucasus to the Volga-Urals regions; the latter area is known as the Second Baku (Considine & Kerr 2002, 311–313). In the 1960s, the Soviet Union was the world's second-largest oil producer after the USA. In the 1990s, as a result of the Soviet Union's collapse, Russia lost the oil production of Baku (Azerbaijan).

In the 1960s, oil production was rapidly developing on the River Ob and its tributaries in Western Siberia (Considine & Kerr 2002, 95–100). Transport was problematic but gradually the potential of production was significantly enhanced by the construction of oil pipelines. First, the crude oil of the West Siberian Plain was converted into fuel products at Siberian refineries in Omsk and Angarsk, to where oil from Russia's European areas was being pumped earlier. At the beginning of the 1970s the direction of the oil flows reversed; Siberia became a large production area providing the Volga area's refineries with oil.

Besides Siberia and the Caucasus, oil production exists in the north in the Komi Republic and in the Nenets Autonomous Okrug, as well as in the Urals and in the Russian Far East. Compared with Western Siberia, these areas are of relatively minor importance. As the units of oil production, refining and consumption are spread across the country, construction of long pipelines has been necessary. Pipelines stretch from the Caucasus towards the Arctic Circle on the western side of the Urals, and from Lake Baikal towards the borders of Western Europe. The construction of pipelines connecting oilfields with refineries has been a precondition for cost-efficient oil deliveries and exports. The only practical way to transport the large volumes of oil from the oilfields of the West Siberian Plain, being Russia's main oil-production area but lying in the backwoods of the country, is by pipeline. Crude oil transport to the CMEA counties of East Central Europe was arranged in the same way, by pipelines. The Druzhba/Friendship pipeline carries oil westwards via Brest (Belarus) and Uzhgorod (Ukraine) (Fig. 2).

The Soviet Union's oil production, in comparison with coal production, was developed more in Russian territory than on the union's fringe. Consequently, the collapse of the Soviet empire did not take away from Russia as many oil enterprises as those of coal. In 1996, Russia produced 89.6% of all CIS, while only one-tenth by the former Soviet republics. Already during socialist times the focus of oil production was directed to Western Siberia, along the River Ob, in particular.

The oil production of the Soviet period peaked in 1987, reaching 569.5 million tonnes (Sagers 2001, 153). Oil production dropped drastically in Russia at the beginning of the transition. Production bottomed out at 301.2 million oil tonnes in 1996 (Sagers 2001, 153). At that time only Saudi Arabia and the USA were bigger producers than Russia. Thus, even during the crisis of the transition when production figures had fallen to half of the 1980s figures, Russia still was a significant oil producer. In the late 1990s, the county's oil production grew rapidly. In 1999 it reached 305.2 million tonnes and in 2000 increased to 323.2 million tonnes (Sagers 2001, 162), with growth continuing in 2001–2003 (IEA 2002b, 274; IEA 2003b, 146). Russia exports a significant part of its oil output. In the late 1990s, the share of oil exports varied from 55 to 62 per cent of the total oil production (IEA 2002a, 275), and since 1995 oil exports have steadily increased.

Russia has an extensive – and according to many, efficient – network of crude oil transport pipelines (Sagers & Green 1986, 143), but the pipes are partly worn out because of insufficient replacement investments. However, the basic transport infrastructure from the fields to refineries, harbours and markets abroad has been constructed. On the other hand, the distribution of petroleum products takes place by land conveyance. The refineries are large and distances are long. Condensates and some refined products can be transported by pipelines between industrial centres in the Central, Volga-Vyatka, Urals and Northern Caucasus Economic Regions, as well as to some export harbours, but otherwise products have to be transported by rail or tank lorries.

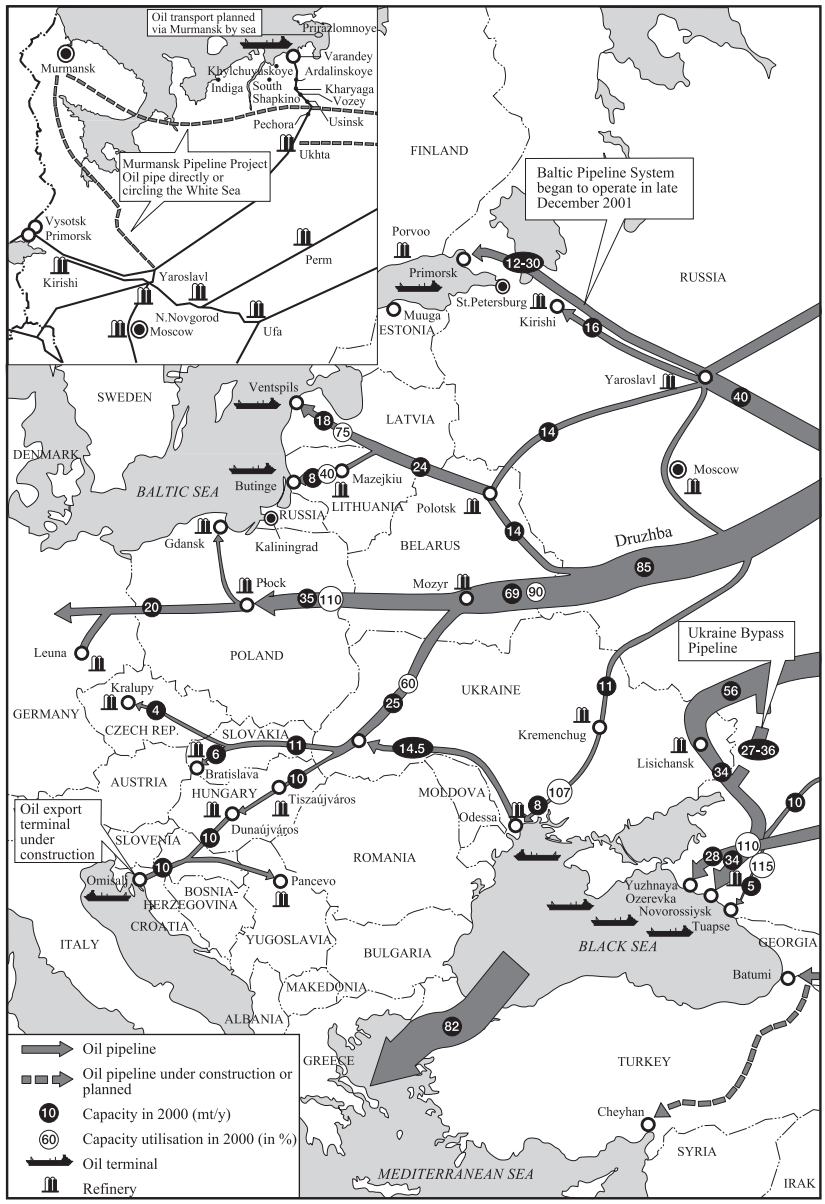

Figure 2. Oil export flows and oil-exporting ports. Source: Bellona 1997; Sagers 2001; IEA 2002a; Khodorkovsky 2003.

Russian oil production (including refining and distribution) has been mostly privatised and it has expanded into the international market. The oil industry almost entirely rests on seven large vertically integrated companies (VICs). The verticality of production can be described by the motto of Lukoil's production philosophy: "From the oilfield to the petrol station." Out of all these companies only Rosneft is a purely state-owned enterprise (Table 3). In 2000, the 11 largest oil companies of Russia produced 88.2% of the oil, and their refineries received 78.8% of the country's total oil deliveries (Sagers 2001, 156). At the beginning of the millennium the number of companies decreased due to takeovers and mergers.

At the beginning of the millennium, the rapidly developed Yukos Company was the second-largest amalgamation including Yuganskneftegaz,

Table 3. The most important oil companies of Russia in 2003. State ownership share, oil and gas production and refined oil production in 2000, and the number of petrol stations in 2000 and 2003. Source: Sagers 2001, 155 and 156.

Company	State ownership share, in %	Oil production, in million tonnes	Gas production, in thousand million m^3	Refined oil, in million tonnes	Petrol stations 2000[e]	Petrol stations 2003[e]
YukosSibneft[a]						2500
– Yukos	0	50	1.6	23	1278	
– Sibneft	0	17	1.4	13	859	
– Slavneft[b]	75[b]	6[b]	0.4[b]	5[b]	9[b]	
Lukoil	14	62	3.6	23	850	1691
TNK-BP						1216
– TNK	0	36	2.9	12	200	
– Sidanco	0	11	1.3	4	40	
– ONAKO	0	7	1.5	4	70	
– Slavneft[b]	75[b]	6[b]	0.4[b]	5[b]	93[b]	
Surgutneftegaz	1	41	11.1	16	470	302
Rosneft	100	13	5.6	7	1087	610
Tatneft	31[c]	24	0.7	6	100	362
Bashneft	100[d]	12	0.4	19	90	90[f]

Notes: [a]Yukos and Sibneft announced on 22 April 2003 that they were merging (Sibneft 2003); [b]the state's shares in Slavneft were auctioned off on 18 December 2002 and transferred to Sibneft and TNK (TNK-BP 2003a) in the proportion of 50:50, accordingly, the figures that appear in the above table have been divided in half; the owners are the governments of [c]Tatarstan and [d]Bashkortostan, autonomous republics that are members of the Russian Federation (Liuhto 2002, 10); [e]petrol station figures are from: Lukoil 2003, 9; Misamore 2003, 20; Rosneft 2003a; Sidanco 2003; Surgutneftegas 2003, 14; Tatneft 2003, 11; [f]no new data obtained.

Samaraneftegaz, Tomskneft, VSNK (Vostochno-Sibirskaya Neftyegazovaya Kompaniya/Eastern-Siberian Oil-Gas Co.) and Manoil. As the result of the merger agreement with Sibneft in 2003 (Sibneft 2003), the company is the largest in Russia. Priobskoye, lying 65 km east of Khanty-Mansiysk, is the largest oilfield of Yukos as well as the main target of the company's investments. Yukos participates in joint-venture projects in Western Siberia and is developing Eastern Siberia's production so that crude oil can be transported to the Chinese market by pipelines. Together with the Hungarian company MOL, Yukos organised a joint venture for developing the Zapadno-Malobalykskoye (Western Malobalykskoye) oilfield on the Ob in the eastern part of the Priobskoye oilfield (Yukos 2001). Oil reserves are located near Nefteyugansk, from where oil is transported into other parts of the country. The conglomerate's Samaraneftegaz is the only oil company acting mainly in the European part of the country. The Yukos Company has international projects in areas of the Caspian and the Black Seas, as well as in Africa.

Acting in Western Siberia, Lukoil was the largest joint enterprise out of the oil companies at the turn of the millennium. Langepasneftegaz, Ukrainaneftegaz and Kogalymneftegaz were incorporated into Lukoil in 1991. In the late 1990s, Lukoil had 120,000 employees and the company's share in Russian crude oil production accounted for 24 per cent (Lukoil 2001a). The production capacity of Lukoil is comparable to that of many large Western companies. In the late 1990s, Shell, BP and Exxon left Lukoil behind in oil production, but Chevron, Texaco, Mobil and ELF fell behind Lukoil (Lukoil 1999). Lukoil also acts outside Russia, mainly in the independent states of the former Soviet Union and East Central Europe. It has developed its downstream business actively, and according to this business strategy, it has acquired refineries and petrol stations abroad. At the end of 2000, it purchased Getty Petroleum Marketing Inc, a North American company running 1260 petrol stations in 13 north-eastern states of the USA. The number of Lukoil's petrol stations grew to 3544 at the end of 2001, of which 1384 were in Russia (Lukoil 2002, 18).

TNK-BP was established in 2000–2003. TNK (Tyumen Oil Co.) bought ONAKO (Orenburg Oil Co.) in 2000. The company received a loan of 700 million US dollars from international banks to fi-

nance the cash acquisition of ONAKO at 1100 million US dollars (TNK 2002, 19). Slavneft became part of the company when the share the state had in Slavneft was auctioned 18 December 2002 and transferred to Sibneft and TNK (TNK-BP 2003a). As a result, TNK and Sibneft each own 48.5% of Slavneft. TNK-BP is a joint venture owned by British Petroleum and the Russian Alfa and Access/Renova groups in the proportion of 50:50, and it comprises the assets of TNK, Sidanco, ONAKO and half of Slavneft (TNK-BP 2003b; TNK-BP 2003a). BP paid 6150 million US dollars for a 50% stake in the new company (TNK-BP 2003c). So far, it is the largest investment of foreign capital in the Russia economy and the merger has been fully supported by Putin's regime.

Surgutneftgaz acts mainly in Western Siberia. The production facilities of the company have been constructed on the River Ob for exploiting oilfields near the town of Surgut. The company's oil refinery is located in Leningrad Oblast in Kirishi, 140 km from St. Petersburg. This KINEF refinery is the largest refinery in North-West Russia, refining 10% of crude oil in Russia and exporting 60–70% of its production (Filippov et al. 2003, 48). Like many other Russian oil companies, Surgutneftegaz is attempting to act everywhere in Russian territory. The company's oil production has been steadily increasing, and its share in the total crude oil production of Russia reached 13% at the turn of the millennium (Surgutneftegaz 2001).

The restructuring arrangements in 2000–2003 resulted in four large private companies that are increasingly integrating into the global economy. Rosneft remains under the control of the federal government, and two smaller companies, Tatneft and Bashneft, are regionally controlled companies. Tatneft and Bashneft operate also in the export market.

The 1990s transition hindered development. By the mid-1990s, investments in oil production had decreased to fewer than 50% of the 1990 figures and drilling to a third. Exploratory drilling dropped even to one-fifth of the 1990 level in 1999 (Lynch 2002, 35). Despite the positive outlook presented by the oil companies at the turn of the millennium, there were still many problems such as insufficient investment activity and decreased exploratory drilling. These were the long-lasting consequences of fallen domestic energy demand, institutional uncertainty and adaptation to the open markets. Although the recovery of oil deposit exploration and oil production development began in 1999 and 2000 (Sagers 2001, 163), the process of oil production growth is rather laborious because of exhausted oilfields, obsolete facilities and transport bottlenecks. However, Russian companies have many plans and strive to invest. According to company reports, investment activity recovered at the turn of the millennium (Lukoil 2003; Surgutneftegas 2003; Yukos 2003).

Western Siberian oilfields comprise the primary oil production area. Companies acting in the area have been created on the basis of large production organisations that remained as part of the inheritance of the socialist period. American and European companies have participated in oil production by establishing joint ventures with Russian companies, but Russian oil production as a whole has been able to attract very little foreign capital. The formation of TNK-BP is one of the first signs of the growing attractiveness of the Russian investment climate. The misappropriation crisis around the largest oil conglomerate YukosSibneft in late 2003 put this development on hold for a while.

Joint ventures operating in hydrocarbon fields demonstrate the possibility of co-operation and technological transfers at a grassroots level. The Russian Federation approves licences for oil companies, as well as for domestic and foreign oil companies' consortiums, to explore oil layers, develop oilfields and make investments. In practice, being a shareholder means that the company has become an actor and investor in a consortium.

In the 1990s, foreign companies faced many legal, fiscal and institutional problems in collaboration despite the Russian authorities' attempts to develop proper legislation and a system of production-sharing agreements (Sagers 2001, 164). Joint ventures have been realised to a greater extent in the northern European parts of Russia and in the Russian Far East than in the other parts of the country. The Far East is attracting business to satisfy the increasing crude oil demand of the Asian market. In the Barents Sea Region, production could be based in part on joint ventures and production sharing, because multinational companies possess offshore technologies as well as offshore work experience in the North Sea, the Norwegian Sea and the Caspian Sea. It would be reasonable to utilise this experience, knowledge and know-how in regards to the Barents Sea.

Granting the licences for exploration and development to national companies, such as to Rosshelf in the north, has not brought about the anticipated development (Moe & Jørgensen 2000, 105–119).

The oilfields of the southern and central parts of the Timan-Pechora Basin are located in the Republic of Komi, and the oilfields of the northern part of the basin are in the Nenets Autonomous Okrug, which itself is within the administrative jurisdiction of Arkhangelsk Oblast. The Okrug of 176,700 km^2 had a sparse population in 1998 of 47,000 inhabitants (Heleniak 1999, 172). Out of all Russia's oil production areas, the Timan-Pechora fields are geographically nearest to Finland. The closest distance from the Usinsk oilfields to the border between the EU and Russia is 1205 km. The Finland-based Fortum energy company has a shareholding interest in the area. In the 1990s, the Finnish construction company YIT built communities and infrastructure in this area. The significance of Timan-Pechora on the federal scale is not great, because it yields only from three to four per cent of the total Russian oil production.

The geological sediment formation[6] of Timan-Pechora containing oil deposits runs from the slopes of the Ural Mountains towards the Barents Sea and covers about 320,000 km^2. The continuation of the sediment formation containing oil layers extends under the Barents Sea and covers about 800,000 km^2. Timan-Pechora's sediment formation lies north of latitude 60°N, and the richest oil and gas fields are located above the Arctic Circle. This area is rather difficult for oil production as the largest part of it is covered with marshy forests and the northernmost parts are sub-arctic tundra with permafrost in places. As a result of this, oil layers in Western Siberia in the coniferous forest zone were exploited earlier than those in the northern parts of Timan-Pechora. In the southern part of Timan-Pechora (in the Komi Republic), oil production has already existed for decades. During the Soviet era, the main actor in the area was Komineft, which became a part of Komi-TEK in 1994. Both were incorporated into Lukoil in 1999. Oil production has decreased in the Timan-Pechora oilfields in the Komi Republic since 1983, thus increasing the pressure to develop the more northern oil deposits to production stage.

Oil production was initiated in the oilfields near the town of Ukhta (63°33′N, 53°41′E) already in the 1930s, and afterwards production expanded to small fields south of the Rivers Pechora and Usa. In the 1960s, oil drilling moved 300 km north of Ukhta, and the oilfields of Usinsk and Vozey were put into production. These two oilfields yielded more than 60% of oil produced in Komi. In 1991, Usinsk produced 44% and Vozey 32% of Komi's oil (Sagers 2001, 194). The next step farther north took place in the 1980s when, in 1987, Kharyaga's oil deposits were developed.

The oil deposits of Kharyaga are located north of the Komi Republic in the Nenets Autonomous Okrug (Fig. 2). From Kharyaga, oil runs 80 km along pipelines to Vozey in Komi, continues along pipes to Usinsk, and then through the Usinsk-Ukhta-Yaroslavl pipeline to refineries and to markets. The oil spillages of 1994 and resultant pollution reported widely in the press concerned the Vozey-Usinsk part of the pipeline.

Numerous oil companies compete for the resources of the Timan-Pechora area. While in 1990 Komineft produced 96% of the Timan-Pechora Basin's oil, in 2000 its successor's share of production decreased to 31.6%. Oil production has expanded to the north of Komi to the Nenets district. There are ten joint enterprises in the area, out of which the Polar Lights Company, established by the American oil company Conoco (now ConocoPhillips) and the Russian companies Arkhangelskgeodobycha and Rosneft, is the most significant in the area. Polar Lights is divided amongst ConocoPhillips, Arkhangelskdobycha and Rosneft in the proportion of 50:30:20 (ConocoPhillips 2002, 22). Lukoil is a partner, owning 74.1% of Arkhangelskgeodobycha (Filippov et al. 2003, 42). The licence area, which is under the control of the joint venture, includes numerous oil deposits in the Nenets Autonomous Okrug north of Vozey and northeast of the oilfields of Kharyaga. The most significant oilfields of the licence area are Ardalinskoye, Vostochnaya/East Kolvinskoye, Dyusushevskoye and Oshkotynskoye (Sagers 2001, 194); Ardalinskoye is the best-known field. The Finnish construction company YIT has carried out building projects in the area.

ConocoPhillips operates in Ardalinskoye. Originally, Conoco aimed to open 24 oil wells and build a refinery, but the production target reached was just fifteen oil wells. The first borehole was drilled in 1993, production amounted to 346,400 tonnes of oil in 1994, and in the subsequent year oil production increased to 1,213,300 tonnes (Sagers 2001, 195). Since 1997, oil production has fluctuated between 1.7 and 1.8 million

tonnes, which is clearly higher than anticipated. ConocoPhillips achieved the initial aims of the project, and it is now developing satellite fields. The first is Oskotynskoye and it was put into production in 2002 (ConocoPhillips 2002). In Finland, ConocoPhillips is known for its Jet petrol stations.

However, ConocoPhillips has more ambitious plans. The company is negotiating about production in a licence area that is known as the Severnaya Oblast/Northern Region, north of the company's present oil production area. To realise the project, an investment of 5000 million US dollars is envisaged (Sagers 2001, 195). The project is dealing with four oil deposits: Inzyreyskoye, Yareyuskoye, Yuzhnyy/Southern Khylchuyuskoye and Khylchuyuskoye (Fig. 2). The estimated volume of these oil deposits is 440,000 million tonnes. The oil deposits stretch in strips northwards from Kharyaga, and the northernmost deposit is Khylchuyu, situated on the very shore of the Pechora Sea. Lukoil is ConocoPhillips's partner in this project. The development of the four deposits will bring a pipeline from Usinsk via Vozey and Kharyaga to the coast of the Arctic Ocean, 120 km west of the oil port of Varandey (Fig. 2).

Besides ConocoPhillips, another significant company developing the area is the French company TotalFina-ELF that, in late 1995, signed a business co-operation contract with Komi-TEK, the predecessor of Lukoil-Komi, and the Russian Federation on the development of Kharyaga's oil deposit and the division of oil production amongst the participants of the contract. The Kharyaga oil deposit was put into production already during the Soviet period. In the oilfields of Kharyaga, the joint venture produced 72,300 tonnes of oil in 1999 and 525,4800 tonnes in 2000, and the 2001 production was estimated to be 600,000 tonnes (Sagers 2001, 195). The total estimated oil production of this project is 45 million tonnes over 33 years with investments of 700–1000 million US dollars.

Numerous foreign companies are exploring and searching for oil in Timan-Pechora (Jumppanen 1999, 103). The areas licensed for oil exploration, as well as areas planned for licensing, cover the distance of 250 km eastwards from the Gulf of Pechora to the Ural Mountains. For instance, the Finland-based Fortum energy company participates in the development of the Yuzhnoye/South Shapkino oil deposit that is situated 85 km from the Kharyaga deposit. The decision to bring the oil field into production was made in 2001. SeverTEK constructed and now operates the field's production facilities (Fig. 3). Fortum Oil and Gas Oy and Lukoil own SeverTEK in the proportion of 50:50.

The hydrocarbon reserves of the Barents Sea were explored in the 1970s and 1980s. According to the explorations up to 1997, the estimated gas and oil resources in the Russian sector of the Barents Sea and the Pechora Sea are 4500 mil-

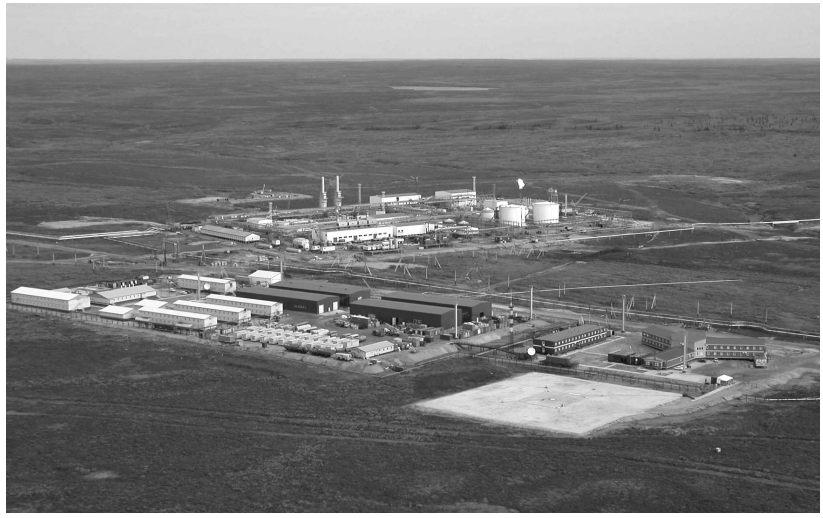

Figure 3. Oil production facilities, storage halls, heliport in front and accommodation complexes in South Shapkino. Crude oil production is estimated to reach 6800 tonnes per day by the end of 2004. Photo: Fortum Oil and Gas Oy.

lion tonnes of oil equivalent (Moe & Jørgesen 2000, 100). The results were partly based on the utilisation of technology developed and built in the West. Drilling vessels (the Valentin Shashin and Viktor Muravlenko) and jack-up rigs (the Kolskaya and Murmanskaya) built in Finland explored the reserves in the seabed of the Barents Sea (Moe 2001, 134). Three rigs built in Vyborg also took part in the exploration. The largest oil deposits are located near the shore of the Pechora Sea – two oilfields are a little over 20 km and one field 57 km from the coastline – while gas fields are farther north. All of the deposits belong to the Russian Federation, because they lie over 12 nautical miles from the coast. The reserves of 400 million tonnes of oil available for production give the potential for 15–20 million tonnes per year. Ten years ago, great expectations were placed upon the oil and gas of the Barents Sea. Nevertheless, the large oil reserves so far discovered have not been brought into production, and development projects have advanced slowly.

Offshore oil production is developed only on Kolguyev Island. Lake Peschanoye oilfield was put into production in 1987 and it produces less than 50,000 tonnes of oil annually (Sagers 2001, 196). In 1998, production yielded 22,000 tonnes.

Russian oil production was in crisis during the transition when domestic oil demand decreased and enterprises experienced payment problems. The network of pipelines, built during the socialist period, is still in use and is the most important system of crude oil transport in Russia. The combined length of the pipelines is 46,700 km, and 294.6 million tonnes of crude oil and 23.1 million tonnes of refined oil products were transported by this pipeline system in 2000 (IEA 2002a, 88). The pipeline network could not have been built under the conditions of the transition economy.

Since the late 1990s Russia has been attempting to set up a system of more direct access to the Western market. An example of such pursuit is the development of the Baltic Pipeline System. The oil port of Primorsk (known in Finnish as Koivisto) was constructed as part of this plan and put into operation in late 2001. The port and the pipelines leading to it are meant to serve the exports from the Timan-Pechora fields. The oil port of Primorsk is being developed with the view of it becoming a very large port that can handle more than the annual exports of 20 million tonnes that previously went via the harbours of the Baltic States. In this way it will be possible to avoid the high transit and port payments, including amongst others those of Ventspils (Latvia) and Butinge (Lithuania), and to decrease logistic dependence on the Baltic States (IEA 2002a, 97). The pipeline built from Kirishi to Primorsk annually transports 12 million tonnes of oil exports. The expansion of the capacity of this pipeline network (via Usinsk) from the Kharyaga oilfields to Primorsk will allow the export of 30 million tonnes of oil annually.

Oil is also shipped from the Barents Sea. In August 2000, the first ship left the oil harbour of Varandey. This port was founded to compete with pipeline transport. The hinterland of the port constitutes a licence area where there are several deposits. The Polar Lights Company's oil production area lies to the south of it. The target of this transport system known as the Northern Gateway is to annually export 5–6.5 million tonnes of oil, possibly even 15 million tonnes, to the international market (IEA 2002a, 97). Other transport projects are also planned. The port of Vysotsk (in Finnish: Uuras) on Vyborg Bay is also being converted to an oil harbour, and the port of Murmansk has been considered for oil transport. The port of Murmansk can tranship oil that is first conveyed by smaller tankers from the Prirazlomnoye field in the Pechora Sea. A more significant plan proposes a pipeline from Nefteyugansk in Western Siberia via the Republic of Komi to Murmansk. Known as the Murmansk Pipeline Project, this YukosSibneft pipeline may be routed either across the White Sea, or may circumvent it via a longer route through the Republic of Karelia. A viable proposal is to construct a new port in the estuary of the Indiga, where ice-conditions are much more tolerable than in Varandey (Bellona 1997; Alekseyev 2002, 2). Indiga is located 320 km west of Varandey. The geographical positions of the Arctic ports are more advantageous than those on the Black Sea when oil and gas condensate are shipped outside Europe, especially to the United States.

The oil production of Russia brings welfare mostly to the oil cities of Western Siberia, especially to Khanty-Mansi. Siberian production is situated in a strategically secure area, far from Russia's borders and in almost inaccessible locations. The oil reserves of Russia's northern European areas play an important role for the economic development of North-West Russia. Until recently, the export of those resources directly influenced the Baltic States, especially because the produc-

tion of the Timan-Pechora oilfields was exported via Ventspils and Butinge. The stoppage of oil transport via Ventspils in winter 2003 caused by the disagreements between Russia and Latvia about the privatisation of the port is indicative of the politico-economic fragility of the situation. The alternative route via Primorsk is not unproblematic; oil transport via Primorsk has been criticised by Finland because of the environmental risks, especially under icy winter conditions, and because the largest oil tankers are too big for Primorsk.

In as much as Russian companies are increasing their oil-refining capacity, the export harbours will increasingly ship petroleum products as the proportion of crude oil decreases. The petroleum product terminal of Batareinaya Bay located southwest of St. Petersburg is under construction. The annual export capacity of this port is planned to be 15 million tonnes, expanding from an initial 5 tonnes per year (Filippov et al. 2003, 46). Furthermore, there are plans to construct refineries to Murmansk and Primorsk.

The growth of oil transport and environmental risks in the Gulf of Finland were the main concern in Finland in the winter of 2003. For Russia, this traffic is of vital importance, as is transport through Finnish harbours, a viewpoint that was not much considered in the media. Along with risks, oil production and transport may produce positive effects on the Finnish economy by increasing demand for construction projects, investment goods, transport services and environmental know-how, as has already happened in the Sakhalin projects, for which parts of oilrigs and two icebreaking vessels were ordered from Finnish companies (Quattrogemini 2003; Kvaerner Masa-Yards 2003). Many Western companies take part in northern Russian oil projects. The viability of Russian oil production is important for many European countries consuming Russian oil. It is anticipated that in the future Russian oil companies will become more integrated into the global market. Russians would like to develop petroleum production and to increase the distribution of refined products transnationally. Lukoil's investments in the West are good examples. Reciprocally, EU- and US-based companies have opportunities to act in Russia. The integration of Russia into the European market is undoubtedly considered positive: Arab and African oil production is a more risky alternative for supplementing the EU's own production.

Natural gas

Measured by energy content, natural gas production became the most important source of primary energy during the 1990s transition. Throughout the economic decline, the natural gas consumption of the country stayed at a relatively high level. As a result, the significance of natural gas to the Russian economy has grown (see Table 2). Moreover, natural gas exports did not plunge as badly as oil exports in the 1990s transition, and gas exports gradually increased in the period 1993–99 (IEA 2002a, 275).

The gas supply of the country is monopolistic. Gazprom controls 90% of gas production in Russia. The four Western Siberian companies under Gazprom's control are Urengoygazprom, Yamburggazdobycha, Nadymgazprom and Surgutgazprom, and together they produce most of Russia's natural gas. For example, in 2000, the gas production of Gazprom in Western Siberia comprised 83% of the total Russian gas production (IEA 2002a, 112). In addition to Gazprom, Itera, established in 1992, operates mainly in CIS countries and near its production area in Yekaterinburg (IEA 2002a, 116–117). The most significant gas fields are in Urengoy, Yamburg and Medvezhye near the Arctic Circle, on the Yamal Peninsula in the Yamal-Nenets Autonomous Okrug (750,3000 km^2; 497,000 inhabitants in 1998; Heleniak 1999, 172) (Fig. 4). In late 2001, gas production in the Zapolyarnoye gas field was initiated. Natural gas is tapped also in Eastern Siberia and in the European part of Russia in Orenburg. In addition, natural gas is obtained as a side product from oil production. The length of Gazprom's gas pipelines is 150,000 km. The share of gas production in primary energy production is more than half (Table 2). In the manufacturing system of Russia, natural gas is of primary importance. If pipelines running from Western Siberia were cut or gas pipes closed, it would cripple the Russian economy as well as affect much of the EU's economy.

The gas fields of the West Siberian Plain are located far from the centres of consumption and the European market. The gas fields lying along the Ob and the lower reaches of the Taz and the Pur Rivers are situated on the same parallel as Oulu and southern Lapland, but the winters are colder than in the European North. India is 4000 km south of this area. In the early 1970s, two cities – Novyy Urengoy (90,000 inhabitants) and Nadym (50,000) – arose in the centre of the Siberian gas

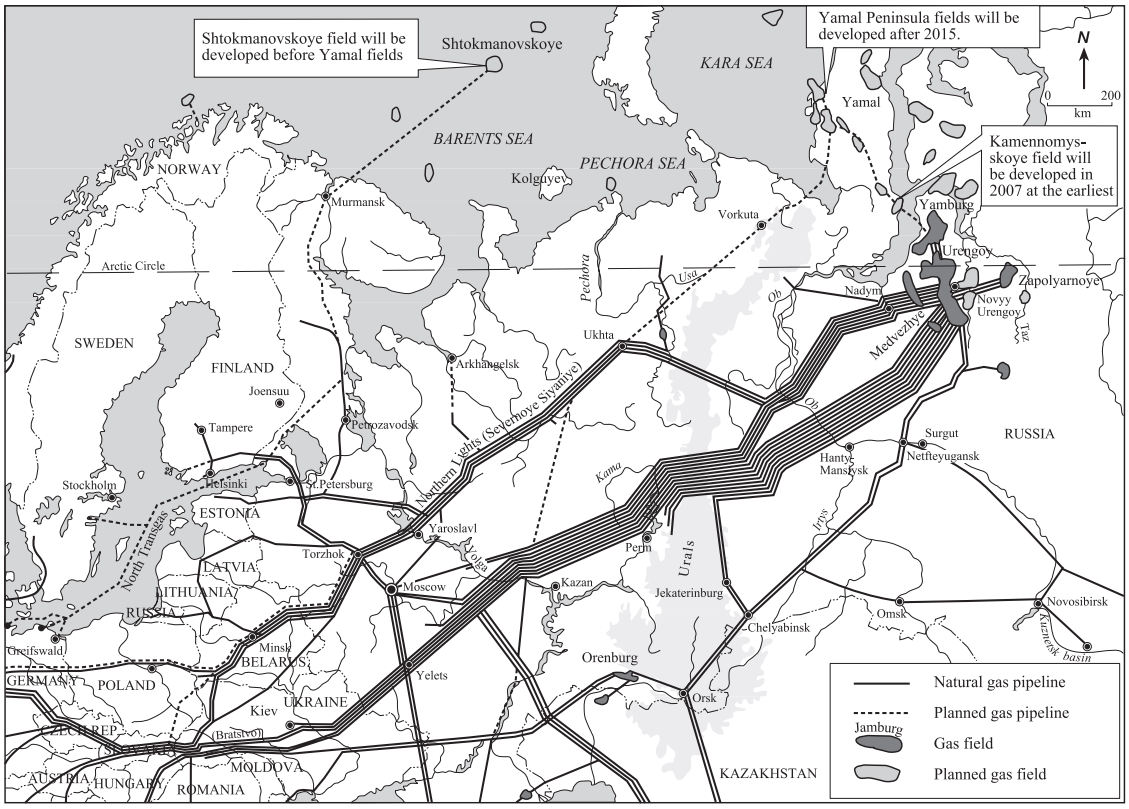

Figure 4. Gas pipelines westwards. Source: Finnbarents 1996; Wingas 2000; IEA 2002a; Gasum 2003.

fields. Both cities have modern infrastructure and housing, and there is an international airport in Novyy Urengoy (66˚05′N, 76˚31′E), 80 km south of the Arctic Circle. Another site, Yamburg, is not a centre of permanent settlement. The city's apartments and vast infrastructure are intended for the temporary accommodation of almost 10,000 employees. The distance from Novyy Urengoy to the Finnish border is around 2000 km, equal to distance from the Finnish border to the main oil-producing area in Khanty-Mansi.

The history of Western Siberia's gas fields is short. In 1970, the West Siberian Plain yielded only five per cent of the total gas output of the Soviet Union, and the total production of Siberia did not account for more than six per cent of the country's gas production (Sagers & Green 1986, 18). The northern Caucasus, the Volga region and Komi produced 35% of the natural gas. The remaining share of the gas was produced outside the present Russian Federation in Ukraine (31%), Uzbekistan (16%), Turkmenistan (7%), Azerbaijan and Kazakhstan (Sagers & Green 1986, 18). In the 1970s and 1980s, the gas production of Western Siberia rapidly increased. Gas production commenced in the Urengoy gas field in 1978, and in 1984 it accounted for 36% of the total gas production of the Soviet Union. The development of the area was rapid. At the same time the distances that gas was transported grew; from 1975 to 1983 the average distance of transport doubled from 1200 km to 2400 km (Sagers & Green 1986, 16). The pipeline that runs via Perm and Kazan became the main transport route. The other, more northernly one, transports gas to the West via Ukhta (Fig. 4).

Russia's dependence on natural gas increased in the 1990s (Table 2). At the turn of the century, gas generated almost half of the electric power and more than half of the heat. It is difficult to satisfy the seasonally oscillating fuel demand of power stations only by gas without an extra fuel

supply. The fuel demand of power and heat-generating plants is supplemented by oil during wintertime. In the 1990s, the capacity of gas storage was increased in order to flexibly react to the fluctuating energy demand. Russia's domestic gas prices and payment system create problems for Gazprom, which is striving to increase its profits in the export market.

Natural gas is delivered to Europe by two main routes consisting of several parallel pipes. The northern pipeline comes to Ukhta, from where gas is pumped along the Northern Lights/Severnoye Siyaniye pipeline to Yaroslavl located north of Moscow. In Yaroslavl the gas pipeline bifurcates west to St. Petersburg (and further to Finland and Petrozavodsk) and southwest via Belarus to Central Europe. The other gas pipeline traverses the Urals south of the northern route, crosses the upper reaches of the River Kama and continues via Perm and Kazan towards Moscow, and further via Kiev (Ukraine) to Slovakia. The decades-old main production areas of the south are joined to the main network by pipelines. Although there are a great many pipelines, in its present state the natural gas trunk pipe network is vulnerable; production is virtually dependent on Western Siberia's production and the pipelines reaching Europe run through former Soviet republics that, naturally, endeavour to improve their own economic standing by transit fees.

In addition to a 90% market share in gas production, Gazprom in practice oversees all gas transport along the large-diameter high-pressure pipes. Gazprom is completely responsible for Russian gas exports to Europe and thus has almost monopoly rights over Russian gas production, transport and exports. Gazprom plays a significant role in the Russian economy, and it accounts for 20% of incomes to the federal budget and 20% of hard currency revenues (IEA 2002a, 111). The Russian Federation owns 38% of the company, other Russian organisations 34%, the Russian private sector 18% and foreign investors 10%. The largest foreign owner is Ruhrgas, which has 3.5% of the shares (IEA 2002a, 111).

Germany is the most important purchaser of Russian natural gas (Table 4). Gazprom has jointly-owned marketing and distribution companies in the gas importing countries. Examples of such joint ventures are: Wingas in Germany, Gasum in Finland, Promgas in Italy and Panrusgas in Hungary. Gasum imports gas to Finland and then distributes it. Natural gas is transported via Vyborg to south-eastern Finland, from where gas goes southwards to Helsinki as well as northwards to Tampere. In Finland there are 1000 km of high-pressure trunk pipes and 1000 km of distribution pipes. The pipeline is being expanded westwards, via Forssa to Turku.

Table 4. The most important purchasers of Russian natural gas. Exports in thousand million cubic metres. Source: IEA 2002a, 137.

	2000	1996	Change in %
Germany	34.1	32.9	4
Italy	21.8	14.0	56
France	12.9	12.4	4
Turkey	10.3	5.6	84
Austria	5.1	6.0	–15
Finland	4.3	3.7	16
Other Western Europe	1.8	0.4	350
Western Europe, total	90.3	75.0	20
Slovakia	7.9	7.0	13
Hungary	7.8	7.7	1
The Czech Republic	7.5	9.4	–20
Poland	6.9	7.1	-3
Romania	3.2	7.2	–56
Bulgaria	3.2	6.0	–47
Ex-Yugoslavia	2.2	4.1	–46
East Central Europe	38.7	48.5	–20
Europe, total	129.0	123.5	4

As Table 4 shows, gas exports to Europe increased by four per cent from 1996 to 2000. The reason for this relatively slow growth of exports is due to the decreased gas consumption in the former CMEA countries. In Western Europe, on the contrary, gas purchases increased by one-fifth. Norwegian gas competes with Russian gas. From the EU's perspective, the problem with the gas market has been the high dependence on the producer-owned gas pipeline. On the one hand the EU is striving to open the European gas market to business competition (KOM 2001), and on the other hand to increase joint projects with Russia to ensure the availability of natural gas. In Russia, Gazprom is ready to develop and expand natural gas production. In the future the Shtokmanovskoye gas field in the Barents Sea will be put into production, an investment that will also affect Finland. A Murmansk-Petrozavodsk-Petersburg trunk pipeline would transport gas to consumers. For the natural gas infrastructure of northern Europe, the more significant project is the construction of a new gas pipeline across the bottom of the Baltic Sea to the centres of consump-

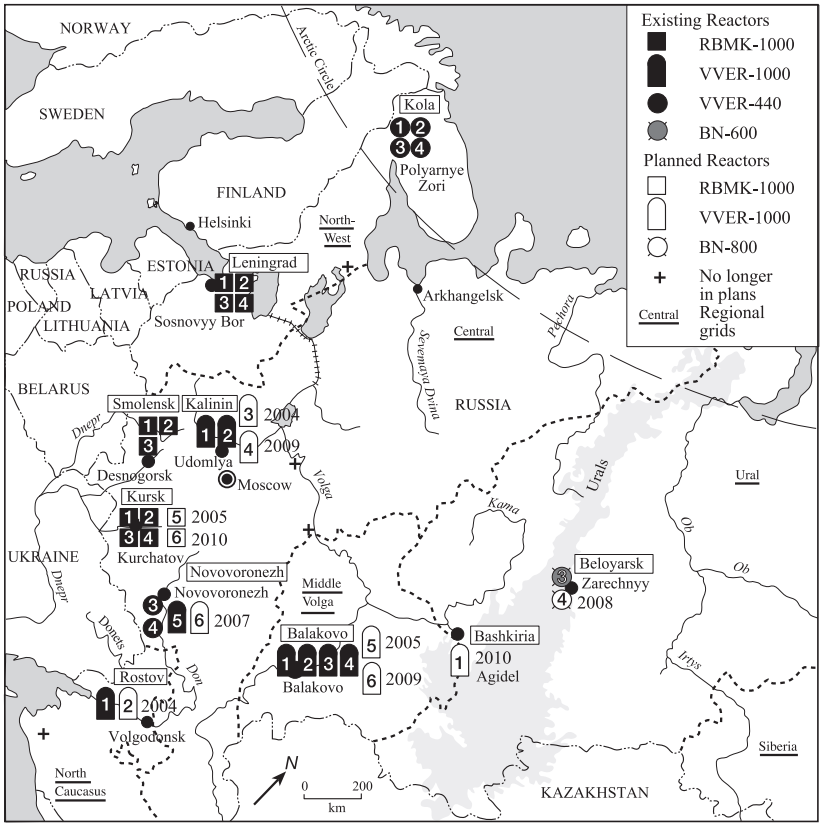

Figure 5. Russia's nuclear power plants (NPPs) in 2002. Anticipated completion dates of new reactors by location until 2010 and the seven regional grids (Energy Systems). The types of reactors are explained in the text. Source: Bater 1996, 223; IEA 2002a; Minatom 2002.

tion in Europe. Russia strives to remain an important actor in the gas market of the European Union.

Nuclear energy

In the late 1990s, Russia was the world's fourth-largest producer of electricity, after the USA, China and Japan, although Russian electricity generation decreased by one-fifth in the 1990s (IEA 2002a, 191). Russia is divided into seven regional grids, also called Energy Systems (ES). The seven regional grids are Central, North-West, Volga, North Caucasus, Urals, Siberia and Far East (Fig. 5). RAO UES operates the electricity production and grids, with the exception of nuclear power plants, which are under the control of a separate authority, the Ministry for Atomic Energy of the Russian Federation.

In Russia, nuclear energy is the fourth most important energy source after natural gas, coal and hydropower, important in the generation of electricity. Nuclear energy is not utilised for heat-generation or steam production in Russia. The principle of the nuclear power plant is simple: when the nuclei of an atom are split, the binding energy of the atomic nuclei transforms into heat and is then converted into steam, which rotates the turbines of electrical generators. In Russia, there are four types of reactors for power generation (IEA 2002a, 174). In a RBMK (Reaktor Bolshoy Moshchnosti Kipyashchiy/High Power Boiling Reactor), graphite is used as a moderator. The VVER (Vodo-Vodyanoy Energeticheskiy Reaktor/Water-Cooled and Water-Moderated Energy Reactor) is a pressurised water reactor, in which water is used as a moderator. There exists one BN reactor (na Bystrykh Neytronakh), which is a breeder reactor. The working principle of Bilibino's very small EGR reactors is the same as in RBMK-type reactors.

Russia is well known for its nuclear power plants (NPPs). However, the share of nuclear energy in the country's electricity generation is lower

Table 5. Electricity generation in 1998 in selected countries. Source: European Commission 2001, 69–167; IAEA 2003; Bassan 2003, 1, 3.

Country	Electricity generation in TWh, 1998	Nuclear electricity in TWh, 1998	Nuclear electricity's share in %, 1998	Nuclear electricity's share in %, 2002
Russia	833	109	13	16
EU	2490	854	34	34
France	510	388	76	78
Germany	557	162	29	30
Japan	1036	332	32	35
USA	3804	714	19	20
Finland	70	22	31	30

than that of many other industrial countries (Table 5). In 2000, the share of nuclear electricity accounted for 15% of the country's total electricity generation. This is clearly less than in Finland, where in 2000 the share of nuclear electricity accounted for 32%, matching the average Western European level (KTM 2001, 27).

The first reactors for power production were connected to the grid near Saratov (Beloyarsk 1) and Voronezh (Novovoronezh 1) in 1964 (IAEA 2002a). Both already have been decommissioned[7]. The first reactors in North-West Russia were connected to the grid in 1973 when Kola 1 and Leningrad 1 started to deliver electricity commercially (IAEA 2002a). The geographical pattern of NNPs indicates that power plants serve the energy demands of large population centres and industrial districts in areas where other sources of primary energy are not abundant.

Nuclear energy production is concentrated in the European part of Russia. In the North-West regional grid (including, amongst others, St. Petersburg, Karelia and the Kola Peninsula) in 1999, 41% of the electricity generated came from NPPs (IEA 2002a, 171). In the Urals regional grid (ES) in 1999 (Fig. 5), almost all electricity was generated by thermal power plants using fossil fuels (90% in 1999; IEA 2002a, 194). In Siberia's ES, electricity is generated by using hydropower (49% in 1999) or fossil fuels (48% in 1999; IEA 2002a, 194).

At the beginning of the millennium, Russia had 30 nuclear reactors for energy production and they were built between 1971 and 2001 (Fig. 5)[8]. The small reactors of Bilibino are located in the Arctic region near the Bering Strait and are thus outside the map in Fig. 5. The newest NPPs are the fourth reactor of the Balakovo NPP (southern Russia), which was put into operation in 1993, and the first reactor of the Rostov NPP, which commenced operations in 2001 (IAEA 2002a). The NPP at Sosnovyy Bor west of St. Petersburg is called the Leningradskaya AES/Leningrad NPP. In 2001, the power output of all Russian NPPs accounted for 21,242 MW (IEA 2002a, 193), excluding the output of the first reactor of the Rostov NPP, which was being tested at that time. In Finland, the power output of its four reactors is 2656 MW, i.e. 12.5% of Russian NPP output. However, the utilisation rate of Finnish nuclear power plants is higher than in Russia and, as a result of this, the annual electricity generation of Finnish power plants accounts for one-fifth of Russian nuclear electricity generation (European Commission 2001, 74, 167).

During the economic recession of 1990–98, NNPs' production decreased slower (12.5%) than other electricity generation (22%; IEA 2002a, 171). The recent recovery of the Russian economy has caused a strong increase in NNP electricity generation. The record level of electricity output from 1992 was reached again in 1999 (122 TWh). In 2000, Russian NPPs produced 131 TWh (IEA 2002a, 177). From an economic perspective, nuclear energy is a competitive mode of electricity generation in Russia. Russia has plans to increase the levels of nuclear electricity generation, unlike many other Western countries, though such a strategy is not exceptional as nuclear power plants are being built in many counties[9].

The different generations of nuclear reactors in Russian NPPs vary in technology and safety. The 12 first generation still operational nuclear reactors were built before the implementation of safety regulations concerning NPP construction. Some of the first-generation nuclear reactors are located close to the border regions with Finland: Kola 1 and 2 in Polyarnye Zori and Leningrad 1 and 2

in Sosnovyy Bor. The reactors' lifetime will be over in the nearest future; they are being renovated and their safety increased.

Authorities in Russia accept the further development of nuclear energy. The cornerstones of the nuclear strategy of the country are 1) the safe and effective use of NPPs, 2) the modernisation of obsolete NPPs with the improvement of their safety and productivity, and 3) the development of new technically advanced nuclear reactors and their production (IEA 2002a, 183). According to plans through to 2005, the reactors of Kola 1 and 2, Leningrad 1 and 2, Novovoronezh 3 and 4, as well as Bilibino 1–4 will be renovated. At the same time, new NPPs are being built and planned. Kalinin 3 and Kursk 5 are soon to commence construction (Fig. 5). In 2001, Rostov 1 was plugged into the Russian grid. A proposed NPP in Karelia will not be included in the Russian energy strategy – at least not during this decade. On the other hand, heat and electricity generation in Arkhangelsk will probably be developed with the help of a NPP. In comparison with the planned projects of the Soviet Union, the Russian Federation has stopped, at least for now, the NPP construction projects not only for Karelia, but also for the northern Caucasus, and for Yaroslavl and Nizhniy Novgorod along the upper reaches of the Volga (Fig. 5).

Energy and changes in the geo-economic structure

Energy projections and geography

Since the crisis of 1998, the Russian economy has been growing and developing. During the past few years, several projections of Russian energy supply and demand have been published. In November 2000, the Government of the Russian Federation approved the energy programme *"The Main Provisions of the Russian Energy Strategy to 2020"* (IEA 2002a). The Main Provisions represent the energy interests and energy geopolitics of the Russian Government and energy players. The International Energy Agency (IEA) has issued two volumes of *World Energy Outlook* (WEO) in 2000 and 2002 (IEA 2000 and 2002b). Both the Russian Energy Strategy and IEA's outlooks have given growing figures for primary energy production to 2020, but the projections are based on significantly differing views of the energy sector's structural changes. IEA has increased the estimated energy consumption figures in its latter outlook. In the main, both institutions result in similar geopolitical developments and geographical macro structures.

The Russian Energy Strategy, presented in the Main Provisions, expects the economy to grow (under favourable conditions) five per cent annually. Such an economic growth rate would shrink the differences in the standard of living between Western Europe and Russia in the long run. This scenario, however, conjectures that energy efficiency will improve substantially and will result from growth in the service sector, which does not use much energy. Thus the scenario arrives at rather moderate energy growth figures. In this scenario, Russia's energy consumption would grow to 884 million tonnes of oil equivalent (Mtoe; IEA 2002a, 51)[10], and energy production would reach the pre-transition level (Fig. 6). Energy consumption would only grow by 36% when compared with the figures of 2000, when without growth in energy efficiency the energy consumption would have to almost triple (IEA 2002a, 50–51). In the late 1990s, the Russian economy was highly dependent on natural gas. According to the *Main Provisions*, this situation is to be changed. The Government's scenario assumes a shift away from natural gas to coal in electricity generation and an increase in the share of nuclear power. By 2020, the share of nuclear power in electricity generation is projected to increase to 21% while, in 2000, it accounted for 15% (IEA 2002a, 56).

According to the IEA's scenario issued in 2000, the Russian economy will grow considerably slower (2.9% annually), and the anticipated annual growth in energy production will be 1.5% up to 2020. The energy efficiency of the economy will increase, but not as rapidly as suggested in the *Main Provisions*. As a result, energy consumption would reach 802 Mtoe. The IEA's scenario published in 2002 (IEA 2002b) is more optimistic about Russian economic growth than the outlook issued in 2000. The 2002 outlook assumes that economic growth will accelerate from 2.9% a year in 2000–2010 to 3.5% in 2010–20 (IEA 2002b, 271). The scenario assumes that growth will decrease to 2.6% in the period 2020–30 as the economy matures. Under these conditions, the scenario foresees that total energy consumption would be 841 Mtoe in 2020 and 918 in 2030 (IEA 2002b, 454). The two outlooks of IEA do not assume considerable growth in the con-

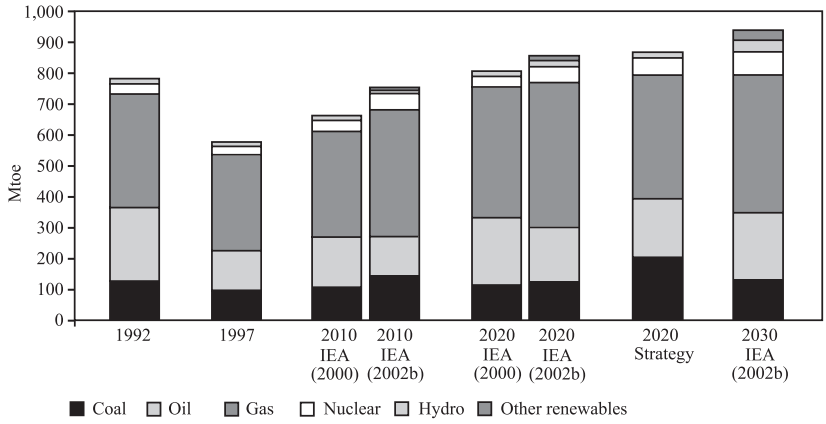

Figure 6. Energy consumption and energy sources in Russia. Future projections according to IEA's calculations and the Russian Energy Strategy. Source: IEA 2000, 177; IEA 2002a, 47, 51; IEA 2002b, 273.

sumption of coal and nuclear energy. Both coal consumption and the production of nuclear energy are assumed to start to decline before 2030. An increase in the share of coal is considered logistically difficult, as reserves are located mostly in Siberia and the Russian Far East. The present gas and oil pipelines also provide the domestic transport infrastructure, the maintenance of which is paid for not only by domestic income but also by export income. Thus, the argument for a large increase in coal consumption can be approached with scepticism.

Russia's strategy in regard to coal aims to increase its production in the Kuznetsk Basin, Kansk-Achinsk region, as well as in the Russian Far East. Other production areas are only of local and regional importance. Near the Estonian border, coal is exported from the port of Ust-Luga lying west of St. Petersburg, and the capacity of the port can be increased by eight million tonnes. Ust-Luga is planned to be a big, but not the only coal exporting harbour, as coal can be exported from various harbours on the Gulf of Finland and the Barents Sea (Hernesniemi & Dudarev 2003, 51). Long rail-transport distances weaken the competitiveness of coal exports, which affects the competitiveness of Siberian coal. Coal exports to Japan have taken place from the Russian Far East, where coal production and its logistics have been competitive.

Russia aims to increase oil production at a moderate rate. Oil companies carry out test drilling and develop new oilfields to replace depleting ones. Oil production grows more dynamically according to IEA's prognoses than in the Russian programme (Fig. 7). In the *Main Provisions*, the oil exports of 2020 will be at the same level as those of the late 1990s (Fig. 7). Measured by transport capacity the two largest pipeline construction projects are the Baltic Pipeline System and the Angarsk-Daqing (from Eastern Siberia to China) system (IEA 2002b, 274–277). The third largest is the construction of an export terminal on and pipelines from Sakhalin. If planned logistical development is realised and new oilfields receive investments, the growth of oil exports will be possible, particularly if many oil companies compete in the oil sector. Besides the logistical investments for the oil harbours of the Arctic Ocean and the Baltic Sea (such as Varandey and Primorsk), and the investments in the Eastern Siberian and Russian Far East hydrocarbon projects, repairs to the Druzhba pipeline and a pipeline bypass of eastern Ukraine are under construction. The growing usage of the ports of Vysotsk, Murmansk, St. Petersburg, and some others will contribute to the transport of oil and petroleum products (Hernesniemi & Dudarev 2003, 51). Nevertheless, the port of Primorsk will be the largest oil-loading port. Some of the new transport capacity replaces the obsolete and problematic sections of the export pipelines. In the future the realisation of the recently proposed Murmansk Pipeline Project may increase export capacity clearly more than any of the above-mentioned pipeline investments (IEA 2003b, 150).

The oil harbours of the Black Sea will be expanded, although Turkey does not want to increase oil transport via the Bosphorus. The port of Novorossiyskiy greatly needs to be expanded,

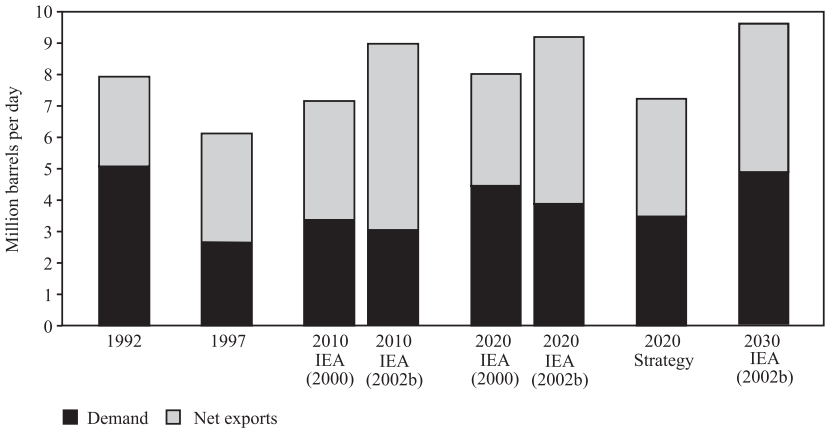

Figure 7. Projections for crude oil production according to IEA's calculations and the Russian Energy Strategy. Source: IEA 2000, 180; IEA 2002a, 52, 61; IEA 2002b, 276.

partly because oil is shipped to this port also from Kazakhstan. The pipeline connecting Odessa to the Druzhba pipeline was ready in December 2001 and it is now possible to transport oil to Europe through it, first shipping it by tanker across the Black Sea (Fig. 2). Besides Russia's own production, the oil of other CIS countries cross the Black Sea. Russian companies also are developing Caspian production and they are participating in the Caspian Pipeline Consortium by utilising Kazakhstan's Tengiz production. Oil transport from Azerbaijan will be developed by the construction of an oil pipeline via Georgia to Cheyhan, on the coast of Turkey. Consequently, there will be fewer oil deliveries from the independent southern Caucasian republics to the oil harbours of the Black Sea.

According to the prognoses, oil consumption in Russian domestic markets will grow owing to increasing traffic and freight. The transport sector's proportion in total final oil demand is estimated to grow from 51% in 2000 to 59% in 2030 (IEA 2002b, 274). Other types of energy sources increasingly will substitute part of the oil consumption, e.g. in district heating. In North-West Russia, wood and wood residue may be used for the generation of energy instead of oil, for instance in saw and pulp mills. As a result, the structural changes in production and refining, as well as the increasing consumption of petroleum products will bring about growth of 85% to Russia's oil refining capacity by 2020 (IEA 2002a, 54).

Russia is aiming to gradually reduce its dependence on the present gas fields in Western Siberia by developing new production both in Western Siberia and other areas. This aim is primarily influenced by a gradual decrease in the production volumes of the present fields, which are already beyond the halfway mark of their lifetime. In Russia, many development projects aim to guarantee the future gas supply. These are of great importance also for the development of the northern areas of Russia. There are plans for new production in the lower reaches of the Ob and the Taz, near the gas fields of Yamburg and Urengoy, and thus also close to present production and transport infrastructure. The gas production and transport to Europe in the Nadym-Pur-Taz region is less costly than the future production of Yamal, and especially of Shtokmanovskoye in the Barents Sea (IEA 2002b, 190). The new fields are planned for development at a radius of 300 km from Nadym (Fig. 4).

A notable new site on the European side is the Shtokmanovskoye gas field in the Barents Sea. The licence holder of the field was Rosself for 1993–2002. The project did not progress as scheduled (Moe & Jørgensen 2000, 118). High gas production and transport costs make the investment less lucrative (IEA 2002b, 190). The licence was reregistered in 2002 in the name of Sevmorneftegaz, formed in accordance to Rosneft and Gazprom's commitment to jointly explore the northern gas and oil fields (Rosneft 2003b). Gas production is scheduled to begin in 2006, which would mean construction of a pipeline south to the Kola Peninsula although gas may first have to be conveyed as condensate by ship. The gas fields on the Yamal Peninsula are planned to be in production probably after 2015. These fields are located

in an Arctic environment north of the present Western Siberian fields.

The expansion of gas production is planned for the gas fields in Siberia north of Irkutsk, where the Kovytkinskiy field and other fields along the Lena are located. The Eastern Siberian fields will be developed in so far as consumers of natural gas are found in Asia. The Lena-Tunguska fields can provide gas to Mongolia and China. The first trunk line is planned from Kovykta to Daqing via Irkutsk (IEA 2002a, 142). The pipeline could be extended later to Beijing and the Korean Peninsula. An optional route is from Kovykta via Irkutsk and Ulaanbaatar to Beijing (IEA 2002a, 14). Japanese-Russian consortia are developing the utilisation of Russian gas (and oil) from Sakhalin in the Russian Far East. On the European side, Gazprom and the Italian company ENI completed the Siniy Potok/Blue Stream gas pipeline across the Black Sea to Turkey in October 2002 (Spies 2003). The gas of Western Siberia will run through this pipeline.

The Russian gas pipeline network is not in good condition. Seventy per cent of the large-diameter trunk pipes were constructed before 1985, and 19,000 km (13%) of the pipelines have passed their estimated lifetime (IEA 2002a, 118). Consequently, considerable investments have to be made in the replacement and renovation of worn-out pipes. In addition, new fields require investments in trunk pipelines. The construction of the pipeline near the Barents Sea and the pipeline connecting the Yamal fields with Ukhta are the most challenging technically. Both of these projects affect neighbouring areas; pipes will go from the Shtokmanovskoye gas field via Karelia, and the pipeline to be built from the Yamal Peninsula will be connected with the Northern Lights pipeline that transports gas southwest to the European market. Russia plans to increase gas transported to Europe by circumventing Ukraine. A new trunk pipeline via Belarus and Poland is to be developed before the gas of Yamal will be put into production. At the same time it would be possible to develop a connecting pipeline from Poland to Slovakia, i.e. to the Bratstvo/ Brotherhood pipeline in the south. This connection would also pass Ukraine.

Russia is developing plans concerning the expansion of gas pipelines through the Baltic Sea. This plan is partly an alternative to the Belarus-Poland pipeline project. The North Transgas project aims to construct a gas pipeline from the northernmost areas of St. Petersburg and to Greifswald in Germany. The pipeline will stretch across the bottom of the Baltic Sea and it would have a connecting pipe to Sweden. If this project is realised, Russian natural gas could be sold to the Swedish market as well. Sweden has had many reservations about Russia's plans for increasing the supply of natural gas; it is not considered to be an environmentally-friendly alternative source of energy. Thus, the plan may be realised without a connection to Sweden.

The Nordic countries' gas market could be broadly set up along with Russian gas pipeline construction. If Norwegian gas pipes were enlarged and connected to the trunk pipes coming from Russia, multiple-actor markets would emerge. Such a gas market structure is the target for the European Union. The EU is attempting to open formerly monopolistic markets with the assistance of deregulating directives. According to these directives, the owner of the gas pipeline and the distributor are to be judicially separate actors. This promotes competition and, at the same time, increases the reliability of the operations. Consequently, gas markets could not be monopolised.

The modernisation of the nuclear energy sector should be rapidly realised in Russia (IEA 2002a, 182–186, 188). Plans exist to replace the old first-generation reactors and to modernise second-generation reactors so that their lifetimes will reach 50 years. Replacement investments are targeted at the first-generation reactors (40% of all reactors), which were put into production in 1971–79. These are still in operation and require renovation over the next years. As the lifetime of the first-generation reactors is 40 years (their original lifetime of 30 years has been prolonged to 40), the last of the 12 first-generation reactors should be replaced by 2020. At the same time the second-generation reactors should be modernised and new capacities created. The plans to expand nuclear energy rest mainly on the carrying out of projects not implemented since 1993. New nuclear power plants are planned for central and southern Russia, outside North-West Russia (Fig. 5). Plans concerning the modernisation of the nuclear power plants close to the border areas of Finland are not far from realisation[11].

Various security aspects (e.g. the military action in Chechnya) appear to promote the energy sector's growth in the north. Northern transport routes also are being explored. Ukraine has increased transit and transport rates to such an extent that

the northern routes are beginning to attract investments (Martelius 1999, 159). The Ukrainian Government is an active actor in regulating the use of pipelines (e.g. Interfax 2003). Belarus also has been able to pay its energy debts to Russia through transit charges. Against this background, attempts to expand the system of transport northwards can be well understood. The shortest way from the Siberian gas and oil fields to the centre of Europe is via North-West Russia and the Baltic Sea Region. From the Barents Sea the shortest way is through Fennoscandia. Russia is striving to reduce dependence on the Baltic States. Latvia and Lithuania are important for oil transport, but Russia has negatively viewed the development project of Ventspils oil harbour, referring to security risks (IEA 2002a, 98). In truth, the ownership arrangements of the harbour are in contention. However, the strategic importance of the Baltic States may grow when these countries join the European Union in 2004.

Russia's energy policy in the Northern and North-Western Economic Regions

In the *Main Provisions*, the Russian Federation is divided into economic regions and Russia's regional energy strategies are based on this geographical division. The division into economic regions significantly differs from the country's division into the seven regional grids (see Fig. 5). The *Main Provisions'* geographical division in the European North matches in full the area of the North-West Federal Okrug, which consists of the Northern and North-Western Economic Regions and the Kaliningrad Oblast enclave. From the beginning of the millennium these areas have become more important to energy conveyance. For instance, the Gulf of Finland, Finland and even the Arctic Ocean are becoming increasingly important channels of energy exports to the West. Is this a temporary phenomenon or does it reflect a new, more stable geopolitical arrangement?

The *Main Provisions* to 2020 assume that oil and gas production will decrease in Western Siberia and increase in the European North. According to this strategy, the Northern Economic Region (as well as Eastern Siberia and the Far East) will become a net exporter of gas (IEA 2002a, 57). The Northern Region, in regard to oil, is already a net exporter, and there are plans to increase oil production in the area. Growth is anticipated in Asia as well. For this reason, it is planned to develop oil exports from Eastern Siberia and the Russian Far East. The Northern Economic Region is the largest net exporter of oil and gas after Western Siberia. The Urals and the Volga-Vyatka Economic Regions will change from net exporters to net importers when the oil resources of these areas are depleted. The export volumes of coal production in Western Siberia, and particularly in Eastern Siberia, will grow.

The implementation of the Russian Federation's *Main Provisions* calls for considerable investments in the Northern Region. The aim of the strategy is to increase both continental and offshore oil and gas production (IEA 2002a, 58). This means increased production in the Timan-Pechora Basin and the start of Barents Sea and Yamal gas production. In the north, the aim is to develop electricity generation based on various energy resources and to improve the power grids, as well as to modernise the four nuclear reactors on the Kola Peninsula. The *Main Provisions* support the upkeep of coal and steam production, as well as the respective transport network. This means support for Russia's preferred utilisation of coal. The *Main Provisions'* strategy focuses on the energy needs of industrial enterprises and the development of proper conditions for their operations in the future. Gas supply networks will be developed in the Republic of Karelia, in Arkhangelsk and Murmansk Oblasts, as well as in the Republic of Komi; this refers to the Petrozavodsk-Murmansk gas pipe construction.

In the North-Western Economic Region, the *Main Provisions* recommend the modernisation of electricity-generating and heat generation plants and logistical investments. In line with the *Main Provisions*, it is planned to develop electricity generation by renovating conventional thermal and nuclear power plants, as well as constructing new units (IEA 2002a, 58). The four reactors of Sosnovyy Bor are to be replaced with new reactors. Heat generation with gas will be particularly developed in St. Petersburg. The energy dependence of Kaliningrad Oblast will be decreased by the versatile development of heat generation, as well as the development of local energy production. Thus Lukoil's efforts to open the small Kravtsovskoye offshore oilfield near the border with Lithuania is in accordance with this energy strategy (Lukoil 2001b; Kaliningrad Regional Administration 2003; Baltenergy 2002)). The construction of a new oil harbour on the Baltic Sea is also mentioned in the *Main Provisions*, and was

realised with the completion of the Primorsk facilities.

If all the *Main Provisions'* steps are realised in the Northern and North-Western Economic Regions, there will be a versatile energy system that will promote the welfare and competitiveness of the country's regions. With the development of the energy system, the forest and mining industries of the Northern Region, as well as the competitive advantages of the heavy industry in this area, will be improved, and a more stable energy supply will be ensured. In this way, it is possible to slow down the depopulation of the Northern Region. The efficiency of electricity and heat generation is of great importance for St. Petersburg. Logistic investments assist in obtaining export income, which will have considerable multiplier effects on the Russian economy. The renovation of nuclear power plants reduces risks connected with nuclear energy.

According to the *Main Provisions*, the share of the Northern and North-Western Economic Regions and Kaliningrad Oblast in the total energy production of the European part of Russia accounted for 18.7% in 2000, and it is expected to increase to 19.7% by 2020 (IEA 2002a, 57). This will happen mainly because of the utilisation of new oil and gas fields. Regional demand also gives a boost to the growth of energy production: Russia's industry is built on the sizable utilisation of natural resources that will continue to require large energy inputs. Energy consumption can be controlled with the assistance of modern technologies, to which the *Main Provisions'* strategy strives. The use of environmentally-friendly energy resources can be increased with the assistance of technological solutions. Modernisation requires investment activities in order to rejuvenate energy production based on obsolete equipment. The development trends of Russian energy consumption are highly dependent on energy efficiency, i.e. technical-economic solutions, and the working order of the production plants and the consumer sector utilising the energy.

Besides oil and gas, Finland imports electricity from Russia. For Russia, Finland is the largest electricity purchaser. In 1990–2000, Finland's net imports of electricity annually accounted for 5–17% of the country's total electricity supply (KTM 2001, 27), and almost all of these imports came from Russia. At its lowest level, annual imports were equal to one-fifth of total Finnish nuclear power's electricity generation, while at its highest level, imports were equal to 59%. At the turn of the millennium, the Russian electricity company RAO UES increased the capacity of the St. Petersburg–Vyborg trunk line (IEA 2002a, 215). The electricity company has made contracts concerning electricity exports to Poland, Germany and Austria. Projects in electric power grid construction are being planned in the northern parts of Europe, and they will pave the way for Russian electricity exports to the European market. For instance, the Kola nuclear power plant would like to sell its excess electricity abroad and to St. Petersburg. The question, however, is whether Russians are able to modernise their old power plants and set up transmission systems. Moreover, North-West Russia's electricity generation is needed to satisfy local demand. North-West Russia's multifaceted industry, infrastructure and households need much electricity in high-latitude conditions, but geographical changes in demand are anticipated.

The aims of Russia's energy plans are to increase and ensure energy supply and the systems of transport. The logistic importance of Fennoscandia is becoming more significant than it has been. The construction of the gas pipeline network opens new potential and expands gas supply in the Baltic Sea Region. Various investments as well as R&D and technological improvements are necessary to realise the steps of the *Main Provisions*. New technology is needed for the increase of energy efficiency as well as for environmental safety. Russian energy measures rest on national interests. For example, in logistic arrangements, Russia is striving to keep all benefits and control over exports inside the country. Partly because of this, the *Main Provisions* support the increased activities via the Baltic Sea.

The goals of the *Main Provisions* support the growth of the Russian economy and the improvement of its economic performance. The Russian economic structures are expected to change significantly with the growth of services, private consumption and transport. Russians strive to create a more efficient and sustainable economic system out of an economy using energy wastefully. Such intentions narrow the gap of the economies of Russia and the EU-Europe. North-West Russia, aided by its geography and European legacy, contributes in no small measure to Russia's transformation and economic evolution.

Conclusions: geo-economic restructuring and future visions

Geographical shifts of energy production and the new regional growth pattern

Eronen (1996, 44) has estimated that 40% of Russian purchasing power is within the radius of 1000 km from the southern corner of the Finnish-Russian border. The majority of people live on the western edge of this large country, but its energy resources are located across eleven time zones. During recent decades there has been a considerable geographical shift in the extraction of energy resources. Oil, gas and coal are extracted increasingly from Siberian sources and this trend continues in addition to the opening up and utilising the resources of the Arctic. The second shift is the decreasing significance of energy production and networks, which included the southern areas that were part of the Soviet Union. All the restructuring of production and networks demands considerable infrastructure (Table 6).

The outcome of the shifts and anticipated energy production changes is that the geographical focus of Russia's energy-driven geopolitics is returning to the north and high-latitude zones in general. Due to locational factors the main market of Russian energy is in Europe. Nevertheless, the improving infrastructure enhances Russia's opportunities to sell oil worldwide. The Asian market for Russian hydrocarbon resources is developing but the capacity to deliver energy to these markets is still rather small and will continue to be for some time to come.

Market forces increasingly determine trade and business connections with remote districts inside the country. Production closures and the investments of the energy sector have strengthened this market-led geographical restructuring. Some structures have reversed; for example oil and gas pipelines, which ensured economic co-operation between small CMEA countries and the Soviet Union, nowadays have become export channels that earn revenues from the market. Nevertheless, this Central European gateway is losing it significance as Russia constructs new ports and pipelines in the northern parts of the country. The reorganisation of transport does not decrease the significance of European actors as trade partners, but Russia is merely less dependent on old export routes to the European and world markets. Both human-made and physical contingencies, manifested in production systems and transport practices, change slowly.

Table 6. Geographical shifts of Russian energy production. Main production areas and the targets of logistical investments.

Source of primary energy (and logistics)	Soviet Union since the Second World War	Russia at the turn of the millennium	Russia during the early decades of the 21st century
Coal	Donets Basin, southern areas of the FSU	Kuznetsk Basin, Kansk-Achinsk, Eastern Siberia, Far East, some European areas (Pechora, Moscow, Donets Basin)	Kuznetsk Basin, Kansk-Achinsk, Eastern Siberia, Far East
Oil	Caucasus, Volga-Urals	West Siberian Plain	West Siberian Plain, Sakhalin, Timan-Pechora
Gas	Caucasus, southern areas of the FSU, Volga-Urals	West Siberian Plain	West Siberian Plain, Sakhalin, Barents Sea, Lena-Tunguska, Yamal Peninsula
Nuclear	European parts, some pilot plants on the Asian side	European Russia	European Russia
Logistics	Construction of internal pipeline network, Bratstvo and Druzhba, Black Sea ports	Baltic Pipeline System and Northern Gateway: pipes and ports, Black Sea ports, Caspian Pipeline Consortium, ports and pipes in Russian Far East	North Transgas, Baltic Sea pipelines and ports, Barents Sea and Yamal pipelines and ports, pipeline from Eastern Siberia to China, pipes and ports in the Far East, Arctic Ocean transport systems

Impacts of new borders

Russia's energy strategy supports the country's economic orientation to the advanced economies and global economy but, on the other hand, it attempts to develop production and logistics for the needs of the domestic market. Due to the changing geopolitical conditions (such as new borders), the resource-rich northern areas of Russia's Asian and European territories are of great importance for the Russian Federation. These high-latitude regions and their localities have greatly differing future prospects (Heleniak 1999), and they are mostly explained by the potential of the energy sector's regional development and logistical position both in Europe and Siberia.

Russia has lost its control in the southern former Soviet states. Clearly, there are cultural grounds to assume that this divide is fundamental and persistent (e.g. Huntington 1993). Having achieved independence, the former Soviet republics created their own profiles both in the economy and foreign policy. For example, nowadays the USA and China are, more than earlier, visible in the oil and gas market of the southern independent republics (Martelius 1999, 157–163). The USA has supported the Cheyhan (Turkey) oil pipeline project, which is being developed by, amongst others, the independent republics. The northern Caucasus is not a peaceful area, which creates difficulties for economic development and energy production.

The geography of Russia is different compared to the geographical domain and power of the Soviet Union and its sphere of influence. The core of the Russian economy is formed around Moscow and St. Petersburg as well as around the rich oil and gas areas (Sutherland et al. 2000). The nucleus of growth of the Russian economy is in the industrial urban agglomerations, in which the population has concentrated already since the beginning of the Soviet period. The industries of these agglomerations act to meet the needs of their domestic markets or strive to enter the global market. Industrial investments, political steps and restructuring programmes support, in the main, the existing geo-economic structures (i.e. production, communities and logistics).

In the regions of Eastern Siberia and the Russian Far East, the energy strategy is developed towards the markets of China and Japan, because those economies demand energy from the easternmost regions of Russia. This economic coupling in Asia is not likely to lead to the disintegration of the Federation or to other conflicts, but the economic development of the regions will be uneven.

Stakeholders and mutual interests

Under the influence of enterprises, policy makers (from the new shrunken Russian territory) and inherited structures, Russia's orientation towards Europe is in the current interests of stakeholders. Europe is now relatively more important to Russia than earlier when the country included large southern republics located in Asia and had thus stronger Eurasian cultural attributes. One of the latest signs of this Europe-oriented policy was the proposal of the Common European Economic Space (CEES), which would comprise both the EU and Russia. This was adopted at the EU-Russia Summit in May 2001 and has been developed further in the Co-operation Council between the European Union and Russia. It also was highlighted in the 300th Anniversary of the Foundation of St. Petersburg in 2003 (e.g. Prodi 2003), which indicates its importance.

The geographical characteristics of the world energy market and the development of the energy transport system promote the integration of Russia with Europe. Economic development is binding Russia and Europe together through economic reasons: the economic connection between Russia and the advanced industrial countries is profitable for both sides because their production systems are complementary to each other. The viability of the Russian energy cluster brings benefits both to the EU and to Russia, and the stability of Russian energy production benefits also the US economy. The formation of such mutual interests causes new security configurations in the foreign policies of these countries. This is seen, for example, in the relations between Russia and NATO and in Russia's attempts to abolish the visa requirements between Russia and the EU.

Instead of being trusted companions in business co-operation, the former empire's regions bordering on Russia in the west – Belarus and particularly Ukraine – have become problematic due to transit and transport payment conflicts. Consequently, the focus of logistic visions has geographically moved farther north. Russian companies are developing the existing northern pipelines and ports as well as planning the construction of new oil and gas pipelines through Fennoscandia. On

the other hand, these northern infrastructure plans are also a geographical manifestation in the way that new oil and gas deposits lie in northern high-latitude zones. Logistic investments near the border regions of Finland are supported by the fact that the shortest way for gas (and partly oil) transport to Central Europe is through the Baltic Sea area.

Logistic advantages

Russia's continuing efforts to avoid the ports of other countries means that logistic decisions for energy production will not significantly change when the countries of East Central Europe become members of the EU in 2004. In regards to exports to Western Europe, however, changes may take place. As the new members enter the EU, direct land access from Russia to the heart of Europe will become available through the Baltic States and Poland, but the shortest routes from the Barents Sea to Western Europe will continue to run through the Baltic Sea Region. Moreover, Finland's logistic location is favourable also from the point of view of the gas and oil projects in the Timan-Pechora and Yamal Peninsula. In any event, Finland can take part in the construction projects of the energy industry and its infrastructure.

The energy infrastructure of Russia has been created in a way that it serves energy transport to the West. Industrial investments are required for upgrading Russia's energy system. The potential growth of primary energy production is limited in Europe, and for this reason energy exports, and gas exports in particular, to Europe are anticipated to increase (IEA 2000, 146–148). Russia will be able to supply large volumes of gas if the planned investments are realised. Russian activities in the oil market create common European energy markets, thus decreasing energy dependence on Persian Gulf countries' and African oil[12]. The EU countries also purchase Russian electricity, and for this reason electric power lines to the EU are being developed. In Europe, electric power grids are utilised for distributing electricity from one state to another on a co-operative and transfer-contract basis. Russia is attempting to join this integrating electricity market.

The network of actors and geopolitics

Co-operation with European actors makes sense for Russia. Russian companies can export energy to places where it is relatively easy to transport. This direction is also positive from the political perspective, because through energy sales Russia can be seen as an important trade partner in Europe. This also increases the political importance of Russia in Europe. Close co-operation between Russia and the European Union in the energy field will bring the former East Central European countries and the Baltic States, when they take EU membership, back into the energy system from which they wanted to be separated when the Soviet Union collapsed. However, conditions for this integration have changed. For example, gas directives create totally different markets, in comparison with the command economy period, for these former Soviet energy purchasers.

During the past few years, energy companies have played a central role in the Russian economy as sources of hard currency. These revenues can be increasingly spent on purchasing production technologies from the West and on investments in other economic sectors. If this mechanism works, the potential of economic development in the country is highly dependent on the success of its energy production.

The energy sector with its multiplier effects will continue to be an important economic cluster. The investment behaviour at the beginning of the twenty-first century indicates that the energy sector's revenues are invested in the maintenance and modernisation of its energy infrastructure. Restructuring processes in the Russian economy also have an effect on refining and petrochemical production. New production capacities are to be created and the old – renovated or closed down. Moreover, Russia's attempts to increase coal and nuclear energy consumption, partly as part of the Russian trade policy, are very ambitious.

The adaptation to new market and institutional conditions inevitably means the emergence of new geopolitics. Otherwise, trade relations suffer. The new post-socialist reality differs very much from the past, but still debated doctrine, which emphasised the role of superpower, non-Western Eurasian cultural identity and unique anti-capitalist institutions. That time is over for the time being. In a globalised and capitalist world, geopolitics means a constant competition between alternatives in the search for the most useful external relations. Energy is part of this network of actors and relations. For Russia, this game means integration with partners (companies, nations and

economic areas) that are able to co-operate successfully in the economic sector and to maintain unproblematic socio-cultural relations. The new Russian geopolitics and the Russian initiatives of integration and co-operation are understandable in this context.

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NOTES

[1] Energy consumption consists of energy used in primary production, in manufacturing, services (e.g. transport) and households. Energy consumption is usually estimated by Total Primary Energy Supply (TPES), which is made up of indigenous production + imports – exports – international marine bunkers " stock changes (IEA 2003a, 62). The concept commercial energy use is defined in the same way (World Bank 2000, 323).

[2] One oil tonne equivalent (toe) is equal to the heat energy of one tonne of crude oil. For example, the heat energy of a coal tonne in Russia is 0.545 toe (IEA 2003a, 59). The conversion factor varies by country and the quality of coal.

[3] CMEA and Comecon are abbreviations for the Council for Mutual Economic Assistance. Its Russian name, Sovet Ekonomicheskoi Vzaimopomoshchi, is abbreviated to SEV. It was founded in 1949 as the socialist countries' economic union. Finland had a co-operation contract with this union from 1973 until June 1991 when the union was dissolved.

[4] Brown coal (lignite) is a type of coal formed out of the relatively young layers of peat. Carbon content is low (50–75%). Anthracite is the best, in respect to heat value, type of coal formed of the oldest layers. Its carbon content is 87–98%.

[5] The Khanty-Mansi Autonomous Okrug was formerly known as the Ostyak-Vogul National Okrug, after the Russian name for these two indigenous peoples. They speak Ob-Ugrian languages from the Finno-Ugrian family of languages. Together they numbered some 30,000, but their proportion of the Okrug's population has decreased, being nowadays only two per cent.

[6] Geological sediment formations comprise of petrified or otherwise compressed soil that contains oil and gas between the layers. The age of the Timan-Pechora's sediment formations belonging to the Palaeozoic and Mesozoic eras is 65–570 million years.

[7] The four oldest reactors have been put out of production (lifetime in brackets): Novovoronezh 1 (1964–88) and 2 (1970–90), as well as Beloyarsk 1 (1964–83) and 2 (1967–90) (IAEA 2003b). These reactors were built in the 1950s and 1960s.

[8] The information on reactors is updated by the IAEA (IAEA 2002b), Ministry for Atomic Energy of the Russian Federation (Minatom 2002), and Institute for Physics and Power Engineering (IPPE 2002).

[9] Nuclear power plants under construction in 2003: 8 units in India, 4 in China, 4 in Ukraine, 3 in Japan, 3 in Russia, 2 in South Korea, 2 in the Slovak Republic, 2 in Iran, 2 in Taiwan, 1 in Argentina, 1 in North Korea and 1 in Romania (IAEA 2003c). The total power of the 33 NPPs under construction is 27,112 MW in 2003.

[10] The original units of data, the coal tonne equivalent (Mtce) used by Russians, have been converted into toe, tonnes of oil equivalent. Energy consumption is measured by Total Primary Energy Supply (TPES) in the IEA's calculations.

[11] 1000 MW VVER reactors are planned to replace the reactors of the Kola NPP and the Leningrad NPP (VTT Energy 1999, 254).

[12] Oil is imported into Europe from CIS countries (29%, 1999), Saudi Arabia (14%), Libya (13%), Iran (10%), Iraq (9%), Algeria (6%), Nigeria (5%) and Kuwait (2%) (IEA 2000, 145). Russia is the leading gas importer into Europe (65%, 1999), followed by Algeria (32%) (IEA 2000, 148). Europe is defined here as OECD-Europe with 22 countries.

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