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The dependency of EU on crude oil, case study of Russian oil.

Závislost EU na ropě, případová studie Ruské ropy.

Bachelor Thesis

The Bachelor Thesis Supervisor: Ing. Mansoor Maitah, Ph.D.

Declaration

I hereby declare that I have worked on my Bachelor Thesis titled "The dependency of EU on crude oil, case study of Russian oil" solely and completely on my own and that I have marked all quotations in the text. The literature and other material I have used are mentioned in the Bibliography Section of the Thesis.

Prague, 2009

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Signature of the student

Acknowledgement

I would like to thank especially to my supervisor Ing. Mansoor Maitah, Ph.D. for his very valuable advices, comments and the time which he devoted to me and I am greatly indebted to him.

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Content

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Summary

As the title suggests the Bachelor Thesis deals with fact that the dependency of European Union on oil and natural gas supplies increases.

Firstly, the future energy demand of EU will be largely satisfied by imports from the Russian Federation and the states of FSU. Despite this fact, the vulnerability of each Member states varies significantly because every state has different resources of fossil fuels and has different means of energy production. Therefore, the attitude of the countries towards the Common energy policy of EU is still not unified.

Secondly, the presence of "Russian threat" caused by closing taps in recent gas crisis does not change the truth that EU and Russia are mutually interdependent.

Last but not least, the Bachelor Thesis aims at describing the fact that the ability of Russia as an energy supplier for Europe in future is influenced mainly by sustaining or even increasing the levels of gas and oil production rather than political decisions.

Keywords

Dependence, Natural Gas, Oil, Russian Federation, Energy Security, Threat, Sustainability of Production.

Resumé

Jak již vyplívá z názvu, bakalářská práce se zabývá skutečností, že závislost Evropské Unie na dodávkách ropy a zemního plynu vzrůstá.

Zaprvé, budoucí poptávka po energii v EU bude z velké části uspokojena dovozem z Ruska a států bývalého Sovětského Bloku. Navzdory tomuto faktu, zranitelnost jednotlivých států v EU se výrazně liší, protože každý stát má jiné zásoby fosilních paliv a získává energii jiným způsobem. Proto se postup jednotlivých států vůči společné energetické politice v EU liší a není jednotný.

Zadruhé, přítomnost "Ruské hrozby" způsobená nedávno uzavřenými kohoutky v plynové krizi nic nemění na skutečnosti, že jsou EU a Rusko na sobě vzájemně závislé.
V neposlední řadě, bakalářská práce se snaží popsat fakt že, schopnost Ruska jakožto exportéra energie do EU v budoucnosti bude z velké části záležet na schopnosti udržet nebo zvětšit současnou produkci ropy a zemního plynu namísto politických rozhodnutí.

Klíčová slova

Závislost, Zemní Plyn, Ropa, Rusko, Energetická Bezpečnost, Hrozba, Udržitelnost Produkce.

1. Introduction

The dependency of European Union on oil and natural gas supplies is very high and will be even higher in the future. It is caused also by the fact that the energy consumption is expected to grow in the Europe due to the economic and population growth. According to the estimates, Europe will probably have to import a projected 71% of its energy by 2030, as opposed to 50% now [Geden, 2006].The dependence is especially high for crude oil 82% and 58% for natural gas, respectively [Energy, transport and environmental indicators, 2007].

From these figures we can see that the growing energy demand in EU is largely satisfied by external suppliers, especially Russia and OPEC. Moreover, it supported by the fact that in EU is not any internal sources covering growing demand.

Despite the fact, that the energy imports from Russia are increasing and many people perceive this as a threat (mainly because of quite recent gas disputes with Ukraine and Belarus), I would like to demonstrate the situation more optimistically and show that Russia is as a matter of fact a reliable supplier.

In the Bachelor Thesis, I stress the importance of mutual interdependence between Russia and EU and depict the reasons which form this so called relationship.

I do not think that the main threats posed by the dependency on Russia energy supplies is the uncertainty about the future development of political and economic reforms in Russia and the possibility that Russia would use its vast resources for blackmailing Europe. I would rather incline to statement that the biggest threat is the inability of the Russian Federation to sustain or increase current levels of production and that Russia will not be able to satisfy the growing Europe's energy demand.

The aim of the first chapter is to outline the energy situation in the member states. It is important to mention that the energy situation is affected by the allocation of resources among the states and it reflects the state's overall dependency on energy imports as well.

The second chapter stresses the risks represented by the gas and oil insufficiency of the European states and how it threatens the energy security. Furthermore, it this chapter are

the reasons which led to the evolution of Common energy policy for Europe and what includes the action plan aimed at decreasing external vulnerability.

The following, third chapter is extremely important. I pay attention to the threats posed by the dependency on Russia and present several views on the situation. I would like to come to the conclusion that the real threat lies somewhere else and that we don't have to be so much afraid about current and future situation. Furthermore, I present the information why is Europe a key energy market for Russia and vice versa.

The fourth chapter includes an overview of existing and major proposed pipeline links between Russia and European Union.

The aim of the fifth chapter is to find out the sustainability of the Russian Federation as an energy supplier. I focus on investments and exploration which largely influence the production. This chapter is very important because as I said before, I think that the sustainability of production will be the key factor affecting the supplies of oil and natural gas from Russia in the long term time period.

The final chapter presents the possible actions that can strengthen the energy security of Member states and lower the threat arising from a dependency on fossil fuels imports from abroad.

2. Objectives of thesis and Methodology

In the Bachelor Thesis I would like to pay attention to the three important objectives.
Firstly, I want to stress the importance of the evolution of an energy policy. This policy has evolved extremely fast mainly during the last decade due to the increasing vulnerability of EU's member states on oil and natural gas supplies. I want to show the reasons which stand behind this evolution and furthermore, that the attitudes of each member states vary according to their dependency on energy imports.

Secondly, I would like to mention the potential threats posed by dependency on Russia. These threats cannot be ignored but on the other hand, there is a mutual interdependence between Russia and EU as well. I want to further describe this interdependence because I think this so called relationship between Russia and European Union is very important for understanding the real threat. The sustainability of Russian oil and natural gas production.

Thirdly, the ability of Russia to produce enough oil and gas is crucial for the member states which are dependent on supplies from this country. My last objective of the Bachelor Thesis which I want to fulfil is the description of the Russia's production ability and show the potential for the long term time period.

For the Bachelor Thesis, I looked up and sorted out information mainly from the experts in their field in order to analyze them a use them in the best possible manner. I wanted to support my ideas and give them higher credibility by using this very valuable information from these authors. My Thesis aims at bringing this information in most understandable and coherent way and gives the readers the opportunity to further develop their knowledge of the thesis topic.
The bookmaking helped me to successfully fulfil the objectives which I have determined at the beginning.

3. The increasing predominance of imports in EU energy supply

3.1 EU's vulnerability

The main topic of this part is vulnerability of European Union with respect to crude oil and natural gas. According to R. Willenborg [2004, p.7], there are two types of vulnerability:

> "***1) Physical supply vulnerability*** refers to the risk of a physical interruption of oil supply and;
>
> ***2) Economic vulnerability*** is the risk of high oil prices and their corresponding influence on Europe's economy. "

A common approach used to reduce or prevent vulnerability of a state is to diversify the suppliers of key natural resources. The main aim of this approach is that one supplier interruption will not have a tremendous impact on a state. Interrupted oil or gas supply can be managed in following ways. Emergency response potential compromises four main elements: stockdraw, demand restraint, spare production capacity and fuel-switching capacity.

The following text will have closer look on supply vulnerability of Europe.

The period from 1960s to first oil crisis was one of rapid economic growth and increasing demand of crude oil. Many European countries produced little primary energy. They became heavily dependant on oil imports from mostly OPEC countries and the Middle East [Oil Supply Security, 2000].

European and world vulnerability was illustrated during the 1970s by two international oil crises. The structure of the international oil market changed significantly during the 1970s. For many years, international oil companies, the so-called majors or Seven Sisters[1], had dominated the international oil market. Nationalisation procedures in producing countries, the relative growth of national Arab oil companies and independent Western oil companies changed the position of the majors. Moreover, OPEC became important with its cartel members that rose from five (at the beginning of OPEC) to thirteen in 1973. The main objectives of OPEC cartel

[1] The Seven Sisters were made up of Exxon (previously known as Standard Oil of New Yearsey, or Esso); Mobil (Standard Oil of New York, which merged with Vacuum Oil); Chevron (Socal, or Standard Oil of California); the Mellon's Gulf Oil; Shell; Texaco; and British Petroleum (AngoÏrania). Those controlled 90% of crude oil exports to world markets by controlling every pipeline in the world.

were increasing income from oil exports of its member countries, increasing the oil prices because they had barely risen during preceding years and bigger participation in the exploration of oil and gas resources on their territory. These attempts carried out by OPEC members led to a series of price increases in the early 1970s. It became clear that oil countries wanted to have bigger participation in producing oil and gas, establish the prices and the volume of resources [Willenborg, 2004].

These demands and political tensions between OAPEC[2] and the rest of the world led in **1973** to a **first oil crisis**. Crisis begun on October 15, 1973, when the members of OAPEC, consisting of the Arab members of OPEC plus Egypt and Syria, announced an oil embargo in response to the U.S. decision to re-supply the Israeli military during the Yom Kippur war. OAPEC declared it would no longer ship oil to the United States and other countries if they supported Israel in the conflict. Independently, OPEC members agreed to use their advantage over the world price-setting mechanism for oil in order to stabilize their real incomes by raising world oil prices [Wikipedia, 2008].

Figure 1 shows us that first oil crisis caused doubling oil prices over night. Almost the same effect has a second oil crisis.

The second international crisis began in 1979, caused by oil market panic in response to a decrease in Iranian output (caused by oil worker's strike, which led to the Iranian Revolution).

These two crises had an important influence on Europe, especially on politic and economic life. Consequently, Europe changed its position on importing oil and tried to find new solutions how to decrease its vulnerability on OPEC countries.

Willenborg [2004, p.11] wrote: "The EU Member States' governments created incentives for companies to explore and produce oil in politically safe countries. North Sea oil production came on-stream and production in other non-OPEC countries increased substantially. In 1978, OPEC's share was 85% or 482 million tons. By 2001, OPEC's share in crude imports had decreased to 210 million tons, representing just 44% of net imports."

Between mid-1970s and mid-1980s there was a drop in oil prices.

[2] The Organization of Arab Petroleum Exporting Countries. During 1970s, OAPEC had threatened many times to cut oil supplies to countries, which supported Israel.

The mid-1980s brought the end of falling oil imports. Since then, low oil prices and steady economic growth has raised oil imports. A bulk of additional imports continues to come from Middle East [Oil Supply Security, 2000].

3.2 Energy situation in the Member States

Energy consumption is expected to grow in Europe, driven mainly by economic and population growth. Energy demand growth is caused by changing life styles, such as increasing number of cars, home appliances and increasing number of households [Hoogeveen, 2005]. The prices of energy are increasing and there is a high possibility that they remain high in the future.

Nowadays, the EU is the largest energy importer in the world, and its dependence on imported resources as crude oil and natural gas is growing. According to the estimates, the total energy consumption in the EU is expected to increase by 25% over a 30-year period and if no actions are taken, Europe will probably have to import a projected 71% of its energy by 2030, as opposed to 50% now [Geden, 2006].

"Currently, approximately 50% of the EU energy is imported. The EU is highly dependent on oil (82%) and natural gas (58%) and the forecasts show the same trend for the next decades. Furthermore, there is an accelerating decline in the resources of fossil fuels, which are concentrated in few producing countries.

In the last decade (1995-2005) total energy dependency rate of the 27 EU Member States increased by 9 percentage points. Eleven countries were in 2005 less dependent than in 1995, and other eleven countries increased their dependency by 0,4% to 9,6%. Hungary, Poland, Netherlands and Ireland experienced bigger increase of energy dependency by 14%-20%. As for the United Kingdom (which had in 1995 energy dependency rate of -16%), the situation was almost reversed in 2005.

Among the EU-27, only Denmark had in 2005 a negative energy dependency of -51,6% while sixteen countries had higher energy dependency ratio than the EU-27 average. Norway, a very significant oil and gas supplier to Europe had six times more energy exports than their own consumption.

From **Figure 2**, we can see how EU-27 is highly dependant on imported oil. In 1995 74,4% comparing to 82,2% in 2005. At EU-27 level, primary production of crude oil

decreased by 23% (39 Mtoe[3]), while the imports increased by 12% over the period under consideration. All member states except for Romania, Estonia, Hungary, Slovakia and two exporting countries, Denmark and United Kingdom, have an oil dependency greater than 90%.

The situation with natural gas in **Figure 3** is similar, but not so bad. While the primary production of EU-27 natural gas remained stable, the Gross Inland Consumption increased by one third compared to 1995. This increase is compensated by the 77% increase of imports. The top 3 import countries (Germany, Italy and France) increased their imports by 53% compared with 1995. In addition, Spanish market with 8,3 Mtoe net natural gas imports in 1995 grew intensely by 15% average annual rate to 34 Mtoe holding a 12% share of EU total imports in 2005. The Netherlands and Denmark are the only EU-27 natural gas exporting countries, with energy dependency ratio of 59% and 114% respectively. The net exports of these countries amounted to 29 Mtoe, 23 for the Netherlands and 6 for Denmark. Apart from the two net exporters mentioned above, the UK, Romania and Poland, the remaining Member States have an energy dependency rate for natural gas bigger than 80% [Energy, transport and environmental indicators, 2007, p. 21-27]. "

3.2.1 Resources found in European Union: oil, gas, coal, uranium

Oil

The EEA[4] is currently an important oil producer ranking fourth in terms of global production, even though oil production has been declining since 2000 from 6.8 Mbl[5] per day in 2000 to approximately 5 Mbl per day in 2007. However, these reserves are limited and represent a small portion of the world reserves.

According to British Petroleum, at the end of 2007 the proven reserves of EU were 6,8 thousand million barrels [BP Statistical Review of World Energy, 2008].

These reserves are mainly located in the North Sea area (Norway, United Kingdom and Denmark) and in South-East Europe (Romania). These reserves are approximately 0,5%

[3] Million tons of oil equivalent

[4] European Economic Area (EEA) consists of 27 European Union member states and three of four states of European Free Trade Association (EFTA)-Iceland, Liechtenstein and Norway. EEA allows EFTA countries to participate in the European single market without joining the EU [Wikipedia, 2009].

[5] Million barrels

of total proven reserves. Data for EEA also shows a declining trend, with reserves falling more and more. These EEA proved reserves represent 1.2% (BP) of world reserves. At current rates, the EEA proved reserves secure 8.3 (derived from BP figures) years of domestic production.

Resources are more limited for EU than for EEA. The problem is that these resources are concentrated in smaller quantities and the conditions are not favourable as well. Therefore, it will depend on these factors: usage of technology, efficiency of the process.

Unconventional oil also offers additional potential. For the EU-25, according to BGR, it could represent more than 25% of the conventional reserves and more than 60% of the conventional resources. [Second Strategic Energy Review, 2008].

Gas

The situation of the natural gas is similar to crude oil situation in EU, even if it looks better. The proven reserves of natural gas at the end of 2007 were 2,84 trillion cubic meters, representing 1,6% of total reserves [BP Statistical Review of World Energy, 2008].

Gas reserves are mainly located in Norway, the Netherlands, the United Kingdom and Romania. At current production rates, the EU proved reserves secure between 14.8 (BP) years of domestic production.

These conventional natural gas resources could be augmented by unconventional resources. This potential will however be more difficult to exploit, in view of enhanced recovery techniques needed and the increasing share of sour gas to be encountered, posing safety issues [Second Strategic Energy Review, 2008].

Coal

About 80% of Europe's fossil fuels reserves are solid fuel (including coal and lignite).

A situation with reserves of coal is slightly better than with oil and gas, but still are lower comparing with world reserves.

Proved reserves at the end of 2007 were 29570 million tonnes, 3,5% of total world reserves and 50 years of today production. Anthracite and bituminous coal represented

8427 million tonnes and sub-bituminous and lignite represented 21143 million of tones [BP Statistical Review of World Energy, 2008].

Proved reserves for hard coal are mainly concentrated in Poland, with significant reserves in Czech Republic and to a more limited extent in Spain, Hungary, UK and Germany. For lignite, reserves are present in a group of countries extending from Germany to Greece.

Uranium

Identified resources of uranium (<USD 130/kgU) in the EU are very modest and unevenly distributed as all previously mentioned resources. As reported by OECD[6] and IAEA[7], they amount to approximately 105 500 tonnes U and represent 1.9% of world-identified resources as of 1 January 2007.

Denmark holds the biggest identified resources with 32 300 tonnes U while France, Spain and Sweden have identified resources above 10 000 tonnes U [Uranium 2007: Resources, Production and Demand, 2008].

3.3 Territorial structure of crude oil and natural gas imports into the EU

The reserves of crude oil and natural gas are unequally distributed over globe. The bulk of oil reserves are especially in countries around Persian Gulf: Saudi Arabia, the United Arab Emirates, Kuwait, Iran and Iraq. Considering production and reserves of these countries and we do not have to forget Russia it is likely that the increasing demand will be satisfied by the imports from them.

According to BP Statistical Review of World Energy 2008, at the end 2007, European Union proven global reserves of crude oil were 0,5%, representing 6,8 thousand million barrels. Comparing these statistical data with the end of 1987, there is a decrease of 2 thousand million barrels. On the other hand, European Union production of crude oil in 2007 was only 2394 thousand barrels daily, representing 2,9 per cent of total production.

At the end 2007, European Union proven reserves of natural gas were 2,84 trillion cubic meters, representing 1,6% of total world reserves. Production of EU was 191,9 billion

[6] Organisation for Economic Co-operation and Development
[7] International Atomic Energy Agency

cubic meters of 2940,0 total world production [BP Statistical Review of the World Energy, 2008].

In 2006, 27 member states of European Union had net imports of energy 1 010 million tones. Energy imports in 2006 were dominated by oil and gas, accounting for around 60% and 26% respectively of the EU27's net imports.[8] The most important European Union suppliers were Russia (33% of oil imports and 40% of gas imports in 2006) and Norway (16% and 23% respectively) [Eurostat News Releases, 2008].

A problem is that the extraction of oil and gas from the North Sea has already reached its peak, so we cannot expect bigger supply from this region. Because of this fact, the growing energy demand in EU will have to be satisfied by external suppliers. It supported by the fact that in EU is not any internal sources covering growing demand.

According to the Commission of the European Communities, the European Union energy production satisfies less than half of its needs, with import dependency reaching almost 54% in 2006. Oil comprises the bulk of total EU energy imports (60%) followed by imports of gas (26%) and solid fuels (13%).

The European Union in 2006 imported 608 million tons of oil. Most of the oil imports come from OPEC (38%) and Russia (33%), while Norway and Kazakhstan respectively provide 16% and 5% of oil imports to the European Union. The EU produces less than one fifth of its total oil consumption [Second Strategic Energy Review, 2008].

More than two thirds of the world's gas reserves are found in the region that also dominates in oil reserves: the Middle East, the Caspian region and Russia, among which Russia (27%), Iran (15%) and Qatar (14%) are by far the most important resource holders [Hoogeveen, 2005].

Looking at the EU as a whole, the situation is better in the gas sector, since domestic production (mostly taking place in the Netherlands and the United Kingdom) satisfies about two fifths of consumption needs. Nevertheless, gas is mainly imported from Russia (42%), then Norway (24%), Algeria (18%) and Nigeria (5%).

The overall energy import dependency in EU is high and it will be even worse in the future. However, the dependency significantly varies from state to state. For instance, Denmark is the sole country which is completely energy independent, while for some

[8] Net imports are exports minus imports.

countries, like Poland and the United Kingdom, import dependency ratios are quite low (close to 20%). At the other extreme, Ireland, Italy, Portugal and Spain have import dependency ratios exceeding 80%, while small island countries like Malta and Cyprus (due to their geographical situation) along with Luxembourg are fully dependent on energy imports.

Countries, which are extremely dependant on fossil fuels imports, are Estonia, Latvia, Lithuania, Bulgaria, Slovakia, Ireland, Sweden, Finland, Greece, Hungary, Austria and Poland [Second Strategic Energy Review, 2008].

4. EU's energy security

4.1 Concept of energy security

Energy security is relatively a new term. It was brought to the theory of international relations and security studies by so called Copenhagen school, represented mainly by Barry Buzzan, at the beginning of the 1990s. This school does not recognise just military threats, but also other threats such us political, economic, societal and environmental. Sufficient and stable energy supplies are crucial for economic well-being of every state which is a part of the essential values of the state [Terrif Terry et. al. stated in Kovačovská, 2007].

Nowadays, many definitions of energy security are used. Some examples follow:

- "an adequate supply of energy at reasonable cost" (IEA, *Energy Technology Policy*,1985);
- "security of supply means the ability to ensure that future essential energy needs can be met, both by means of adequate domestic resources worked under economically acceptable conditions or maintained as strategic reserves, and by calling upon accessible and stable external sources supplemented where appropriate, by strategic stocks", European Commission, 1990, (*Security of Supply*, *Energy in Europe* No. 16); the Commission more recently defined energy security as, "…the availability of energy at all times in various forms, in sufficient quantities, and at reasonable and/or affordable prices" and in their study, focus on "the availability of oil and gas in sufficient quantities, and in particular on the risk of oil and gas supply disruptions." (EC, *Study on Energy Supply Security and Geopolitics*, 2004) [stated in Skinner, 2005, p.92]

Although European Union's 27 member states have ceded some part of their national sovereignty to EU institutions in many ways, energy policy still remains in competence of each state. Morelli [2006, p.4] commented it by words: "The European Commission has been able to exercise a significant amount of influence over energy policy through its authority to pursue internal market competition, environment and consumer protection policies. However, the continued practice of individual member states to make energy-related decisions without consulting with or assessing the impact of such

decisions on other member states is viewed by some as making it difficult for the EU to coordinate a set of common goals or practices for the Union as a whole." Especially, decisions regarding oil or gas supply, development or improvement of energy-related infrastructure and the use of particular fuels, is still made by individual member states [Belkin, 2008].

Most European Union member states are heavily dependent on imported energy and are sensitive to events which could increase the price of energy, disrupt the delivery of current or future energy supplies [Morelli, 2006]. Europe interest in energy security is caused by both internal and external factors. Internal factors are: steadily raising energy prices, declining energy supply and a fragmented internal energy market. These factors contributed to a fear that Europe will not be able to satisfy its future demand. External concerns are mainly quickly emerging economies such as China and India and their growing energy demand, instability in energy producing regions, the threats of terrorist strike on energy infrastructure and Russia obvious willingness to use its predominance of oil and gas supply for political needs [Jos Van Gennip, 2006 stated in Belkin, 2008].

Member states are becoming increasingly dependent on imported hydrocarbons. Most of the crude oil and natural gas imports go from OPEC and Russia. Main problems associated with these regions are wars, terrorism and unstable political regimes.

Due to these issues, Europeans have begun to plan more seriously for their energy future and to give energy policy within the EU much higher priority.

4.2 The common energy policy of EU

4.2.1 Evolution of the common energy policy

European concern regarding the security of its energy supply was prompted by two oil shocks in 1973 and 1979. Both these shocks were caused by restrictions in oil supplies as a reaction to international political crisis. Specifically, the embargos highlighted three important issues.

Kovačovská [2007, p.7] commented it by words:" The reaction of the EEC[9] followed in three parallel steps:

> **1.** Diversification of the oil supplies (pipeline from the North Africa to Spain, northern pipeline, interest in the oil from the Caspian Sea);
>
> **2.** Diversification of energy sources (increase in the black and brown coal mining, re-opening of the already mothballed mines, research and development of alternative sources of energy);
>
> **3.** Development of oil and gas exploitation and to it related industries in the EEC countries (Great Britain, the Netherlands, and Denmark)."

One of the responses to the first embargo was creation of International Energy Agency in 1974. IEA is a primary instrument for monitoring and analyzing world energy markets. Another response was diversification of energy supply.

After the embargos, Russia and other Eurasian countries were identified as new potential energy suppliers. The problem of Soviet Union at that time was that its energy sector needed major investment. On the other hand, former Soviet Union was beginning to realize its important role as an energy supplier. A view of future cooperation in the energy field began to play a very important role in European perspectives on developing relations with the Soviet Union [Belkin, 2008].

In 1983, the Council of Ministers entrusted the European Commission to prepare the principles of coordinated energy policy. In 1986, these goals of energy policy were presented: restructuralization, rationalization of consumption, stabilization of gas proportions in the total energy consumption and increase in security of nuclear power plants [Kovačovská, 2007]. Later on, the European Union launched the Energy Charter Declaration in order to promote energy cooperation and diversify Europe's energy suppliers. The declaration was replaced in 1994 by Energy Charter Treaty and established a framework of rules and directives to promote international energy cooperation. Since the beginning of this Treaty, the European Commission has attempted to shape a European energy policy in a variety of ways. The most important

[9] European Economic Community (EEC) was an international organisation founded in 1957 in order to bring about economic integration between Belgium, France, Germany, Italy, Luxembourg and the Netherlands. When the EU was created in 1993, the EEC was transformed into the European Community, one of the EU's three pillars [Wikipedia, 2009].

is pursuing a more cooperative approach to external relations with current and also future energy suppliers [Belkin, 2008].

The break-points that raised attention of European policymakers towards energy security were cuts in deliveries of Russian gas exports to Belarus in 2002 and 2003 and to Ukraine in December 2005 till January 2006. Within hours of the gas shut off to Ukraine, several countries such as Austria, Italy and Germany reported drops of in their own pipeline pressure up to 30 per cent. In December 2006, Russia threatened by closing the gas taps for Belarus in case of not paying market price for Russian gas deliveries.

These crisis raised questions of whether Russia was a reliable energy partner and whether Moscow would use its dominant energy position in pursuit of increasing political power.

According to Morelli [2006, p.8], "The events of the winter of 2005/2006 did not force European leaders to initiate a new effort to rethink European energy policy. What the Ukraine gas crisis did, however, was set into motion a new sense of urgency for action on an EU energy policy." Before the European Fossil Fuels Forum on 19th October 2005, a commissioner A. Piebalgs announced a coming Green Paper addressing those issues. On 22nd December 2005 the Operational Programme of the Council for 2006 was presented including the Commission's Green Paper: **"A European strategy for sustainable, competitive and secure energy"**.

The Green Paper suggested steps towards enhancing security of supply. The real importance of this strategy Kovačovská [2007, p.8] commented by words: "It stresses the risks represented by the gas and oil insufficiency of the European states. It addresses important questions on competitiveness and the internal energy market, diversification of the energy mix, solidarity, sustainable development, innovation and technology and finally, external policy."

The Green paper identifies six areas where actions are important to address the challenges EU face.

1. Competitiveness and the internal energy market
2. Diversification of the energy mix
3. Solidarity
4. Sustainable development

5. Innovation and technology
6. External policy

Beside EU-OPEC and EU-Russia dialogues, the strategy in the Paper suggests using the G8 summit to secure rapid ratification of the Energy Charter Treaty by Russia and conclusion of the negotiations on the Transit Protocol [Green Paper, 2006].

4.2.2 An energy policy for Europe

The point of departure for European energy policy is following: combating climate change, limiting the EU's external vulnerability to imported hydrocarbons and providing secure and affordable energy to consumers [An Energy Policy for Europe, 2007].

The EU policy goals are reflecting the efforts to achieve a low carbon economy and a more sustainable and diverse energy mix. Security of supply should be solved by converting demand to other energy sources and by the reduction of import dependency on only few suppliers. The new policy goals of the EU need to be translated to the member states' national energy policies. It is important because member states are in charge of composition of energy mix and will come with different solutions to comply with the EU goals. Especially for EU, it is important to have energy-policy making, internal EU policy-making and external policy connected [van der Linde, 2008].

The summarized, simplified action plan outlined below will help EU to become low carbon knowledge-based economy and furthermore, improve its security of supply and become more competitive.

1) ***Internal energy market-*** Europe energy challenges are:
    a. Competitiveness
    b. Sustainability
    c. Security of supply: A competitive internal energy market can provide big advantages such as security of supply and high standards of public service. It can result in real incentives for companies to invest in for example: new infrastructure, inter-connection capacity and new generation capacity. It can help avoid price surges.

2) ***Solidarity between member states and security of supply for oil, gas and electricity***

The Internal Energy Market increases the interdependence of Member States in energy supply for both electricity and gas. Even with the targets on energy efficiency and renewable, oil and gas will continue to meet over half the EU's energy needs, with import dependence high in both sectors (over 90 % for oil and some 80% for gas in 2030). Therefore, security of supply of these hydrocarbons will be still essential for EU. European Union has good relationship with traditional gas and oil suppliers from inside the European Economic Area (EEA), in particular Norway and outside represented by Russia and Algeria. Nevertheless, it is always important for EU to promote diversity in suppliers, transport routes and transport methods. In particular for countries that are highly dependent or almost fully reliant on energy imports. Member states have launched new projects to import hydrocarbons from new regions and increase pipeline and energy infrastructure investment [An Energy Policy for Europe, 2007]. European states have singled out Central Asia and the Caspian region and Black Sea areas. A good example is a project in the Central Asia and the Caspian region called Nabucco gas pipeline. This pipeline, when finished, would bring Central Asian and Caspian gas to Europe, without passing through Russia [Belkin, 2008].

3) ***A long-term commitment to greenhouse gases reduction, higher usage of renewable energy.*** EU member states have committed to reduce total EU-wide carbon emission by 20% compared with 1990 levels by 2020. In addition, the EU seeks a 20% increase in Europe-wide energy efficiency by 2020 and that 20% of all EU energy consumption come from renewable resources and 10% of transport fuel from bio fuels by 2020.

4) ***Future usage of nuclear power***

Approximately one third of the electricity and 15% of the energy consumed in the EU is from nuclear power which is one of the largest sources of carbon dioxide free energy in Europe. The main advantages are that nuclear energy is one of the cheapest sources of low energy in the EU and that nuclear power is less vulnerable to fuel price changes than coal or gas-fired generation [An Energy Policy for Europe, 2007].

5. Threats to the EU's energy security posed by dependency on Russia

5.1 Consequences of the monopolization of the Russian energy sector

On of the main threats posed by the dependency on Russia energy supplies is the uncertainty about the future development of political and economic reforms in Russia. Historically, the Russian state remains an extremely important player in the economy. Thus the issue of state ownership and the governance of state-owned companies are of prime importance. Still, this ownership is not without the problem. For instance, the conflict of interest in the case where state plays the role of regulator with its role of owner distorts the competition.

The problem with the state-owned companies is that they are generally less efficient than privately held companies and also that enterprise insiders in large companies are able to borrow huge amount of money for themselves.

The Russian government has expressed an intention to increase the level of competitiveness in sectors such natural gas and crude oil, where state-owned companies play a dominant role. However, there is a little progress in recent years and I dare to say that the situation is even worse than before. The state extended its assets holdings in some key sectors rather than reduce them. Russia wants to intervene more directly to industrial sectors which perceives as strategic, although these sectors are not precisely defined and they seem to change from time to time according to political decisions.

First of all, the monopolization of energy sector causes diminishing investments into the exploitation facilities and the pipeline system. The Russian Ministry of Energy has estimated that 5% of crude oil output is lost through leakages, whereas the Washington-based Centre for Strategic and International Studies places the figure at almost 7%. It means that the amount of Russian oil lost through faulty infrastructure is almost equal to twice the output of Azerbaijan and only slightly bellow current production levels in Kazakhstan [Kovačovská, 2007]. In addition, Russia is facing really high domestic demand for natural gas and Gazprom[10] is obliged to satisfy this demand at prices far below the production costs. It also causes decreasing the possibility of Gazprom to invest in new expensive gas fields. Nowadays, Gazprom relies more and more on the imports of cheap Turkmen gas [Harks, 2006].

[10] Russia's state run gas monopoly

Secondly, the monopolistic situation on Russian energy market enabled the former president Putin to pass the law, which declared the amount of Russian crude oil and natural gas to be the state secret. Especially in today's world it can present a threat because even minor changes in supply of these precious fossil fuels have tremendous impact on price fluctuations. Moreover, some experts expressed their feeling that Russian oil fields are being depleted and that current level of production cannot be sustained over the long run.

Last but not least, the Gazprom's and Transeft's[11] control of transportation routes does not allow the EU to diversify its imports through supplies from other former USSR states and Caspian Region [Kovačovská, 2007].

5.1.1 Gas and monopoly of Russia: Gazprom

According to BP Statistical Review of World Energy 2008, Russia holds the largest natural gas reserves, representing 1576,75 trillion cubic feet, which is almost twice the reserves of the second country Iran. In 2007 Russia was the world's largest gas producer 607,4 billion cubic meters as well as the exporter 147,53 billion cubic meters. According to the official Russian statistics, 85% of production during 2007 was produced by Gazprom. Gazprom is Russia's state-owned monopoly that instead of production also operates the country's natural gas pipeline network. The company's tax payments account for app. 25% of federal tax revenues.

Gazprom's natural gas production forecast is around 1-2 percent per year by 2010. Russia's natural gas production growth reflects its aging fields, state regulation, Gazprom's monopolistic control over the industry, and insufficient export pipelines. Although the company projects increases in its natural gas output between 2008 and 2030, most of Russia's natural gas production growth will come from independent gas companies such as Novatek, Itera, and Northgaz. If Gazprom wants to fulfil its long-term aim of increasing sales to Europe, it will need to boost its production as well as to secure more reliable export routes to the region.

Despite its important role, Gazprom faces domestic regulation. Gazprom must supply the natural gas to the domestic market at government-regulated prices, regardless of

[11] Russia's state-owned pipeline monopoly

profitability. Low prices have impacted the gas sector's ability to finance capital spending and have hurt incentives for greater efficiency. Increasing domestic prices towards parity with market rates in Europe (to avoid two-tiered pricing system[12]) is now a major challenge of the country and will play an important role in avoiding supply shortfalls in the future [Country Analysis Briefs, 2008]. Gazprom's vertically-integrated structure of monopoly maintains tight control over the sector's infrastructure and over information flows within it. Gazprom's control over information is particularly problematic, as it stays unclear what happens in the sector. The two-tier pricing is in fact a subsidy from the gas sector (the state) to the rest of the economy. If one considers that Russia enjoys some market power in the world market of gas it has its interest in price discriminating [Hare, 2004].

5.1.2 Oil and monopoly of Russia: Transneft

According to BP Statistical Review of World Energy 2008, Russia has proven oil reserves of 10,5 thousand million tons, most of them located in Western Siberia, between the Ural Mountains and the Central Siberian Plateau. Russia is major oil producer and sometimes produces more than Saudi Arabia. Over 70% of Russian crude oil production is exported and the rest is refined locally. The export of Russia's crude oil is via pipeline controlled by Transneft, a Russia's state-owned pipeline monopoly.

Russian output significantly increased during 2000s, but negative effects such as high government taxation and a mature field base threaten the future production. Another reason is the lack of investment in field maintenance. Russia's future production growth will largely depend on the availability of viable transport routes for the country's crude oil. The problem is that crude oil exports via pipeline fall under the jurisdiction of Transneft. Only around 4 million bbl/d can be transported in main pipelines of Transneft. The rest must be shipped by rail and river routes which makes them more expensive and especially when the prices of world oil fall. These problems make the company's export capacity constrained in view of producers. Certain steps were undertaken in order to improve situation but is the potential role of private firms and investors is at stake, at expense of Transneft [Country Analysis Briefs, 2008].

[12] Difference between domestic and export prices. Often criticized by European economists.

5.2 Abusing EU's energy dependency for geopolitical goals

The Russia energy presence in European energy market is becoming more pervasive. The growing asymmetry can be specifies as follows: while EU thinks about further liberalization of energy markets and the privatization of energy companies, the Russia government on the other hand, extend its assets holdings in some key or strategic sectors, limits opportunity of foreign investments into its energy sector and uses state powers to back up the commercial interests of state-linked energy companies [Milov, 2008].

Is such an environment a stage for cooperation or confrontation? Due to the problems of oil or gas supply shortages, disputes between Russia and its neighbouring countries from recent past, I think that there are risks which cannot be ignored.

The biggest threat arising from state-controlled monopolies is the possibility that Russia will turn off the taps in order to pursuit its strategic geopolitical goals.

5.2.1 European gas crisis

The main disputes from past were: confrontation about gas with Ukraine in December 2005, resolved in the beginning of 2006, a confrontation on gas and oil with Belarus in late 2006, respectively in early 2007 and today's dispute between Russia and Ukraine about the gas again. In all these cases, the dispute took place in the context of re-negotiation of yearly contracts about gas or oil delivery and was generated by the intention of Russia to increase the price of its deliveries. The problem is that the prices of deliveries to those republics are far below the market prices for Europe. Simply, if the importing republic did not accept new terms of contract, Russia would cut the deliveries. For instance, these problems stand behind the today's European gas crisis. Russia and Ukraine are locked in a dispute over natural gas prices, payments and transit fees. Russia stopped shipments intended for Ukraine on 1st January 2009 while continuing to supply gas intended for Europe. The main reason behind the cut-off of gas was $600 million debt (penalties for late payments) and the new pricing terms for 2009. Furthermore, Russia accused Ukraine of siphoning gas intended for European customers.

Taking into consideration, that more than 80% of Russian gas supplies flow through Ukraine pipelines and that several countries, especially new member states are almost

completely dependent on deliveries of Russia's gas, we can see a big threat for the energy security. As of January 6, several countries, including Austria, Romania, Bulgaria, Poland, Turkey, Italy, Germany, Slovakia and Czech Republic reported drops in pipeline pressures resulting in reduced gas throughout.

From the last dispute in 2006, Europe announced many resolutions like new pipeline routes such as Nordstream, Nabucco, and South Stream, but they are rather long-term solutions. On the other hand, there are several actions that Europe can take to strengthen its immediate energy security.

These include:

- Reducing the role of monopolies;
- integrate the new members that are heavily reliant on Russia further into the Europe-wide energy infrastructure;
- increasing market flexibility and efficiency.

However, the foreseeable solution is not sure. Both Russia and Ukraine want to protect their reputation as supply and transit partners to Europe. Although, they are pointing the blame on each other, they both realize the need and urgency to solve the problem. The most immediate points are: gas price, transit fee, volumes, and penalty fees. However, any solution that is worked out will not probably be a long-term solution. According to Bovair and C. Chow, these problems could be solved with domestic reforms within Ukraine that must include a pricing system to reflect the true economic value of gas. Moreover, the supply/transit relationship between Russia and Ukraine must be according to international standards, including long-term contracts and transparent business practises [Bovair, Chow, 2009].

Some experts claim that certain actions towards Russia's closest countries were solely economic and justified: the desire of Russia to avoid two tiered pricing system, increase energy export prices to be same as international prices. However, we can also find incidents with political implications, suggests that far more than just price issues are involved. According to Milov [2008, p.7], the incidents include following:"

- Permanent tension in gas relation with Ukraine over issues that goes far beyond the level of gas prices-public accusations of Ukraine's stealing of

Russian gas from storages and pipelines (never proven true, while some of these accusations clearly proven false), or gas cut-offs that follow the emergence of relatively insignificant and controversial debts and correlate surprisingly highly with government changes in Ukraine;

- Complete shutdown of oil supply to Lithuania after the Lithuanian Mazeikiu Nafta refinery is sold to a Polish company rather than to Russian bidders;
- Refusal to build initially planned second line of Yamal-Europe gas pipeline through Poland, substituting it with the Nord Stream gas pipeline via Baltic Sea, which turns out to be at least five times more expensive in capital costs and about one-and-a-half times more expensive in terms of gas transportation tariff."

We can see that these conflicts did not only involve price disputes, but also political context which should not be discounted. Milov [2008, p.7] commented it by words:" Generally, those experts who suggest that Russia is only pursuing its legitimate economic interests in energy relations with neighbouring states fail to analyze the complex nature of Russia's energy relations with these countries, focusing only on the analysis of public rhetoric of the Russia officials connected to the gas conflict with Ukraine 2005-2006."

These energy pressures irritate energy relations between Russia and Europe for several reasons:

- Europe must somehow protect its easternmost allies;
- Although Kremlin is reliable in its relation with Europe, there is no certainty that the methods used again East European nations will not be used against Europe on future occasions;
- Problematic relations between Russia and countries like Ukraine or Belarus continue to directly affect Europe, which is fundamentally dependent on gas and oil deliveries from Russia [Milov, 2008].

Despite all those factors mentioned above, the real long term worry is the inability of Russia to produce enough oil and gas for its internal consumption as well as for the demand of European customers. Such shortages will not be link either to Russia using the energy weapon or its inability to invest, but to the fact that its resource base is being depleted, and is like to go into decline in the near future [Guillet, 2007].

5.3 Mutual EU-Russia interdependence

During the last four decades, which were presented by many events brought to the boil such as Cold War, EU and Russia enjoyed very stable export-import relations. However, since recently EU is becoming more worried about the stability of the oil and gas exports from Russia. One of the main reasons is that the local production of energy within EU is declining[13], and the dependence on Russia as a main importer is increasing [Borisechova, 2007].

Nowadays, approximately 50% of the EU energy is imported. The EU is highly dependent on oil (82%) and natural gas (58%). The forecast for the next decades show the same trend in increasing dependency on energy imports.

On the other hand, if EU expands to include Switzerland, Turkey and Norway, the EU-30 energy import would decrease to 44,4 % in 2010 and 56,3 % by 2030 due to domestic Norwegian energy production.

EU is trying to reach alternative markets such as Central Asia with its direct access to Caspian oil and gas in order to reduce its dependence on one importer. These regions have advantages that are relatively close to the Europe and have extensive resources. For instance, Turkmenistan (2850 bcm proven natural gas reserves) and Azerbaijan (1370 bcm of proven natural gas reserves). However, these countries are to certain extent dependent on the existing Russian controlled infrastructure, both legally and geographically, since they trespass the territory of Russia. These reasons make cooperation with EU difficult. There is a chance to invest in new pipelines which would bypass the territory of the Russian Federation, but they do not seem very probable[14].

[13] By 2030, it is predicted that crude oil production should be at minus 73 percent of 2000 levels, and natural gas production at minus 59 percent of 2000 levels.

[14] A pipeline through Iran to access Turkmen gas is not viable due to many reasons.

Therefore, despite the fact that EU receives its energy from many sources, Russia was and will be the main supplier of energy in future [Borisechova, 2007].

The EU is the largest trade partner of the Russian Federation and this mutual interdependence is especially evident in the energy sector. Almost 60% of Russian exports to the EU by value are energy products, and Russia accounts for more than 26% by value of total EU energy imports [Gusev, 2007]. In addition, 80% of Russia's oil exports and 60% of gas exports goes to the Europe [Larsson, 2006].

Russia today is the single most important supplier of natural gas, accounting for 40% of total gas imports in 2006, and the second most important supplier of crude oil after OPEC, accounting for 33% of oil imports [Eurostat News Releases, 2008].

In case of natural gas, dependence of EU on Russia will definitely increase in the future. It is caused by the problems with the extraction of oil and gas from the North Sea that has already reached its peak, so we cannot expect bigger supply from this region. Therefore, growing energy demand in EU will have to be satisfied by external suppliers.

On the other hand, Götz [2006, p.2] from German Institute for International and Security Affairs has a quite different point of view on the situation. He says that: "Although Russia in the long run will remain the biggest individual gas supplier for Europe, its relative share in European gas imports will decrease." Europe is in much better situation than other region because it is surrounded by gas-exporting countries with which is connected by pipelines or which can be relatively easily built- namely the Central Asian CIS[15] states, North Africa, and the Middle East. From African countries like Algeria, Nigeria, Libya or Egypt, the supply of gas to Europe will increase significantly. Another possibility is natural gas in form of LNG[16] from the Middle East to Southern Europe as well as through gas transport corridor Turkey on the Nabucco pipeline which, however, is not yet built [Götz, 2006].

Undoubtedly, we can see that the Russian Federation will play a very important role in ensuring reliable energy supplies for future and that continuing energy cooperation is of special importance for EU.

[15] Commonwealth of Independent States (CIS) is a regional organization which is formed by former Soviet Republics [Wikipedia, 2009].
[16] Liquid natural gas.

Gas and oil reserves are sufficient to supply Europe for long time, but it is uncertain whether the deposits will be opened soon enough to meet the increasing demand from Europe and also South East Asia/China. Moreover, the Russian gas supply to Europe also depends on Turkmenistan which can either be supplier of Russia or can turn to the Asian market. The success and failure of Russian export plans depends on the ability to permanently interlink the Turkmen gas economy with Russia [Götz, 2006].

Other reasons why Europe is key energy market for Russia are following:

- The possibility of bigger energy trade between Russia and the United States remains low, at least for the coming years. Gazprom, state-owned monopoly is quite inactive in development of LNG supplies. For instance, the Baltic LNG project was canceled, the development of the Shtokman LNG production will be probably delayed due to the complexity of the project itself;
- Low probability that Russia will supply gas towards China on a large scale basis within next 10 years. Oil supplies should be limited to 600000 barrels a day from 2010 according to the Sino-Russian agreement of 2001, and the project of gas pipeline from Western Siberia to China is probably dead due to the planned Turkmenistan-China pipeline [Milov, 2008].
- According to projections, by 2030, while China and India together would import approximately 80 bcm[17] of natural gas per year, OECD Europe would import almost 500 bcm per year. In term of oil, China and India will consume around 18 million bpd[18] in 2030, while Europe will need 14,9 million bpd in order to satisfy its consumption needs [Energy Security and Transatlantic Cooperation, 2006 stated in Borisechova, 2007].

[17] Billion cubic meter
[18] Barrels per day

6. Oil and gas pipeline links between Russia and EU

To satisfy the growing needs of energy, it is important to modernize the existing energy transport network and to create new infrastructure based on modern rentable and ecologically save technologies. Realization of such projects and choice of routes are mainly the responsibility of companies and countries, participating in projects, but we can see obvious involvement of governments [Gusev, 2007].

6.1 Existing infrastructure

Oil pipelines

Russia export capacity during 2007 was 1.3 million bbl/d[19], exported via the Druzhba pipeline to Belarus, Ukraine, Germany, Poland, and other destinations in Central and Eastern Europe (including Hungary, Slovakia, and the Czech Republic), around 1.3 million bbl/d via the new flagship Primorsk port near St. Petersburg, and around 900,000 bbl/d via the Black Sea.

Around 4 million bbl/d can be transported in main pipelines of Transneft (majority of oil exports). The rest must be shipped by rail (almost 170,000 bbl/d) and river routes. [Country Analysis Briefs, 2008]

Druzhba is the world longest oil pipeline of 4000km. Approximately 70% of overall Russian crude levels destined for Europe passing through this pipeline network, representing the biggest artery for transportation of Russia oil across Europe. Its current capacity is 1,2 to 1,4 million bpd. The pipeline begins in Samara, south-eastern Russia, where it collects oil from western Siberia, the Urals and the Caspian Sea. It exports the oil to Mozyr in southern Belarus, where it is divided into a northern Druzhba I and into a southern branch Druzhba II. The northern branch reaches Poland and Germany. The southern branch runs to Ukraine, Slovakia, Czech Republic and Germany.

Novorossiysk, a Black Sea port is connected to the Russia Samara-Tihorek pipeline, which transports oil from Makhachkala and Baku (Azerbaijan). From this place oil is transported to the Mediterranean and then to the European and Asian markets.

[19] Barrel per day

The Baltic Pipeline System (BPS) is another very important export link, carrying approximately 74 million tons of crude oil from West Siberian, Ural-Povoljye and Timan-Pechora regions towards newly completed port of Primorsk in the Russian Gulf of Finland. From here it is shipped via tankers. This route is important from Russia's view, because it reaches west markets without the help of Baltic countries (reduced dependence on them) [Borisechova, 2007].

Gas pipelines

Russia exports significant amount of natural gas to customers in the Commonwealth of Independent States (CIS). Furthermore, Gazprom shifted much of its gas export to European customers to satisfy the growing demand.

In 2007, Russia exported 6,75 tcf[20] (191 bcm) of natural gas, includes 5,4 tcf to outside FSU and to Baltic states and 1,3 tcf to CIS countries [EIA Country Analysis Briefs, 2008].

Yamal 1 is a 4,196 km long pipeline which runs through Belarus and Poland to Germany. It's the only Russia's gas export route which does not cross Ukraine. Even though the capacity of pipeline is 33 bcm, each is exported only around 17 bcm of gas. The objective of this route is to satisfy the demand of Germany and eventually Great Britain (decreasing supplies from North Sea due to the maturing gas fields).

Brotherhood is a 2750 km long gas pipeline connecting Russia, Ukraine, Slovakia and Western Europe. Natural gas which runs through this pipeline represent about 25 percent of natural gas consumed in Western Europe and 70 percent of Russian gas exports to Western Europe.

Northern Lights, 4,500 km long pipeline, which trespasses the area of Ukraine, where it joins the path of Brotherhood and runs in direction of Slovakia, Austria and Germany. This route transports another third of gas destined for Europe.

[20] Trillion cubic feet

Blue Stream is a 1,250 km pipeline that connects Russia with Turkey. This pipeline was built in 2005 with the aim of diversifying Russian gas deliveries to Turkey and avoiding third countries such as Ukraine, Belarus and Moldova. By 2010, Blue Stream is expected to deliver 16 bcm of gas annually [Borisechova, 2007].

6.2 Major proposed oil and gas pipelines and pipeline expansion projects

This section lists the planned EU and Russia backed oil- and gas-pipeline projects.

EU supported oil pipelines

Odessa-Brody-Plozk-Gdansk extension project is a 490 km extension of an existing pipeline from Brody in western Ukraine northward to the polish port of Gdansk on the Baltic Sea, with Azerbaijan providing the necessary supplies of 280,000 bpd (14 million tons annually). The first part, from Odessa to Brody was completed in 2004 with the main aim of delivering Caspian oil to central Europe. The main problem associated with this pipeline is the fact that it is not clear whether Azerbaijan could commit enough crude oil to make the project economically viable [Borisechova, 2007].

Russian supported oil pipelines

BPS expansion: The BPS gives Russia the possibility to bypass the countries such as Estonia, Latvia, and Lithuania in order to reach northern European consumers (reducing dependence on transit routes through these countries). Throughput capacity at Primorsk has steadily increased, reaching around 1,5 million bbl/d during 2007 on average. It is expected that the throughput of port will increase in following years thanks to large-seized Baltimax tankers. The actual capacity of the port is around 3 million bbl/d, however limited by the pipeline capacity. The BPS expansion will add new export outlets to the region, and in 2008 the Russian government decided that a new line will run to the port of Ust-Luga with a branch going to Kirischi oil refinery. Costs were estimated by Transneft at around $3,3 billion.

Murmansk Area, Kharyaga-Indiga Pipeline, and Varandei Terminal: International shipping of oil from the Murmansk area has two main advantages: the port is ice-free for most of the year and it is deep enough to make shipping to the USA possible without reloading in Europe. Currently, Russia's oil is delivered to the Murmansk area by rail

and in 2007, around 270,000 bbl/d of crude oil and products was exported from this area. Lukoil completed its $1 billion, 240,000 bbl/d terminal at Varandei in 2008, which will allow shipments from the northern part of Timan-Pechora. The major source of oil for this terminal is Yuzhno-Khylchuyu field where the production is estimated at 150,000 bbl/d by the end of 2009.

Druzhba Pipeline and Adria Reversal Project: Of the 1,3 million bbl/d of oil transported via Druzhba Pipeline, only around 350,000 bbl/d flows to the south to Hungary, the Czech Republic and Slovakia. The pipeline was completed in 1974, originally designed to load Middle Eastern oil at Omisalj, then pipe it northward to Yugoslavia and on to Hungary. However, given both the Adria pipeline's existing interconnection with the Russian system, and the Russian booming production, the pipeline's operators and transit state have since considered reversing the pipeline's flow, thus giving Russia a new export outlet on the Adriatic Sea. This proposal included expanding the capacity from 100,000 bbl/d to 300,000 bbl/d at a cost of around $320 million [Country Analysis Briefs, 2008].

To launch the project, cooperation of six states (Russia, Belarus, Ukraine, Slovakia, Hungary and Croatia) is required. Since the preliminary agreement signed in 2002, progress has been very slow. Of the six countries, only Slovakia, Hungary and Ukraine are ready to implement the reversal [Borisechova, 2007].

In 2005, Croatia determined that an environmental impact study of such a reversal was incomplete and not based on enough expert knowledge, thereby killing the proposal. On the other hand, during the Belarus-Russia oil dispute in 2007, Hungary said that it could technically reverse its portion of the pipeline within 20-30 days.

Eastern Siberia Pacific Ocean Pipeline (ESPO): Taishet-Skovorodino-Kozmino Bay: The 1,200-mile first stage of the 600,000 bbl/d pipeline will flow from Taishet to Skovorodino along with a port facility at Kozmino Bay. Oil will be shipped via rail to the Pacific Coast until the second stage will be finished. China has agreed to finance 43-mile, 300,000 bbl/d spur from Skovorodino to the Chinese borders. Transneft estimates the costs for the first stage of the pipeline up to $12,5 billion. In April 2008, approximately 1,5 million barrels filled the first stage of the pipeline , which will first

operate in reverse mode to bring oil production from East Siberia to refining centres in West Siberia. The second stage of the pipeline will run from Skovorodino to the Pacific Coast, with planned design capacity of 1,6 million bbl/d. The first stage of the pipeline will get crude oil from three fields: TNK-BP-led East Siberian Verkhnechonsk field, in which Rosneft is a partner, from Surgutneftegas' Talakan field, and from Rosneft's Vankor field [Country Analysis Briefs, 2008].

EU supported gas pipelines

Trans-Caspian Gas Pipeline is under Caspian gas pipeline, with initial carrying capacity of 6,25 bcm, expandable to 30,6 bcm. The purpose is connecting Kazakhstan to the already present BTC pipeline in Azerbaijan. Further plans include onward flow of Caspian gas along the planned Nabucco pipeline. In addition, the pipeline could carry gas from eastern Turkmenistan, and could eventually include exports from Uzbekistan and Kazakhstan. However, the realization of the pipeline is not very probable due to the many problems. The biggest obstacle is that in May 2007, Kazakhstan, Turkmenistan and Russia agreed on the realization of the Pre-Caspian gas pipeline[21].

Nabucco is a planned 3,300 km long pipeline project through which is intended to flow 31 bcm annually of Central Asian gas from the eastern end of Turkey, across Romania, Bulgaria, and Hungary into Austria by 2020. The purpose of the pipeline is to bypass Russia and bring BTC gas to Central Europe. For these reasons the pipeline is strongly supported by EU. However, this pipeline project has encountered financial problems and lack of political will in several countries, with particular reference to Hungary, which supports another project- Blue Stream pipeline [Borisechova, 2007].

The Galsi Pipeline currently at feasibility study page. It should be 900 km natural gas pipeline between Algeria and Italy, providing 9-10 bcm per year. 2 bcm would be used

[21] Central-Asia-Centre gas pipeline build in 1974, has two branches, with the western branch running from the Turkmen Caspian region to the north, and the eastern branch from east Turkmenistan and south Uzbekistan northwest. Both branches go to the Kazakhstan. From there the pipeline it goes north where it connects to Russian natural gas pipeline system. In May 2007, countries specified above signed the agreement for the renovation and expansion of the western branch of pipeline.

to cover Sardinians needs and the rest would be destined for Italy and European markets [Edison Company Web Sites information stated in Borisechova, 2007].

Southern Europe Gas Ring Project has been constructed to transfer gas sources from the Caspian Basin, Russian Federation, Middle East, Southern Mediterranean countries through Turkey and Greece. The first part of project, the Turkey-Greece, is approximately 300 km long and includes an offshore section of 17 km across the Marmara Sea [Shaukat, 2008]. It will initially carry 250 million cubic meters of gas annually. By 2012, annual capacity will reach 11,6 bcm [First pipeline to provide Europe with non-Russian gas supply, 2007]. The second part of the project, Italy-Greece gas pipeline (IGI), is an 800 km undersea pipeline that would allow Italy to diversify its gas resources and therefore increase its energy security [Edison Company Web Sites stated in Borisechova, 2007].

Russia supported gas pipelines

Yamal-Europe II will expand the Yamal-Europe I for another 1 tcf under this proposal. However, Gazprom and Poland currently disagree on the exact route for the second branch as it travels through Poland. Gazprom is seeking a route via south-eastern Poland to Slovakia and on to Central Europe, while Poland wants the branch to go through its own country and then on to Germany. This pipeline should be completed by 2010 and would cost of around $10 billion.

South Stream: In June of 2007 Italy's Eni and Gazprom signed a memorandum of understanding on a feasibility study for the first component of the South Stream project. The first component plans to send natural gas from the same starting point as the Blue Stream pipeline at Beregovaya under the Black Sea. The second component will cross Bulgaria with two options: first crossing Serbia and Hungary and linking with existing gas pipelines from Russia; second directed to the southwest through Greece and Albania, linking directly to the Italian network. According to Gazprom, project should be completed till 2013.

Blue Stream Expansion and Interconnection: The Blue Stream natural gas pipeline connects Russian system to Turkey through a 750-mile pipeline, 246 miles of which extends underneath the Black Sea. In 2004, flows through pipeline totalled only 113 bcf[22]. Despite this fact, Russia will launch a new gas compressor allowing the pipeline to run at its design capacity of 565 bcf per year. During 2007, roughly 330 bcf of natural gas was transported via Blue Stream.

Nord Stream Pipeline was proposed in June 2003 by Russia and the UK, and was renamed Nord Stream in 2006. This pipeline extends over 2,000 miles from Russia to Finland and the UK via the Baltic Sea. Offshore pipe lying is expected to begin between 2008 and 2010. The projected pipeline is expected to transport 0,9-1,0 tcf of natural gas via two parallel pipelines. The main advantage from Russia's point of view is that Russia will no longer have to negotiate transit fees with nearly half dozen of countries or pay them in natural gas [Country Analysis Briefs, 2008].

[22] Billion cubic feet

7. Russia's role as an energy supplier

7.1 Sustainability of reserves

Oil

A key factor which will affect the ability of Russia to produce oil is a reserve base. In determining the actual amount of reserves, it is important to know the methodology of estimating the reserves.

Three accounting and reporting methods are used: the first is used by the **Society of Petroleum Engineers (SPE)**, the second by the **Security Exchange Commission (SEC)**, and the third is the **Soviet/Russian classification system**.

The first two methods are used for reporting by international oil majors and are considerably different from the third method. The biggest difference is that the Western methodologies take into account not only geological matters but also economic and commercial considerations. On the other hand, the Russian system uses only geological and technological data and ignores oil prices.

According to SPE, there are three categories of reserves: **proved, probable and possible**. The most important from investment decisions point of view is the proven category [Janssen, 2005]. SPE's definition of proven reserves: "those quantities of oil, which by analysis of geological and engineering data, can be estimated with reasonable certainty to be commercially recoverable, from a given date forward, from known reservoirs and under current economic conditions, operating methods and government regulation [SPE Web Sites stated in Janssen, 2005]."

The probable and possible reserves are part of unproven category. Generally, the computation used for this category is similar as to the proven category, but due to many aspects such as economic or contractual these reserves cannot be used as proven.

The definition of reserves by SEC is similar to SPE's definition, but it is much stricter. SEC definition is that proven reserves are just those which can be extracted under current economic and operating conditions. In addition, proven reserves must be proved by actual production and must be adjusted every year.

Russian system pays lesser importance to costs. It rather ascertains the geological presence and therefore, the system divides the reserves according of geological certainty

[Janssen, 2005]. Instead of what is commercially possible, the Russian model focuses on what is technically possible to extract [Leijonhielm and L. Larsson, 2004].

Proven reserves:

A Geologically examined reserves currently in production;

B geologically examined reserves, which are the unused production capacity;

C1 geologically evaluated reserves, which according to engineering data show partial recoverability.

Probable resources:

C2 Reserves that are presumed to exist based on geological and geophysical data analogous to that of verified reserves;

D1 speculative reserves, presumed to exist on basis of geological analogy to reference areas;

D2 same as D1, but less evaluated [Janssen, 2005, p.3].

The Sum of A+B+C1 represents the proven reserves according to the Russians. The main disputes between the methodology used by Russia and Western countries is that the quantity of C1 reserves are different. According to Russian experts, around 75% of C1 reserves are calculated as a part of proven reserves, whereas Western experts are more critical. Categories lower than C1 are not used because of the uncertain recoverability.

From the **Table 1** we can see the discrepancies between the estimation from different sources.

Table 1

Who?	Reserves, billion barrels
Oil & Gas Journal	60 (proven SPE)
World Oil	69 (proven SPE)
BP	72 (proven SPE)
10 largest Russian oil companies combined	82 (ABC1)
E. Khartukov (Russian oil expert)	110 (ABC1)
United States Geological Survey	116 (proven SPE)
Wood Mackenzie	120 (proven SPE)
M. Khodorkovskiy (former CEO Yukos)	150
Brunswick UBS (Consultants)	180 (proven, probable, possible SPE)
Russian government (*)	322 (ABCD)

(*) The Russian government still does not publish official figures, although they do speak of prognosed reserves of 44 billion tonnes (322 billion barrels) in their latest version of the Energy strategy for the period up to 2020.

[Janssen, 2005, p.4]

Comparing the data from BP Statistical Review of World Energy 2003 and 2008, we can find out that the proven reserves of the Russian Federation have increased from 60,0 thousand million barrels at the end 2002 to 79,4 thousand million barrels at the end 2007 [BP Statistical Review of World Energy, 2003, 2008]. It is a significant change in the amount of the proven reserves. According to Jansssen [2005], the main reasons that stand behind this change are better geological examinations and growing performance of Russian oil companies. Furthermore, better management (new recovery techniques) and productivity of existing or idle wells have increased the proven reserves. Due to the fact, that exploration of potential fields was not very intense during last years, there is a high probability that the proven reserves will increase further.

Over 70% of Russian reserves are in West Siberia. The rest of the reserves are in the Volga-Urals region (14%), Timan-Pechora (7%), East Siberia (4%) and the Far East (3%).

Figure 4 shows us the existing oil basins and pipelines.

The proven reserves of the six largest operating oil companies- Yukos, Lukoil, TNK-BP, Surgutneftegaz, Sibneft and Tatneft are 62 billion barrels. But ultimately recoverable resources are much higher. IHS Energy estimates Russia's resource potential at 140 billion barrels at the end of 2001. US Geological Survey in its study from 2000, states that undiscovered resources of oil and natural gas liquids economically recoverable are 115 billion barrels, 12% of total world undiscovered resources [World Energy Outlook, 2004].

In Eastern Siberia little exploration has taken place, therefore this region has a great potential [Country Analysis Briefs, 2008].

The Russia's oil reserves are vast and especially in relation to other producers. It means that Russia and its reserves will play the dominant role from a geological standpoint. From the long term perspective, many have argued that the Russia's field will not be able to produce enough oil for increasing worldwide demand and its national demand as well. On the other hand, Russia is vast and still relatively unexplored, which means that new fields can be found. Moreover, the usage of unconventional hydrocarbon liquids is probable in the future.

Gas

Situation with the classification of gas is very similar to the classification of oil. The figures from Western experts may differ with the figures from Gazprom, state-owned monopoly. The main reason is that as stated above, the sum of A+B+C1 represents proven reserves according to the Russians. From the figures of BP Statistical Review of 2008, we can see that the proven reserves of natural gas in the Russian Federation were 44,65 trillion cubic meters at the end 2007. It represented 25,2% share of total reserves worldwide [BP Statistical Review of World Energy, 2008].

Gazprom holds licences to the fields holding 55% of overall Russian reserves; other producers hold 28%, while 17% are unallocated. Three quarters of Russian gas reserves are in West Siberia, particularly in the Nadym-Pur-Taz region.

In Figure 5 we can see the gas reserves and supply infrastructure in Russia.

European Russia (including Barents Sea shelf) accounts for 16% and East Siberia plus the Far East stands for remaining 9% [EIA World Energy Outlook, 2004].

Russia has 11 super giant fields[23] and at least 13 giant fields[24]. Most of these fields are currently not in operation but are preparing to be opened in the near future. Reserves estimates by Gazprom suggest that 77% of known reserves are found in Western Siberia, specifically in the Pur-Taz region and on the Yamal Peninsula that contain 50% and 22% respectively [Leijonhielm and L. Larsson, 2004].

The major exploration targets up to 2010 will be the West-Siberian, Timor-Pechora, and Caspian Regions. Further explorations will be conducted in the East Siberian and Far Eastern Region.

In 2011-2020, the exploration will take place in the shelf of the Artic seas and the Sea of Okhotsk, Krasnoyarsk Territory, Irkutsk region, SakhaaYakutia, and the Sakhalin shelf.

In the long term, exploration will continue in the above mentioned regions. Moreover, it will focus on uinvestigated regions of the Siberian and Far Eastern federal districts [Gazprom Web Sites, 2009].

The main threats from the long term horizon are ageing or maturing fields resulting in decrease of production. In addition, in many giant or super giant fields, the extraction of natural gas has yet not started. Therefore, very important will be the future investments in technology which could improve the extraction from maturing fields and could prolong their future utilization.

7.1.1 Investments

Re-nationalization of oil and gas assets cost huge amount of money: for example, the total debt of state-owned monopolies, Gazprom and Rosneft, totalled more than US$85 billion after 9 months in 2007. This serious indebtedness constrains the ability of previously mentioned companies to invest in new projects. At the same time, Gazprom announced in June 2008, that construction costs for Bovanenko-Ukhta gas pipeline from Yamal Peninsula are around US$80-90 billion. It means that future investments to develop a full-scale industrial base at the Yamal Peninsula could be as high as US$200billion. Other investments would be needed for development of Shtokman gas field.

[23] These fields have more than 1 trillion cubic meters of natural gas
[24] These fields have between 0,5 and 1 trillion cubic meter of natural gas

The problem is that is not sure who would invest this money.

First, Russian state companies have huge debts from the process of re-nationalization and foreign companies do not invest at all due to the possibility of asset expropriation. This statement support the fact that oil companies such as TNK-BP or Surgutneftegaz rather paid out net yearnings on dividends or accumulated cash for future potential merger with one of the state companies respectively [Milov, 2008].

Second, the Putin administration considers equity holding in Russian companies by foreign investors as a threat for national security therefore only accept the minority stakeholders.

After the lots of problems from past, for example Yukos affair, many Western companies went away. Those which stayed, BP or ConocoPhillips, sought formal approval from Kremlin before investing in the Russian Federation [Janssen, 2005].

Many projects like development of ex-Yukos gas assets acquired by Italian ENI/Enel consortium are yet unclear, or participation of foreign gas companies (Total and StatoilHydro) in the development of Shtokman gas field in the Barents Sea has encountered problems and it is not resolved [Milov, 2008]. These obstacles mean that foreign investments in Russia are much lower than in other transition economies (for instance, Poland, the Czech Republic, Hungary, and China) [Janssen, 2005].

Milov [2008, p.12] commented this situation by words: "The redistribution of property in favour of national champions has delivered a strong institutional blow to the long-term investment climate in capital-consuming sectors- particularly in energy sector. It is a big question whether in the coming decade Russia will be able to cope with the possible decline in gas and oil output."

IEA World Energy Outlook [2004] predicts that developing energy resources will need investments of more than $900 billion up to 2030. In addition, a stable and predictable regime will be important for financing this investment. Large amount of investment from foreign investors are unlikely for projects which are not export orientated.

Many experts, such as E. Janssen, think that only way out how to finance the projects is to obtain loans from foreign banks. As a matter of fact, foreign bank institutions are eager to lend to Russia, since rating companies (e.g. Moody's) have upgraded Russia's credit rating due to the stable economic performance [Janssen, 2005].

7.1.2 Exploration

According to Bamford [2009], the most reliable information about the reserves growth, the conventional produced and remaining resources of the Former Soviet Union are data from either IHS or the annual BP Statistical Review of World Energy. These data from the end 2005 tells the following numbers:

- For liquids, an excess of 500bn barrels, of which around 150bn has been produced and some 150bn barrels is Yet-To-Find (YTF).
- For gas, an excess of 4,200Tcf, of which around 700Tcf has been produced and some 1,400Tcf is YTF.

These figures are impressive but we have to mention one fact. The YTF representation of exploration potential is just a guess and remains supportable so long as year-on-year exploration success is delivered [Bamford, 2009].

The main areas suitable for exploration

West Siberia

The West Siberia Basin is the main source of production for all major oil companies. This Basin covers a huge area, even bigger than whole Western Europe, and it should have six or seven distinct regions. West Siberia was heavily explored during the Soviet era and shows a declining trend of new fields' discoveries. We could make an assumption that due to the decreasing and flattening in the discovery volumes since 1970s and 1990 respectively that the field is maturing. A great example which contradicts this assumption is the Samotlor field. Discovery of this field in 1965 truly opened the West Siberian Basin. A massive utilization of this field with the help of waterflood to pump the oil up meant that more than 3 million barrels of oil per day were produced in 1980s. Unfortunately, by 1990s the wells were producing mainly water and the majority of previously estimated 30 billion barrels of oil were believed to have been produced. Despite this fact, in 2003 Samotlor was opened by TNK-BP and it is believed to recover 6 billion barrels of oil. Key to the reopening has been extensive seismic surveys to pinpoint the reserves and availability of new technologies of sweeping oil out of the reservoir (for example horizontal drilling) [Bamford, 2009].

East Siberia

East Siberia is a huge area and is though of as heterogeneous, with several distinct areas. The southern part, sometimes called as the Southern Triangle of East Siberia, was well explored during the Soviet era and resulted in many big discoveries such as Kovyktinskoye (reserves up to 7 billion boe[25]) or Yurubcheno-Tokomskoye in the Baykit Anteclise (reserves up to 5,5 billion boe). Therefore, we can state this area as mature for further exploration.

Other areas of East Siberian basins are less explored and are suitable for exploration. For instance, Verkhoyansk ´Foreland´ has drawn the eyes of explores. The problem is that there are many unanswered fundamental questions regarding this area. Bamford [2009, p.6] mentioned them:

- "Is there a workable petroleum system based on a Cambrian source rock?
- Can the proposed structural style of the 'Foreland' as seen in some publications be supported and, in particular, are there any good quality regional (2D) seismic lines? "

To answer these questions, good regional geology and fieldwork is required. Therefore, the important exploration drilling we cannot expect within this decade [Bamford, 2009].

Sakhalin

Most production comes from the onshore areas but also large findings have been made offshore which are currently developed by ExxonMobil and Shell, and most recently BP and its partner Rosneft have made significant discoveries in the 6000sq kms North Sakhalin V Block. Two major developments of Sakhalin I and Sakhalin II hold 2bn barrels of oil plus 17 tcf of gas and 1 billion barrels of oil plus 18 tcf of gas respectively. Other discoveries were made in this basin: according to U.S. Geological Survey, the North Sakhalin basin has 21bn boe of known and undiscovered reserves.

The main challenge faced by Western oil companies and its Russian partners is ice formation in this area. For instance, Shell's Sakhalin II project is only capable of

[25] The **barrel of oil equivalent** (BOE) is a unit of energy based on the approximate energy released by burning one barrel (42 U.S. gallons) of crude oil [Wikipedia, 2009].

producing oil for approximately 180 days during the year due to the ice formation around Vityaz Production Complex [Bamford, 2009].

Artic

The main problems in view of exploration are little actual data, especially seismic data and apart from the Barents Sea province, which seems to be gassy, little evidence of the presence of mature source rocks. Estimates of the YTF of the Russia Artic could be as high as 100bn barrels with super-giant fields in excess of 10bn barrels [Bamford, 2009].

7.2 Production

Russia will definitely play an important role in global energy supply over coming years with major implication for energy security in view of many countries, especially from European Union.

Oil

In recent years there was a large turnaround in oil production. The main reasons which caused this change were higher prices, the 1998 rubble devaluation, higher investments and usage of new technologies and management practises. Production between 1987 and 1996 reached 6,1 mb/d as a result of the end of the FSU. In 2003 production was around 8,5 mb/d and over 9,3 mb/d in August 2004. International Energy Agency projects production to continue to increase, though more slowly than in recent past, from 8,5mb/d in 2003 to 10,4mb/d in 2010 and 10,8mb/d in 2030.

Net exports of crude oil and refinery products are projected to increase from 5,6 mb/d in 2003 to 7,3 mb/d in 2010. Export will decline after 2010, as domestic demand for oil will be bigger than the increase in the production. Other factors affecting production and exports are changes in oil prices, costs and taxes.

There is a great uncertainty about the future production growth. The reason is that much of the growth has come from rehabilitating and stimulating existing wells. For instance, Yukos and Sibneft have mainly relied on boosting well productivity. Average well productivity rose from 51 barrels per day in 1996 to 66 b/d in mid-2003, although it is still lower than in other producing countries.

The pace of production will decline in coming years because the oil fields will be maturing. Therefore, it will be important to focus on new greenfield developments in

West Siberia, Timan-Pechora or still largely unexplored parts of East Siberia. Development and production costs of these potentially new projects are likely much higher than for existing brownfield projects. It is caused by poor infrastructure and more difficult geological and operating conditions [EIA World Energy Outlook, 2004].

Gas

The gas production is also not very certain. Despite this fact, the Russian Federation will be the world's biggest gas exporter in 2030.

Russian gas production fell significantly in 1990s due to the circumstances connected with the collapse of the Soviet Union and subsequent decrease in domestic demand. It fell from 632 bcm in 1991 to 561 bcm in 1997. Since that time, production has recovered and output in 2003 was 608bcm, of which Gazprom produced 540 bcm. The majority of production comes from three super-giant fields (Medvezhye, Yamburg and Urengoye) in Nadym-Pur-Taz that are in production for many years and are maturing nowadays. Rising output from fourth super-giant field, Zapolyarnoe, should compensate for decreasing production from previously mentioned fields. Moreover, it will be important for Gazprom and other independent producers to invest into new fields in order to satisfy the demand. Gazprom expects production from three super-giant fields to decrease by 7% to 8% per year over the rest of the current decade. It means that production in 2020 could be as less as 200bcm. Gazprom prefers investing in new fields instead of trying to sustain production in the current fields. The priority is to develop a number of smaller fields close to super-giant fields which will be able to use spare capacity in the pipeline system leaving the Nadym-Pur-Taz. These include Pestsovoye, Yen-Yakhinskoye, Yuzhno-Russkoye and shallow-water fields in the Ob-Taz Gulfs. For example, Yuzhno-Russkoye should fill the planned North European Pipeline.

It is unlikely that Gazprom will develop new fields on the Yamal Peninsula before the beginning of next decade. The first Yamal fields to be developed should probably be Bovanenkovskoye and Kharasevey, with the estimated production of 150 to 180 bcm a year at plateau. Other possible field, Shtokmanovskoye field in the Barents Sea, holds 2,5 tcm of proven reserves. Estimated production is at 70 bcm per year.

Oil companies and independent gas producers, which hold one-third of gas reserves, are expected to make greater contribution to Russia gas production in future. But it will

heavily depend on transparent and reliable access to Gazprom's gas processing capacity and transmission system.

In addition, also Central Asia will play an important role in future to meet Russia's domestic demand and Gazprom's export commitments to Europe. Especially, states such as Turkmenistan, Kazakhstan and Uzbekistan. These states and the arrangements about the future imports of gas will allow Gazprom to delay the development of its own reserves in Yamal and Artic regions. Moreover, Gazprom will not have to buy the gas from Russian independent producers.

In 2003, Gazexport, a wholly-owned subsidiary of Gazprom and sole exporter to Europe, exported 119 bcm to OECD Europe. Exports to the European Union are expected to rise to 137 bcm in 2010 and 155 bcm in 2030 [EIA World Energy Outlook, 2004].

8. New ways of dealing with dependency on Russia

The arising threat from dependency on Russia over the past years has caused a change in the attitude towards the Common Energy Policy of the European Union and European energy security [Kováčovská, 2007].

As I have discussed in earlier chapters, European countries are increasing their energy consumption, especially fossil fuels such as crude oil and natural gas, which they import mainly from states of Former Soviet Union, particularly Russia. Their own production of oil and gas is decreasing (maturing fields in North Sea) and therefore, they are much more dependant on imports from other countries out of the EU. This statement also support the words of Dr. G. Rigon from the European Commission that the future energy needs of the EU states are expected to increase in all sectors- households, industry, tertiary and transport. The demand for fossil fuels will be strong and rapidly increasing, while the renewable resources are supposed to have a moderate increase [Ringmar, 2005].

To decrease this dependency on imports, the EU member states have undergone several actions in order to strengthen their energy security and lower the threat arising from a dependency on fossil fuels imports from abroad.

The first action to be mentioned is **diversification of energy mixes of EU member states**. Despite the fact that the composition of energy mixes vary from state to state and that is not coordinated on EU level there is an apparent shift towards other sources of energy. For example, **usage of renewable sources of energy,** especially biomass and wind power [Kováčovská, 2007]. Member states of EU have agreed and committed themselves to following steps:

- Double the share of renewable energy (representing 12%) in the total primary energy consumption in EU 15 and 11,1% in EU25;
- to increase the share of renewable in electricity generation from 14% in 2000 to 22% by 2010;
- in transport the usage of bio fuels from less than 1% to 5,75% [Ringmar, 2005].

Other possibility is the **usage of more traditional sources of energy such as coal**, mainly for the electricity production.

According to Mr. Piebalgs, the EU-Commissioner of energy, other actions except of supporting renewable energy, to ensure security of supply and decrease dependence are:

1. **Promoting energy efficiency**

   Energy efficiency is really important because the cheapest, most competitive and secure energy is energy saved by better regulation, by introducing the new technology and by better awareness of citizens. It is estimated that over one fifth of Europe's energy usage can be saved with simple, quick and inexpensive measures.

2. **Proper functioning of the internal market for electricity and gas**

   Since July 2004 all business customers throughout the EU have possibility to choice its electricity and gas supplier. The same is true ordinary consumers from July 2007.

3. **Better linkage between energy policies and environmental & research policies**

   Satisfying of both Lisbon and Kyoto objectives with aim to develop and introduce new technologies.

4. **Strengthening nuclear safety and security**

   Mr. Piebalgs emphasize the importance of research in the fusion field and in particular the ITER project[26] [Ringmar, 2005]. Kovačovská [2007] thinks that we can expect the renaissance of nuclear power. It supports the fact that countries like France, Finland, Czech Republic or even Germany are considering to start the construction of nuclear power plants.

5. **Developing external energy policy relations**

   EU should further strengthen international energy policy relations by building up dialogue with Russia, relations with the neighbours and develop dialogue with OPEC [Ringmar, 2005].

[26]" ITER (originally the International Thermonuclear Experimental Reactor) is an international tokamak (magnetic confinement fusion) research/engineering proposal for an experimental project that will help to make the transition from today's studies of plasma physics to future electricity-producing fusion power plants" [Wikipedia, 2009].

9. Conclusion

Since the recent years, energy security in the European Union has been gaining on importance. It is caused by the fact that the energy consumption is growing in the Europe as a result of the economic and population growth. Unfortunately, in EU are not any internal sources covering growing demand. Moreover, the extraction of oil and gas from the North Sea has already reached its peak, so we cannot expect bigger supply from this region. As a result, there is a growing gap between the demand for energy and the supplies of oil and natural gas.

It means that EU has to satisfy its energy demand by importing hydrocarbons from abroad, particularly the Russian Federation (33% of oil imports and 40% of gas imports in 2006). In 2006, EU27 energy dependence rate was at 54%. The overall energy import dependency in EU is high and it will be even worse in the future.

EU is aware of increasing vulnerability and therefore carried out certain steps in order to change this situation. This process was speeded up by events in the winter 2005/2006 represented by next gas dispute between Russia and Ukraine. This crisis set into motion a new sense of urgency for action on an EU energy policy. To address these issues, at the end 2005 "A European strategy for sustainable, competitive and secure energy was presented."

All these steps taken by EU are in order to become low carbon knowledge-based economy and furthermore, improve its security of supply and become more competitive. Nevertheless, the most important is the translation of the new policy goals to the member states' national energy policies because member states are in charge of composition of energy mix and will come with different solutions to comply with the EU goals. The energy-policy making, internal EU policy-making and external policy should be connected. Unfortunately, the common approach comes mainly from the member states which have the highest dependency on Russia. Whereas the rest of the states with the low dependence do not have any inclination or willingness to give up their sovereignty and transfer part of their control over energy security on EU institutions.

Despite the fact that the energy imports from Russia are increasing and many people perceive this as a threat (mainly because of quite recent gas disputes with Ukraine and

Belarus), the Russia is as a matter of fact a reliable supplier. Looking back to the past, EU and Russia enjoyed very stable import-export relations (despite many events brought to the boil such as Cold War). The reason why the EU is now more concerned about increasing dependency than before is declining its own production.

It is true that while EU wants further liberalization of energy market and the privatization of the energy companies, the Russian government on the other hand, extends its assets in strategic sectors, limits opportunity of foreign investments into its energy sector and uses the states power to back up the interests of state-owned companies. These risks cannot be ignored.

On the other side, there is a strong mutual interdependence between Russia and EU and in the Bachelor Thesis I depicted the most important reasons which form this so called relationship.

I think that the biggest problem is the ability of Russia to be able to produce enough oil and gas to satisfy its domestic growing demand and European demand as well. It is true that the Russia's oil and gas reserves are vast and especially in relation to other producers. It means that Russia and its reserves will play the dominant role from a geological standpoint. But the problem is that from the long term perspective, the fields are ageing and maturing resulting in decrease in production. Therefore, crucial will be future investments in technology which could improve the extraction from maturing fields and could prolong their future utilization. Russia is also vast and still relatively unexplored, which means that new fields can be found. Furthermore, the usage of unconventional hydrocarbon liquids is probable in the future.

Therefore, I do not think that the main threats posed by the dependency on Russia energy supplies is the uncertainty about the future development of political and economic reforms in Russia and the possibility that Russia will turn off the taps in order to pursuit its strategic geopolitical goals.. I would rather incline to statement that the biggest threat is the inability of the Russian Federation to sustain or increase current levels of production and that Russia will not be able to satisfy the growing Europe's energy demand.

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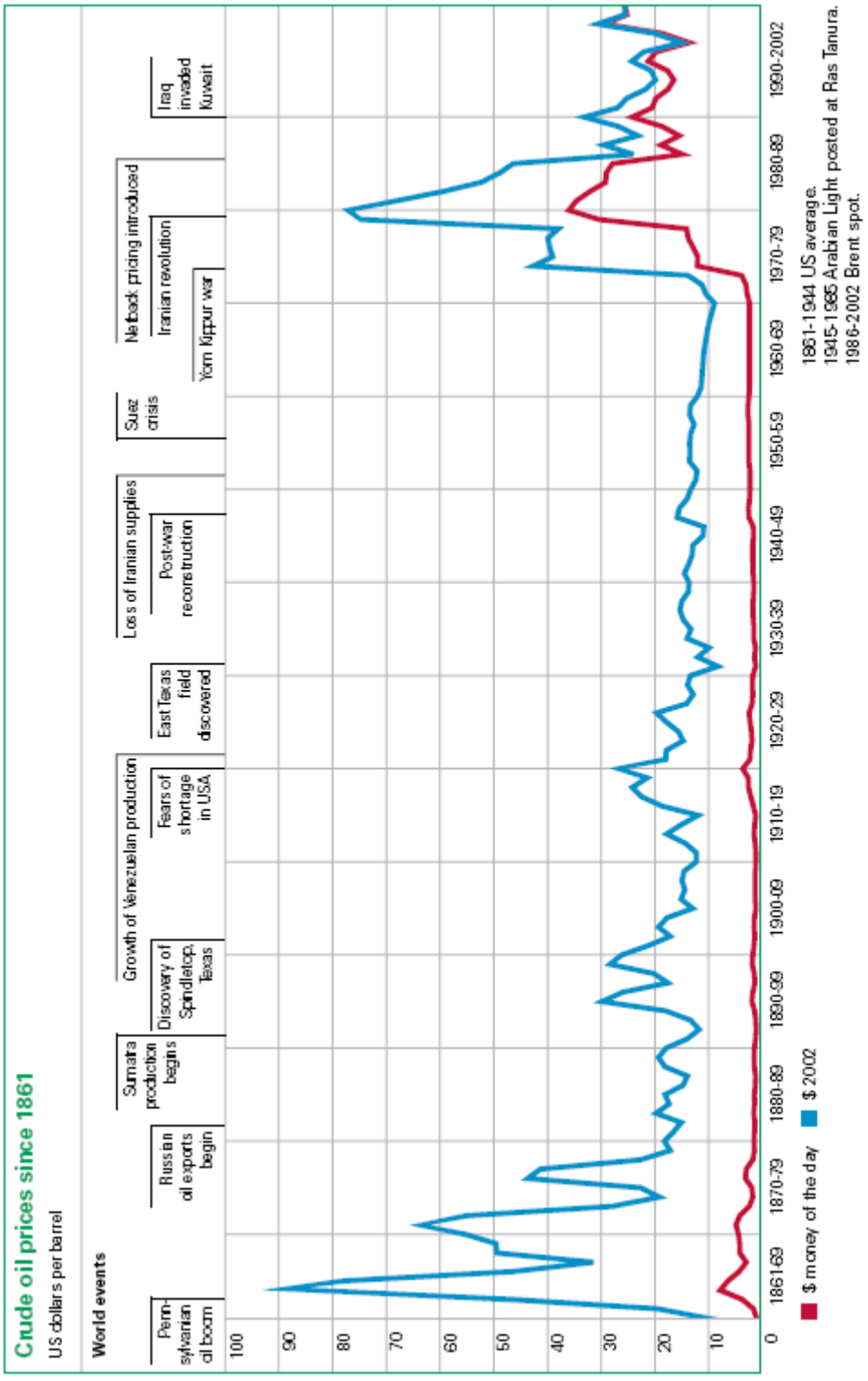
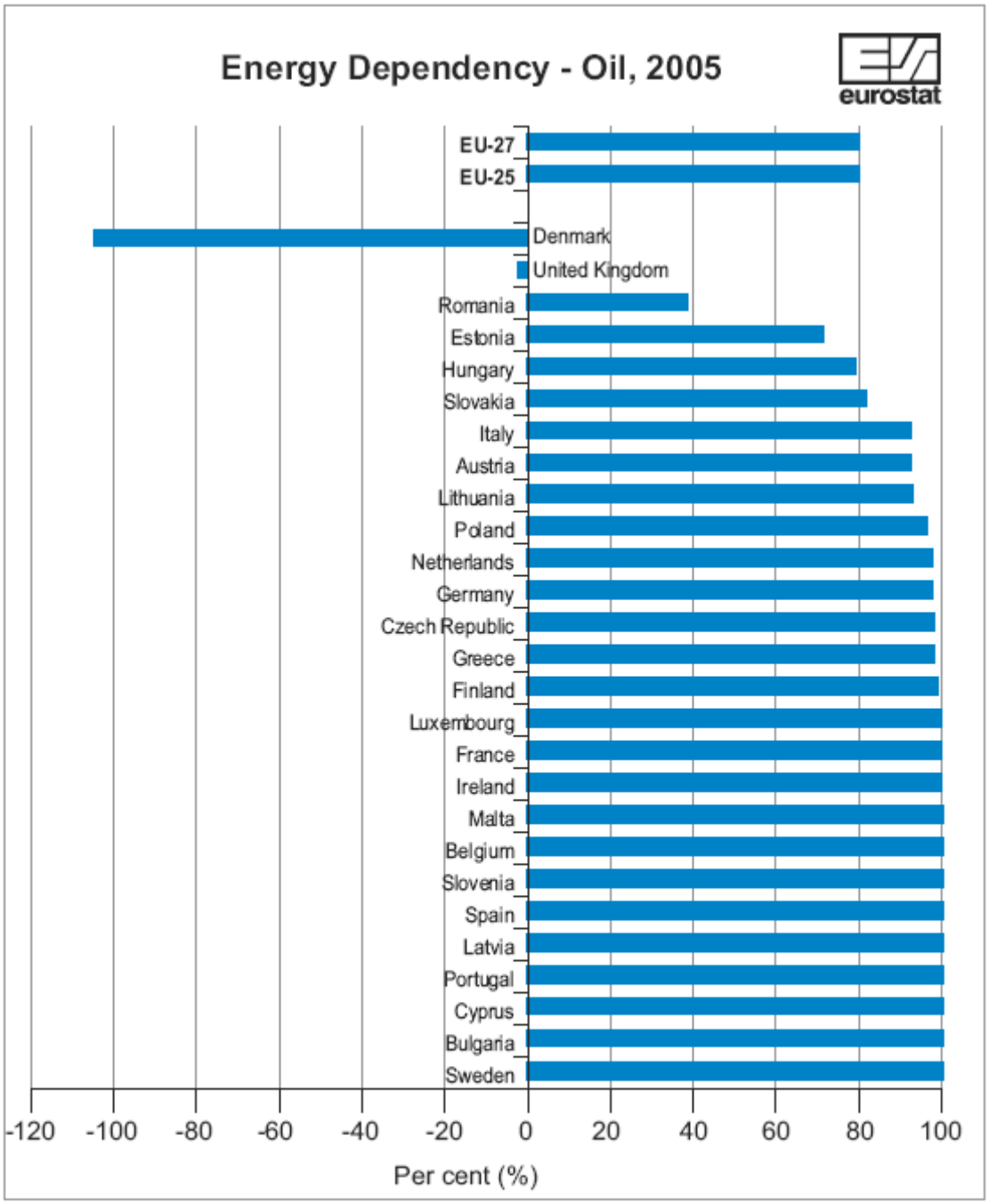
12. Supplements

Figure 1



[BP Statistical Review of World Energy, 2003, p.14]

Figure 2

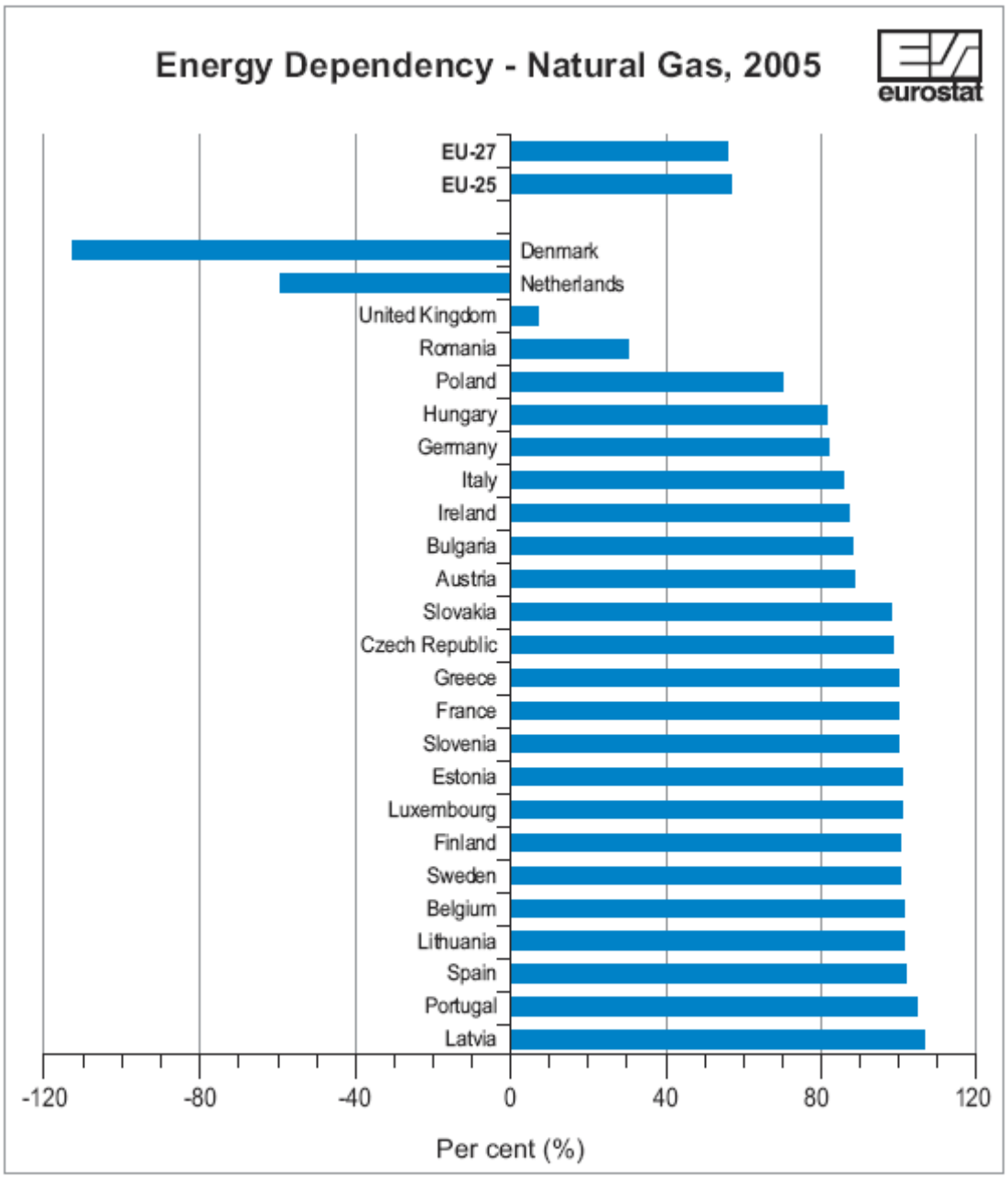


Per cent (%)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
EU-27	74.4	75.5	75.8	77.0	72.9	75.8	77.2	75.9	78.3	79.7	82.2
EU-25	74.7	75.9	76.1	77.4	73.3	76.3	77.6	76.4	78.9	80.1	82.7

[Energy, transport and environment indicators, 2007, p.25]

Figure 3

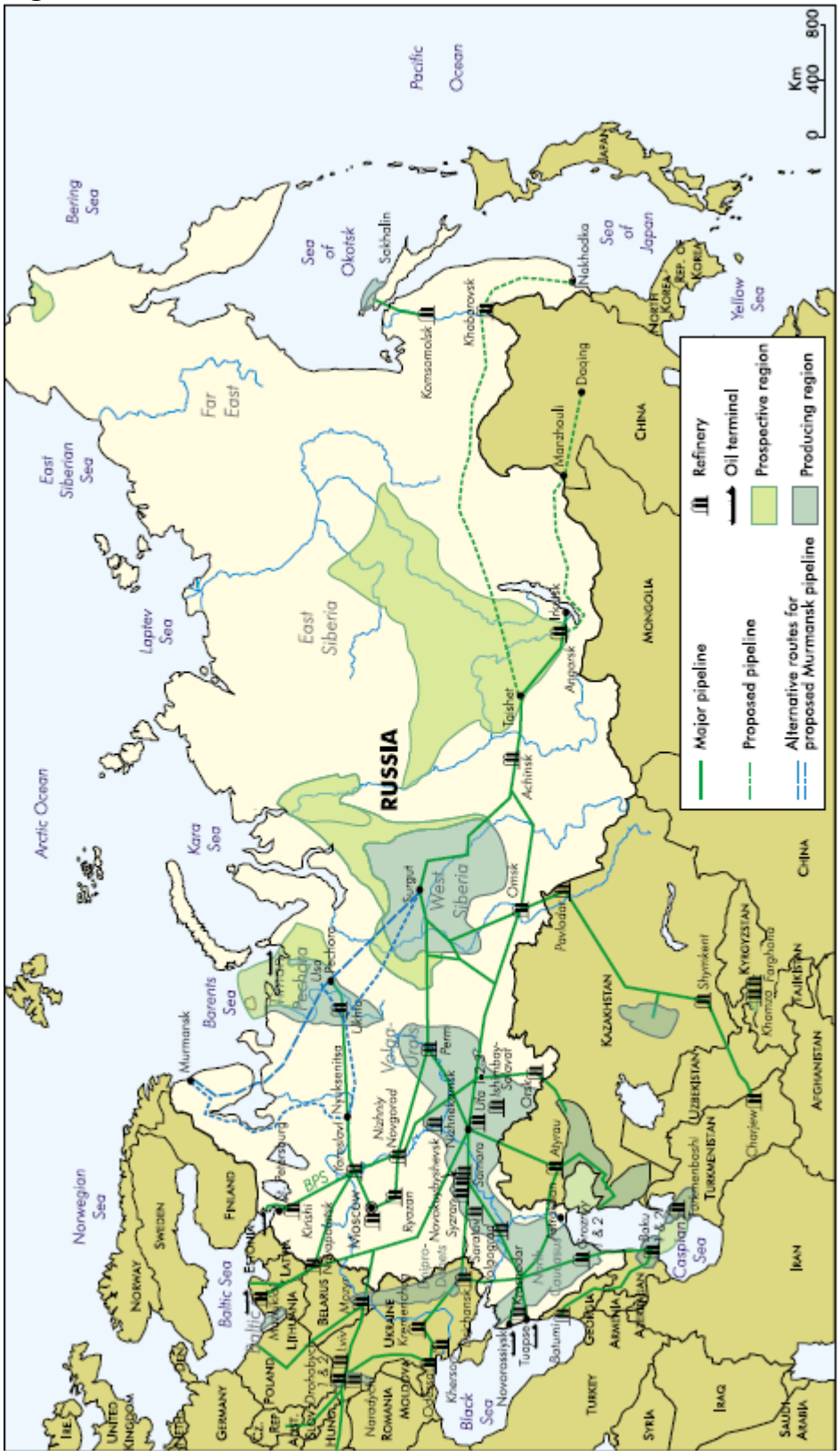


Per cent (%)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
EU-27	43.6	43.5	45.2	45.7	47.9	48.9	47.3	51.1	52.5	54.0	57.7
EU-25	43.9	43.5	45.5	46.0	48.6	49.6	48.0	51.8	53.1	54.6	58.4

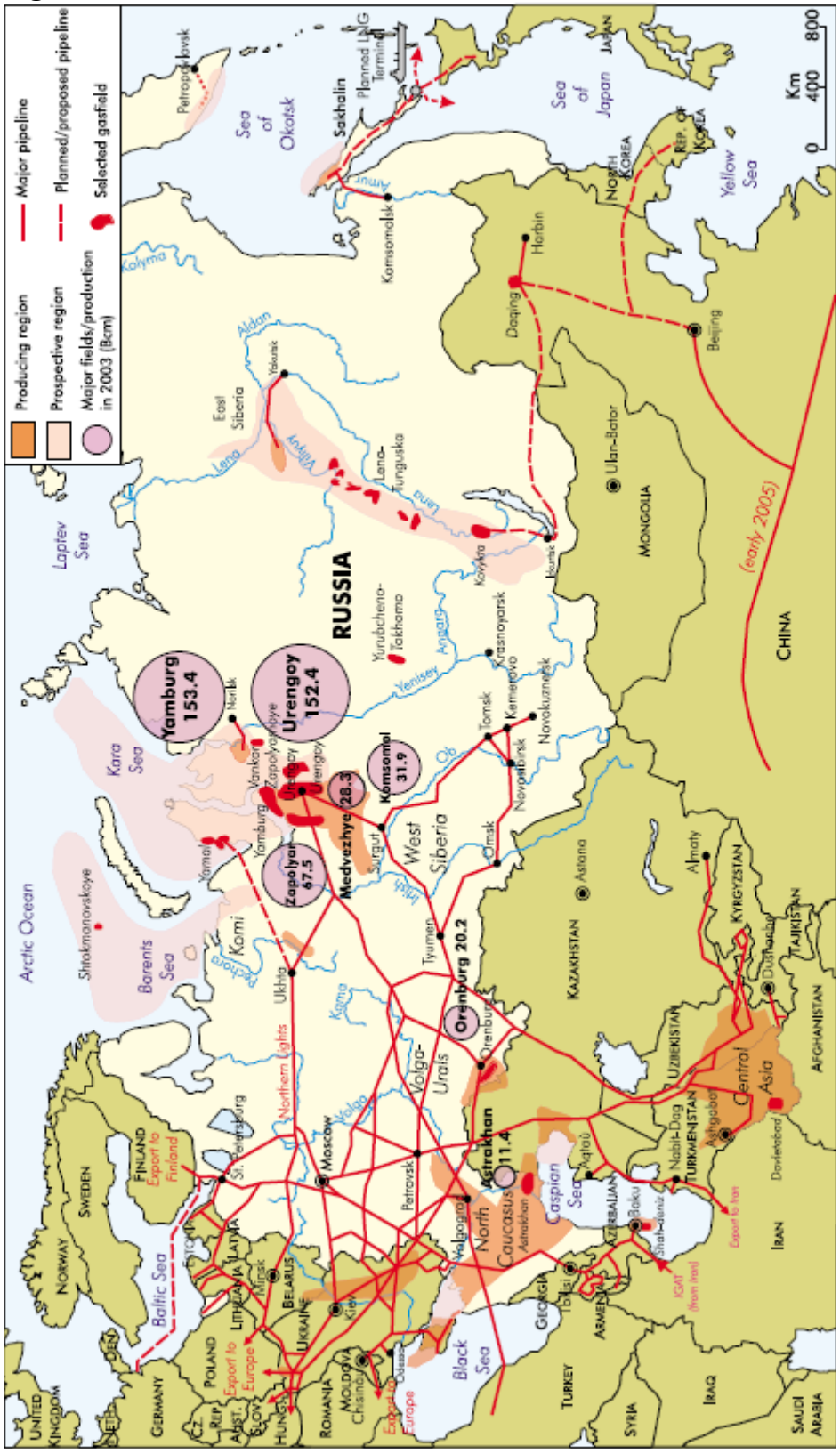
[Energy, transport and environment indicators, 2007, p.27]

Figure 4



[EIA World Energy Outlook, 2004, p.302]

Figure 5



[EIA World Energy Outlook, 2004, p.310]