Oil and Gas Delivery to Europe

An Overview of Existing and Planned Infrastructures

New Edition

GOUVERNANCE EUROPEENNE ET GEOPOLITIQUE DE L'ENERGIE

11

Susanne NIES

les études ifri

The Institut Français des Relations Internationales (IFRI) is a research center and a forum for debate on major international political and economic issues. Headed by Thierry de Montbrial since its founding in 1979, Ifri is a non-governmental and a non-profit organization.

As an independent think tank, IFRI sets its own research agenda, publishing its findings regularly for a global audience. Using an interdisciplinary approach, IFRI brings together political and economic decision-makers, researchers and internationally renowned experts to animate its debate and research activities.

With offices in Paris and Brussels, IFRI stands out as one of the rare French think tanks to have positioned itself at the very heart of European debate.

The Program aims to contribute to the emergence of a coherent and sustainable energy and climate policy through seminars, debates, and publications. This series of works covers the principal issues in the energy sector.

Tome 1: Abatement of CO_2 Emissions in the European Union (2007)

Tome 2: L'énergie nucléaire et les opinions publiques européennes (2008)

Tome 3: The External Energy Policy of the European Union (2008)

Tome 4: Gaz et pétrole vers l'Europe. Perspectives pour les infra-structures (2008)

Tome 5: La gouvernance mondiale de l'énergie : enjeux et perspec-tives (2009)

Tome 6: Governance of Oil in Africa: Unfinished Business (2009)

Tome 7: Energy in India's Future: Insights (2009)

Tome 8: At the Speed of Light? Electricity Interconnections for Europe (2009)

Tome 9: Ukraine: a Transit Country in Deadlock? (2010)

Tome 10: The EU's Major Electricity and Gas Utilities since Market Liberalization (2010)

ISBN: 978-2-86592-817-0
ISSN: 1962-610X

Ifri
27 rue de la Procession
75740 Paris Cedex 15 – France
Phone: +33 (0)1 40 61 60 00
Email: ifri@ifri.org

Ifri-Bruxelles
Rue Marie-Thérèse, 21
1000 Brussels – Belgium
Phone : +32 (0)2 238 51 10
Email: info.bruxelles@ifri.org

Website: *Ifri.org*

Abstract

The European Union's hydrocarbon energy supply depends heavily on imports. While the European Commission has recommended diversifying and increasing domestic resources, notably with renewable resources which should grow to 20% by 2020, dependence on hydrocarbon imports will remain not only substantial, but will increase.

Particular attention must thus be paid to the question of transportation, and also to the countries of origin, investments in infrastructure, their protection, relations with transit countries, 'competing consumers' (notably China and emerging countries, but also the United States), energy wastefulness in producing countries, and, finally, price. Security of supply depends on adequate and reliable infrastructure, and must always be thought of in the long term.

This entirely revised edition of the fourth study conducted by the European Governance and Geopolitics of Energy program at Ifri includes discussions about pipeline routes and potential outputs, their current use and financial requirements for transportation, ongoing projects and those planned for the future, their cost, their financing, and their probable operational start-up date. While all infrastructures are necessarily included (including Norway, the United Kingdom, and North Africa), particular attention is paid to transportation infrastructure that connects Europe with Russia and the former Soviet Union (Central Asia, Caspian Sea). It will be immediately clear that the issue of gas is dominant in current discussions.

Contents

Introduction

The European Union's hydrocarbon energy supply depends heavily on imports. While the European institutions have set the 20/20/20 targets for 2020 (20% of energy to come from renewable sources; a 20% increase in energy efficiency; and a 20% reduction in greenhouse-gas emissions), European dependence on hydrocarbon imports will not only remain important but will continue to increase. This is also the case with the reduction in consumption induced by the recession, which is expected to continue affecting consumption until 2015/16.

Particular attention must thus be paid to the question of transportation of oil and gas, to the countries of origin, the investments in infrastructure, the protection of such infrastructures, relations with transit countries, the 'competing consumers' (notably China, emerging countries, and the United States), inefficient use of energy in producing countries, and, finally, the price involved in each case. Security of supply depends on adequate and reliable infrastructure, and must always be thought of in the long term. However, it is interesting to note that the EU-27 currently considers itself quite vulnerable, and opinions are divided about relations with its largest supplier, Russia. Excessive dependence and beneficial interdependence are the buzz-words on both sides of the debate. Escalation in the bidding to secure potential routes for Russian and Commonwealth of Independent States (CIS) gas delivery to Western Europe is putting the two schools of thought into conflict. In addition, Russia's dominance in the debate, as presented by the media, means that the role of the second largest exporter of natural gas to the EU – Norway – is often forgotten or pushed to the side.

When creating new oil and gas infrastructure it is imperative to pay special attention to geopolitical issues and 'energy diplomacy': pipelines are not only commercial concerns but also fall into the political realm and can sometimes become overly politicized. These energy links, which include interconnectors in addition to massive oil pipelines spanning thousands of kilometers such as Druzhba and the BTC (Baku-Tbilisi-Ceyhan), in many cases replace dependence with interdependence. An oil or gas pipeline can be as much a factor for peace and stabilization as for war. For example, during the Afghan-Soviet War, the Soviet gas pipeline to Kabul became a target for multiple attacks, but its parts today are used in the construction of private houses in the Afghan capital. It is also important to remember that the construction of one such link allows others to be added onto

it. The construction of Yamal, for example, allowed Russia to integrate a fibre-optic cable in order to avoid Polish transit fees. Simply put, one can use an oil pipeline's path to construct a gas pipeline, or vice versa, as is the case of the BTC. Finally, one can benefit from the commotion associated with an oil or gas pipeline by spying – a problem that Norway is confronting in its projects in the Barents Sea with Russia. Energy links are as much affected by geopolitical conditions as they are influential in shaping them. Thus, the spectrum goes from peace pipelines, such as those conceived between Israel and Arab states, or Druzhba, the East-West 'friendship' oil pipeline of the Cold War, to pipelines that are targets for attack, such as the already mentioned Afghan pipeline, the Kirkuk-Ceyhan pipeline, the Tapline in the Middle East, bombarded in 1991 and out of service ever since, or the Adria pipeline, closed at the time of the Yugoslav wars and reopened only in 1996.

Energy infrastructure changes economic and cultural relations, and potentially prices. The British interconnector, for example, has allowed 'free gas' from the UK to reach the European gas market; in 1998, gas-gas competition was realized.

The abundant literature on particular energy projects contrasts with the absence of a 'simple' overview of the whole picture – a vision that transforms the complex landscape into more understandable terms, translates a multitude of maps without over-simplifying them, and is, of course, up to date on the state of different projects. Where is the guide that enables an understanding of the underlying principles behind the remarkable number of interconnected projects, such as the BTC and the Trans-Caspian, or Nabucco and South Stream?

This study is intended to create this overarching view and provide a clear picture of existing and planned projects, including not only oil and gas pipelines, but also regasification terminals. It will also look at imports from the North (Norway, the United Kingdom), the South (Algeria and Libya), and above all the East (Russia and the CIS). It is important to note that, since this study covers a lot of territory, it has some limitations: a general approach inevitably leads to a lack of detail concerning regional projects and issues.1

When Europe is discussed in this study, it will include the EU-27 as well as Croatia, Turkey, and the Western Balkans, since they are tied to the EU by Association Agreements (AAs) and, in a larger sense, by the Stabilisation and Association Process (SAP).

It is important to emphasize the difference in approaches between the oil and the gas markets, which justifies looking at gas and oil infrastructures in two separate chapters. While the oil market is global, and oil pipelines play a minor role in comparison to maritime transport, the gas market is still rather regional. That means that it

1 Studies on regional issues carried out by Ifri's various centres are available at *Ifri.org*

currently depends on gas pipelines and for the time being2 remains a regionalized market while awaiting the further expansion of liquefied natural gas (LNG) as well as shale gas development. As a result the gas market is characterized by much stronger dependency relationships. However, having two distinct chapters on gas and oil infrastructure introduces a new problem, because it means that a clear, complete view of a given country's or region's geopolitical role is lacking. Relevant references will be given to attempt to lessen the negative consequences of this approach.

While gas and oil infrastructures are thought of in the long term (substantial investments become profitable only after many years), the projects themselves often prove to be highly unpredictable and are affected by the geopolitical risks of the post-Cold War era. The reader will be astonished to learn of the high number of linkages throughout Europe that have never been completed or have been on the table for many years, even decades, only to disappear and reappear sporadically (such as the Nord Stream project which 'disappeared,' then reappeared under a different name led by a different consortium). Others may completely change course, for example Odessa-Brody, or are finally completed, as is the case with Medgaz between Algeria and Spain. Never quite going away, these projects persist over long periods, and this prevents us from hastily classifying them in the history books. Geopolitics creates a climate where some projects flourish and others simply perish. Factors that affect a project's outcome range from economic stability (long-term contracts, price, available resources, consumers), to legal frameworks (such as EU legislation with its direct or indirect impact – the Third Package – or even national legislation on Production Sharing Agreements, for example), to diplomatic ties between producers, transit countries, and consumers. Nonetheless, each period has its key issues, and, in 2010, debates have mainly concentrated on three principal projects: Nord Stream (currently under construction), Nabucco and South Stream.

This study thus includes two case studies on these key projects. It develops discussions about pipeline routes and potential outputs from these infrastructures, their current usages and the financial requirements for transportation (when they are available), ongoing and future projects, the costs and financing of such projects, and their probable operational start-up dates. While all infrastructures are necessarily included (including Norway and North Africa), particular attention is paid to transportation infrastructure that connects Europe with Russia and the former Soviet Union (Central Asia, Caspian Sea). One will quickly understand that the issue of gas is dominant in today's discussions.

The role of transit countries in hydrocarbon trade is very important and represents a potential factor of disruption between

2 Cf Davoust, Romain, "Gas Price Formation, Structure & Dynamics: An Integral Overview," Ifri Note, March 2008.

producer and consumer, as the repeated Russian-Ukrainian conflicts have clearly demonstrated. Even though factors such as regional or international integration have pacifying effects and diminish the risk of a crisis, they do not eliminate them. In this context, it is crucial to remember that most EU countries are also transit countries, and that conflicts have also arisen between them, notably over the use of networks.[3] The East-East conflicts over certain political, cultural, and economic aspects of their new relationships have also resulted in transit conflicts. For example, one might wonder whether the East-East conflict arose in 1991 with the end of the USSR, or in 2006. Surprisingly, at the end of the 1970s, Moscow had already decided to circumvent Poland, a "possible source of dissension",[4] in order to transport gas to Germany, Austria, France, Belgium, and Italy, passing through Ukraine and Czechoslovakia. Recent analyses of the gas conflicts between Russia and Ukraine, and even Belarus, reveal conflicts dating back to at least the early 1990s between Moscow and Kiev, representing a pathological relationship between a former hegemonic power and its subject as well as a lack of confidence between producer and client (this is also the case with the recent dispute between Russia and Turkey over the Blue Stream project). As for the Ukrainian supply cuts in 2006 and 2009, we witnessed continued reinterpretation of the events: ranging from placing clear responsibility with Russia in 2006 to sharing responsibility with the two conflicting parties. The conflicts that have arisen since the fall of the Soviet Union have two strategic effects: first, they create genuine competition around the role of transit state, as Bulgaria's zeal has proved, and secondly, these conflicts increase Russia's will to create direct links and reduce dependence on the transit country, Ukraine, through which three-fourths of Russian gas passes on its way to the European market. The new political constellation in Ukraine since February 2010 could alter this ambition. Finally, we are also witnessing the emergence of Turkey as an important transit country for energy coming into the EU through the so-called Southern Corridor, and the increasing importance of the countries of South-East Europe, including Austria and the Baumgarten hub.

Methods and Sources

Tables and maps are an important tool for interpreting the complex EU energy infrastructure mosaic.

---

[3] Cristobal Burgos-Alonso, former chair of the Transit Committee, European Commission, stated in an interview with the author in February 2008 that, although access to infrastructures was a notable source of conflict, agreement was finally always reached without EC mediation.

[4] Quoted from Chevalier 2004: 276.

At the author's request, Madeleine Benoit-Guyod, a cartographer, created three maps that serve as the backbone of this study (these maps have been updated for the second, entirely revised edition of the study). These three maps – a panorama of gas and oil infrastructures, and a general survey of both – reflect the status quo in 2010 of existing and projected infrastructure. For the other maps included, the following source deserves mention: the yearly updated maps in the annual publication of Petroleum Economist, World Energy Atlas, UK, Edition 2009 (see Petroleumeconomist.com, to purchase available maps). Maps are also available from the websites of Inogate (Interstate Oil and Gas Transport to Europe; latest update in 2003: Inogate.org), the Centre for Global Energy Studies (Cges.co.uk), and of corporations such as Gaz de France (Gazdefrance.fr) and Transneft (Transneft.ru). This study thus includes around ten maps, which show existing infrastructure as well as future projects.

Christian Schülke, a former research fellow with Ifri who is now working in the oil and gas industry, is owed much gratitude for his critical comments, and his work on developing the existing and projected infrastructure tables, which make up an essential part of the annexes and are partially integrated into the text in order to facilitate reading and analysis. The tables include the name of the pipeline, its route, transit countries, the owner or operator, its length, diameter, capacity, and finally the date it began service. In the annexes, they are listed by geographic region, not by importance. The statistics (output, transit costs, investments, imports, production) come from diverse sources, including Eurostat, ENI (ENI World Oil and Gas Review, edition 2009), the US Energy Information Administration (EIA.doe.gov), and the BP Statistical Review (BP.com). A complete overview of sources is listed in the annexes. When necessary, we note contradicting data from different sources. Finally, the fact that outputs and investments are calculated in different units, between the barrel and the tonne of oil equivalent (toe), or the Euro and the dollar, also makes comparisons difficult. While investments are generally expressed in dollars, European projects more often use the Euro. As for units of measurement, bbl/d is used for oil (barrel per day), and billions of cubic meters per year (bcm/y) is used for gas.

The author would like to thank the European Governance and Geopolitics of Energy Program team – William Ramsay, Jacques Lesourne, Maïté Jauréguy, Maité de Boncourt – for their constant support, crucial proofreading, and indispensable input in this project, which was conceived by Jacques Lesourne. She also thanks Vitalyi Sharlayev for updating the annexes, Ariel Rogers from Rice University for the editing, and Madeleine Benoit-Guyod for creating the maps.

The study is structured as follows: it begins with a section on European history, discoveries and infrastructure in order to establish the context and background. This helps to clarify certain oil and gas traditions, as seen in the following chapters. This chapter also includes a section on European action with respect to infrastructure.

Chapter II analyzes oil, and Chapter III looks at gas. Both chapters look at the relevant reserves, the general issues surrounding transport, and finally at the links and regional considerations. Chapter III on gas is much more copious than the preceding chapter due to fact that the prevailing regionality of the gas market (which is exposed to the sensitive geopolitical transition of post-Cold War Europe) translates into a multitude of projects. The third chapter includes also the two case studies.

Chapter IV deals with the two main transit countries, Turkey and Ukraine, and finally Chapter V summarizes the results and puts all the analyses into perspective.

The originality of this study consists in its being a 'foundation' paper, of the kind that was generally believed to already exist. It will fulfil its purpose if it conveys an all-encompassing, complete overview of energy infrastructure, and if it also serves to support more detailed future research, on infrastructure trajectories or on various regions and countries. In brief, it is a snapshot that establishes the status quo of the transportation landscape in full evolution.

This is the second, completely revised edition of the study.

Setting up Gas and Oil Infrastructures in Europe

Since gas and oil infrastructures are long-term projects, past experiences with a producer, transit country, or consumer can prove to be determinants in future projects. Many aspects of these relationships need to be considered. How reliable is the supplier or consumer? Are there solid diplomatic links? Does one party have negative or positive perceptions of the other? This introductory chapter will discuss the legacies of past discoveries and the successive creation of European linkages. The goal is not to simply give a historic overview of this interesting aspect of the Cold War; others have already done so:[5] instead, the intention is to gain an understanding of the current and future situation by means of these legacies. Readers who are in a hurry or are experts in this field can look at the summary and outline of the status quo and then proceed directly to Chapter II.

Summary

Gas and oil pipelines appeared after WWII during the 1950s and 60s, when coal was increasingly replaced by oil and gas. Their construction followed distinct approaches, emanating from both sides of the Iron Curtain. These differences continue to this day and are apparent principally through the excessive dependence on Russia of new EU member states. These links thus reflect past relationships. One may be surprised by the existence of 'bridges' that pierced through the Iron Curtain during the Cold War; those from Austria and from West Germany. This precursory role was criticized, notably by the two countries' American ally. West Germany quickly became the first client of the USSR after the Cold War, as a result of these preemptive links. In today's context of debates over Nord Stream and the map of European gas pipelines, it is interesting to note that gas crossing through the heart of the East to the West circumvents Poland. This partly explains the dominance of coal production in Poland, which is atypical for Europe. Another curious situation is that Austria and Hungary play

[5] Victor and Victor 2004; Stent 1982; Gustafson 1985; Victor, Jappe, Hayes 2006.

double roles in the Nabucco/South Stream debate, a phenomenon that we will return to in the case study.

This chapter concludes with an outline of the status quo in Europe after the fall of the USSR. The collapse of the Soviet empire was accompanied by the proliferation of state actors within Europe and the redistribution of the energy cards within the former USSR. This redistribution creates new opportunities but also huge risks for the EU and the whole of Europe. Evolving transit countries are a source of crisis, as is the pathology of East-East relations. There are increasing trends of decentralization, while conflicts within the ex-Soviet bloc over political, economic, and even historiographic plans reached the European Union in 2004 and 2007 with the integration of 10 countries from Central and Eastern Europe. The status of 'transit countries' became problematic, which had not been the case in the past. Western Europe as a whole is an example of the inter-dependence and high level of integration into European and international structures and how this can be the best protection against the risk of energy blackmail (although it was necessary to establish a code of conduct, a common judicial framework, before such security could occur).

It is also interesting to that the fall of the USSR gave way to a multiplication of oil and gas pipeline projects, alternative routes, and the reconstruction of energy industries in Eastern Europe. This type of project proliferation was unheard of during the Cold War.

From the Discovery of Resources to the Construction of Separate East-West Networks

Post-WWII

Europe's energy supply after the War, in the East as well as West, was dependent on the domestic production of coal – a raw material whose share in the total energy mix would later diminish in a manner inversely proportional to the rapid development of hydroelectric, gas and oil capabilities. Nuclear power became a competitive source of energy only towards the 1970s, within the context of the first oil crisis. The very advantageous price of oil transported by sea made it an ever more important energy resource for Western Europe. Europe thus became dependent on petroleum resources from the Middle East. These natural resources were successively discovered, beginning in 1935 (Bahrain, Kuwait, then Saudi Arabia), but the massive scope of the oil fields, especially in Saudi Arabia, was not confirmed until the period between 1945 and 1960. The reserves are estimated at 25 billion tons – six times more than the reserves of the US and the

USSR combined.[6] The Middle East is home to the most important reserves in the world, two-thirds of them being controlled by the five member states of the Organization of the Petroleum Exporting Countries (OPEC)[7] of the Persian Gulf. It was only in the mid-1970s that Europe's excessive dependence on oil imports would again decrease, going from over 60% to around 50% of European consumption.[8] The first oil pipeline, PLUTO (Pipeline Under the Sea), was constructed in Western Europe during the World War II and connected the UK to France under the English Channel, thereby supplying the Allied Forces. However, it was not until the 1960s when Druzhba appeared that the construction of the first civil European oil pipeline happened.[9]

Discoveries and the Setting-up of Networks in Western Europe and French Algeria

Petroleum reserves were discovered in Austria in the 1940s and guaranteed Austria's autonomous supply until the 1960s. In addition, those reserves funded war reparation payments to the USSR until 1955. The company founded by Moscow, the Russian Petroleum Administration (Russische Mineralölverwaltung), became the Österreichische Mineralölverwaltung (OMV) in 1955. In other words, the actual Austrian petroleum company was created by the Soviet Union and thus benefited from prolonged cooperation with Moscow. A question that might be asked at this time is whether or not this connection could possibly be tied to the recent entry (January 25, 2008) of Gazprom into the Baumgarten gas hub.

Italy was the first European state to exploit gas, beginning in the Po Valley during World War II and subsequently building up the biggest gas market in Europe, until 1965. Agip and then ENI were later able to invest in the development of resources in North Africa.[10] Only in the 1960s was there confirmation of the other considerable gas discoveries in other European countries. The gas field of Groningen (the Netherlands, 1959), followed by Norwegian and then British reserves (1960s; oil, then offshore gas), opened up new perspectives. Groningen had a decisive impact not only on the Dutch eco-

---

[6] Favennec 2007: 254. Historically, oil production began in the USA, and, in Europe, in Romania and Russia (Baku), as well as in the Middle East, in Persia (1907) and Iraq (Kirkuk 1927). While exploitation in the Arab Peninsula had already begun in the 1930s, its rapid development only began after the World War II.

[7] OPEC was created in 1960, initiated by Iran and Venezuela, and joined by Saudi Arabia, Iraq, and Kuwait.

[8] Fayennec 2007: 167.

[9] A first oil pipeline in Eastern Europe was constructed in 1872 in Baku, at the time of the formation of this city at the periphery of this most important oil region of Tsarist Russia.

[10] Hayes, M., "The Transmed and Maghreb Projects: Gas to Europe from North Africa," in Victor 2006.

nomy,[11] but also on Western Europe's energy supply. The diversification towards gas was reinforced during the 1973 oil crisis, and following that, gas was established as the rival hydrocarbon to the dominating oil.

Groningen began to be exploited in 1964 by Gasunie, Shell, Exxon and the Dutch state, and gas pipelines were established between this gas field and France, Germany, and Belgium. Later, nationnal gas companies such as Ruhrgas, Snam, and Distrigaz were launched.

Discoveries and Pipelines in the North Sea: United Kingdom, Norway

The discovery of the Groningen gas field spurred other intense investigations in surrounding areas. This quickly led to a succession of discoveries in the North Sea, in a zone surrounded by the United Kingdom, Norway and the Netherlands to its south, including the giant Brent, Ninian, Pipers, and Forties (UK) fields, as well as Ekofisk and Troll, and later Statfjord, Ormen Lange, Oseberg, Gullfaqks, and Snohvit (Norway). These discoveries gave way to a production boom in the UK and Norway in the 1980s. The petroleum reserves discovered in Norway at the beginning of the 1960s reached a peak exploittation of 3.4 million barrels a day (mb/d) in 2001, which has been on the decline ever since. Norway, which for many years had been the world's third biggest oil producer, fell to fifth in 2006. In 1975, Norpipe Oil, the first oil pipeline, came into service connecting Ekofisk and Teesside in the United Kingdom, stretching over 354 kilometers (km). Next, Norpipe gas came into existence in 1977 covering 440 km and going to Emden in Germany. A gas pipeline connecting Norway to the UK, Vesterled, began in 1978 and was followed by a new series linking Norway and the European continent in 1993: Zeepipe, to Zeebrugge, Belgium, spanning 800 km (1993), the two Europipes (1995 and 1999) to Germany, Franpipe going to Dunkirk (1998), and finally, in 2006 and 2007, the two Langeleds, to the UK, over 1,200 kilometers.

Algerian Gas

Along with gas coming from the European continent and the North came Algerian gas. The 'super-giant' Hassi R'Mel gas field was discovered in French Algeria in 1956, and is the largest gas field in Africa. Just a few months later, the biggest oilfield in Africa, Hassi Messaoud, was discovered. These two fields constituted the foundation for the corporation Sonatrach. This corporation is exceptional as no other African country has succeeded in creating a national energy

[11] The concept of the 'Dutch Disease' suggests that the profits from raw materials were not used for the development of Dutch state and other economic sectors, but that these sectors instead suffered a decline. The term was coined to explain the decline of the manufacturing sector in the Netherlands after the discovery of the gas field in 1959.

company. Sonatrach was the result of the Algerian government nationalizing infrastructures, at the end of the 1960s, that had been put in place by France. This development hardly pleased Paris.[12] In 1961, following other gas discoveries in the south of Algeria, the first LNG liquefaction factory was constructed at Arzew, financed by a Franco-American-British consortium that put into place the first gas chains between North Africa and Western Europe. Since the technology to build an underwater gas pipeline to Europe was not available at that time, this other infrastructure was constructed. The gas pipeline Transmed would not open until 1982, transporting Algerian gas to Italy and the European Community (EC) by way of Tunisia and Sicily.

The Discovery of Fields in Eastern Siberia and the First Infrastructures

The first resources discovered in Imperial Russia date from the middle of the 19th century (1853) and were located in the Baku region of eastern Siberia. A hundred years later, the Soviets named the field found to the west of the Urals (1942) the 'Second Baku' (after the 1853 discovery). The fields in Samotler, the biggest ever found in Russia, were named the 'Third Baku' in 1967. There are also the major gas fields of Tjumen-Urengoy, Yamburg, and Medvezhye.

In 1953 the USSR reached its peak coal production, while gas production was insignificant with around 9 billion cubic meters (bcm) coming from various fields in Russia and Ukraine. Nikita Khrushchev, the Secretary General of the Communist Party, was at the heart of the change in focus from coal to gas. To "catch up with the US in 25 years," it was necessary to supply Soviet industry with modern energy products. The development of the gas industry, part of the Five-Year Plan from 1956-1960, was furthered through the construction of long-distance gas pipelines and the exploitation of resources in the Caucasus, Ukraine, and Turkmenistan. While petroleum was almost immediately successful, and began to dominate the energy mix in 1968, gas followed at a slower pace. Khrushchev made gas a priority in the eighth Five-Year Plan (1966-72), with a particular emphasis on exploiting Siberian resources to the east of the Urals, which had been discovered in 1966 (Urengoy) and been in use since 1978. The fields to the west of the Urals, on the other hand, are too scattered, while exploitation in the Arctic comes up against insurmountable technological obstacles. The priority given to the Eastern Urals was thus

[12] Quotation from Rosoux, V., "Les usages de la mémoire dans les relations internationales" in: C. Andrieu, M.C. Lavabre et D. Tartakowsky (dir.), *Politiques du passé. Usages politiques du passé dans la France contemporaine*, Aix-Marseille, Publications de l'Université de Provence, 2006, p. 171-181: "Houari Boumediène, the Algerian president, spoke of Algerian oil which would be red 'with the blood of our martyrs who made the ultimate sacrifice for Algeria's sovereignty,' in order to justify, in 1971, the nationalization of Algerian oil companies." Sonatrach is today Algeria's largest corporation, employing more than 50,000 people, and alone accounts for 30% of Algeria's GNP.

because of geographic factors. The Soviet authorities established links between the new fields to the east and the pre-existing infrastructures, especially in Ukraine. In fact, Ukraine was the only western republic of the USSR that benefited from a modern gas network and stockage infrastructures, which explains its subsequent fundamental role in East-West exports. The most common route became the line going from Eastern Siberia to the south-west, which then joined up with the Muscovite network and crossed through industrial regions and Ukrainian gas fields. Gas transport presented a considerable challenge because of technological delays and climatic conditions (regions of permafrost, for example). An important sector, industry, began using gas again only much later in the Soviet economy. Until the 1970s, households were the primary gas users. The USSR, while progressively becoming an exporter to the West, was at the same time a net importer of gas from Iran (IGAT gas pipeline {Iranian Gas Trunkline}, operational since 1970),[13] as well as from Afghanistan. This phenomenon likewise deserves our attention and raises parallels to the current situation in Iran.

Developing Infrastructures in the Soviet Bloc, and their Extension to Western Europe

The setting-up of infrastructures within the Soviet bloc from 1968 to 1980 has been the focus of many important studies, such as Stern (1980, 1993), Gustafson (1985), and Stent (1982). In this study, this topic will be only briefly touched on; the other studies can provide a more in-depth analysis. At the start there was Druzhba, the oil pipeline constructed between 1959 and 1964, which links Almetyevsk in Tatarstan through Belarus and Poland at Schwedt/Oder in eastern Germany. A second arm to the south extends Druzhba from Masyr in Belarus through Ukraine to Czechoslovakia (today Slovakia and the Czech Republic). While the oil industry, driven by the market, is always in search of maritime routes and thus openings to the global market, the construction of Druzhba was guided by political thinking: to reinforce the Soviet bloc.

During the 10th Council for Mutual Economic Assistance (Comecon) session in Prague in December 1958, the decision was made to build the world's longest oil pipeline. The Soviet satellite countries (Czechoslovakia, Bulgaria, Poland, East Germany, and Hungary) participated in its execution, each having to manage around 550 km. These countries financed their own parts (infrastructure, housing for workers, etc), and were repaid with free gas. The branch to Omisalj (Croatia), shown on Map 1, was added in 1974; it was

[13] IGAT connected Iran to the Caucasus gas pipelines through Georgia, and delivered gas north of Moscow. The line was closed in 1979 during the Iranian Revolution.

created to flow in the opposite direction so as to be able to transport Mid-East oil through Omisalj to Eastern Europe. Since this flow never occurred, the direction was reversed and Russian oil was exported through it. The pipes came from Japan, West Germany, and Italy. On July 17, 1963, the first Russia oil arrived in Schwedt in East Germany.

Map 1: The Druzhba Pipeline

Source: *Robertamsterdam.com*

As for gas, a first pipeline called Bratstvo ('fraternity') in 1968 linked gas fields to the east of Kiev to Czechoslovakia, with one small extension to Austria and another to Poland. At the start of the 1970s, Soviet authorities began projects for additional links to other countries in the Soviet bloc as well as to countries that were politically and geographically close such as Austria, Germany and Finland.

Sorting Out Transit Countries: the Federal Republic of Germany and Austria

The first energy bridge to cross the Iron Curtain was through Austria, which had exchanged electricity with Eastern countries since 1956 (beginning in 1985 with Russia). Above all, Austria exchanged gas, beginning in 1968, via the Bratstvo pipeline. Better known and more strategic for the European Community were the agreements made between Bonn and Moscow at the beginning of 1970. The German Economics Minister, Karl Schiller, and his Soviet counterpart signed an accord linking the Ruhrgas and Gazprom monopolies and Deutsche Bank in the following project: in exchange for the Federal Republic of Germany (FRG) receiving supplies of half a bcm of gas per year in 1973, and 3 bcm per year beginning in 1978, the USSR would get 1.2 million tons of piping manufactured by Mannesmann

plus a very advantageous loan of 1.2 billion Deutsche Marks. This agreement, the first of its kind, was known as the 'Gas for Pipes' deal (Erdgas-Röhren-Geschäft). This accord served other EC member states, and they in turn would sign supply agreements with the USSR, in order to connect to German infrastructure.

The East-West barter model was simple. The USSR needed Western currency and technology while Western European countries – West Germany, France, Austria, Italy, and Belgium – looked to diversify their gas supply and diminish their reliance on Dutch gas. At the same time, the subsidized prices for 'brother countries' and the complex barter trades reinforced interdependence within the Soviet bloc.

The previously unseen rapid development of the gas industry and exploitation of networks was possible only after the first oil crisis in 1973 due to the interwoven linkages with Russia. It was thus a veritable catalyst for the first series of long-distance gas pipelines connecting the East to the West. Looking at the political context of the 1970s, the overall détente aided both sides in realizing their mutual interests in East-West commercial exchanges. While in 1970 only three countries received Soviet gas (Czechoslovakia, Austria {Bratstvo 1968}, and Poland {gas pipeline in 1949}), the situation had changed considerably by 1975 due to new clients and pipelines. A new gas pipeline, the Trans-Austria Gasleitung (TAG I and II), transported gas to Czechoslovakia, Austria, and Italy (TAG pipelines I and II, in 1974); the MEGAL[14] gas pipeline took gas to Austria, both Germanies, and France (1974, 1976, 1979), and the Soyuz (Union, 1975) gas pipelines exported to Romania, Bulgaria, and Hungary, with resources from Orenbourg.[15] The USSR grew more and more dependent on the export of raw materials, which moreover, by the end of détente in 1980, made up 62.3% of its GNP. Between 1975 and 1980, the volume and the price of gas tripled and, as a consequence, Soviet revenues increased ninefold.[16]

As already mentioned, this economic and energy rapprochement between the East and the West faced resistance and criticism from the United States, notably during the second series of contract negotiations between the USSR and Ruhrgas. These agreements were reached in a tense international context: the end of the Brezhnev era, the arrival of President Ronald Reagan, the start of a new arms race, martial law in Poland, and the Soviet intervention in Afghanistan. The Reagan administration resorted to using sanctions. During the ongoing negotiations to increase exports between the German gas monopoly Ruhrgas and the USSR, the CoCom[17] list banned the

[14] MEGAL = Mittel-Europäische-Gasleitungsgesellschaft GmbH (Central European gas distribution company), with Ruhrgas 50%, GDF and OMV each with 25%.
[15] Victor/Victor 2004 2004: 9.
[16] Victor/Victor 2004 2004:10, 11.
[17] The Coordinating Committee for Multilateral Export Controls was an international organization that aimed to control the export of strategic products and technologies to

technology transfer of one part of the compressor that is necessary in the gas chain, because the gas pipeline, operational since 1985, used a mix of Soviet and Western technologies. The new network doubled Soviet exports to the West (Germany, Italy, France, Austria, Switzerland, Turkey, Finland) from 1985 to 1991. The Reagan administration's sanctions proved to be ineffective because a barter system had been set up with a new gas pipeline, STEGAL. This joint project between France, Germany, Italy, and the USSR was put into operation in 1992; the USSR had only days earlier ceased to exist.

Continuity and Ruptures

The construction of oil and gas infrastructures in Europe reveals a thinking that, at first, follows Cold War reasoning. In both the East and the West, coal was substituted with the hydrocarbons oil and then gas, and hydrocarbon linkages were created. The remarkable turn-around of the 1970s at the time of détente went hand in hand with the emergence of the first connections between the two sides and a growing interdependence between the European Community and the USSR. This rapprochement came up against US opposition at the end of the 1970s, but US sanctions had a limited impact as the inter-dependence continued to grow during this period. The foundation of today's cooperation between the EU and Russia/CIS was laid during the 1970s. The construction of energy links and increasing inter-dependence changed the relationship between the two superpowers and gave birth to the EC's own approach to its interests, whereby it gradually became a regional actor.[18] During the 1970s, transit states emerged in the East. They were at first simply objects in the transport business, but would then become a fundamental issue and concern once the Soviet bloc collapsed.

Hydrocarbon Transport and the Consequences of the Fall of the Soviet Union

The dissolving of the USSR and the Soviet bloc had five major conse-quences directly related to energy:

- New relationships, new energy prices within the ex-USSR
- A proliferation of states and transit countries

---

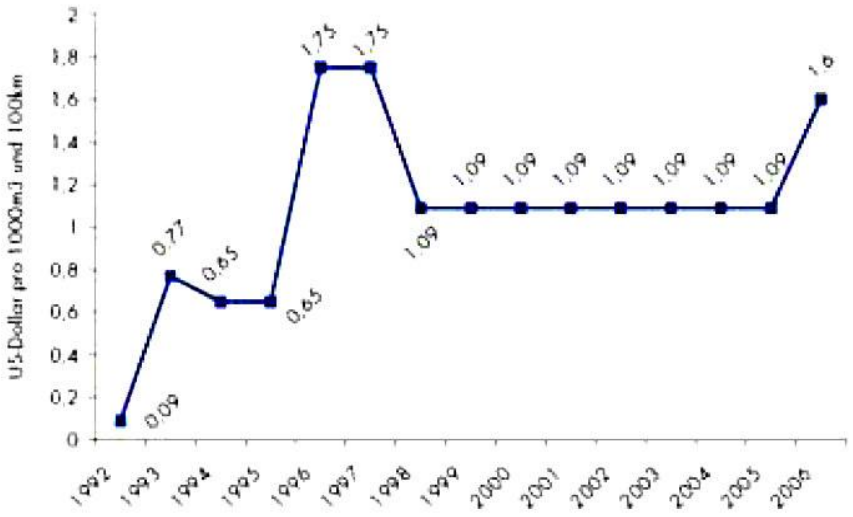
banned locations. It was made up primarily of NATO member states as well as other countries such as Japan and Australia.

[18] It is necessary to mention in the context of this relative emancipation the putting in place of the monetary plan and system, in the same period, following the collapse of the Bretton Woods system.

- A collapse in production and consumption
- A reorganization of the energy sector in the East and in the EU
- Stagnation in the maintenance and restoration of infrastructure
- New relationships, new prices within the ex-USSR

The Central European countries seeking integration into Western structures must now take on world market prices for gas and oil, or at least negotiate a special reduced price, usually in convertible currency. The multiplication of consumers paying world market prices could thus be considered an economic advantage for Russia, a point that is often overlooked in the literature. At the same time, the new transit countries began to benefit from their location and in turn began charging Russia higher transit fees. This evolution is illustrated in Graph 1, using as an example the transit fees charged by Ukraine between 1992 (fall of the Soviet Union and beginning of the CIS) and 2006; note the periods 1992-93 – post-Soviet independence and the transition to a market economy, and an increase in the price of Russian gas which led to an increase in transit – and 1995-1997 – the transit crisis between Ukraine and Russia.

Graph 1: Evolution of Transit Fees in Ukraine, 1992-2006



Source: Ukraine-Analysen 2, available at *Ukraine-anlysen.de*

While the price of oil rapidly aligned with world market prices and quickly ceased presenting problems, including in the case for Russian adhesion to the World Trade Organization (WTO), the situation would be very different in the gas sector. In 2007, Belarus, Armenia, and Ukraine were charged $100, $110, and $130 for 1,000 m3, in contrast to the $235 paid on the European market. Georgia and Azerbaijan, on the other hand, have paid world prices since the beginning of 2007.

A proliferation of states and transit countries

Out of the European part of the USSR, seven independent states emerged: Russia, Ukraine, Belarus, the three Baltic states, and Moldova. From then on, all new Russian projects went through transit states, notably Ukraine (on which 90% of Soviet gas exports depended in 1992) and Belarus. Moreover, this traditional gas export route now went through not only two countries (Ukraine and Czechoslovakia) but three: Ukraine, the Czech Republic, and Slovakia, after the break-up of Czechoslovakia in 1993. These states tend to act in their own self-interest, which led Russia to consider establishing direct routes. In fact, only one direct link has existed connecting the USSR to Finland since 1974. It was not until 2003 that a second direct link, this time to Turkey – Blue Stream – was constructed. The proliferation of states in Eastern and Central Europe following the disintegration of the Soviet empire created new tensions, conflicts, and pathologies. Competition between transit countries continues and Ukraine's dominant position in gas production is being contested by new projects in countries such as Bulgaria and even Serbia. The aim here is to raise the stature of the country, thereby becoming a wild card in the game of infrastructure. These relationship pathologies have a strong impact on Western Europe and are now a problem for the EU since the fifth enlargement took place in 2004. The EU is creating a European energy policy with a strong focus on external relations and a newfound distrust towards its historic Russian partner due to Russia's increased dominance in gas and energy markets and infrastructures in Europe.

Collapse in production and consumption

Following the economic shocks provoked by the disintegration of the Soviet bloc and the often irresponsible experiments of this unprecedented political-economic transition, Russia's gross domestic product (GDP) shrank by 40%, leading to a reduction in energy consumption of around a third (OECD 1997). Commercial exports to former satellites and CIS countries also decreased because of their decline and their decreasing consumption.

Russian petroleum production, number one in the world, decreased by half between 1988 and 1995: from 600 million tons in 1988 to 350 for the CIS (500 to 300 million tonnes alone for Russia).[19] The only advantage of the decrease in domestic demand within the ex-USSR during this period is that it allowed the CIS and Russia to maintain exports in petroleum as well as in gas despite the drop in production.

[19] Favennec 2007: 190.

Reorganization of the energy sector (gas) in East and West

The gas sector, administered in the USSR by the Soviet Gas Ministry, underwent important organizational changes. First, in 1989, the ministry was transformed into a committee controlled by the state. Then, according to a presidential decree at the end of 1991, it became a corporation owned by Belarus (1.5%), Ukraine (9.5%), and Russia (89%). Within three years' time, this corporation had to be privatized. The Russian state retained a share of 38%. State control over the hydrocarbon sector was repeatedly reduced during Yeltsin's presidency, and restored only in 2000, with the election of President Putin.[20]

Important changes occurred in the EU as well. A new European energy policy aims to increase competition on the common market by using different forms of unbundling as well as interconnectors, to improve security of supply, to stimulate investment, and to curb carbon emissions. EU energy policies have strong effects on the energy market not only within the Community, but also, via for example the Energy Community externally. The reciprocity clause (familiarly referred to in Brussels as the 'Gazprom clause') prevents countries that do not apply the same rule of separating generation and grid from purchasing EU infrastructure.[21]

Stagnation in the maintenance and restoration of infrastructure

The managerial collapse became clearly evident in terms of infrastructure. Since 1985 the former Soviet Union infrastructure is subject to permanent deterioration. New projects are stagnating, especially upstream. Some of the fields were opened to exploitation by foreigners (notably in the 1996 law on production sharing agreements {PSAs}). From 1998 on, oil production began to increase and today it is close to 1980s levels. There is a strong push for new and updated infrastructure, through renovation and repair, and also the introduction of new infrastructure, especially LNG terminals, that have been missing until now, and the development of fields for post-2015. Difficult climatic conditions necessitate technology transfers and the investments that are essential for creating international consortiums. However, these latter matters come up against a confusing legal framework that has historically deterred investors, especially during the early 2000s.

Several attempts have been made to find a solution to the lack of an East-West legal framework. In the early 1990s, at the initiative of the Dutch prime minister, the Energy Charter was conceived of as a framework for dialogue and cooperation on energy between Western and Eastern Europe. The European Energy Charter (1991)

[20] Cf Stern 2005 on Gazprom's evolution, the return of the State under Putin, etc.
[21] Cf Nies, "Unbundling," Editorial, Ifri Energy Program, January 2008, *Ifri.org*

then became the Energy Charter Treaty in 1994; no longer limited to Europe, it currently has 51 members. Purely consultative, and notably not ratified by Russia, this tool quickly showed its limitations. Another institution was also developed: INOGATE, set up in 2001, which also does not include Russia. This umbrella agreement is supposed to support the development of transport structures for gas and oil, as well as investments in the former USSR. Its efficiency and usefulness remain to be seen.[22]

[22] Information on this organization, based in Kiev, can be found at *Inogate.org*

EU Actions on Gas and Oil Infrastructure

This study would be incomplete without a summary of EU policies on infrastructure. Energy policy holds an increasingly important place on the EU agenda, especially since the gas conflict between Russia and Ukraine in 2009. The Commission's Green Paper (March 2006) had already advocated "secure, competitive, and sustainable energy," one of the main elements being an external energy policy that should also direct relations with foreign suppliers. This initiative is to be seen as the result of the January 2006 Ukraine-Russia gas crisis, as well as climate policies. On January 10, 2007, the Commission underlined in a communiqué that energy had become a central element of all EU foreign relations. Supply diversification, security of supply and energy efficiency have become new concerns. The Strategic Energy Technology Plan (SET Plan) endorsed in November 2007 will incentivize technological progress in the field of energy, common research, and bundle funds.[23] Interconnectors and energy policy are mentioned in the Lisbon Treaty (Art. 194) and policymakers in September 2007 were pressed to ensure their implementation.[24] Investment is meant to be stimulated by granting exceptional status to pipelines with Third-Party Access exemption. The unprecedented disruption of supply between Russia and the EU in Ukraine in January 2009 intensified concerns about security of supply much further. One-fourth of the EU gas supply was shut off for two weeks during a very cold winter.[25] The Gas Security Regulation (2010) needs to consider the solidarity clause of the new Art. 194 on Energy in the Lisbon Treaty as it will reinforce the harmonization of the regulatory landscape and the security-of-supply measures in EU member states, as well as reverse flows and interconnections, especially between Western and Eastern Europe.

New climate policies and related decarbonization strategies also have a strong impact on the energy mix, and the policies of the EU and member states. Security of demand for hydrocarbons could be decreasing, from the perspective of producing countries like Russia.

Currently, there is a large-scale reshuffling of the European energy market in terms of unbundling, decarbonization and

[23] *Ec.europa.eu*
[24] Text of the Reform Treaty, available at *ConsiliumEuropa.eu*
[25] See Pirani 2009, Nies 2009 ('Ukraine: A Transit Country in Deadlock ?')

optimization. This reorganization is followed closely by third countries and especially suppliers like Russia, Algeria and even Norway. Indeed, all changes to conditions in the Community framework alter a fortiori the terms of trade. In addition to these internal changes, the question of energy will for the first time be part of the Partnership and Cooperation Agreement (PCA) between Brussels and Moscow. This EU-Russia energy dialogue was established in October 2000, at the initiative of the then president of the Commission, Romano Prodi, and was based on the axiom of growing interdependence between Brussels and Moscow. Despite serious delays in updating the PCA, the Early Warning Mechanism was put in place in November 2009; it proved to be quite reliable during the Belarus-Russia crisis.26 We are thus witnessing the recent politicization of energy at the EU level – its communautarization.

How does the EU today intervene directly or indirectly in the multitude of gas and oil pipeline projects? Increasing importance is attributed to the European infrastructure because of the decarbonization shift as well as the security-of-supply considerations.

First, the EU's actions are normative and aim to open up national markets in order to establish a European market via liberalization. Projects on unbundling transport networks and distribution are included in this area. Secondly, the EU aims to promote and to complete intra-European connections and links. Here, the EU identified 'priority' projects, the so-called TEN-E, the trans-European energy networks. In 2010, TEN-E is subject to an assessment and to reinforcement. The Commission wants infrastructure projects to not only follow commercial but also political logic, which is why these projects should be labeled as being in 'the European interest.' The recovery package from 2009 devotes 3.5 bn Euro to energy projects.27 Thirdly, to set up a common legal space and to soften borders with neighbors, the EU set up the Energy Community, whose secretariat is based in Vienna. This organization's mission is to promote the energy acquis communautaire (the accumulated body of EU law) in neighboring countries so that there is legislative harmonization with the Western Balkans, as well as with Ukraine and Moldova. South-Eastern Europe is considered somewhat separate in the European energy picture. Subject to the devastations of war in the 1990s, closely followed by territorial fragmentation and new borders, regional trade has only started developing since 2002, largely due to the Central European Free Trade Agreement (CEFTA) and international support.

The treaty establishing the Energy Community (ECSEE), signed in 2005, has the objective of stabilizing and developing the region. This legally binding treaty covers the gas and electricity industries. The signatory countries must conform to European energy legislation and create a market in line with the EU obligations. Its mem-

[26] *Europa.eu*
[27] *Europa.eu*

bers include (as of July 2010): Albania, Bosnia-Herzegovina, Croatia, Kosovo (UNMIK), the Former Yugoslav Republic of Macedonia, Moldova, Montenegro, Serbia, and the EU.[28] Georgia, Norway, Turkey and Ukraine have observer status. Ukraine is expected to become a full member soon; its entry is still pending, awaiting its commitment to energy market reform, especially in the field of gas.[29] In early July 2010, Ukraine adopted the required new gas law, but no official accession date to the Energy Community has been announced (as of August 2010).[30]

In sum, the EU is integrating energy issues more and more into agreements with third countries and is at the early stages of creating an 'external energy policy.'

Normative Actions, the Domestic Market, and the Impact on Third Countries

The liberalization of the energy market is a key element of the different EU 'energy packages.' Unbundling – the separation of transmission from generation – is a major element here. A 'reciprocity clause' (known as 'the Gazprom Clause' in Brussels jargon) bans the involvement of all companies or individuals from a third country in liberalized infrastructures, without reciprocity in unbundling, liberalization and preliminary consent by the respective national regulatory authority (see Art. 11 of Gas Directive 2009/73/EC).[31] After the Commission gives its opinion, the national regulator "shall take utmost account of the Commission's opinion." In the end, however, it is the national regulator, or the member state, that decides, and not the Commission.

The other key element of recent EU energy legislation is climate change and the related Emission Trading Schemes (ETS), as well as the development of Renewables and Carbon Capture and Storage (CCS). The widely shared 20/20/20 goals will obviously affect the energy mix and the energy choices made by member states. There is indeed a certain contradiction between Article 194, which leaves the energy-mix choice to member states, and the requirement that 20% of EU energy come from renewable energy sources (RES) by 2020.

---

[28] See *Energy-community.org*

[29] See Boodts, Nies (2010) The Energy Community, Ifri working paper, September 2010, *Ifri.org*

[30] On Ukraine, see 'Transit Countries' section later in this chapter.

[31] For the debate surrounding unbundling, see Susanne Nies, "Editorial Unbundling", *Ifri.org*, January 2008.

Lines with TPA Exemption

Merchant lines present an interesting exception to the publicly accessible, 'unbundled' infrastructure. To stimulate investment, exemptions were granted in 2003 for gas, LNG infrastructure and electricity interconnections. According to Article 36 of the EU directive 2009/73/ EC, "new direct current interconnections may, upon request, be exempted [...] under the following conditions:

> **EU directive 2009/73/ EC - Article 36, paragraph 1:**
>
> Major new gas infrastructure, i.e. interconnectors, LNG and storage facilities, may, upon request, be exempted, for a defined period of time, from the provisions of Articles 9, 32, 33 and 34 and Article 41(6), (8) and (10) under the following conditions:
>
> (a) the investment must enhance competition in gas supply and enhance security of supply;
>
> (b) the level of risk attached to the investment must be such that the investment would not take place unless an exemption was granted;
>
> (c) the infrastructure must be owned by a natural or legal person which is separate at least in terms of its legal form from the system operators in whose systems that infrastructure will be built;
>
> (d) charges must be levied on users of that infrastructure; and
>
> (e) the exemption must not be detrimental to competition or the effective functioning of the internal market in natural gas, or the efficient functioning of the regulated system to which the infrastructure is connected.

A similar exemption has been granted, via exemption, for merchant lines in electricity. This regulation was adopted at a moment when the EU was suffering from insufficiently regulated investment in interconnection capacity. It thus decided to try to offset the trend by granting exemptions – which have to be requested from the EU Commission – for 20 to 25 years. This means that third parties have no access to the merchant infrastructure within a certain period of time. Nevertheless, until recently, such opportunity was only rarely exploited. A change has occurred only in the last months, partly due to increased public interest and the allocation of new subsidies, including to renewables and appropriate infrastructure. In gas, NEL and OPAL for example, two gas pipelines connecting Nord Stream with the German gas network, have applied for exemption from third-party access (TPA). TPA exemption was granted to OPAL, but not (yet) to NEL.[32]

32 "Germany rules favourably on OPAL gas pipeline," Reuters, 25 February 2009.

Gas Security in the EU

The main problem of EU energy security is gas and the huge dependency of the new member states, the former Eastern Bloc countries, on Russia. Due to its history, West-East and North-South interconnections are largely absent in Central and Eastern Europe. This Cold War legacy reinforces the vulnerability of the new member states in the event of a crisis. Energy efficiency as well as diversification of the energy mix is insufficient, especially in countries such as Bulgaria, Slovakia, and most of the Western Balkan countries. To ensure the security of the gas supply of the EU 27, these specific national and regional problems must be addressed through appropriate measures. Until these are implemented, the union's solidarity is in a state of crisis.

The new Article 194 of the Lisbon Treaty

Article 194 of the Lisbon Treaty precisely sets the scene for solidarity among member states, while preserving national choice in the energy mix: "In the context of the establishment and functioning of the internal market and with regard for the need to preserve and improve the environment, Union policy on energy shall aim, in a spirit of solidarity between Member States, to ensure the functioning of the energy market; ensure security of energy supply in the Union; promote energy efficiency and energy saving and the development of new and renewable forms of energy; and promote the interconnection of energy networks."[33]

Crisis and the EU response

The EU has been subject to gas-supply disruptions twice; a minor crisis in 2006 was followed by a major crisis in 2009 during which the EU was deprived of a major part of its gas supply for 14 days. Both crises were related to conflicts between the transit country, Ukraine, and the supplier, Russia. As a consequence, the EU has developed its first and second Strategic Energy Review on how to cope with gas import dependency and has decided to reinforce solidarity and interconnection within the EU. The supply disruption especially hit the new member states that are highly dependent on Russian gas, namely Slovakia and Bulgaria. Non-member states in South-East Europe, including Moldova, were also heavily affected. In response, states such as Hungary and Italy, but also Germany and Greece, used stocks, reverse flows, or LNG supply. A recent crisis in June 2010 involving Russia and Belarus had the potential to affect supply to the Baltic States, Poland, and the Russian enclave of Kaliningrad – potential, because the conflict over outstanding payments was solved before a complete disruption occurred. But the effects of the crisis confirmed again how vulnerable some of the EU's member states in Central and Eastern Europe are.

[33] *Europa.eu*, p 88 of the PDF

Gas security legislation: endorsement in autumn 2010

Six years ago in 2004, the Gas Security Directive was adopted, based on the assessment that natural gas played an increasingly important role in the EU energy mix and that import dependency was growing. The measure was meant to deliver policy answers in case of a major supply disruption, defined as a loss of 20% in gas supply. Here, a three-step approach, from market to national to EU level, is advocated. Today, the European institutions are discussing substituting the directive with a regulation that would strengthen the legal framework of energy security. The regulation was formally adopted in September 2010, but it is worth taking a glance at the recent developments and EU considerations. The crisis in January 2009 clearly demonstrated the lack of East-West reverse flows as well as the lack of diversification in the energy mix in some member states. The crisis management itself, via the Gas Coordination group, the Commission, the Energy Community, monitors, governments and industry, had been efficient, and projects have since been initiated, such as the reinforcement of interconnections between Greece and Bulgaria.

The content of the Gas Security regulation

In July 2009, the Commission published an impact assessment for the Gas Security Directive,[34] taking account of the January crisis and the unprecedented changes in the global and European gas market. If some of its conclusions seem to be outdated, others remain valid: the Commission understands the need for greater harmonization of security-of-supply standards and predefined emergency measures at regional and EU levels; the threshold for triggering EU action should be reconsidered and compensation arrangements be clarified. There is insufficient evidence at this stage for the Commission to make strategic gas stocks obligatory. In its draft for the regulation, however, the Commission outlines deficits in crisis response and stresses the need for more infrastructure investment – reverse flows, stocks, interconnections. But reverse flows are not a panacea: if they are crucial for some places, they are useless in others. The revised regulation takes this aspect into account and grants exemption to some states, such as Luxembourg.

As the impact assessment states, the strategic objective of the new regulation is to guarantee an adequate level of preparedness for gas-supply disruption in the EU.

[34] European Commission, July 16 2009 : *Ec.europa.eu*,
Impact Assessment accompanying the proposal for a Regulation, COM (2009) 363, SEC (2009) 979

Doubts about the N-1 criterion for gas supply

An important change is the application of the N-1 norm which is normally used in the sphere of electricity. N-1 in electricity means that, within a short period of time (less than 30 minutes), there is an urgent need for response to the loss of a major generation unit. N-1 is related here less to the question of energy security than to maintenance of uninterrupted service, where the consumer does not even notice that a problem arose. With gas, one has between five and twenty hours to react to a crisis, due to the different qualities of the commodity. Applied to gas, N-1 in the regulation proposal is equivalent to the default of the principal infrastructure for a given member state in the gas supply: from an LNG terminal (Portugal, Spain) to the major production site (UK, Netherlands, Denmark), or especially of the Ukrainian Gas Transmission System (GTS), as in January 2009 (Eastern and Central Europe). But, if a closer look is taken at the role of these major infrastructures, their default could be equivalent to total (100%) disruption in some cases, or to a marginal disruption (up to 10%) in other countries. This has led to criticism by institutions and energy experts who point out the fundamental differences between gas and electricity. Indeed, as the "Calculation of the N-1 indicator" shows, the application of N-1 to gas would oblige member states to maintain a high level of gas supply at more than 100% as a precautionary measure in case of a crisis.

In practice, guaranteeing adequate preparedness means that member states have to set up competent authorities that elaborate risk assessments, scenarios, and preventive-action plans. These plans must ensure that, even during extreme periods of cold, 60 days of gas supply can be sustained. Three main crisis levels are defined and each has to be reported to the Commission if it arises. A Union Emergency can be declared at the request of one competent authority, or when the EU, based on the ENTSO-G calculations, loses more than 10% of its daily gas import from a third country. If one geographical region is specifically affected, a regional emergency can be declared. The regulation obliges member states to submit to the Commission intergovernmental agreements concluded with third countries on infrastructures and supply (Article 6a). Meanwhile, natural-gas undertakings have to notify the competent authority about the details of contracts with suppliers from third countries (Article 6b).

System Security and Renewables (RES): the Intermittency Challenge

The ambitious 20/20/20 targets of the EU, endorsed in March 2007, consist of three climate and energy targets for 2020:

- a reduction in EU greenhouse-gas emissions of at least 20% below 1990 levels
- 20% of EU energy to come from renewable resources

- a 20% reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency [35]

The share of RES in the EU energy mix will increase as a result of this 20/20/20 plan. The intermittency of some renewables – especially wind and solar – constitutes a particular challenge to grids, since it destabilizes them. There is a paradox here, since intermittency has to be balanced with traditional and continuous generation capacity. Also, while the energy mix is defined at a national level, the solution to intermittency can only be delivered at a European level. If this is not done, introducing RES on a large scale does not make sense commercially. The integrated European electricity market is the appropriate solution as it helps to offset intermittency.

Priority Projects and Interconnectors

As for the construction of new infrastructure, the Commission decided on a list of 10 gas and electricity projects (not oil) of "European interest," with the goal that seven of them would be up and running between 2010 and 2013. Currently, only Green Stream, which connects Libya and Italy through Sicily, and Balgzand-Bacton, between the Netherlands and the UK, have begun service, and only the Turkey-Greece section of the Turkey-Greece-Italy pipeline (TGI) is currently working. The eight other projects are:

Under construction: Transmed II, between Algeria, Tunisia, and Italy, through Sicily; Medgaz, connecting Algeria and Spain; Nord Stream, between Russia and Germany

In the development phase: the Greece-Italy section of the TGI pipeline; Galsi, connecting Algeria to Italy via Sardinia, with a branch to France via Corsica; Nabucco.[36]

These infrastructures will increase the EU's import capacity by around 80 to 90 bcm. Learning from past experience, the improvement of West-East interconnection, including the Baltic Energy Market Integration Plan (BEMIP), is a clear future priority.

[35] *Ec.europa.eu*

[36] See the Common Position (CE) no. 1/2006 of December 1, 2005, decided by the European Council, for a detailed list and also for the interconnector projects.

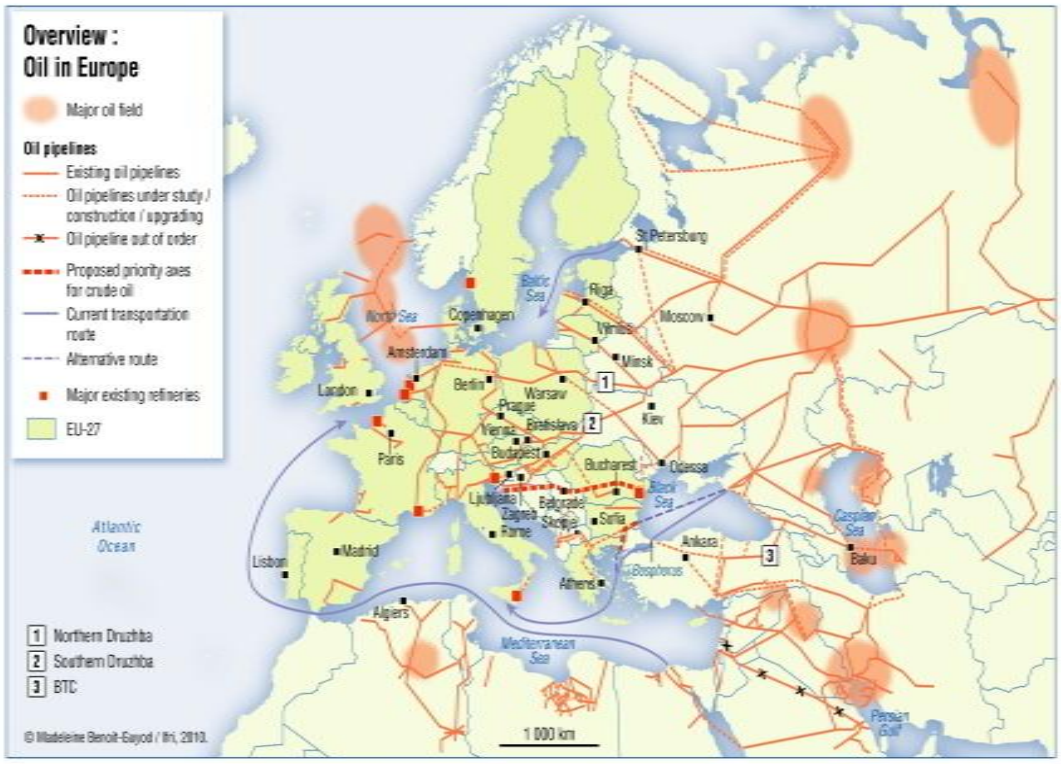
Oil Transport to the EU

This chapter examines oil transport to Europe. Russia and the CIS are the main suppliers to the EU, followed by the Middle East, Norway, North Africa, and West Africa, with a small part coming from the Americas. As the Middle East's share progressively decreased since the construction of Druzhba and the increase in intra-European exchanges, Europe's main attention is naturally fixed on its large supplier in the East and its former satellite countries. In the following introduction, the origins of European resources and supplies are outlined. In the next section, the infrastructures by region of origin, present condition, and included projects are described. The Turkish issue is not covered in this section; a separate section is dedicated to the whole of this country – an important energy crossroads; it covers both oil and gas, as well as the significance of the Turkish Straits.

Introduction: Origins of Resources and European Supply

The EU accounted for 17.3% of the world's oil consumption in 2009 (source: BP 2010), which made it the world's second largest oil consumer behind the US. It imports roughly 85% of its resources. Only the United Kingdom, Denmark, Italy, and Romania have significant national resources and these are rapidly diminishing. Around 47 % of Europe's oil originates from the former Soviet Union, 24% from the Middle East, 21% from Africa, and 22% from Norway. The clear trend over the last 15 years has been for the share of former Soviet Union oil to grow to the detriment of imports from the Middle East. Oil imports are acquired partly in the form of refined products. While the EU is self-sufficient in refining petroleum, it is deficient in naphta (the substance used for the fabrication of synthetic fibres and plastics) as well as diesel oil. This gap is filled with refined Russian and, to a lesser extent, North African imports.

Map 2: Overview: Oil in Europe



Due to the economic crisis, we witnessed a decrease in consumption in the EU of 4.4%, bringing consumption down from 14,775 thousand barrels per day in 2008 to 14,143 one year later. The EU is thus in line with general OECD and former Soviet Union trends, but the fall in consumption is above the total world contraction, estimated by BP 2010 at 1.7%.[37]

[37] BP Statistical Review of World Energy 2010:11.

Table 1: Europe's Crude Oil Imports in 2009, by Country of Origin (in million tons)

Country or region of origin	Quantity
Former Soviet Union	347.8
Middle East	105.9
North Africa	81.0
West Africa	48.3
South & Central America	21
North America (USA 20.3, Canada 0.3)	20.6
Mexico	5.6
Other Asia Pacific	4.4
Singapore	1.9
Japan	1.1
India	3.5
China	1.8
East & Southern Africa	0.1
Unidentified	22.1
Total imports	665.3

Source: BP 2010 (p. 20) and author

Introductory remarks on oil transport

Crude oil can be transported by pipeline, tanker, or by a combination of the two: first by oil pipeline and then by oil tanker. Over distances greater than a few thousands kilometres, transport by means of large tankers is generally cheaper. The size of ships used for crude-oil transport varies from a few thousand to several hundred thousand tons. Their capacities have grown considerably over time, particularly between 1946 and 1970 in response to the heightened demand during the 'Glorious Thirties.' While in 1945 the capacity of an oil tanker was limited to tens of thousands of tons, today it is more than 500,000 tons. It is important, however, to point out that the two oil crises reduced demand and stimulated production in locations closer to consumer countries. Consequently, the demand for immense tankers diminished since they required modified and costly facilities to accommodate them. Finished petroleum products are transported by tankers of a limited size, such as those of Rotterdam along the Rhine that hold some 1,000 to 3,000 tons. Currently, the EU lacks the refining capabilities and the investment that are necessary for this type of infrastructure.

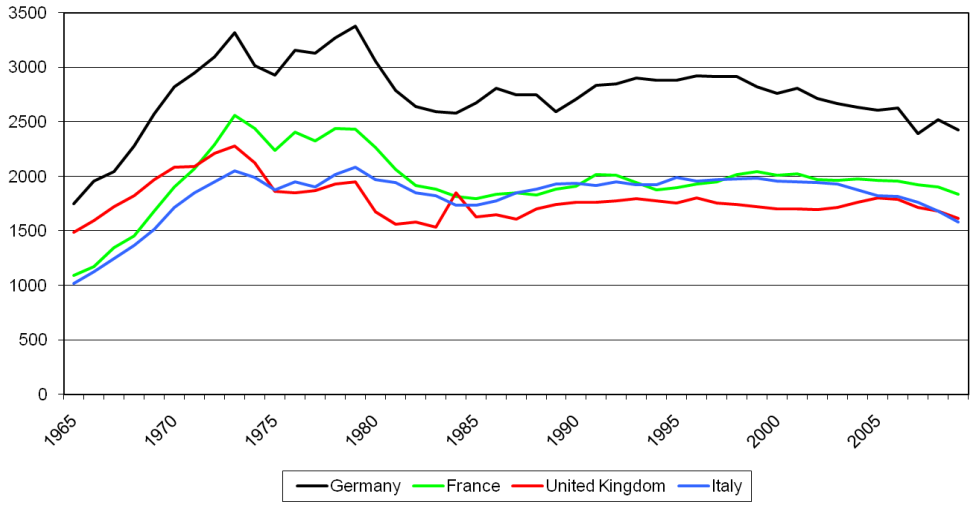
Europe's oil supply and the impact of oil prices

Only Russian and Norwegian oil is transported to Europe by pipeline – through Druzhba and Norpipe. The rest is imported by maritime transport. Because of their proximity, CIS in general and Russia in particular are naturally the top European suppliers for oil and gas.

In terms of domestic production, the EU and the European Economic Area (EEA) have three major producing countries: Norway, the United Kingdom, and Denmark, with the North Sea dominating (United Kingdom, Norway). However, this group's resources have been in decline since 1999 (UK peak) and 2001 (Norway peak).

The idea that Russian flows could eventually be reoriented to competing consumers such as the Americans, Japanese, or Chinese is a concern for the EU. On the other hand, uncertainties over price and Europe's long-term consumption worry their principal supplier and influence their projects. In the EU, the four biggest economies consume more than half of the hydrocarbons consumed in Europe (56.2%). These are Germany, the United Kingdom, France, and Italy. The UK, a producer and exporter up until 2005, became a net importer that year. Norwegian production has likewise been decreasing since 2001.

Graph 2: Oil Consumption of the Four Biggest European Consumers 1965-2009 (1,000 barrels per day)

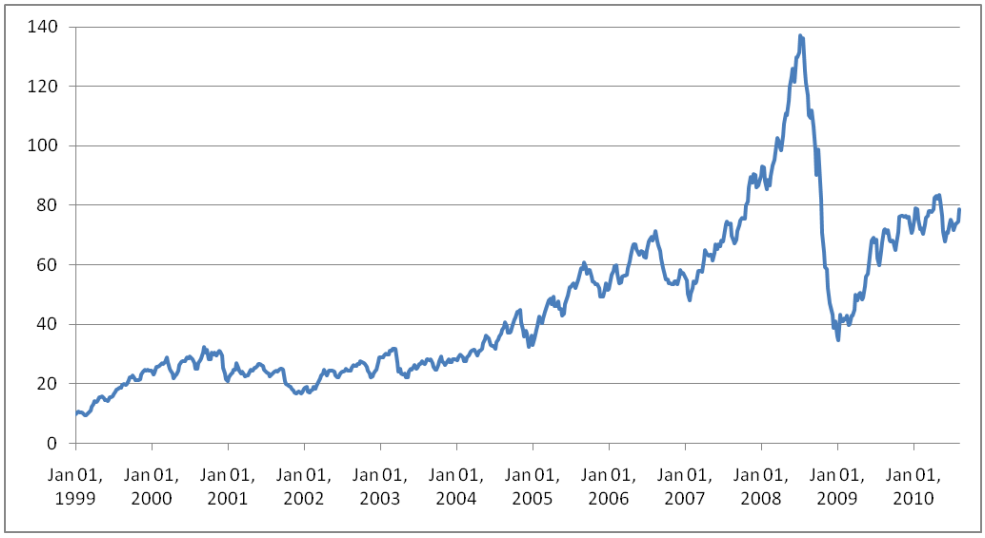


Source: Christian Schülke, based on BP 2010

The global oil price has been extremely volatile in the last three years. In an unexpected and, for producers (notably OPEC), an uncontrollable manner, prices rose to $147 a barrel in July 2008. Certain experts even speculated about a rise to $300 in the future due to growing demand from emerging states, notably in Asia, and also due to the decrease in Russian production during the first quarter

of 2008.[38] But, unexpectedly, the oil price collapsed again, to reach around $80 in June 2010, as the graph below indicates.

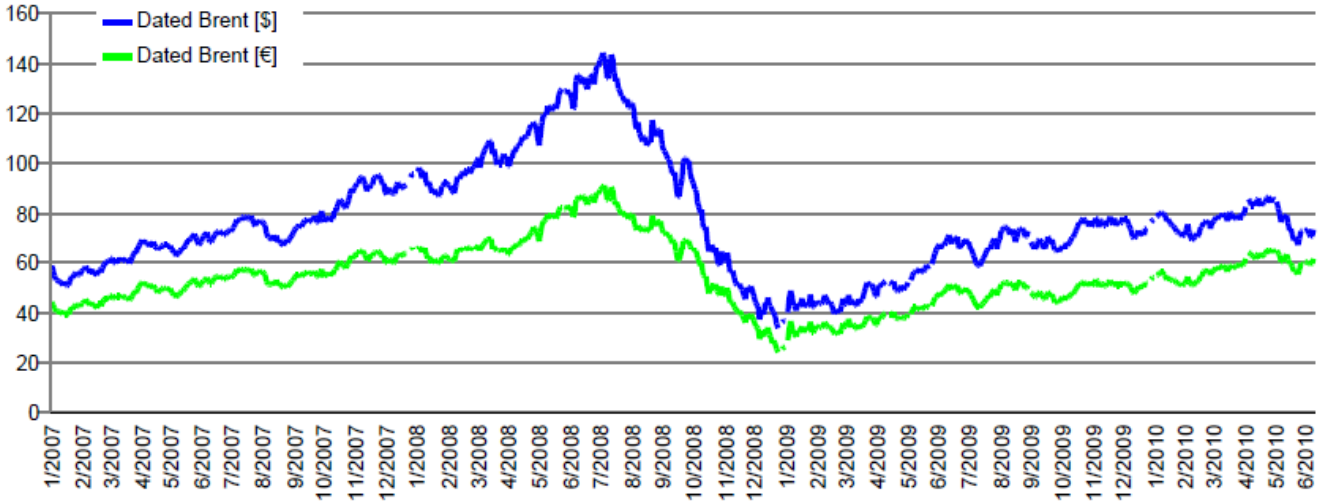
Graph 3a: Crude Oil Prices 1999-2010



Weekly All Countries Spot Price FOB Weighted by Estimated Export Volume (Dollars per Barrel)

Source: Christian Schülke, based on EIA

Graph 3b: Crude Oil Prices 2007-2010, Comparison Dollar-Euro



Source: *Ec.europa.eu*

Psychologically, the shock was bigger in 1973 during the first oil crisis when the price quadrupled, going from $2.5 to $12 a barrel, then during the second crisis when it increased to around $30.[39] The

[38] For example, see Dennis, Neil, "Oil hits record on supply concerns," Financial Times, April 15, 2008.

[39] Cf, for the evolution of the price of oil, the chapter in Favennec 2007: 42-56. The numbers cited are from Favennec.

comparison of oil prices in dollars and constant Euros should also be noted. With an advantageous exchange rate for the Euro until the end of 2009, a barrel of oil at $90 was equivalent to 1979-1980 oil prices for the Euro zone. The fall in the Euro against the dollar since the end of 2009 will, conversely, increase the price for Europeans.

The oil price remains volatile. If it was considered 'fair' at $25 up until 2003, geopolitical changes have added a 'risk premium' of around $5 to $15 a barrel. Due to the global recession, the oil price decreased since the end of 2008, to recover only since the second half of 2009.

The EU's Principal Suppliers

Norway and Norpipe Oil: a decline in domestic resources

For the moment, Norway remains the most important European exporting country, with an average production in 2009 of around 2.3 million bbl/d; this contrasts with weak domestic consumption of only 211,000 bbl/d. Nonetheless, production has decreased by 33% since its peak in 2001.[40] The Norpipe, which supplies the EU with oil, began service in 1975 and reached a capacity equivalent to Druzhba North. With the progressive decline in Norwegian oil reserves, this supply seems to be at risk; consequently, no new oil infrastructure is planned. Graph 4a shows this drying up of Norwegian oil production.

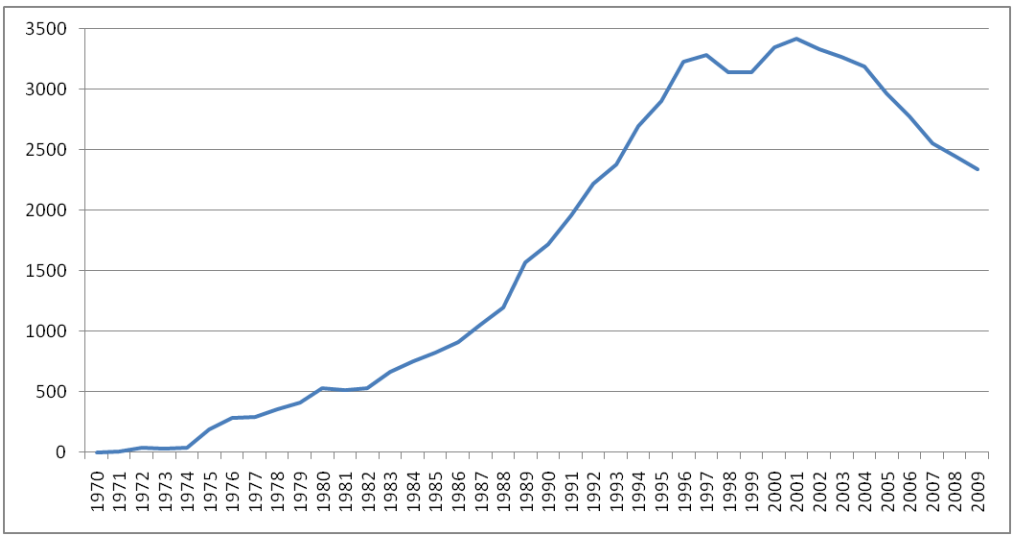
Table 2: The Norpipe Oil Pipeline

Oil Pipeline	Route	Owner/Operator	Length (km)	Technical capacity (bbl/d)	In service since
Norpipe Oil	Ekofisk Centre (Norway offshore) Teesside (UK)	Owner: Norpipe Oil AS - ConocoPhillips Skandinavia: 35.05% Total E&P Norge: 34.93% Statoil: 15% Eni Norge: 6.52% SDFI: 5% Norsk Hydro Produksjon: 3.5% Operator: ConocoPhillips Skandinavia	354	900,000(1)	1975

Note: reception facilities limit capacity to 810,000 bbl/d (NPD)

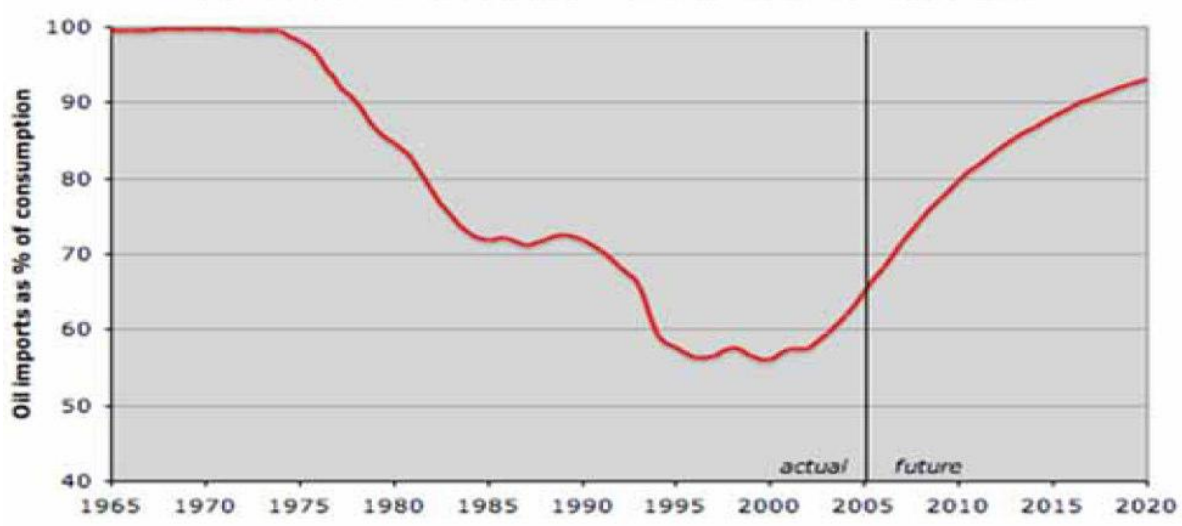
[40] Data from the BP Statistical Review 2010.

Graph 4a: Norwegian Oil Production, 1970-2009
(thousand barrels per day)



Source: Christian Schülke, based on BP 2010

Graph 4b: EU and Norway, Oil Imports as % of Consumption, 1965-2020



Source: adaptation from "EU oil imports set to grow by 29% by 2012", *Europe.theoildrum.com*, October 3, 2006, from data of BP Statistical Review 2006.

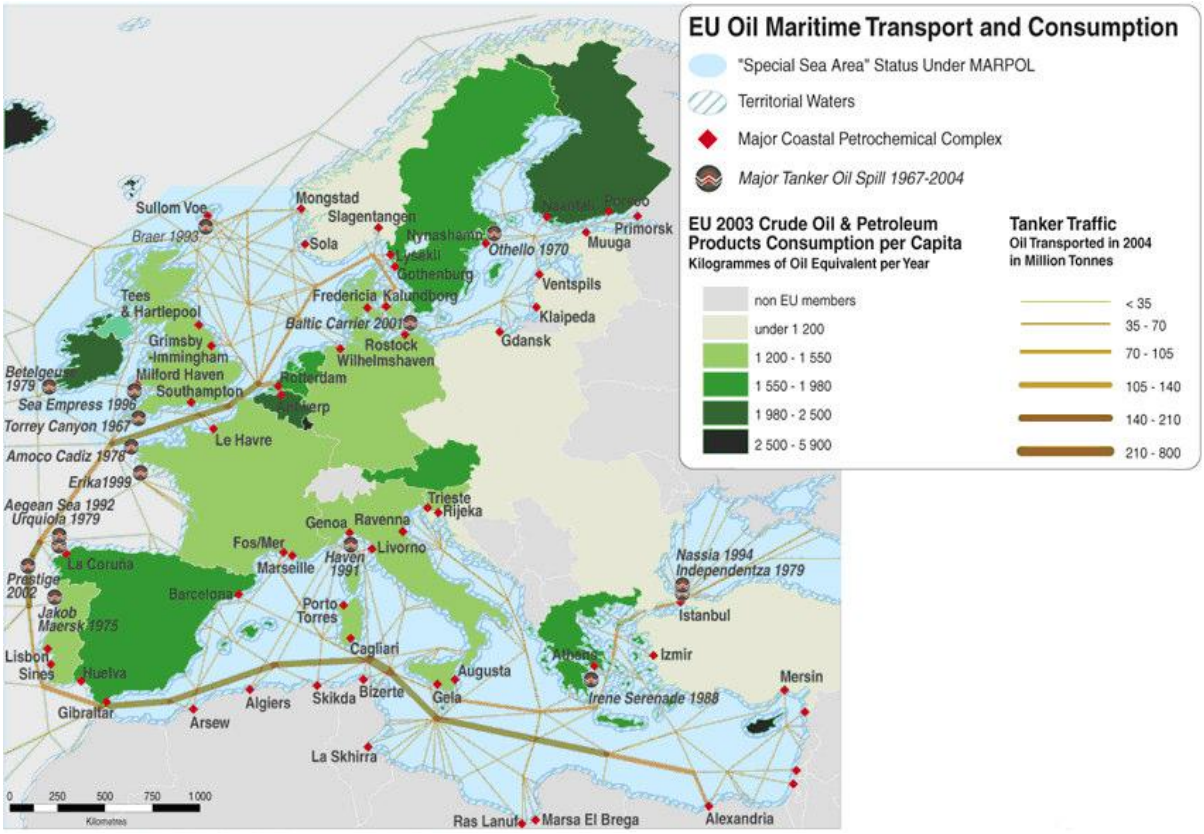
The Middle East

Supplies from the Middle East arrive in Europe by oil tanker. The Alexandria-Rotterdam line is the most important (as Map 3 shows). Iranian oil makes up around 2.5 % of the EU's energy imports.[41] While Asia is today the largest consumer of Mid-East oil, as it makes up two-thirds of its energy mix, the EU has experienced a diversification of its sources, notably to Russia, as well as a decrease in its oil consump-

[41] EU Commission 2009 : *Ec.europa.eu*

tion. Because of the existence of alternative supplies (Africa, South America) and the global approach of the oil market, the EU is more concerned with price than with the source of oil.

Map 3: EU Oil – Maritime Transport and Consumption



Source: adaptation from "EU Oil Maritime Transport and Consumption", United Nations Development Program and European Commission, JRC, Eurostat, ITOPF, UN Population, UN Geographic Information Working Group.

Russia and the CIS

Russia and CIS Reserves

The largest concentration of Russian oil resources is located in the north of Eastern Siberia, in the north of Western Russia, and in the Urals. Reserves in the North Caucasus, including Chechnya, are nearly exhausted and their impact is now only local. While Russia is the world's second largest oil producer and number one within the CIS, Kazakhstan is the world's eighth, with resources equivalent to about half of Russia's. Note that "producer" is not equivalent to "exporter"; Russia consumes a huge part of its production itself due to insufficient energy-efficiency measures. In 2009, Russian oil production was 10 million bbl/d, 2.7 million of which was consumed domestically and around 7 million exported (4 million barrels of crude oil, and the rest as refined products); 1.3 million barrels of crude oil were exported by Druzhba to Belarus, Ukraine, Germany, and Poland, and by Druzhba South to Central European countries such as Hungary, Slovakia, and the Czech Republic; 1.3 million barrels of crude oil were exported through the new

Primorsk Port near St. Petersburg, and 900,000 barrels were transported through the Black Sea, notably through Novorossiysk. While most Russian oil is exported via pipelines controlled by Transneft, around 300,000 barrels per day are transported by other means, notably through the two big ports of Novorossiysk and Primorsk. A negligible portion is also sent to China via railway.

Challenges for Russia as hydrocarbon exporter

Russia must face three major challenges in its export policy, related to geography, geopolitics, and infrastructure. Geographically, there are concerns about the distances between oil fields, the immense size of Russia's territory, and its limited access to warm waters. Geopolitical worries include its loss of influence over its 'Near Abroad' and the emergence of a new transit zone. Finally, Russia has concerns about the quality of its infrastructures; most, including the Druzhba pipeline, are more than 20 years old and urgently need to be modernized, not only to satisfy domestic but also foreign demand. Recent reports stating that Russia's oil has peaked raise a major concern for consumers and again highlight the urgent need for foreign investment in Russian oil exploitation and transport.

Competing consumers for Russian/CIS resources

Table 3 details the flow of Russian oil exports as well as their means of transport. Today, relatively insignificant quantities of oil are sent to China from Russia, via the old-fashioned way, by train. Nevertheless, the ESP (East Siberian Pacific) project to build a pipeline to China deserves mentioning. The first stage was completed in December 2009, and the line should be opened in October 2010. Russia would then supply China with 300,000 bpd. Map 4 shows an asymmetry in CIS exports to the East and West; these are very much in Europe's favour. However, over the past few years a new perspective on Central Asia has emerged. Yukos Oil Company (which until its liquidation was in charge of exports to China) proposed a pipeline from Angarsk (Lake Baikal) to Daqing (China), which is the largest Chinese oil field and is equipped with adequate infrastructure and refineries. This pipeline was projected to have a length of 2,400 km, a capacity between 20 and 30 million tons per year, and an estimated construction cost of $2.8 billion. The project generated great interest in China, but for Russia the pipeline had the disadvantage of being a quasi-monopolistic link favouring the Chinese consumer. It was also feared that the Chinese might abuse its position and modify prices and quantity to its liking. After the arrest of Mikhail Khodorkovsky, the CEO of Yukos, the project was substituted by another: an oil pipeline to the Russian port of Nakhodka that could eventually export 50 million tons of oil to Asia. For the Russians, Nakhodka has the advantage of avoiding dependence on one single client and they could export to the North American market as well as to other Asian countries besides China. Japan, in particular, has showed great interest in this project. The United States is another competing consumer, importing around 28.7 million tons of oil from the CIS in 2009,

with China importing 26.7, and the EU 347.8.[42] It should also be highlighted that one of the most important competing consumers is the producer itself. This is because of limited energy efficiency and growing internal consumption. The latter is the outcome of the economic equation whereby a growth rate of 1% is intended to translate into a rise in energy consumption of only 0.8%. Social and cultural issues are also important to promote energy efficiency improvement during a period of higher prices for commodities. Indeed, citizens of the USSR were used to nearly free public goods and cheap energy prices. The current socioeconomic situation, especially outside metropolitan areas, makes difficult to adjust energy prices so that they can reflect their real cost as this a politically complicated issue.

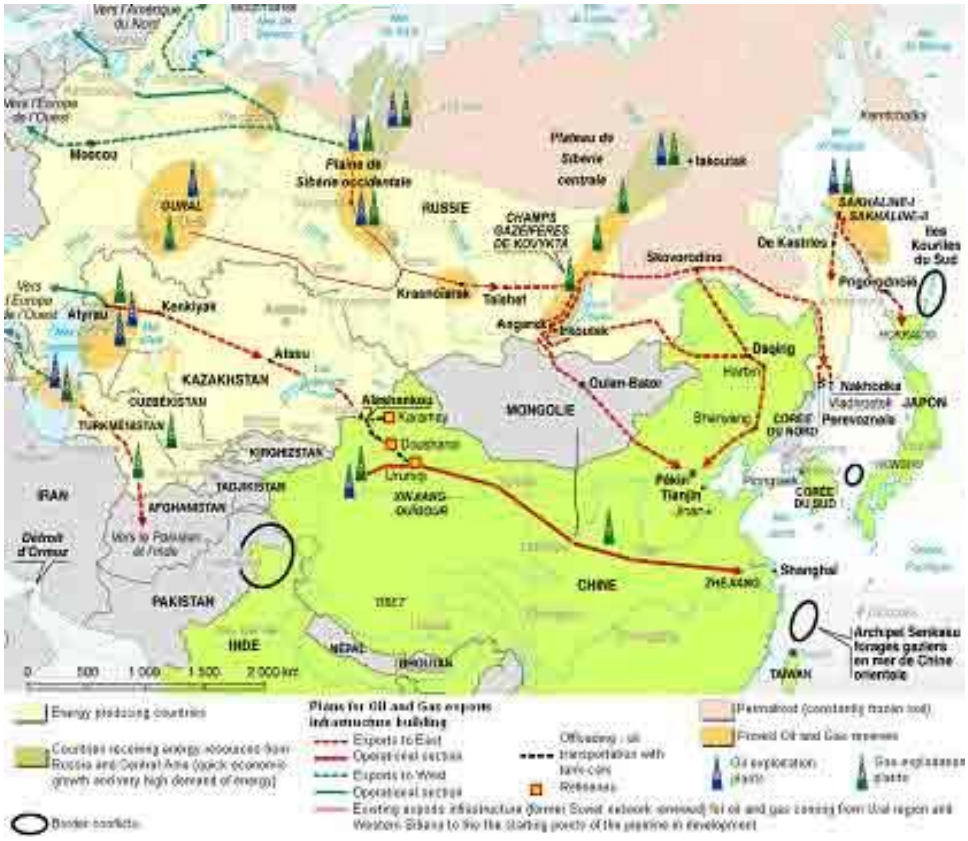
Table 3: Russian Crude Oil Exports by Export Outlets, in 2006 and 2007 (1,000 bbl/d)

Origin	2006	2007
Black Sea Ports		
Novorossiysk	768	885
Other Black Sea	212	476
Baltic Sea Port		
Primorsk	1,255	1,484
Druzhba Oil Pipeline	1,261	1,269
Germany	437	420
Poland	466	516
Hungary	136	160
Czech Republic	104	92
Slovakia	118	111
Lithuania	158	0
Total exports to Europe	3,660	4,114
Other Exports		
Non-Transneft by sea	170	307
China (train)	178	179
Murmansk (train)	47	48
Other non-Transneft train	47	45
CPC	53	72
Total	4,155	4,764

Source: EIA Country Analysis Russia using Energy Intelligence (Nefte Compass, 2007, 2008)

[42] BP Statistical Review 2010.

Map 4: Russian and CIS Resource Export Infrastructure



Source: adaptation from P. Rekacewicz, "En Asie, des projets de construction de voies d'acheminement du pétrole et du gaz," *Lemondediplomatique.com*, May 2005.

Existing Oil Pipelines: Druzhba

Table 4: Druzhba Pipeline

Oil Pipeline	Route	Owner/Operator	Length (km)	Technical Capacity (Mt)	In Service since
Druzhba North	Tjumen-Almetyevsk / Samara (Russia) /Schwedt (Germany)	Transneft (Russia), Gomeltransneft Druzhba (Belarus) PERN (Poland)	around 4,000 of which is in Russia: 1,603 Belarus: 521	2005: more than 51(1) Russia: 82 Belarus: 50 (2)	1964
Druzhba South	Tjumen Almetyevsk / Samara (Russia) / Czech Republic / Hungary	Transneft (Russia) Gomeltransneft Druzhba (Belarus) Ukrtransnafta (Ukraine) Transpetrol (Slovakia) Mero (Czech Republic) MOL (Hungary)	around 4,000 of which is in Russia: 1,603 Belarus: 521 Ukraine: 634	Russia: 82 Belarus: 50 Ukraine: 17 (2)	1964

(1) Lang, (2) (ECS)

Druzhba's Capability Constraints

At this time, the transport capacities of Russia's oil pipelines are fully exploited; if one goes by the forecasts of Russian demand and production, these capabilities will be almost doubled between now and 2020.43 Druzhba has a capacity of 85 million tons per year, which is not currently being used in the South since oil consumption in Hungary, the Czech Republic, and the Balkan States has diminished and the offshoots to Latvia and Lithuania are no longer supplied.

Projects around Druzhba

Oil-tanker traffic from Primorsk (Baltic Sea) and Novorossijsk (Black Sea) are the reason for potential Druzhba extensions, which would reduce tanker traffic, being discussed. Despite the rationales, the projects have not reached a concrete stage, for commercial reasons.

The extension of Druzhba to the north and up to Wilhelmshaven was first proposed in the early 1990s. This extension allowed the transport of Russian and Caspian oil to world markets. It also decongested maritime routes: the Baltic, Black and Mediterranean seas. As for capacity, the current network is adapted for this project up to Mosyr in Belarus where Druzhba splits into its two, north and south branches. From this junction, it would be necessary to increase the technical capacities to Poland and on to Schwedt, in the order of 20 million tons per year, in order to eventually extend it from Schwedt to Wilhelmshaven, Germany.44 As logical as this project may seem, its current chances for success are quite low. Russia is looking to decrease its dependence on transit countries by means of large investments such as Nord Stream and this interest also coincides with those of numerous European countries. Therefore Russia will certainly not opt for the opposite approach since these same countries will have an increased role in transporting oil. The extension of Druzhba will depend on the relationship between Russia and either Belarus or Poland. As for demand, US demand will be decisive. Currently, a third pipe between Adomovo and Plock is under construction and will increase capacity to 60 million tons per year for this section. Such a project could indeed create the desired link, relieve congestion in the Baltic Sea, and allow for savings in infrastructure as oil and gas could be transported in parallel pipes. But the project would run up against the same controversies and opposition as Nord Stream Gas does and also would have some economic implications. Nevertheless, oil-tanker transport remains the most economical and it does not tie the producer to one particular consumer. This explains the absence of new projects for this raw material.

43 Götz 2004.
44 Soria/Gray 2004; Götz 2004: 12.

Odessa-Brody: A Project Without Oil

The Odessa-Brody oil pipeline is the best example of the risks that accompany intense political interference in a project that is not aligned with economic reality. In fact, this pipeline was conceived to limit Polish and Ukrainian dependence on Russia by transporting oil from the Caspian through Odessa, Ukraine, to Brody, on the Polish-Ukrainian border. Strongly supported by the EU, this project was completed in 2001. In 2003, Ana Palacio, the Energy and Transport Commissioner, declared this project to be one of pan-European interest. A trilateral working group (Poland, Ukraine, EU) was set up and Warsaw and Kiev allocated considerable funds to ensure that the project was successful. Nevertheless, the result was a complete failure. While this pipeline of 674 km was initially meant to receive oil primarily from Central Asia (Kazakhstan) and thus diversify Ukraine's oil revenues and later even Poland's through the Brody-Plock link, it remained empty for three years, from 2001 to 2004, due to a lack of supply. Finally, an agreement signed in 2004 between Ukraine and Russia allowed for the reversal of the pipeline flow and consequently Russia's use of it to export oil towards the Black Sea, and from there to Mediterranean destinations. However, the debate over its use in the original direction continues and reappeared with the 'Orange Revolution' and the declarations by Ukrainian President Yushchenko in 2005 concerning imports of Central Asian oil coming through this line. At the end of 2006 Yushchenko and his adversary and former Ukrainian prime minister, Viktor Yanukovych, reiterated the intention of using the original direction. Another agreement on the Sarmatia project in May and June 2007 planned for a link with Gdansk and the forming of a consortium. This was confirmed by a political agreement between Poland, Ukraine, Lithuania, and Azerbaijan during a conference in Vilnius on security of supply. Only time will tell if this project succeeds, but the fact is that, despite the many agreements and political goals, most have not yet been translated into viable economic and commercial plans. On the contrary, the Polish and Ukrainian governments lost large sums of money on the construction of a pipeline that remained empty from the start and was then used to transport oil in the opposite direction.

New Oil Infrastructure in the North: the BPS, Primorsk, and the Baltic Issue

Table 5: The BPS, the Port of Primorsk and the Baltic Issue

Oil Pipeline	Route	Owner	Length (km)	Technical Capacity	In Service since
Baltic Pipeline System (BPS)	Yaroslavl (Russia) / Primorsk (Russia)	Transneft	1,514	42 Mt/y(1) 65 Mt/y(2) 1.3 Mb/d(3) 1.5 Mb/d(4)	2001

(1) In March 2004 (Goetz); (2) Since April 2006 (RIA); (3) In 2006 (RIA); (4) In March 2007 (EIA).

The pathological side of the relationship between Russia and the Baltic States after the fall of the USSR took and continues to take multiple forms. The researcher Locatelli revealed that Gazprom's export statistics include the three Baltic States in the CIS category even though none of them is a signatory to the Minsk Treaty. 45

During Soviet times Druzhba supplied the two Latvian and Lithuanian ports of Butinge and Ventspils and to a lesser extent Muuga near Tallinn in Estonia, from which exports left for the Northern markets. The independence of the Baltic States and a series of conflicts led Russia to progressively reduce supplies and eventually permanently close them once the oil port at Primorsk was inaugurated in 2003. The Baltic Pipeline System (BPS), opened in December 2001, supplied the new oil terminal at Primorsk. Russia secured new direct access through the Gulf of Finland to European and American markets. The risk of potentially polluting the already fragile ecosystem in the Baltic 'Dead End Sea' is also important to note here; Latvia and Lithuania were eliminated as transit countries even if the official explanation noted "repairs to the oil pipeline for an indefinite period of time." Export capacity at Primorsk has steadily increased, with an average of around 1.3 million barrels a day in 2006, and 1.5 in March 2007.46 Exports from the Baltic region doubled since 1999, and the Primorsk Port, which belongs to Transneft, has profited the most from this increase even though it is climatically disadvantaged compared to other Baltic ports. It freezes 145 days out of the year, which increases the risk for accidents, and it can only accommodate small oil tankers. While in the past Ventspils was the biggest oil port in the region and the second biggest in the USSR after Novorossiysk, Transneft stopped oil shipments to it at the end of 2003 once construction at Primorsk was finished. An attempt to compensate for this loss through railway deliveries was abandoned soon after by the Latvian government. Then, in October 2006, Latvia sold its shares to the company Vitol/Euromin, based in Cyprus, and operator of the Kaliningrad port. Mazeikiai, in Lithuania, is the Baltic region's only refinery. It was modernized in 2003 and was subject to a succession of acquisitions and sales with Yukos in 2002 and a forced sale in May 2006. In choosing between Russian or Polish buyers, Vilnius opted for the latter – the Polish company PKN Orlen. Lithuania interpreted the subsequent oil cuts by Moscow as a reaction to Vilnius's choice. According to Lithuania, the decline in relations between Poland and Russia led to the de facto closure of the infrastructure, explained officially by Russian authorities as "technical problems" with the oil pipelines that supply the refinery.47 Since the election of Donald Tusk, and then of Bronislaw Komorowski, relations have improved between the two countries.

45 Locatelli 2008: 7, footnote on page 5.
46 EIA 2007: Russia Country Analysis.
47 Wagstyl, Stefan, "Lithuanian Leader in Cold War Warning," Financial Times, 22.1.2008: 4.

In addition, Lithuania used its veto right as an EU member state to block the renegotiation of the Partnership and Cooperation Agreement with Russia (PCA) as Poland had already done. Lithuania insisted that "the success of these negotiations with Russia directly depends upon the resumption of deliveries via Druzhba."48

During the transit conflicts between Russia and Belarus in early 2007, the president of Transneft, Semyon Vainshtok, announced the construction of a supplementary oil pipeline from the Belarusian border to Primorsk, with an initial capacity of 1 million barrels a day and a possible increase to 1.5 million in the near future. This project has not yet been approved by the Russian government, but construction could be completed in 18 months. A part of Druzhba's flows could thus be redirected to Primorsk.

Pipelines in the Yukos-Transneft Conflict and Projects in the Barents Sea

At the end of 2002, an oil pipeline was proposed to connect Eastern Siberia's oil fields to the 'warm water port' in Murmansk in order to supply the American market and to reinforce energy links between Russia and the US. This project included an onshore oil pipeline through Karelia and an offshore pipeline through the White Sea to the Kola Peninsula.

This project, the Murmansk Pipeline, was backed by the oil company Yukos in particular and its president Mikhail Khodorkovsky. It came up against opposition from the state company Transneft due to the pipline's projected lack of profitability and Transneft's rejection of private financing for energy infrastructure.

Table 6: Projects in the Barents Sea

Oil Pipeline	Route	Owner	Length (km)	Technical Capacity	Estimated Cost
Murmansk / Barents Sea projects 1	Field in western Siberia (Russia) / Murmansk (Russia)	Transneft	2,800-3,900	50-100 Mt/y	$9-15 billion (Götz)
Barents Sea (alternative) 1	Field in western Siberia (Russia) / Indiga (Russia)	Transneft	1,700	50-100 Mt/y	$12 billion (Götz)
Kara Sea	Field in Vankor (Russia) / DIkson (Russia)	Transneft		15 Mt/y	
Kharyaga-Indiga pipeline	Kharyaga (Russia) / Indiga (Russia)	Transneft	430-468	12-24 Mt/y 500 000 bbl/d (EIA)	$2-6 billion (EIA)

(1) Götz

48 "UE/Russie: La Lituanie a levé ses réserves à propos de l'ouverture des négociations avec Moscou sur un nouvel accord de partenariat." Agence Europe, n°9659, May 14, 2008, p. 5.

Alternatively, Transneft proposed the transformation of the Indiga port into an oil export port, which would necessitate a complete overhaul of the infrastructure and the use of an icebreaker in winter. This port in the Barents Sea could supply the North American market through a much shorter route.

Sakhalin and Reconsidering Yeltsin's Opening Up

Sakhalin, the Russian island in the far east, has been the object of much speculation and many projects since the 1970s when a Soviet-Japanese team began to explore its resources. This zone could in fact become a 'second North Sea,' being rich in oil and gas reserves. Moreover, the Okhotsk Sea is in a strategic geopolitical situation, being close to Asian countries with increasing energy demands.49

The first Production Sharing Agreements were signed in 1994 and 1995 after a call for a consortium by the then Soviet authorities. The Sakhalin II project included Shell (United Kingdom, Netherlands) and Mitsui and Mitsubishi (Japan), and was therefore the only project without Russian participation. Sakhalin I on the other hand included not only Exxon Mobil (United States), SODECO, and ONGC Videsh (India), but also the two Russian companies Rosneft and Sakhalinmorneftegaz. Sakhalin I and II are examples of offshore explorations and opportunities for oil-tanker transport, since the region does not have any pipelines and transport is impossible during periods of freezing.50 Sakhalin I plans for the construction of an underwater oil pipeline to the continent, running for 250 km, to arrive at the De Kastri platform. Sakhalin II plans to construct an onshore pipeline of 800 km to the Russian 'warm water port' of Prigorodnoe. While a Russian law on Production Sharing Agreements was adopted in 1996 and allowed foreign groups entrance into projects, in 2003 Vladimir Putin finalized the law by tightening the criteria required for a field to be opened up to PSAs. These subsequently became the exception for the development of Russian fields.

At the end of 2005, the Russian Energy Ministry finally announced that only companies where Russian entities had majority ownership could obtain licenses to develop gas and oil fields in Siberia. The period from 2003 to 2005 represented a clear change in Russian energy policy – the return to state control over production and transport, and the limiting of foreign influence and participation. The Yukos affair and the media-hyped arrest of its president are the best symbols of this change. Yukos controlled 20% of Russian oil production and a merger with the fifth largest oil company, Sibneft, was about to go through, while there were also negotiations about the injection of ExxonMobil and Chevron capital. Nevertheless, compared to other oil and gas producer states, Russia remains relatively open to foreign investment.

---

49 For a detailed map of the Sakhalin projects, see *Robertamsterdam.com*.
50 Bradshaw 2006.

The change in Russian policy (regarding foreign companies' investments) altered participation in Sakhalin II in April 2007. Parts of the Sakhalin Energy Investment Company Ltd (Sakhalin Energy) were divided between Gazprom and the former investors with the signing of a new contract on April 18, 2007. Subsequently, Gazprom obtained 51%, Shell 27.5%, Mitsui 12.5%, and Mitsubishi 10%.51

Since 2003 the Sakhalin projects have been under review. In addition, Moscow has been using ecological arguments – a well-known weapon in infrastructure projects all over the world. Foreign companies were charged higher fees. Moscow's behaviour was criticized by the countries and companies involved, which highlighted the unstable investment environment and the lack of a legal framework in Russia. While projects in Russia without Russian participation, such as Sakhalin II, are a thing of the past and although this strategic change in Russia is understandable, the legal uncertainty – due more to recent circumstances than to an actual plan – also results in a lack of investment in new oil fields and infrastructures in producer countries.

A Pan-European Oil Pipeline Project?

Croatia, Romania and Serbia all signed an agreement in April 2008 in Bucharest for the construction of an Adriatic pipeline. This project, first proposed in 2002, would connect, over 1,300 kilometers, the Romanian port of Constanta to Trieste via the Italian coast, Serbia, Croatia, and Slovenia. The EU supports this project and, above all, the idea of alleviating congestion on the traditional route through the Black Sea.52

Access to Oil in the Caspian

The Caspian Sea is home to gas and oil resources of global importance; however, they were not exploited during Soviet times because of a lack of financial and technological means, as well as a lack of priority (Chapter 3 includes an extensive section on the problematics of the Caspian). Indeed, after discoveries of hydrocarbons in Russia and then Siberia, Baku I became increasingly neglected. The fall of the Berlin Wall changed this situation in two ways. First, the newly sovereign Central Asian countries as well as Azerbaijan became interested in their national potential. Secondly, for the first time the door was open to foreign investors. According to expert estimates, Caspian production could quickly reach very high levels. However, because of a complicated geopolitical environment due to the fact that these resources are located in a completely enclosed sea, matters are not so simple. The two bordering countries that potentially are the best able to transport resources (Russia and Iran) are not considered as partners by Western countries. Apart from Russia and Iran, the bordering countries of the Caspian – Azerbaijan,

51 See *Sakhalinenergy.com*; Financial Times June 6, 2007.
52 "Croatia, Romania, Serbia sign Pan-European Oil Pipeline agreement," *Setimes.com*, April 23, 2008.

Kazakhstan, and Turkmenistan – do not have any access to an open sea and are thus entirely dependent on their neighbors, notably Russia. Western strategy focuses very much on unlocking these countries and giving them access to Western markets via the Caspian, Azerbaijan, Georgia, and Turkey. Resources in the Caspian Sea are unequally allocated, which puts Iran at a disadvantage and explains this country's opposition to recognizing it as a sea.

The BTC Shock

In order to remedy these geopolitical problems, the Baku-Tbilisi-Ceyhan (BTC) crude-oil pipeline was set up in 2005. It was conceived by the US, and in particular Richard Morningstar, who since 2009 has again been involved in Caspian affairs as US Special Envoy for Eurasian Energy. Before the BTC line, oil was transported from Baku to Supsa through a small oil pipeline, the Western Early, with a capacity of 155,000 bbl/d.53 But Western Early proved to be insufficient, since tankers have to cross the Bosphorus and Dardanelles straits afterwards. As well, Supsa was under threat during the Georgian War in August 2008. In this case, the trajectory through Georgia – which is a detour – was the only option, due to the Armenian-Azerbaijani and the Armenian-Turkish conflicts.

The BTC represents a momentous failure in Russia's strategy of containing the new producer countries of the former Soviet Union. Associated with the post-Soviet deterioration of the Yeltsin era, the 'BTC shock' has since influenced Russia's and Gazprom's strategies, as they have been confronted with projects by-passing Russian territory, such as Nabucco, a subject that we will later discuss. And the containment of hydrocarbon producers in the newly independent states of the former Soviet Union has a prominent place on the Kremlin's agenda.

The project was approved during the Organization for Security and Cooperation in Europe (OSCE) conference in Istanbul in November 1999, as was a parallel gas pipeline from Turkmenistan to Turkey through Baku.

The Baku-Tbilisi-Ceyhan pipeline, the second longest in the world, spans over 1,768 km and transports oil from the Azeri-Chirag-Gunseshli field in the Caspian Sea to the Mediterranean, bypassing Baku, Tbilisi and Erzurum, and arriving in Ceyhan in Turkey. Oil was first pumped on May 10, 2005, and exports reached Ceyhan in June 2006.54

53 EIA Azerbaijan 2007.
54 IEA 2007.

Table 7: Baku-Tbilisi-Ceyhan (BTC) Pipeline

Oil Pipeline	Owner	Length (km)	Technical Capacity	Price	In service since
Baku/ Tbilisi/ Ceyhan (BTC)	BTC Pipeline Company – BP: 30.1% AzBTC: 25% Chevron: 8.9% Statoil: 8.71% TPAO: 6.53% Eni: 5% Total: 5% Itochu: 3.4% INPEX: 2.5% ConocoPhillips: 2.5% Amerada Hess: 2.36% (in July 2006)	1,768 of which: Azer-baijan: 443 Georgia: 249 Turkey: 1,076	1 Mb/d (1) 1 Mb/d (2) 50 Mt/y (3)	The price for members of the consortium, from Sangachal to Ceyhan, is: $3.3/bbl (2005-10), $4.6/bbl (2010-16), $5.5/bbl (2016-29). Turkey will make between $140-200 million/y in transit and operational fees. Georgia stands to make $112 million in 2004-2008 and $566 million in 2009-2019.	May 2005

(1) For 2008-2009 (EIA); (2) ECS; (3) Götz.

The Caspian's Status: Sea or Lake?

There is an important legal dispute between the five countries surrounding the Caspian: Is it a sea or a lake?

Historically, the Iranian-Soviet agreement of 1921, renewed in 1940, ensured that the Caspian was regarded as a "sea, with shared use" between the two neighboring states, and gave the Iranian fleet navigational rights over the sea. But the fall of the USSR gave birth to three new bordering states: Azerbaijan, Kazakhstan, and Turkmenistan. The resources are unequally distributed in the Caspian, with Iran having the minor share. In addition Russia, wants to prevent Central Asian countries from exporting directly to the West. These two factors are the reason the legal question gained prime importance.

While a sea is governed, according to international law, by the rule of granting bordering states exclusive zones of 12 miles out (22 km), and any area beyond that is treated as international waters, the status of lake requires the agreement of all neighboring states on its use, exploitation of resources, and construction of infrastructure.

After 1991 Russia and Iran both claimed that the Caspian is a lake and opposed all attempts by the three new states to give it the status of sea (which would guarantee them ownership in a zone of 12 miles (22 km) and protect them against the necessity of unanimous agreement for all projects). Nowadays, Iran is the most important opponent to settling the legal issue. De facto, the old

Soviet-Iranian divide line is respected, and a lot of infrastructure and upstream projects have been developed in the former Soviet part, with the tacit agreement of the four states concerned. These projects include the development of the Shah Deniz fields near Baku, technical pipelines, and infrastructure both upstream and in the Turkmen offshore area. If the old Iranian-Soviet divide is respected, conflicts arise between the newly independent bordering states concerning ownership of the fields, for example the Alov field. If the exact status of the Caspian is not established, there will be problems with setting up infrastructure and the potential for conflict. Russia would have an advantage – a powerful tool to prevent the newly independent states as well as Western companies from setting up infrastructure in the Caspian. In practice, until now, a trans-Caspian link between Turkmenistan and Azerbaijan has been blocked, and thus threatening the supply for the Southern Corridor project Nabucco.

The five bordering countries have taken part in annual conferences on the status of the Caspian and a final conference may be held in 2012. But, considering the interests of Russia and Iran, the chances of a breakthrough are slim.

Map 5: Southern Caspian Energy Prospects

Source: CIA, *Utexas.edu*

Other Caspian Projects

The Caspian region[55] continues to experience a veritable proliferation of projects such as the Trans-Caspian oil pipeline. Discussion on this project, in which a parallel gas line is planned, has been under way since Kazakhstan proposed a link between the Kazakh port of Aktau and Baku, thereby connecting to the BTC. An agreement on the joint development of a feasibility study was signed in October 2009 by the Azeri and Kazakh state oil companies. The question now is whether the project is going to advance, in spite of the undefined status of the Caspian. While all these other matters are being considered, Astana announced the construction of a Kazakh-Caspian transport system, which should be operational by 2010. This project includes an oil pipeline from Iskene to the Caspian port of Kuryk, terminals in Kazakhstan and Azerbaijan, and the construction of oil tankers. Since the sea is fully closed off, it is necessary to construct all oil tankers on-site. However, there are no shipyards in the Caspian! This makes it difficult to build necessary infrastructure of any kind.

The European Commission uses the term the 'Southern Gas Corridor' to describe the planned infrastructure projects bringing gas from the Caspian and Middle East to Europe. Chapter 3 details these numerous gas projects, which are all inextricably linked to the question of the status of the Caspian Sea.

Summary and Conclusion

Europe's oil supply is tied to two principal pipelines, Druzhba and Norpipe, but it largely depends on the world market and supply by oil tankers. While Russia is an important supplier, concerns about it having reached a peak in production as well as under-investment in oil fields and infrastructure worry the EU. In addition, the Caspian's unclear legal status slows down the development of these fields. Currently, there are very few new oil pipeline projects, which contrasts with the status of gas projects. We are witnessing an increase in oil-tanker transport, with, for example, the development of the Primorsk oil terminal in the Baltic Sea. Primorsk and the BPS create direct access between the producer and consumer, while avoiding former Soviet Union transit countries. This is a strategy that Gazprom and Russia are also pursuing with regard to gas. As for investment in order to exploit resources, Russia began to change its approach in the early 2000s, as the PSAs for Sakhalin and changes in the legislation demonstrate. In this sense, Sakhalin is a symbol of this major shift in trends and of the Russian authorities' drive to control foreign investment, notably in this industry.

---

[55] See also Chapter 3 for details of Caspian gas projects; the works of Adrian Dellecker on Caspian energy projects, and "Caspian Pipeline Project Consortium, Bellwether of Russia's Investment Climate?", Russie.NEI Visions, no 31, Paris, June 2008.

Gas from the North, South and East European Demand for Gas and Sources of Supply

The world's proven natural gas reserves are held by Russia (23.7%), Iran (15.8%), Qatar (13.5%), and to a lesser extent Turkmenistan (4.3%), Saudi Arabia (4.2%), the US (3.7%), the United Arab Emirates (3.4%), Nigeria (2.8%), Algeria (2.4%), and a few other countries that account for less than 2% of the world's reserves.[56] Natural gas makes up 24% of the world energy mix, as it does in the EU-27. France is one important exception among the larger member states, as gas accounts for only 15% of its energy mix while nuclear energy plays a major role.[57] Poland also deserves mention, since gas accounts for around 12% only, while in Sweden it makes up about 2%.

The year 2009 was one of turmoil in the world's gas markets. Due to the recession, global gas consumption decreased in an unprecedented manner – by 2.1%, with the EU accounting for 5.9% and the former Soviet Union for 7.3%. EU natural-gas consumption declined from 490 bcm in 2008 to 460 in 2009. [58]

But what are the trends to be expected in the short and long run? In 2008, with unprecedented high oil prices affecting oil-price-linked gas, the US started to develop unconventional gas. As a consequence, LNG imports in the US decreased and went into competition with pipeline gas in the EU and other world markets. Today there is an oversupply of the EU gas market, which shifted from being a producer to a consumer market. We also witnessed competition between spot markets and long-term contracts, which is detrimental to the latter. Globally and in the short run, the demand for gas appears to be increasing again, even if the recession set off the trends foreseen by the IEA and the OECD in 2008. The current assumption is that there will be a new increase in EU pipeline gas consumption from 2015, due to the projected demand for LNG from Asia and especially China. The latter would thus absorb today's surplus on the EU market. EU demand in 2030 is projected to be around 500-600 bcm, according to experts.[59] In any case, the EU will

[56] BP 2010: 22.
[57] Chevalier/Percebois 2007: 22.
[58] BP 2010: 28.
[59] Primes Modell, Baseline, EU DG ENER, *Europa.eu*, June 2010.

increase its dependence on imports, which will reach about 84% in the third decade of the millennium. This can be explained by the continuous substitution of gas for oil, the growth of electricity generated by gas, and decreasing domestic production. Gas is efficient in offsetting intermittent RES, unlike the more expensive and more problematic nuclear power. Also, gas capacity is less expensive to set up than nuclear plants, and more acceptable to the public: gas is considered to be 'clean' – or at least cleaner than oil and coal. When it comes to electricity production, for instance, gas-fired power stations emit around 50% less CO2 than coal-fired power stations. Nevertheless, there is a certain misperception: if it is true that CO2 emissions are less with gas, it contains on the other hand other climate-affecting gases, especially methane. Currently there is a dispute between those who consider that gas will be just a transitory commodity from oil to RES and those, especially the gas lobbies, who see it as a destination commodity.

Gas supply in Europe essentially stems from five sources: domestic production (37%), Russia (23%), Norway (18%), Algeria (9%), Nigeria (3%), and other sources (10%).[60] The proportions of imports vary from member state to member state for obvious geographic reasons (see Table 8). Algeria is the major provider of gas to the Mediterranean states (Italy, France, Spain and Portugal) and Russia the main provider to Central Europe, notably the new member states and Germany.[61] Domestic production, although decreasing steadily, accounted for 39% of consumption in 2008.[62]

Table 8: Natural Gas Imports to the EU-27 in 2008, by Country of Origin

Origin	Quantity		% of total
	TJ	bcm	
Russia	5095662	137	41
Norway	3899854	105	31
Algeria	1998381	54	16
Nigeria	540366	15	4
Libya	398006	11	3
Qatar	298578	8	2
Egypt	226955	6	2
Oman	6895	0.2	0
Total	12464697	335	100

Source: Eurostat 2010 and V. Sharlayev

[60] Numbers for 2008, source: www.eurogas.org.
[61] For a detailed table of energy profiles for each member state, see Energy Information Administration.
[62] Eurostat Yearly Statistics, 2005, BP 2009.

Map 6: Overview. Gas in Europe

Central and Eastern European EU member states are much more dependent on Russia than the EU-15, which partially explains the reason why they view energy policy as security policy, since they see Russia as the major threat.[63]

Table 9: Gas in the EU-25 and Central/Eastern European Member States: Uneven Dependency on Russia (in %)

	EU-25	New Member States
Domestic Resources	41	33
Russia	26	62
Algeria	12	1
Norway	16	4
Others/LNG	5	0

Source: Tönjes/De Jong 2007, based on the BP Review of World Energy 2006.

[63] Lang, 2007: 11.

Introductory Remarks on Gas Markets and Gas Transport

The functioning and terms of trade of the gas market are an important issue on today's agenda and for the years to come. Regional pipeline gas, regional shale gas, and global liquefied natural gas (LNG) will set the stage. Long-term prices, with oil indexation, will contrast with spot prices. The latter can be applied to pipelines too, as much as long term contracts to LNG.

Gas can be transported either by pipeline or in liquefied form on specially designed ships, LNG carriers. LNG is obtained by cooling gas to -161°C, which is a costly process. The liquid obtained is transported by LNG carriers with capacities from 100,000 to 150,000 m3, and is then regasified on arrival. Pipelines remain the favored mode of transport, which is more economical up a distance of some 3,000 km.

While awaiting the further development of LNG, gas markets remain regionalized and depend on pipelines despite LNG becoming more and more established throughout the world (though of course in a very uneven manner from region to region). LNG production will double within ten years; LNG accounts for 28% of world gas trade in 2009.[64] Like a communicating vessel, the number of liquefaction terminals must correspond to the number of regasification facilities. Both are expensive, but there has been a movement towards that process since 2009 due to the shale gas development in the US. The US consumed much less LNG and therefore LNG reached other markets and went into competition with long-term gas there. LNG prices have been steadily decreasing. Shale gas and its impact on external trade relations can't be overestimated, especially considering its fast development in the US these past three years.

We will certainly witness much debate on the terms of trade in gas markets in the coming decade. Here, spot prices (LNG, UK) will compete with long-term contracts, but so also will long-term contracts among themselves, with new suppliers from Central Asia entering the picture. These factors together will improve the gas markets, and diversify dependencies.

A gas pipeline is expensive to lay, but it has the advantages of longevity (between 35 and 60 years) and lower maintenance costs.[65] Subsea links are in general more expensive than onshore ones, but maintenance is cheaper and pressure higher, to quote the example of Nord Stream or South Stream. Moreover, there are no transit fees, as

---

[64] BP Global Reports and Publications, 2010.

[65] This is very different from the telecommunications industry, with its continuous innovations. There are few innovations in gas pipelines. Cf Hirschhausen, Neumann, 2007: Competition in Natural Gas Transportation. Natural gas is transmitted under pressure (10-80 bar) in gas pipelines and compressed every 100-400 kilometres. Diameters vary between 100 and 1,400 mm.

there are no transit countries. Construction of offshore links is sometimes the only solution, such as between Norway, the UK, and the European Continent, and also politically preferable if the producer seeks to avoid third countries and install direct links. This is the case with Blue Stream, opened in 2005, which connects Russia and Turkey, and also with Nord Stream, which is the focus of a case study later in this chapter.

Shale Gas – a panacea?

The debate on non-conventional gas started in the EU, but no such production has been initiated there yet although the technology is mature and the US example is convincing.[66] The Barnett shale in Texas, exploited since 2007, has demonstrated the economic viability and potential of this resource. EU companies such as Statoil and Total have engaged in joint ventures in the US and tend to import the technology from across the Atlantic. Prospects are showing that shale gas is available in north-east France, northern Europe (the Alum Shale), Germany, the Netherlands, and Poland.

Table 10: Unconventional Gas Resources in 2006

Trillion cf	CBM	Shale Gas	Tight sands	Total	% of World
North America	3,017	3,842	1,371	**8,228**	25.3
Latin America	39	2,117	1,293	**3,448**	10.6
Western Europe	157	510	353	**1,019**	3.1
Central and Eastern Europe	118	38	78	**235**	0.7
Former Soviet Union	3,957	627	901	**5,485**	16.8
Middle East and North Africa	0	2,548	823	**3,370**	10.4
Sub-Saharan Africa	39	274	284	**1,097**	3.4
Centrally planned Asia and China	1,215	3,528	353	**5,094**	15.6
Pacific (OECD)	470	2,313	705	**3,487**	10.7
Other Asia-Pacific	0	314	549	**862**	2.6
South Asia	39	0	196	**235**	0.7
World total	**9,051**	**16,112**	**7,406**	**35,560**	**100.0**

Source: National Petroleum Council

[66] For an overview on shale gas prospects in Europe, see Carola Hoyos, “Europe, the new frontier in shale gas rush,” Financial Times, March 8, 2010, p. 19.

Large-scale exploitation of shale gas is improbable in the EU for the time being due to the relatively low gas prices in 2010, the investments needed and the density of population in Europe. The importance of shale gas and LNG is the fact that they are alternatives to inflexible long-term pipeline contracts. On the other hand, if LNG stands for the globalized gas market yet to come, shale gas stands for an increase in domestic supply and a decrease in external dependency.

LNG in Europe

Currently, the percentage of LNG in Europe's gas supply is about 84% of gas transported by pipeline and 16% by LNG carriers.67 In 2009, the EU received LNG from Qatar (18.5 bcm / 29% of LNG imports), Algeria (16.5 bcm / 26%), Nigeria (9.6 bcm / 15%), Trinidad and Tobago (7.5 bcm / 12%) and Egypt (6.6 bcm / 10%); other sources accounted for 4.5 bcm (7%).[68] It is estimated that the share of LNG in the EU-27's gas consumption will increase from 8.9% to 31.8% by 2030. However, regasification capabilities are currently not equally distributed and neither is the usage of LNG itself. While Spain is the number one consumer in Europe, ahead even of France and the UK, countries such as Germany and Poland do not have any LNG capabilities. As of June 2010, there are 17 LNG terminals in the EU-27 and many more are being developed or under construction.[69] Debates and doubts over LNG in certain European capitals (such as Berlin) continue in part because there is a fear that regasification capabilities will exceed those of liquefaction in producer countries, the latter also being subject to seasonal and climactic uncertainties. Reception terminals assume an increase in LNG production in countries such as Iraq, Iran and Qatar, which still largely prefer the advantages of the Groningen system[70] to the risks of LNG carriers.[71] Nonetheless, the development of LNG is clearly in the interest of consumer countries, as it reduces European vulnerability in the face of unexpected gas cuts. To cite some examples, Turkey was able to make up for recent Iranian gas cuts through LNG imports[72] and, more recently, Bulgaria was supplied during the January 2009 supply interruption from the LNG terminal in Greece. As for the Świnoujście terminal in Poland, its commercial viability is contested, although it is an important contribution to the security of supply of the country and its neigbors in the East, especially the three Baltic States.

---

67 BP 2010: 30.
68 BP 2010: 30.
69 *Gie.eu*
70 Cf the next section for gas prices and Groningen's legacy.
71 Cf the section on LNG.
72 "Interruption in Iran gas: Problem still exists." The New Anatolian, January 1, 2008. LNG had been imported by Algeria and Nigeria.

LNG terminals and projects in Europe

Russia opened its first LNG terminal in Sakhalin in February 2009 and intends to construct others in the Barents and the Baltic Sea.[73] Russian LNG is designated, for the time being, for Asian and not European markets.

The first European export terminal opened in October 2007 in Hammerfest in Norway, with a capacity of 145,000 m3 going to the EU, the US and Asia.[74] This terminal, which was quite costly and constructed in difficult climactic conditions, is supplied by the Snohvit gas field in the Barents Sea and was developed by a consortium made up of Statoil, Petoro, Total, GDF-Suez, and RWE. A carrier will eventually leave every five days from Melkoya (Hammerfest), each with a capacity of 150,000 m3. The supplies first go to European, then to other clients on the global market. The issues surrounding the relationship between cost and security of supply remain a concern. Norway's experience and Shtokman's proximity led Russia to allow Statoil into the consortium to develop the Arctic reserves.

Table 11 illustrates the situation in 2007 and provides a forecast up to 2015. Table 12 shows possible capacities, if certain countries, such as France or Italy, further increase their capacities, and if countries that do not currently have any LNG terminals, such as Germany, Croatia and Greece, construct them. But there are divergent positions on the capacities: thus, the industry association Gas LNG Europe, a part of GIE, indicates a capacity of 153,2 bcm, as of June 2010.[75]

Table 11: LNG. Evolutions in Regasification Capacities in EU-27 (bcm/y)

	2007	2010	2015
Belgium	6.5	9.1	9.1
France	15.6	23.9	26.4
UK	9.0	44.0	49.7
Italy	0.0	1.0	17.0
Spain	50.5	57.3	64.3
Portugal	5.5	5.5	5.5
Greece	2.6	2.6	2.6
Total	93.2	159.8	198.0

Source: CIEP Analysis, based on company information, WGI, IEA, taken from Tönjes, de Jong 2007

[73] *Sakhalinenergy.ru*
[74] "Hammerfest LNG Exports First Cargo," October 25, 2007, *Ogj.com*
[75] *Gie.eu*

Table 12: Evolution of Regasification Capacities in EU-27 (bcm/y)

	2007	2010	2015
Germany	0.0	5.0	10.0
Belgium	6.5	9.1	9.1
France	15.6	23.9	59.4
UK	9.0	44.0	54.7
Italy	0.0	1.0	27.0
Spain	50.5	57.3	64.3
Portugal	5.5	8.5	8.5
Greece	2.6	2.6	2.6
Ireland	0.0	0.0	2.5
Croatia (1)	0.0	0.0	10.0
Poland	0.0	0.0	2.5
Total	93.2	167.8	301.50

(1) Not currently a member state of the EU, but its entrance is likely by 2015, and its terminals will serve the EU-27.

Source: CIEP analysis, based on company information, WGI, IEA, taken from Tönjes, de Jong 2007; author.

The Groningen legacy and gas prices

The discovery of the Groningen gas field established long-term gas contracts and their indexation to the price of oil. The Dutch government and the companies Esso and Shell estimated that fixing prices in this manner would guarantee the necessary large investments.

Ever since, the market value of exported gas to a given country has been determined by the price of substitutes (replacement value), primarily oil. The value in any importing country is then determined by deducting the fees incurred during transit to the particular client state (netback pricing). For the East-West movement of gas, we generally refer to the German average border price.[76] This explains the differences in the exporting price outside the producer country. The result is that prices are not dependent on the consumer country, the cost of production, or transport costs. A price review clause is scheduled in contracts spanning from 20 to 30 years in the event that the price of substitutes changes (price review clause).

In long-term contracts, it is the client who assumes the risks associated with quantity while the producer takes on those of price

[76] *Energyintel.com*

(take or pay), which it cannot influence. This system, which was established in 1962 and was largely adopted throughout the world, creates a situation where gas prices are unrelated to supply and demand. As a world gas market does not exist, long-term contracts thus reflect world oil prices.

In the 1970s a viable gas market was established in the face of oil's dominance, using long-term guarantees and transparent prices. These instruments continue to create new infrastructure. Infrastructures are only constructed (this goes for LNG as well) when all production is sold through long-term contracts. A debate surrounding a 'Gas OPEC' was prompted by Russia in 2007, but such an organization does not appear plausible. It would assume the cancellation of all long-term contracts, which would not be in the producers' interests.[77] Examples of the end dates of long-term contracts between Gazprom and EU operators are: GDF-Suez in 2030, E.ON in 2036, ENI in 2035, and OMV in 2026.[78] In 2009 the shale gas-induced LNG oversupply of the EU market led to strong pressure on the more expensive long-term contracts and made Russia, the producer, adapt the terms of short-term trade for the time being.

Prices and the race for hubs

Most of the gas consumed in Europe is subject to long-term contracts, with the exception of some wholesale natural-gas markets.[79] These include Bacton in the UK (National Balancing Point) and Zeebrugge in Belgium. Almost all EU exchanges pass through these two hubs[80] and through smaller ones such as the TTF in the Netherlands, Emden/Bunde in Germany, Baumgarten in Austria, and the PSV in Italy. Since prices on the European Continent are indexed on oil, and the UK and US apply spot prices, interconnectors between the UK and the Continent face the two pricing mechanisms.[81] While prices in the UK depend on supply and demand, the Continent's approach promotes indexation to the price of oil. We are currently witnessing increased competition between the sites mentioned above for first place among European gas exchanges and important hubs, which is reinforced by arriving LNG, and potentially shale gas.

[77] For a detailed debate on the price of oil and gas, see Energy Charter Secretariat, « Putting a Price on Energy," Brussels 2007, and for the debate on a 'gas OPEC' see Finon (2007). On the proposal to index gas to an energy basket (a bit like the ECU), see Chevalier/Percebois 2007.
[78] Percebois 2007.
[79] For gas prices since Groningen, see Chapter I.
[80] Chevalier and Percebois 2007, p. 97.
[81] Chevalier, 2004: 289.

Spot-price versus long-term contracts: the UK-Continent example

The UK-Continental Europe interconnector links two markets, each focused on domestic considerations. Bacton-Zeebrugge is an under-water gas pipeline spanning 235 km, completed in 1997 and in service since 1998. It has played a considerable role since 1998 because it put Russian, Norwegian and British gas into competition with each other as well as with LNG. Zeebrugge maintains a key role because of both the arrival of LNG and the underwater Norwegian pipeline Zeepipe. With Bacton-Zeebrugge came the first natural-gas hub in Europe, connecting the British and Belgian networks. Exports through this interconnector doubled between 1998 and 2005.[82] Interconnectors play an important role in the diversification of supplies. Being reversible, they allow for the introduction of supplies from different sources into the pipes. Russian gas could arrive in the UK by Nord Stream and the BBL. A second interconnector connecting Bacton (Norfolk, UK) to Balgzand (Netherlands) was put into service in December 2006 and strengthened 'free gas' imports to continental Europe. The BBL is owned by Gasunie at 60%, E.ON at 20% and Fluxys (Belgium) at 20%. At the end of 2007, Gazprom entered with 9% of the capital, to the great dismay of the British, in exchange for Gasunie's entrance to the Nord Stream consortium.

Table 13: The United Kingdom-Continental Europe Interconnectors

Pipeline	Pipeline Route	Owner/Operator	Length (km)	Diameter (inches)	Capacity (bcm/y)	In service since
Balgzand Bacton Line (BBL)	Balgzand (Netherlands) / Bacton (UK)	Gasunie: 60% E.ON Ruhrgas Transport: 20% Fluxys: 20%	235	36	15	12.1.2006
UK Interconnector	Zeebrugge / Bacton	Caisse de dépôt et placement du Québec: 23.5% CDP Investissements (Canada): 10% Distrigas: 11.41% Electrabel : 5% E.ON Ruhrgas: 15.09% Gazprom: 10% ConocoPhillips: 10% ENI: 5% Fluxys: 10%	230	40	Zeebrugge / Bacton: 25.5 Bacton/ Zeebrugge: 20	10.1.1998

[82] Source: Digest of UK Energy Statistics, UK Department for Business 2007, Chapter 4 on Natural Gas.

Aspirations to become a hub

Several countries are vying to play crucial hub roles, one of them being the Netherlands. Indeed, the depletion of resources at Groningen is diminishing the country's strategic energy position, and it is looking to create a new role for itself, drawing from its experience and infrastructure. Groningen could thus become a gas hub in the north-western European markets, especially if Nord Stream is constructed. Baumgarten in Austria is hoping for a similar role in South-East Europe, but this will depend on the completion of certain projects, notably Nabucco and/or South Stream. The Netherlands has taken several steps toward achieving its goal: it is planning three LNG terminals (two at Rotterdam, starting in 2011/12, and one at Emshaven (operational from 2015); it participated in the Nord Stream consortium; it invited Gazprom to participate in the BBL, and it negotiated for a link with Norway.

The debate on trade terms in the gas market are important and include the proposals for setting up a gas OPEC on the producer side (Putin) and for consumer indexation to an energy basket (Chevalier/Percebois 2007) or to coal (the Chinese position). A change in the gas-oil indexation approach would effectively put these two hydrocarbons in competition with one another and put an end to their alignment, thus raising the importance of gas hubs. As already stated, nowadays there is gas/gas competition between shale, LNG, long-term contracts, and even new commercial models like Nabucco, which will most probably ease the conservative and inflexible European gas market in the near future.

Future Supplies: Looking to the North, South, and East

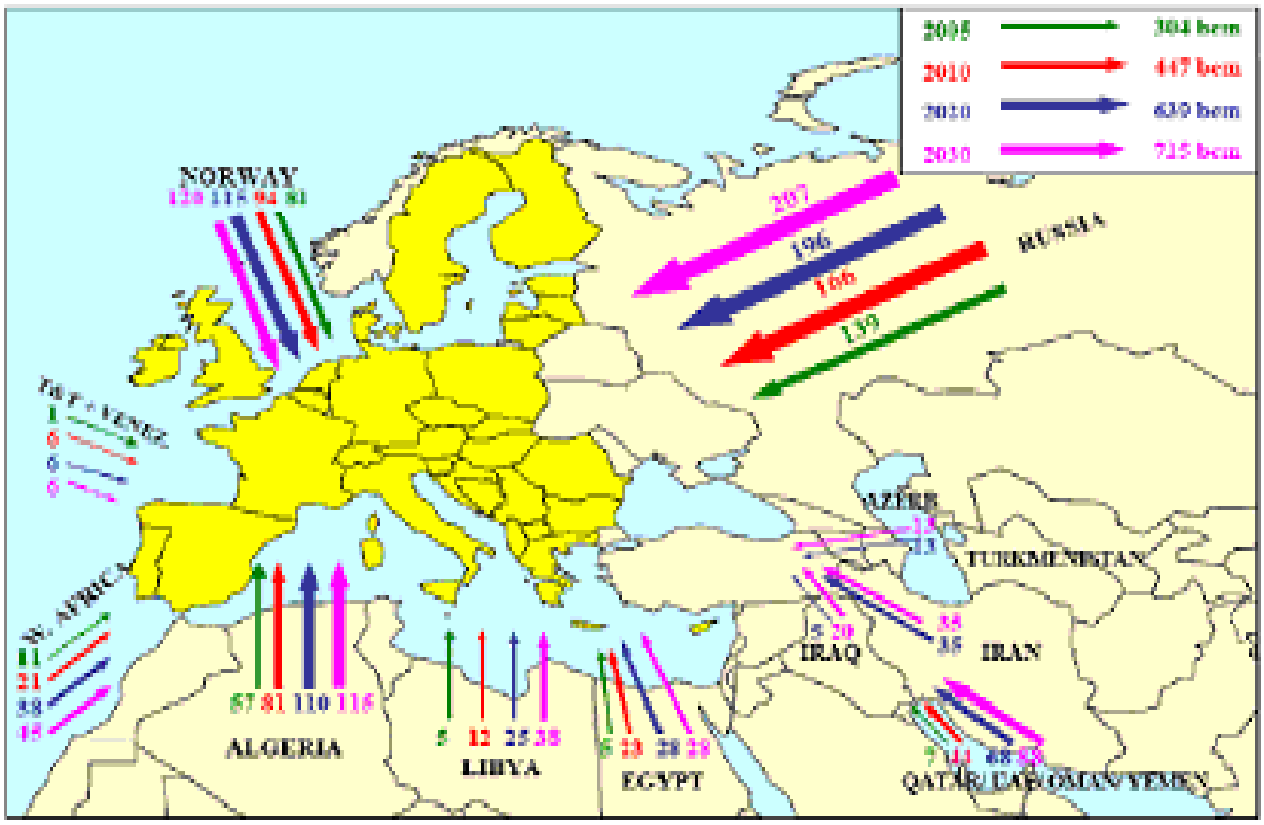
How to cope with future demand?

While Russia seems to be well positioned to satisfy growing European demand in the future, questions remain over the possibility of Russia domestic market actually competing with the European market. While its resources are abundant, its increase in domestic consumption was substantial in the early 2000s: from 354 bcm in 2000 to 422 bcm in 2007. Since 2007, Russian consumption has decreased again (416 bcm in 2008 and 390 bcm in 2009).[83] Upstream investment is limited, and foreign acquisitions have been a priority in recent years.[84] The economic crisis also provoked a downturn in consumption as well as a price decrease, which strongly affected the sector.

[83] BP 2010.

[84] Green, Matthew, "Russia's Gazprom is opening doors in Africa by pledging an equal balance between give and take," Financial Times, 1.6.2008.

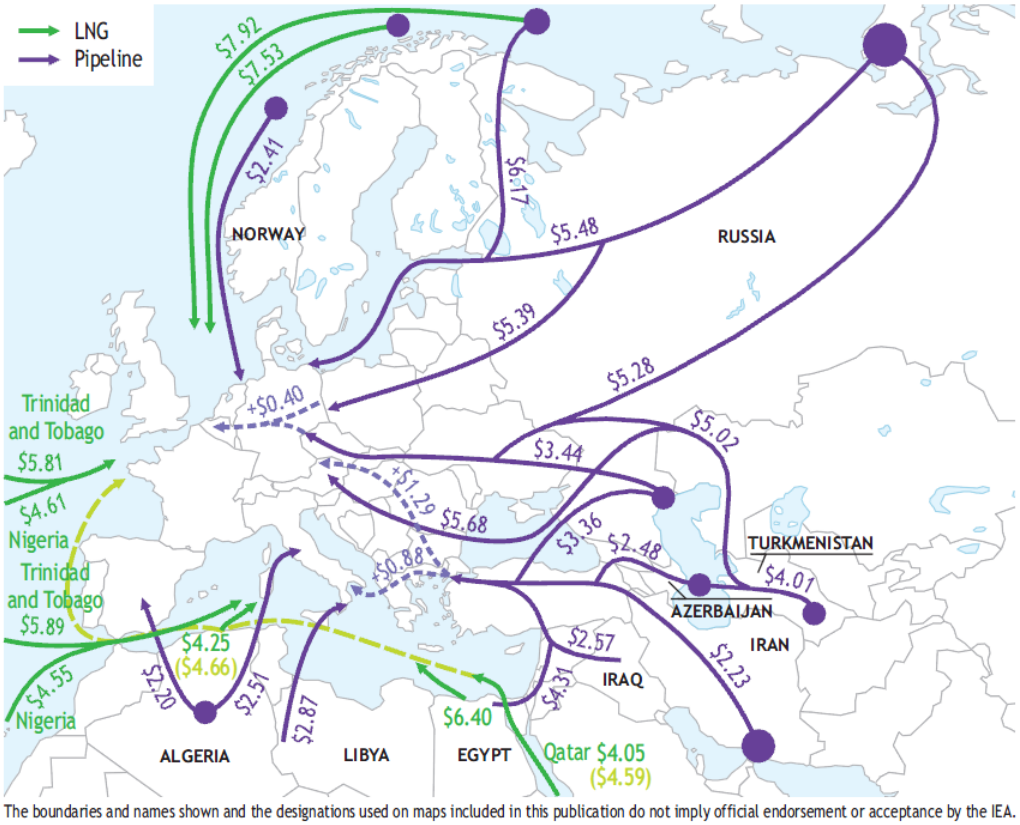
Map 7: Gas Export Potential of Main Producers to the EU, Switzerland, and Balkan Countries (in bcm)



Source: OME, 1st Trans-European Energy Networks information day, March 30, 2007, available on *Ec.europe.eu*

Faced with disappearing resources (despite some minor discoveries such as the recently discovered gas field in Hungary with reserves of 600 bcm), the EU and its member states must consider alternative scenarios and supplies. As Map 8 shows, gas prices vary depending on the origin – LNG or pipe gas. The EU must focus on increasing the competitiveness of its market and the Southern Corridor is one major instrument here. Map 8 (IEA 2009:482) clearly shows the interest in Central Asian pipeline gas; it is the cheapest, at approximately $2.5 for 1 MBtu, or even at $2.23 from Iran. But LNG from Africa or Trinidad and Tobago will be competitive with Russian gas (about $5.2 for Russian gas, and $4.5 to $5.8 for LNG from the South). Diversifying supply and establishing the Southern corridor thus makes commercial sense for the European Union.

Map 8: Indicative Costs for Potential New Sources of Gas Delivered to Europe, 2020 ($/MBtu)



Source: IEA, World Energy Outlook 2009: p. 482

The link with Baku both in oil and gas is already established as far as Turkey, but the Eastern side of the Caspian remains a problem because of the legal dispute on the status of the Caspian and competing interests. They will be discussed later in this study.

Algeria and the amount of LNG in the energy mix, the potential development of shale gas, as well as cooperation with Norway are equally important issues for the EU. While Iran was regularly brought up in the debate until the elections there in 2009, the political conditions in the country and the sanctions will prevent any serious cooperation during the coming years. Iraq contains important gas reserves in its Kurdish north, but its instability makes this option unlikely in the near future, despite the European Commission signing with Iraq a Memorandum of Understanding (MoU) on strategic energy and the media presenting this as the answer to Nabucco's supply problems.[85]

[85] AFP, April 16, 2008, Reuters: "L'UE et l'Irak se disent proches d'un accord sur l'énergie," 16.4.2008; MoU April 17, 2008.

The following section analyzes supplies and projects in the North, East and South, and includes two case studies on the most discussed current projects: Nord Stream and the Southern Corridor (Nabucco/South Stream). The EU's interest, all in all, is security of supply and a true market with competitive prices.

Norway and the Baltic Region: Northern Dynamics

Seldom covered by the press due to the peace and harmony reigning happily in the Scandinavian geopolitical constellation, the gas pipelines between Norway and the EU play an important role. The first pipe from Norway to the EU, Norpipe, was put into operation in 1997. Four gas pipelines were put into service in the 1990s between Norway and the European continent, including Zeepipe to Belgium (1993), Europipe I and II to Germany (1995, 1999), and Franpipe to France (1998). In 2006 and 2007, Langeled North and Langeled South were opened, covering 1,200 km up to Easington in the UK. This pipeline, which is the longest in the world, runs between Nyhamma and Easington and is considered by London to be the most important gas import project for decades to come.

Other projects, such as Skanled, a pipeline connecting Norway not only to Denmark and Sweden but also to Poland, have been discussed since the beginning of the 2000s and promoted by the EU as a means of helping to reduce Poland's dependence on Russia and develop the gas sector in this country. The project has been recently abandoned as the higher price of Norwegian gas in relation to Russian and the small size of the Polish market make the project commercially unviable.

EU representatives continue to highlight Norway's importance as a supplier but also as a development partner in Europe's energy policy and for technological advancement.[86] Norway's energy industry recently experienced a substantial shake-up with the merging in October 2007 of two historic companies built on the discoveries of the 1960s. Statoil, the new 'energy champion,' present in 40 countries, produces 1.7 million barrels of tonnes of oil equivalent per day and disposes of some 6.2 billion tonnes of oil equivalent of proved reserves, originating for the most part in Norway.[87]

---

[86] Joint declaration between Andris Piebalgs, European Energy Commissioner, and Thorwild Widvey, Norwegian Oil and Energy Minister, 7.6.2005 or 2.2.2007, on cooperation in the area of carbon capture and storage. Norway is in the midst of constructing such infrastructure at Mongstad, which will be operational in 2014.

[87] Wyngrove, Martin, "The Vikings are coming," Lloyd's List, 10.9.2007.

Table 14: Norwegian Gas Pipelines

Gas Pipeline	Route	Owner / Operator	Length (km)	Diameter (inches)	Capacity (bcm/y)	In Service since
Europipe I	Draupner E (Norway offshore) / Emden (Germany)	Owner: Gassled Operator: Gassco	660	40	13-16	1995
Europipe II	Kårstø (Norway) / Dornum (Germany)	Owner: Gassled Operator: Gassco	650	42	22	1999
Norpipe Gas	Ekofisk (Norway offshore) /Emden (Germany)	Owner: Gassled Operator: Gassco	440	36	13-16	1977
Franpipe	Draupner E (Norway offshore) / Dunkerque (France)	Owner: Gassled Operator: Gassco	840	42	16	1998
Zeepipe I	Sleipner (Norway offshore) / Zeebrugge (Belgium)	Owner: Gassled Operator: Gassco	814	40	13-15	1993
Langeled (northern leg)	Nyhamna (Norway) / Sleipner (Norway offshore)	Owner: Gassled Operator: Gassco	600	42	20	October 2007
Langeled (southern leg)	Sleipner (Norway offshore) / Easington (UK/England)	Owner: Gassled Operator: Gassco	600	44	20	October 2006
Vesterled	Heimdal (Norway) / St. Fergus (UK/Scotland)	Owner: Gassled Operator: Gassco	350	32	12-13	1978
Frigg	Alwyn North/Frigg (Norway offshore) / St. Fergus (UK/Scotland)	Total	472	24/32	13	1977
Tampen Link	Statfjord B (Norway offshore) / FLAGS tie-in (UK offshore)	Statoil: 43.9% ExxonMobil:18.2 % Shell: 12.2% Statoil:10.5% ConocoPhillips:8. 2% Petoro: 7%	23	32	9	October 2007

Table 15: Norway/Baltic Region Projects

Pipeline	Pipeline Route	Consortium	Length (km)	Capacity (billion m3/y)	Estimated Operation Start-Up	Estimated Cost
Skanled (Sus-pended)	Karsto (Norway)/ Rafnes / Sweden/ Denmark. « Exit points » are expected at Rafnes (Norway), Lysekil, Vallby Kile, Bua (Sweden) and Jutland (Denmark)	Skagerak Energi: 20% E.On Ruhrgas: 15% PgNiG: 15% Energinet.dk: 10% Hafslund: 10% Ostfold Energi: 10% Göteborg Energi: 8% Agder Energi: 5% Swedegas: 5% Preem Petroleum: 2%	800	Maximum 20 (Gassco/ DNV) 20-24 (Energinet.dk)	October 2012	€900 million (Gassco) $1,1 billion (EIA)
Baltic-connector	Helsinki (Finland)/Paldiski (Estonia)	Gasum Eesti Gaas Latvijas Gaze Gazprom	80-120	2	2011 at the earliest (Gasum) 2014 (BFAI)	€100-120 million (Gasum)
Baltic Pipe	Copenhagen (Denmark) / Poland	Energinet.dk Gaz-System	250	8-10 (Lang)	2011	€1 billion (Lang)
Baltic Gas Interconnector (BGI)	Rostock (Germany) /Avedore (Denmark) / Trelleborg (Sweden)	ENERGI E2 (ex-DONG Energy) Hovedstadsregionens Naturgas (HNG) Verbundsnetz Gas E.ON Sverige Göteborgs Energi Lunds Energi Öresundskraft	220	3 at start 10 at the finish (Nord Stream)	2012	€232-284 million (BGI in 2001)
Mid-Nordic Gas Pipeline	Skogn (Norway) / Finland	Pohjolan Voima Oy	880, of which is in: Norway:70 Sweden:335 Offshore:220 Finland:255	2.8-4.7 (PVO)	2010 at the earliest (PVO in 2002)	€1 billion (PVO)

Increasing role for Statoil

Statoil is present, among other countries, in Azerbaijan, Algeria, Angola, Brazil, and the US. The cooperation initiated with Gazprom is closely followed by the EU and focuses on the exploitation of reserves in the Barents Sea, but more generally on the creation of a strategic alliance. In fact, Statoil and Gazprom share many similarities. They are both national companies benefiting from large, available national resources and both have turned towards the Community market. They also share a mutual client, Germany. Thus, if they had formed a strategic partnership, it would have had a major impact on the dynamics of the gas market. Furthermore, since

October 2007, Statoil has held a 24%[88] stake in the development of Shtokman, along with Total. For the Russians, the Norwegians' involvement assures the technical competency of Arctic exploitation (as evidenced by the Norwegian skill in opening Snohvit and Hammerfest). Nevertheless, there are major differences between Norway/Statoil, and Russia/Gazprom, in that the Norwegian state does not use Statoil as a political tool.

Arctic Resources, shared between Russia and Norway

On the Norwegian side, the giant gas field of Snohvit was discovered in 1984. The Soviet/Russian side followed suit some years later with Shtokmanovskoye, Ledovoye and Ludovskoye. These Barents Sea resources possessed by Russia (80%) and Norway (20%) are estimated to have more than 5,000-6,000 million tonnes of oil equivalent (mtoe), gas and oil combined. To this day, only the Snohvit fields have been developed and exploited, with the opening in 2007 of the Hammerfest LNG plant. Shtokman, discovered in 1988, is located 555 km from the coast. This field, with an area of 1,400 km,2 holds gas reserves estimated at 3.8 bcm. However, 20 years after its discovery, a definitive development plan is still not in place.[89] Shtokman should eventually supply the Nord Stream pipeline to make up for the decline in Siberian reserves. Gazprom had initially envisioned supplying the North American market using LNG carriers.

Russia and the CIS

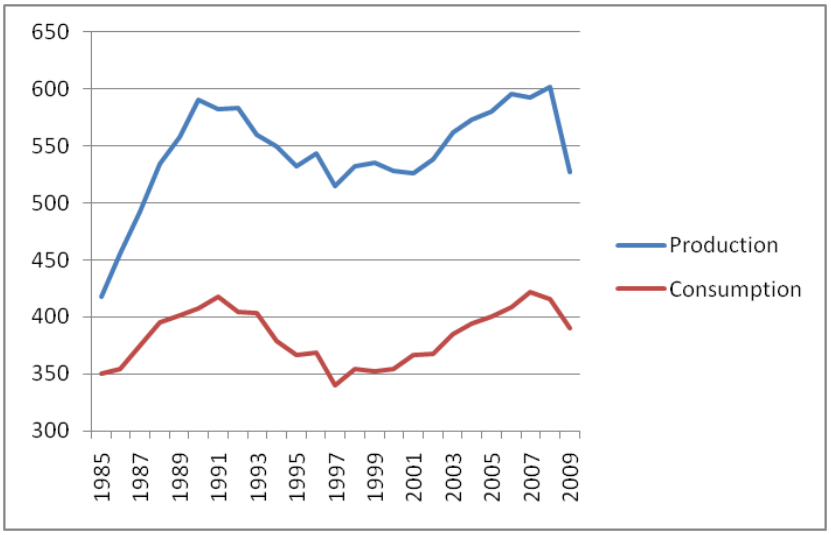
This section introduces questions relating to Europe's Russian gas supply and then looks at geographic issues. The Nord Stream case study concludes the examination of issues in the North, while an outline of the controversy surrounding South Stream and Nabucco wraps up the look at those in the Caspian region.

Russia currently exports reserves, mostly from Western Siberia, and has become the most important single EU supplier. After declines in economic production and an unprecedented political crisis in the 1990s, Russia seems to be making a comeback. In terms of gas production, in 2006 Russia for the first time passed its 1991 levels (593.8 bcm).90 Production decreased to 529.5 in 2009, due to the crisis and less consumption: this is equivalent to a fall of 12.5% compared to the 601.7 bcm in 2008.91 While Siberian reserves make up more than 90% of Russian exports, Eastern Siberia and the Far East are only beginning to be exploited. In order to remain at the current level of production, the development of new fields is crucial in

[88] Following merger on October 24, 2007.
[89] Also see Godzimirski, Russia NEI Visions 25.
[90] 592.0 bcm in 2007, and 601.7 in 2008, according to BP 2009.
[91] BP Statistical Yearbook 2010:24.

Western Siberia, on the Yamal Peninsula, and in Shtokman. The potential for Russian exports is largely influenced by its domestic consumption: two-thirds of its gas is consumed domestically since the country opted for gas instead of coal or nuclear during the 1980s (the 'gas pause'). Russian GDP growth naturally goes hand in hand with an increase in domestic consumption and is heightened even more so by poor energy efficiency, no economic encouragement to improve efficiency, and low domestic prices. The economic crisis and its impact on energy consumption have indeed hurt the Russian economy. All in all, numerous experts doubt Russia's ability to satisfy growing EU demand, once it resumes.92 Russia must thus rely on gas from Central Asia, use it as a buffer gas, and pursue a strategy that assures deliveries from Turkmenistan, Uzbekistan, and Kazakhstan. A solution for Russia is to link up with Central Asia and import its resources without being obliged to buy huge quantities in difficult times, as now during the financial crisis. A main objective for Moscow is to contain others and to have a privileged position on the EU market. The OPEC gas project also falls into this thinking. This project was presented by Vladimir Putin at the start of 2002 and aims to create a "Eurasian alliance of gas producers," thus grouping the four countries noted above, and to counter the Community's attempts to liberalize the gas market beyond its borders.93 Table 17 summarizes existing and planned routes for Russian gas exports.

Graph 5: Russian Gas Production and Consumption 1985-2009 (in bcm)



Source: Christian Schülke, based on BP 2010

92 See for example Tönjes/Jong 2007: 8; or Goetz 2004: 24.
93 For the debate over a gas OPEC, see Goetz 2004: 24-25.

Concerns over direct links

As already mentioned in Chapter 2 (the Primorsk example), Russia's strategy consists of promoting direct links even if the price is higher than for using the existing networks. This approach is interpreted as one of the consequences of the Russia-Ukraine and Russia-Belarus conflicts in 2006 through 2009 – conflicts which gravely damaged Russia's image as a reliable supplier. On the other hand, the economic crisis limits possibilities for Gazprom to invest.

Table 16: Russia's Gas Export Routes to Central and Western Europe and Turkey (in bcm)

Pipeline	Route	Capacity 2006	Capacity 2010/2011	Capacity 2012 or 2015
Brotherhood/Union (Soviet pipeline grid)	Russia / Ukraine / Central Europe	130	130	130
Polar Lights (Soviet pipeline grid)	Russia / Belarus / Ukraine / Central Europe	25	25	25
Trans-Balkans (Soviet pipeline grid)	Russia / Ukraine / Balkans	20	20	20
Finland Connector (Soviet pipeline grid, extended in 1999)	Russia / Finland	20	20	20
Yamal-Europe (in operation since 1999)	Russia / Belarus / Poland – Western Europe	33	33	33
Blue Stream (in operation since 2002)	Russia / Black Sea / Turkey	16	16	16
Nord Stream pipeline	Russia / Baltic Sea / Germany		27.5	55
South Stream	Russia / Black Sea / Bulgaria / Austria/Italy			63 (2015)
Total export capacity to Central & Western Europe	244	271.5	362	

Source: Heinrich 2007: 87; Author

As a legacy of Soviet times, Russia has only one small, direct gas pipeline connecting it to Finland. All others were transit pipelines, before the construction of the underwater gas pipeline opening the way to the Turkish market through the Black Sea. In the 1990s, only two gas pipelines were set up: Yamal, through Belarus and Poland (which for the first time bypassed Ukraine) and Blue Stream. All others date to before

1990 (as Table 18 illustrates). The table also reveals the extreme dependence of the Russian exports on the Ukrainian transit route.[94]

Yamal, Ukraine, Poland and BASF

It is important to highlight that the financial conflicts between Russia and Ukraine over transit date back to the 1990s, and thus took off immediately after the collapse of the Soviet Union. The Ukrainian state, unable to collect taxes and to charge for energy, did not pay for Russian energy supply and thus accumulated a large debt. Russia responded by not paying the rapidly rising transit fees. Gazprom's distrust of Ukraine led it to design bypassing gas pipelines. Yamal, Nord Stream, and Blue Stream are the manifestation of this circumvention.

While Druzhba passed through Poland and a small share of Soviet gas reached Poland through a pipeline built in 1949, all Soviet pipelines constructed in the 70s and 80s bypassed Poland, not only because of pre-existing infrastructure in Ukraine but also for political reasons. Moscow's preferred route was Ukraine and then Czechoslovakia. Unlike other satellite countries, Poland thus did not develop gas but relied primarily on coal.[95] Several factors favored the construction of Yamal, also called the Belarusian connector, which took Russian gas through Belarus and Poland to Germany. Yamal reflects commercial and competitive thinking, since BASF, one member of the consortium and the largest industrial consumer of German gas, shared Gazprom's desire to put an end to the Ruhrgas monopoly (although for different reasons).[96] The Russian objective to decrease dependence on Ukraine was a second argument, and the desire to supply the Polish market was a third. As for Poland, it was ambivalent because it was split between the fear of new-found dependence on Russia and its own desire for cleaner energy than coal. Finally Yamal, as was later the case with Blue Stream, turned out to be a temporary commercial failure for Moscow in that the Polish market was largely overestimated and gas failed to rival coal there.[97] In Eastern Germany there was a very different evolution, in which unification (and massive subsidies) brought about almost immediate change from coal to gas.

---

[94] For the Russian-Ukrainian energy relationship and the conflict in January 2006, see the analyses of Dubien (2007) and Pleines (2006).

[95] For Soviet routes and debates, see Victor and Victor (2004), "The Belarus Connection: Exporting Russian Gas to Germany and Poland," Working Paper 26, Institute for Public Policy; Program on Energy and Sustainable Development, Stanford University.

[96] There is a detailed presentation of the Yamal project in Victor and Victor (2004); this calls Yamal the Belarus Connection. See also Victor and Victor 2006, "Bypassing Ukraine: Exporting Russian Gas to Poland and Germany, in: Victor, Jaffe, Hayes 2006.

[97] For details on the error in estimations of the Polish market in the 1990s, see Victor and Victor 2004: 27. The estimation that the Polish market could in 1993 absorb around 10 bcm and in 2010 around 20 bcm proved to be wrong: in reality Poland consumed only 11.5 bcm in 2001 and 13.7 bcm in 2009 (BP 2010). Coal-based electricity generation was much cheaper for the Polish economy.

Table 17: Gas Pipelines between Russia and Europe via Ukraine, Belarus, and Finland

Pipeline	Route	Transit Countries	Owner / Operator	Length (km)	Capacity (bcm/y)	In service since
Yamal-Europe	Torzok/Yamal (Russia) / Frankfurt (Oder) (Germany)	Belarus, Poland	Russian and Belarusian parts: Gazprom Polish part: EuRoPol Gaz: Gazprom: 48% PGNiG: 48% Polish Gas-Trading S.A.: 4%	4,187 of which is in: Russia: 2,932 Belarus: 575 Poland: 680	31 (1) 33 (2) 35 (3) 33 in Belarus, 20 in Poland (4)	Belarus-Poland: 1997 Russia-Belarus: September 1999
Northern Lights/ Beltransgaz/ Siyaniye Severa	Russia / Ukraine	Belarus	Russian part: Gazprom Belarusian part: Beltransgaz		25 (4) 14 in Belarus (5)	
Finland Connector	Russia /Finland				20 (4)	1973, enlarged in 1999
Bratstvo (north)	Russia/ Germany	Ukraine, Slovakia, Czech Republic, Austria	Gazprom for the Russian part		30 (4)	
Bratstvo (south)/ Trans-Balkan	Russia / Turkey	Ukraine, Moldova, Romania, Bulgaria	Gazprom for the Russian part		20 (4)	
Urengoy	Urengoy (Russia) / Germany / Austria	Ukraine, Slovakia, Czech Republic	Gazprom for the Russian part	5,000	40 (4)	
Progress / Yamburg	Russia / Ukraine		Gazprom for the Russian part		30 (4)	
Soyuz / Orenburg	Russia / Ukraine		Gazprom for the Russian part		30 (4)	

Source: Author

Yamal almost suffered its first transit crisis in June 2010; the following map reveals clearly the Yamal dependency of Lithuania, the two other Baltic states benefiting from a small direct line from Russia. Kaliningrad is also dependent, whereas the German-Polish section can be reversed nowadays. Note also that Belarus is nearly 100%

dependent on gas for electricity generation. The supply disruption of Yamal would have hit the country hard, while also having collateral effects on neighboring countries such as Lithuania. In fact, Lithuania received substantial quantities of electricity from Belarus, since its Chernobyl-type nuclear power plant Ignalina was shut down, in December 2009.

Case Study: Nord Stream

Nord Stream is clearly the most advanced of all new gas pipeline projects. Its first pipe will probably be operational in 2012 and its second pipe soon after. Construction in the Gulf of Finland started in April 2010.

Nord Stream, a gas-pipeline project of around 1,200 km offshore, will connect Vyborg in Russia to Greifswald in Germany. It has caused debate and controversy in Europe ever since 2005 because it bypasses Central European countries and conjures up the nightmares of the Russian-German ententes, but also stirs up ecological worries about its impact on the already heavily polluted Baltic Sea.

According to Nord Stream AG analysis, the estimated lack of European supplies by 2015 could be satisfied as follows: beginning in 2015, Norway will supply 20% of gas, Nabucco[98] some 20-30%, and Nord Stream the remaining 55%. Nord Stream will first be supplied by fields in Eastern Siberia, and later by Shtokman.

The project was officially started in 2005 by Chancellor Schröder and Russian President Putin. Plans for a similar project led in the early 1990s to a Soviet-British joint venture (Sovgazco) which foresaw the UK as the major destination of the gas. British gas demand was indeed in full swing after the liberalization of the electricity industry, with demand at around 55 bcm per year. The idea was abandoned, however, because of lack of British confidence in Gazprom and the high costs of the project.[99]

Today, Nord Stream is perceived by many as an important means to guarantee Western European supplies; extensions from the pipeline are planned to the Netherlands and the United Kingdom so as to connect the European network. To alleviate transit countries' concerns, especially those of Poland, the Merkel administration in Germany proposed an interconnector to Poland. This proposition was rejected by Warsaw at the time; its worst nightmare is to find itself 'at the end of the pipe' (of the Yamal pipeline but also the less-used

[98] Sebastian Sass, representative for Nord Stream AG, referred to Nabucco, not South Stream, in his presentation in Helsinki (November 2007), which itself is interesting. Logically, for a project with a majority controlled by Gazprom, the preference should be South Stream and not Nabucco!

[99] Victor/Victor 2004: 32.

Druzhba, if a link is constructed to Primorsk), with the risk of seeing its supplies cut to the advantage of German and Western European clients. The EU put Nord Stream on its priority projects list, along with Nabucco, in December 2000, while giving it the status of a trans-European network project.

The facts: Nord Stream – history and status quo

The project started with a feasibility study in 1998 under the name North Transgas and North European Gas Pipeline (NEGP). It was led by a Russian-Scandinavian consortium including Fortum, Gas Oy, and Gazprom. It was then abandoned and taken up again in 2004 by Gazprom alone. Gazprom allied itself at the end of 2005 with two German companies, BASF and E.ON, to create the corporation called Nord Stream AG, headed by Mathias Warnig,[100] with headquarters in Zug, Switzerland. Up to the end of 2009, feasibility studies were carried out, notably focusing on potential routes and ecological and security issues in the Baltic Sea. The presence of chemical residue and weapons dating from WWII adds to these issues.

The consortium

The consortium made up of Gazprom (51%), BASF, Wintershall, and E.ON Ruhrgas (each with 24.5% up until November 2007, and then down to 20%) was enlarged on November 7, 2007 with the Dutch company Gasunie participating at 9% (with a reduction in the two German companies' share). In exchange for Dutch participation, Gazprom entered (in a gas-pipeline-monopoly kind of way) into the BBL interconnector with 9% of the capital. The Dutch company's entrance and the interest shown by the companies Centrica (UK), Distrigas (Belgium), and Repsol (Spain) improved the image of the project, which had previously been thought of as a 'Russian-German' one. In March 2010, GDF-Suez and Gazprom signed a memorandum on gas supplies from Nord Stream and on the entry of GDF-Suez into the consortium, with a 9% share, reducing the shares of E.ON and Wintershall by 4.5% each. This agreement was finalized on June 18, 2010. The contract with Saipem, a subsidiary of ENI (Italy), for the construction of the underwater section of the line was signed in February 2008. Contracts have been signed[101] for 20.5 bcm of the first gas pipeline, purchased by DONG, E.ON Ruhrgas, GDF-Suez, Wingas, and Gazprom Marketing and Trading UK.[102]

---

[100] A controversy emerged in Germany in fall 2005 concerning, notably, the Stasi past of the CEO Mathias Warnig.

[101] Contracts signed: DONG (Denmark) 1 bcm/year, with an option to increase; E.ON Ruhrgas 4 bcm; GDF 2.5 bcm; Gazprom Marketing and Trading (UK) 4 bcm; Wingas 9 bcm. Source: Antasz 2007, homepage Nord Stream: *Nord-stream.com*, consulted June 2010

[102] Paszyc, Ewa, Loskot-Strachota, Agata, Lukasz Antas, "Nord Stream: The Current Status and Possible Consequences of the Project's Implementation," in: East Week, Analytical Newsletter 39/104, 11.14.2007, Poland.

Table 18: Nord Stream Gas Pipeline

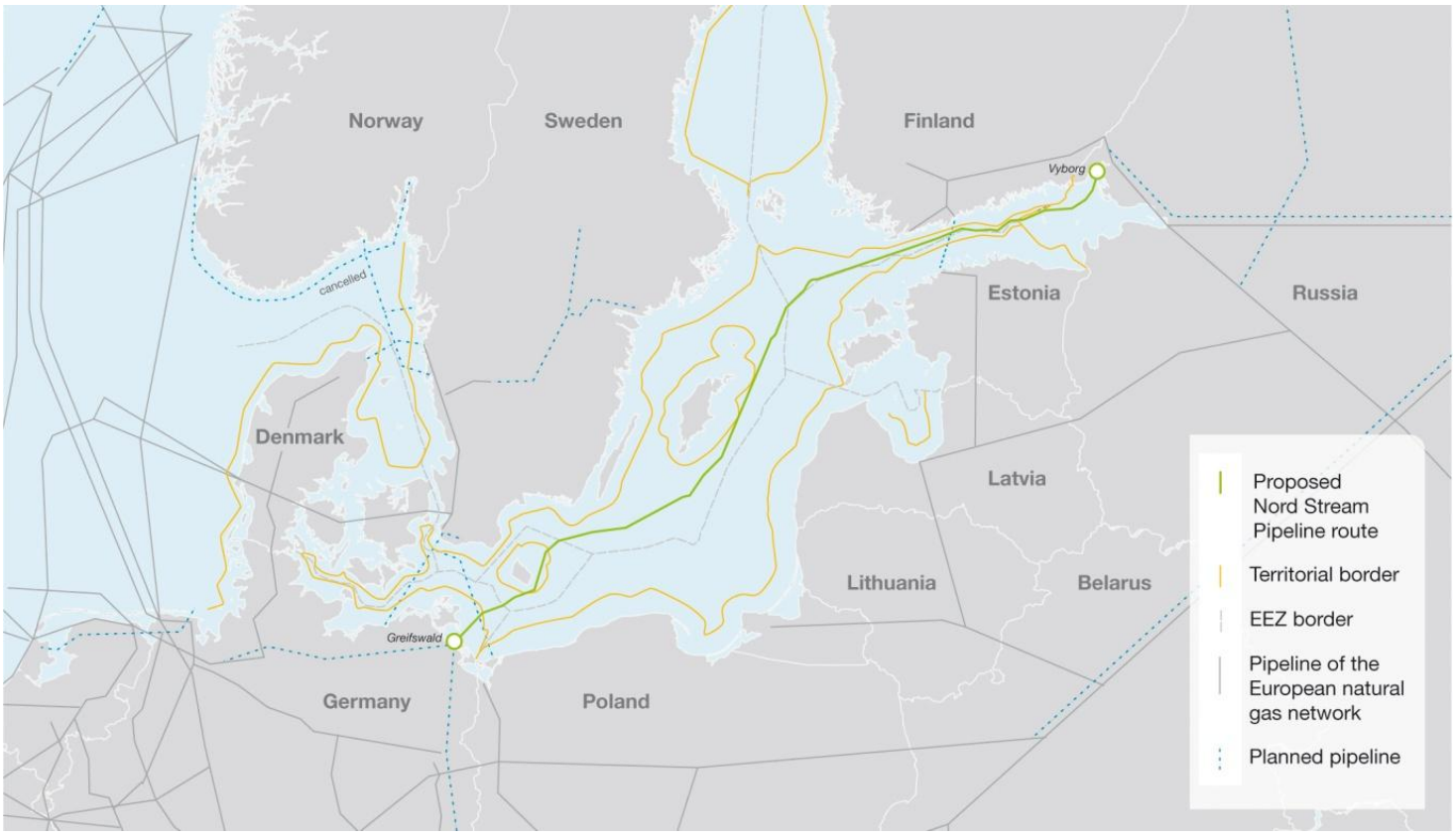
Pipeline	Route	Owner / Operator	Length (km)	Estimated operational start-up	Estimated cost (€ billion)
Nord Stream	Vyborg (Russia)/ Greifswald (Germany)	Gazprom: 51% Wintershall: 15.5 % E.ON Ruhrgas: 15.5% (initially Wintershall and E.ON 24,5%; reduction in two steps in 2007, 2010, due to the entry of Gasunie and GDF-Suez) Since 2007, 9% for Gasunie, a reduction of E.ON and Wintershall to 20% for each Since June 2010 GDF-Suez 9%, reduction of E.ON and Wintershall of 4,5%	1,200 (offshore)	1st pipe: 2011 2nd pipe: 2012	5 (1) 8 (2) 9 (3) 7,4 (4)

(1) Nord Stream 2008; (2) Schröder in December 2007; (3) BASF in November 2006; (4) Nord Stream website June 2010

Technical features

Nord Stream is comprised of two pipelines and will eventually transport 55 bcm per year. Gas is compressed at the Vyborg station and arrives in Greifswald. The two gas pipelines, running 1,200 km, will pass through Finnish, Swedish, and Danish Exclusive Economic Zones (EEZ), as well as through territorial waters belonging to Denmark north-west of Bornholm. Once the project was declared of Community interest, other countries rallied around it. The Netherlands especially hopes to be involved by providing a hub and would like to see the pipeline extended to Groningen, then through the BBL interconnector to the UK. The construction of the onshore gas pipeline has already begun on the Russian side, creating a link between the production fields and Nord Stream, and leaving from the Yuzhno Russkoe field from which the first gas supplies will come.

Map 9: Nord Stream – The Pipeline Route



Source: Nord Stream AG

Once the gas arrives in Germany, it must be transported through German territory through two other gas pipelines called NEL and OPAL (yet to be completed). NEL (with a capacity of 20 bcm) will transport gas to Western Germany and the Netherlands while OPAL (with a capacity of 36 bcm) will supply the Czech Republic, Southern Germany, and France. Wingas and E.ON will set up these two gas pipelines; they received a TPA exemption for OPAL, but not for NEL.[103]

Nord Stream has been experiencing difficulties related to the dramatic increase in the price of raw materials, notably steel. Management changed their estimation in December 2007, putting costs at □7.4 billion instead of the original figure of □5 billion.[104] They are also facing delays due to resistance by affected countries; for example, an environmental study, which is obligatory for this type of project, was turned down by Estonia.

[103] For updated information, see the OPAL website *Opal-pipeline.com*
[104] Süddeutsche Zeitung, 12.14.2007: "Ostsee-Pipeline wird teurer; Betreiber-Konzerne müssen für umstrittenes Projekt mehr zahlen." *Nord-stream.com*

The Nord Stream controversy

The following critiques of Nord Stream arose:

- the bypassing of new member states
- ecological concerns
- economic issues and its sustainability compared to alternatives such as Yamal
- the role of the Russian military in the pipeline's security

Regarding bypassing of new member states, Russian-German intentions have been the focus as they are perceived to be showing a disregard for small countries, while re-establishing the historic alliance between Moscow and Berlin. The fact that this project was presented after and despite the entrance of eight Central European countries into the EU in 2004 (with at that time a pro-Russia German chancellor, Schröder, who would after his mandate join the Nord Stream company) only aggravated the situation. Nonetheless, the integration of Nord Stream into European projects and the interest shown by other EU member states, including the UK and the Netherlands, put an end to the serious initial controversy surrounding the project.

Opposition to Nord Stream has been particularly strong in Sweden and Finland, which are contesting the planned route through their Exclusive Economic Zones (EEZs), including the planned station on Gotland Island (a tourist destination). This opposition featured strong distrust – especially a distrust of Russia's intentions. In early April 2008, the Swedish authorities announced that Gotland was definitively off the table as a base for the project.[105] However, in November 2009, the two countries issued their final agreement.

Gas Resources in the Caspian and Central Asia

Looking in all directions?

To reduce dependency on Russia and to achieve more competition on prices, the EU is ambitiously attempting to set up an independent link to the Caspian producers. The Southern Corridor, which means direct access to the resource-rich Central Asian region, is the focus here, and more particularly Azerbaijan and Turkmenistan. The link to Azerbaijan has been established already. But the one to Turkmenistan remains problematic for a number of reasons which will be developed further in this chapter. Russia is suspiciously observing Western and EU efforts to establish a link to the former parts of the Soviet Union. Moscow's ambition is clearly to contain this region, to have the final say on its exports, and to remain the decisive player in the EU gas market. Russia also needs the Caspian and particularly

[105] Press release of Nord Stream AG, April 7, 2008.

Turkmen gas as 'swing' gas, thus compensating, if necessary, for its own insufficient production. Overall, then, there is currently a complex strategic game, with many actors, much negotiation, and a variety of tools. One powerful tool for Russia as well as for Iran is the lack of clear legal status of the Caspian Sea.

South Stream, on the one hand, and Nabucco on the other have rightly become symbols of the traditional Russian versus the new Western export links of Central Asia. They are competing projects, therefore, even if both sides always insist on the fact that they could easily co-exist, and even if they illustrate additional and different interests. For example, South Stream could be used to deflect Ukrainian transit capacities to the South.

The potential gas exporters in the region are Azerbaijan, Kazakhstan, Turkmenistan, and Uzbekistan, each with different reserves. While resources in Uzbekistan are already exploited at 35% and will be difficult to increase, the other three are 'young' producers whose output will increase in the future. Azerbaijani production, currently at 14.8 bcm, will increase to 20 bcm by 2020; Kazakhstan's production is around 32.2 bcm; and Turkmenistan, possessing by far the most resources, produced 66.1 bcm in 2008, with a collapse to half (36.4 bcm) in 2009 (for reasons which will be explained below)[106] The average potential of Turkmenistan, which sends most of its exports to Russia (44 bcm in 2006) and 6 bcm to Iran, is 150 bcm. That leaves enormous export potential since its domestic consumption is 17 bcm. Uzbekistan currently produces around 50 bcm but it consumes, like Kazakhstan, most of the production itself.

A brief glance at today's gas and oil infrastructure reveals that the former-Soviet-Union context remains decisive and that Russia continues to have a major impact on the choices of the region. But the map reveals as well emerging Western export routes, with BTC and BTE from Azerbaijan to Turkey, and, lately, the entrance of China into the game with the 2010 opening of the Turkmenistan-China gas pipeline. Iran, which produces 131.2 bcm, approximately what the country consumes (131.7 bcm), imports gas from the region, too, and thus is part of the picture, though less for economic than for political reasons.[107]

The following section presents Azerbaijan's role and the first Western projects (BTC and BTE), Turkmenistan and its potential place in the picture, and the most debated projects ,South Stream and the Southern Corridor (Nabucco, ITGI, TAP, CDC).

Getting closer to Azerbaijan: the BTE

Chapter 2 highlighted the BTC as an important breakthrough from a Western perspective, and as a 'shock' from the Russian perspective. The Baku-Tbilisi-Erzurum Pipeline (also called the South Caucasus

[106] BP Statistical Review of World Energy 2010:24.
[107] BP Statistical Review of World Energy 2010: 24, 27.

Pipeline or SCP) from Baku to Erzurum in Turkey and mostly running parallel to the BTC oil pipeline, was opened in 2007 and mainly supplies Turkey. Designed for 16 bcm, its potential could be increased by setting up parallel lines. Transporting huge quantities of gas via the Southern Corridor to Turkey and then to the EU would require upgrading this infrastructure and its extension. The war in Georgia increased doubts about the long-term reliability of the Georgian trajectory. Due to ongoing tensions between Armenia and Azerbaijan, there is no alternative for the time being. The EU Commission might financially contribute to increasing the capacity of BTE.

Turkmenistan: sitting on the reserves

Turkmenistan is currently in a very uncomfortable geopolitical situation. Dependent on its Russian, and, more recently and to a much lesser extent, Chinese market, the country must largely accept its clients' terms of trade. Ashgabat has no direct access to the highly profitable Western market – an access which could hugely improve its negotiation position. Locked on a Caspian Sea that lacks clear legal status, infrastructure in Turkmenistan is of major political significance and also raises security issues. The Georgian war in August 2008 reminded all the countries of the Caucasus and Central Asia of the presence of Russia and its interests. Highly dependent on hydrocarbon exports, Turkmenistan has suffered a violent economic downturn as a result of the massive reduction in gas imports by Russia. When the prices that Moscow had to pay for Ashgabat gas went above world market prices, Russia used a technical manipulation to destroy the gas pipeline importing Turkmen gas to Russia. Imports only resumed, and on a minor scale, at the end of 2009; currently Russia reluctantly imports 10 bcm a year. The BP Statistical Report 2010 shows that gas production by Turkmenistan halved in 2008-09, from 66.1 to 36.4 bcm. In a kind of negative 'swing,' Russia passed the decreasing gas demand of its clients on to its supplier Turkmenistan; as a result, the pipeline was sabotaged and gas could no longer be provided. The country has three export markets today: Russia, Iran, and, since the beginning of 2010, China. The terms of trade are rather poor and the producer, dependent on its exports, has no control over them.

Turkmen supply to Iran

The first external – to the former Soviet Union – gas pipeline opened at the end of 1997, from Turkmenistan to Iran (Kordkuy), with a capacity of 8 bcm, the gas being then transported from Iran to Turkey. A second gas pipeline was inaugurated by Iranian President Ahmadinejad in January 2010, with a capacity of 6 bcm, and which can be increased up to 12 bcm.108 An agreement signed in June 2010 allows for an increase in Turkmen exports to Iran from 25 bcm to 40 bcm. 109

108 Enerpresse, June 21, 2010.
109 Ibid

Turkmen supply to China

China, like the West, has been interested in the Central Asian resources since the beginning of the 1990s; its gas demand has grown fourfold in ten years, between 1999 – 21.5 bcm – and 2009. But so did its gas production, amounting to roughly the same numbers for the same period.110 Unlike in OECD countries, China's gas consumption kept growing during the economic crisis. Beijing started to negotiate a Kazakhstan-China gas pipeline in 2003. A framework agreement with Turkmenistan was signed on April 3, 2006 in order to construct the pipeline. One year later, Turkmenistan officially joined the Chinese-Kazakh Consortium. At the end of August 2007, Stroytransgaz, a Russian company and Gazprom subsidiary, began setting up the Turkmen 188 km section, while the Uzbek section was started in June 2008 by Azia Trans Gas, a joint venture of Uzbekneftegaz and CNPC. It is worth stressing here that the participation of a Russian company reveals a desire to associate Russia with this project and the acceptance of Russian involvement in the project, prior to its implementation. Moscow does not intend to set up a direct gas infrastructure to China and counts on the Turkmen/Central Asian infrastructure in case it, too, wants to export to the east one day.

The major part of the pipeline crosses Kazakhstan and work began in July 2008. The first line was completed in November 2009; the second should be finished by the end of 2010. An inauguration ceremony took place on December 14, 2009 in eastern Turkmenistan, in Saman-Depe, in the presence of Chinese leader Hu Jintao, as well as the heads of states of Turkmenistan, Uzbekistan, and Kazakhstan. An additional line from western Kazakhstan to China was decided on, on June 13, 2010.

The pipe, built for some $7.3 billion, has a capacity of 40 bcm – 30 from Turkmenistan and 10 from Kazakhstan. It remains unclear whether prices are indexed on coal or oil.

The new infrastructure, of some 7000 km, is unprecedented and often mentioned in the European and international debate on Nabucco or the EU Southern Corridor project in general; it is possible to set up infrastructure without having an agreement on gas deliveries. The infrastructure is the first step to engage the producer. Although the Chinese success with Turkmenistan is considered impressive in the EU, experts argue that the market economy functions differently, and that the Chinese case is an exception. The debate re-emerges again and again, with respect to Nabucco: is it possible to set it up, with its 3.300 km, which is roughly half of the Chinese infrastructure?

110 BP Statistical Review of World Energy 2010: 24,27.

Map 10: Central Asia-China Pipeline

It is important to highlight, too, that the China pipeline has improved the Turkmen negotiating position by putting an end to its almost complete dependency on a single market, Russia. Adding the EU and Western market would certainly be extremely beneficial for the country.

… and the EU?

Although the EU and Turkmenistan share an interest in establishing a commercial link and energy trade, the path that would lead there is complicated and success has not been met so far. And, since everything relating to gas exports is so politicized, Ashgabat considers that it needs to be more than cautious. The following is a summary of the efforts so far to 'get together.'

To strengthen security of supply, the US government has been promising, since 1996, the trans-Caspian gas link from Turkmenbashi to Baku, a project that has failed so far.[111] It was frozen in 2000 over Russian and Iranian opposition despite feasibility studies and the fact that Azerbaijan and Turkmenistan had agreed, in 1999, on its completion. From a US perspective, there was also competition between this project and Blue Stream. In 2006, following the Ukraine-Russia gas conflict, the project was revived and debated by European Energy Commissioner Andris Piebalgs and Turkmen President Niyazov (March 2006). Following the political changes in December 2006, with the death of the dictator Saparmurat Niyazov, Turkmenistan under Gurbanguly Berdimuhamedov appeared at first to be more open; its behaviour at the international conference on

[111] See Janusz 2007 on the status of the Caspian Sea, or lake: A lake is exploited by a group of countries, while the status of sea gives bordering states exclusive zones of 12 miles. While Russia and Kazakhstan came to an agreement in 1998 about their border, and Azerbaijan in 2001, differences persist between Turkmenistan and Azerbaijan, and Iran insists on joint exploitation.

energy held in November 2007 seemed to be proof of this change. There was widespread hope that the infrastructure project could now progress. However, an indirect setback occurred, involving the trilateral agreements in March and May 2007, thereby fostering the relationship with Russia again.

In 2009 the multilateral initiative, the Caspian Development Corporation (CDC), was kick-started by the EU Commission. Bilateral projects emerged, but have been unsuccessful so far. RWE had a project to set up a 'technical' pipeline linking the Turkmen and Azeri offshore gas sites, in agreement with Bakou and Turkmenbashi, via a line of some 60 km. But just before signing a memorandum of understanding on the purchase of some 10 bcm by RWE, in April 2010, the Turkmen president did not attend the meeting with the RWE CEO. This meant that the CDC was considered more realistic than a bilateral project between a German company and Turkmenistan. The following section explains this complex project.

The Caspian Development Corporation (CDC): the ultimate solution?

How will Caspian cooperation be achieved? Ever since the collapse of the Soviet Union, this link has become theoretically possible; scenarios have been envisaged, negotiations held, and projects elaborated. The CDC is one of these projects that have the potential to be the long-awaited breakthrough in this cooperation. The CDC, set up in 2009, is the tentative means of providing a simplified scheme of cooperation between the European gas-market stakeholders and the Central Asian gas producers, especially Turkmenistan. As a technical-assistance project, the CDC designs this interface and examines different options for bundling gas demand and sharing investment risks. The CDC steering committee includes the European Commission, the World Bank, and (with observer status), the Energy Community based in Vienna; this makes sense since the members of the Energy Community are potential customers for Central Asian gas as well. The technical assistance will be financed by the EU Commission, the European Investment Bank (EIB), the Public-Private Infrastructure Advisory Facility (PPIAF) and the World Bank. The Cambridge Energy Research Associates (CERA) have been charged with elaborating a proposal and models for the functioning of the consortium, and a first report and a progress report were released in Brussels in spring 2010.

The following table presents the different projects related to the Caspian, including the East-West pipeline that Turkmenistan started on its own, in May 2010. The Caspian Coastal pipeline, although a project of Turkmenistan, Russia and Kazakhstan, has not been started, interest being limited for the time being. The technical pipeline, as RWE for example intended to set it up, consists in linking the Azeri and Turkmen offshore fields. But no progress has been made, and Ashgabat is reluctant to export from offshore without first bringing reserves onshore. The table also includes the ENI Compressed Natural Gas (CNG) project, although it is not a pipeline.

The CNG would transport several billion m2 of Turkmen natural gas to the Azeri coast, to be transported then via overland lines. The project is in an early stage of discussion.

Table 19: the Caspian Projects

Pipeline	Pipeline Route	Transit Countries	Consortium	Length (km)	Diameter (inches)	Capacity (billion m3/y)	In service since
Caspian Coastal pipeline	Turkmeni-stan / Russia	Kazakh-stan	Gazprom for the Russian section			5 (EDM) an increase of 20 is expected for 2012	
Trans-caspian pipeline	Turkmeni-stan / Turkey	Azer-baijan, Georgia	Botas	1,700 of which 230 is offshore		31(EIA)	$2-3 billion (EIA)
East-West Pipeline (Under construction)	Shatlyk (Turk-menistan) / Belek (Turk-menistan)		Turkmengaz / Turkmennebitgazgurlushyk (Turkmen Oil and Gas Construction)	750-900	56	30	€ 2 (Interfax)
Technical Pipeline	Petronas-Fields to Shah Deniz; would link Turkmen and Azeri offshore sites		RWE	60 km			
CNG Project ENI# See ENI press release of 20 July 2010, *Eni.com*	Turkmeni-stan Azerbaidjan with special vessels, no PIPELINE		ENI (compressed natural gas project	60 km by special vessels, than via overland lines			

Source: Author

The country started, at the end of May 2010, to set up an East-West pipeline on its own, which improves its options to the West as much as to the North. This infrastructure, to be finished by 2015 and intended to establish a true internal market, could put gas into Nabucco as well as into the old Central Asian system. The country is thus making progress, while leaving its export options open.

Case Study: the Southern Corridor

As already discussed, the CDC is intended to make progress in establishing a single interface with Turkmenistan. With or without

Turkmenistan, the gas from the Shah Deniz field phase II is expected to account for 17 bcm/y by 2016 and needs appropriate infrastructure to deliver it to the EU. To date, these are the options available:

TAP, the trans-Adriatic Pipeline, would run 520 km from an extended line from Turkey through Greece and Albania to Italy and cost about $1.5 billion.

ITGI, the Italy-Greece-Turkey interconnector, would transport some 11 bcm a year, including a 200 km offshore section (also called Poseidon) and 600 km onshore, with no official price indicated yet. Despite rivalry with TAP, there is potential cooperation between ITGI and TAP, according to recent reports.[112]

Nabucco, also called the Turkey-Austria gas pipeline, would need an investment of $7.9 billion and stretch over 3,300 km from Erzurum/Turkey to Baumgarten/Austria. In EU territory, the pipeline would be granted exemption from regulated third-party access, including tariff regulation, for 25 years – a classic method to encourage investment.

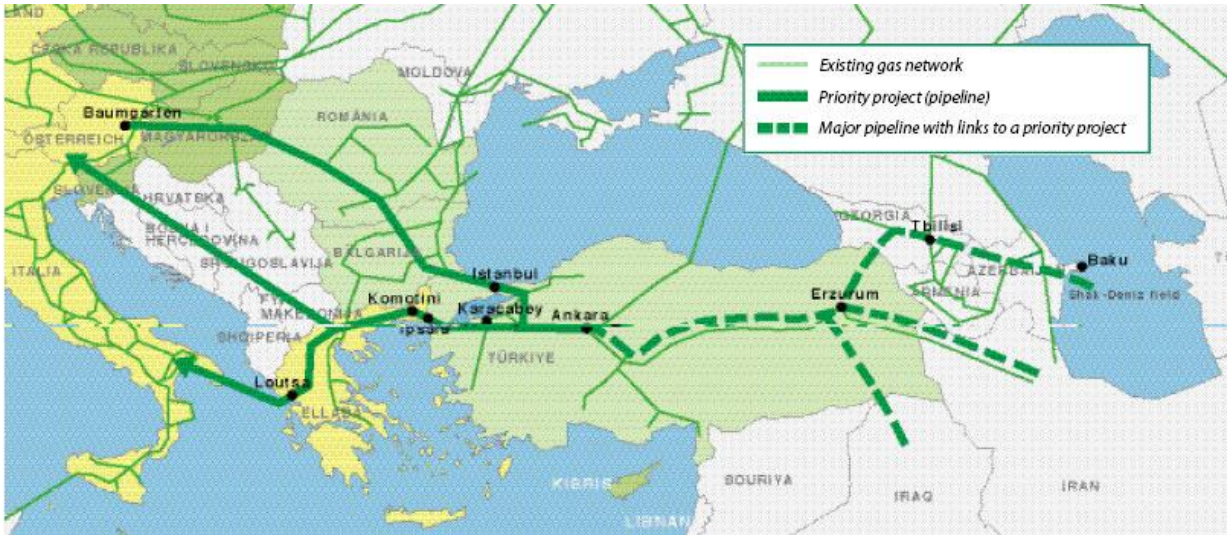
South Stream or Nabucco? politicized and competing projects

During the last few years, Nabucco and South Stream were clearly the most politicized gas-pipeline projects. It seems that the overall politicization of Caspian and Central Asian resources has spilled over to all the projects relating to the region. Nabucco became something of a symbol for access to the Caspian at large, to the detriment of equivalent projects such as ITGI or TAP. Learning from this mistake of taking a political position on a commercial project, the new Energy Commissioner Oettinger (in office since February 2010) insists now on the priority of the Southern Corridor in general, rather than of any single project.

There has been some questioning in recent years on the loyalty of EU member states or EU enterprises toward the ‘EU project’ of the Southern Corridor; some organizations (ENI, EDF) are shareholders in the Russian project South Stream and, in June 2010, RWE said it was considering entering South Stream.[113]

[112] « TAP ready to join forces with ITGI, » New Wires, June 30, 2010.
[113] “Merkel urges RWE and Gazprom to clarify” (“Merkel drängt bei RWE und Gazprom auf Klärung “), Handelsblatt, July 14, 2010.

Map 11: The Southern Corridor



Source: *Bsdp.org*.

Facts

In 2006, following the Russian-Ukrainian gas conflict, the EU put Nabucco on its list of priority projects. The Recovery package of January 2009 foresees $200 million for the pipeline.[114]

Nabucco, with a length of 3,300 km and investment estimated at around $8 billion, has no clear start date – officially, the earliest is 2014 (Nabucco website, as of August 2010). This pipeline aims to supply Western Europe with gas from Central Asia, the Caspian Sea and the Middle East, thereby completely bypassing Russian territory. The planned route passes through Turkey, Bulgaria, Romania, Hungary, and up to Baumgarten, Austria where it finally connects with the European gas network. Nabucco would increase the security of supply of Bulgaria and Slovakia especially, but also of Bosnia and Serbia, which found themselves dramatically exposed during the gas interruption in early 2009.

The Nabucco project company, led by the Austrian group OMV, backed by its partner RWE, includes an equal share for Hungary's MOL, Transgaz, Bulgargaz, the Turkish group Botas, and the German RWE. All five Nabucco transit countries have a stake in the project, although detailed agreement on the South Stream transit countries' contribution is still missing as Gaz de France stopped being interested in the South Stream project at the end of 2007. While the French group cited other priorities, notably African, analysts insist that their departure was due to the Turkish factor; Ankara would have used its veto due to poor French-Turkish relations and RWE could enter due to this. Considering the strategic importance of this

[114] *Euractiv.com*

infrastructure, the Commission appointed a coordinator, the former Dutch foreign affairs minister Jozias van Aartsen, to oversee its completion. But van Aartsen was elected mayor of The Hague in March 2008 and has not been replaced. His mission had limited success – very different from, for example, Mario Monti's role in the French-Spanish interconnection.[115] However, the multi-vector Southern Corridor project cannot be compared to the bilateral one at the Pyrenees because of the different number of actors and issues, and the strategic importance of the project. Joschka Fischer, the former German foreign minister, has been engaged as an advisor by RWE and OMV since July 2009 in order to sort out the Turkish transit question (addressed separately later in this chapter) and he has been successful in doing so thus far.[116] [117]

There is still no decision on the financing of Nabucco and the companies involved will only go for it once the supply and demand questions are settled. Incentives have been created by the EU Commission, with a feasibility study as well as €200 million from the European Economic Recovery Plan. The EIB and the EBRD confirmed, at a Nabucco summit in January 2009, that they were ready to provide financial backing.

How supply Nabucco?

The problem of Nabucco is supply, although the situation has improved since last year. The main source will be the second stage of the Shah Deniz gas field in Azerbaijan and will be on stream from 2015. An agreement over 8 bcm a year has been signed. Turkmen gas (10 bcm) has been repeatedly mentioned as a realistic option by the consortium members; this would require the construction of infrastructure under the Caspian Sea (the Trans-Caspian) as well as a MoU. However, the intended MoU between RWE and the government was not signed in April 2010, as projected. On the other hand, the already mentioned East-West pipeline in Turkmenistan could potentially comply with Nabucco.

Other options include Egypt providing about 3-5 bcm through the Arab Gas pipeline, and Iraq could possibly also supply. Although Iran showed interest from the beginning, this is not currently an option, for political reasons. One should not forget that Iran was strongly considered in the early stages of the Nabucco conception.

ITGI and TAP

ITGI and TAP will also bring Caspian gas to the EU – ITGI via Turkey, Greece and Italy, and TAP via Greece and Albania. Their transport

---

[115] Final activity report, Jozias van Aartsen 2009, *Ec.europa.eu*
[116] *Wsws.org*
[117] GDF retire sa candidature du projet Nabucco, available on *Euractiv.fr*, February 19, 2008.

capacities are lower than those of Nabucco: 10 bcm for TAP, which spreads over 520 km, while the costs are about one-fifth of those of Nabucco (□1.5 bn), especially since an existing pipeline in Turkey will be extended.

South Stream

Rather surprisingly, in mid-2007, Gazprom presented plans for a project with ENI to construct an offshore gas pipeline[118] in the Black Sea, in addition to the Blue Stream gas pipeline, following an agreement in November on a feasibility study to be completed by 2008. The South Stream project includes several companies from EU member states, the most important being ENI from Italy. If EDF and ENI would be involved in the offshore part, the others would participate in onshore parts, or land sections: Hungary with Gazprom for Hungary, and so on. The others include Bulgargas, EDF, ENI, MFB–Hungarian Development Bank, OMV, and Srbijagas. In Hungary the partner is not MOL, but MFB. Gazprom is the de facto entity controlling the Serbian and Bulgarian energy markets.[119] Greece has also signalled its interest in South Stream.[120] This gas pipeline will leave from the Russian Beregovaya compressor station and proceed over 900 km to Varna, Bulgaria. Its southern branch will then pass through Greece towards southern Italy, and its northern part will go through Serbia, Hungary, and Slovenia towards northern Italy, with a branch also going to Austria. The presumed capacity of the pipeline is 63 bcm for two strings, following a route similar to that of Nabucco, starting in Bulgaria. It could begin service in 2015 and, like Nord Stream, it would have the advantage of avoiding Belarus, Ukraine and Turkey. Both of these projects would reinforce Gazprom's dominant position in the European market. South Stream is a technical challenge in that it has to pass through very deep Black Sea waters. It is clearly competing with Nabucco, ITGI or TAP, since the pipeline would channel Caspian resources through the Russian network, and would thus russianize them', if the rules of the game remain those of today.

---

[118] Gazprom and ENI signed MoUs at the end of 2007, in order to proceed with the first feasibility study of the project.

[119] MacDonald, Neill, "Gazprom raises offer for Serbia oil and gas group," Financial Times January 16, 2008; Mongrenier, J. "La Serbie, point d'appui de la politique balkanique de la Russie;" available on *FenetreEurope.com*.

[120] "La Grèce envisage de participer au gazoduc South Stream," available on *Armenews.com*; declaration made by Gazprom following the visit by Medvedev to Athens on March 31, 2008.

Table 20: Nabucco (ITGI, TAP) vs South Stream

Gas Pipeline	Route	Transit Countries	Owner / Operator	Length (km)	Estimated operational start-up	Estimated cost		
Nabucco	Turkish/ Georgian border and/or Iranian/ Turkish border / Baumgarten (Austria)	Turkey, Bulgaria, Romania, Hungary	OMV: 16.67% MOL: 16.67% Transgaz: 16.67% Bulgargaz: 16.67% Botas: 16.67% RWE 16.67	around 3,300	2014	around €7.9 billion (Nabucco) $5.35-5.8 billion (EIA)		
ITGI Greece-Italy-Interconnector /South European Gas Ring Project / Poseidon5	Komotini (Greece) /Ottranto (Italy)		IGI Poseidon S.A: DEPA 50%, Edison 50%	800 of which: Greece: 600 Offshore: 200		8 (EIA, Platts)	2011 - 2012	$1,3 billion (EIA)
Trans-Adriatic Pipeline (TAP)6	Saloniki (Greece) / Brindisi (Italy)	Albania	EGL 42.55% Statoil 42.55% E.ON 15%	520 of which 117 is off-shore	48 onshore, 36 offshore	10, expandable to 20 (TAP)	2012	€100-150 million (TAP)
Ionian/ Adriatic Pipeline7	Vlore (Albania) /Ploce (Croatia)	Montenegro	EGL, Plinacro	400 of which: Albania: 170 Montenegro: 100 Croatia: 130	28	5 (Plinacro)	2011 - 2012	€230 million (energypublisher)
ITGI								
TAP								

South Stream	Bere-govaya (Russia) / Black Sea / Varna (Bul-garia) / Italy (et Austria)	Bulgaria and Greece (+Albania) + Ionian Sea or Romania/ Hungary/ Slovakia or ex-Yugoslavia	South Stream AG: Gazprom, ENI for offshore part: Numerous JVs between Gazprom and energy companies for onshore part.	900 (off-shore)	2015	$12 billion (Brower 2007) $10 billion (Global Insight) €10 billion (Platts) €20 (Russian Energy Ministry 2008)		

White Stream, no serious alternative? Later?

The then Ukrainian Prime Minister Yulia Tymoshenko, at the start of 2008, advocated another project: the White Stream or 'Ukrainian pipeline".[121] This was presented to Brussels as an alternative to Nabucco, going through Georgia by the Crimea to Ukraine and then on to the EU. A linkage to the Iran-Armenia gas pipeline is also a possibility, even though this pipeline, opened in 2007, operates on a much smaller scale.

Table 21: White Stream

Gas Pipeline	Consortium	Length (km)	Capacity (bcm/y)	Estimated cost
White Stream / Georgia-Ukraine- EU (GUEU)	GUEU – White Stream Pipeline Company: Pipeline Systems Engineering (PSE) Radon-Ishizumi consulting	950 of which is in: Georgia (Tbilisi-Supsa): 100 Offshore: 650 Ukraine: 200	8 at the beginning 24-32 if connected to the Trans-Caspian Gas Pipeline - the completion of which is not assured (PJG)	$2 bn (PGJ)

White Stream shares a number of problems with Nabucco, notably the issue of supply. It does not create an alternative to the Ukrainian transit and lacks incentives for all countries except Ukraine. Since the new presidential administration took office in Ukraine in February 2010, White Stream has somewhat disappeared from the debate. Experts such as John Roberts from Platt's has mentioned this project as an option for follow-up discussion after more infrastructure is established

[121] "Gaz: Timochenko préconise un 'Ukrainian Stream'," Ria Novosti, January 30, 2008; "Wir brauchen neue Transitwege für Gas," FAZ, Interview with Ms. Timochenko, January 30, 2008.

and once the Southern Corridor opens, since there would then be more upstream development in the Caspian which would necessitate more infrastructure. White Stream could be one part of the answer.[122]

Prospects

What are the prospects for the EU-Caspian link in the near future? The establishment of the Turkey-Azerbaijan connection was important as a first step. The next step is the Trans-Caspian and, as Roberts terms it, the "kick-start" of the infrastructure for the region, as well as the regional upstream development. For the time being, the prospects for the Turkmenistan-EU link are unclear. Is the East-West pipeline to be considered as a promising start? It is too early to assess, since the pipeline could be tied up with two other projects. The Azerbaijan link, on the other hand, is likely to progress and, commercially, there is a bigger chance of realizing TAP and/or ITGI than the rather expensive Nabucco project. Energy Commissioner Oettinger as well as members of the Nabucco consortium have said that a decision on the realization of Nabucco will be made in early 2011.[123]

The new commercial approach represented by Nabucco is intriguing as it could help to reorganize the European gas market. Due to the difficult financial situation of the companies involved and the current oversupply of the gas market, there is a good chance that discussions on both South Stream and Nabucco will continue during the next five years. Even if Nabucco remained empty in the beginning, its very existence would incentivize exports.[124] The Chinese establishment of the Turkmenistan gas pipeline as a first step is an often quoted example of this. However, it appears that this is not the way European markets and decision-making work. Should that be necessarily the case?

The South: Algeria and Nigeria

Imports from the South will be reinforced with new gas pipelines, such as Medgaz, to Spain, which should be operational in September 2010, and Galsi, to Italy, which should be finalized by 2016. Algeria is very dependent on its hydrocarbon exports, which constitute 97% of its total exports, 30% of its GDP, and 65% of the state budget. Meanwhile, 62.7% of Algeria's energy exports are delivered to the EU.[125] Export capacities will rise hugely, from 67 bcm (2008) to a planned 102 bcm in 2015 due to the construction of several

---

[122] Roberts, John, "Europe's Caspian gas policy to be key to energy security," in: Europe's World, summer 2010, pp 76-78

[123] *Upstreamonline.com*

[124] Ifri Conference in Brussels, February 27, 2008, Brendan Devlin, assistant to Jozias van Aartsen, project coordinator for Nabucco.

[125] DG Relex, EU-Algerian relations.

infrastructures.[126] As the table below shows, three gas pipelines connect North Africa to Europe. Three other projects are under way, and Transmed's capacity will be increased in the near future. The opening of the Enrico Mattei gas pipeline in 1983, which goes through Tunisia and arrives in Sicily, put an end to dependence on the LNG that had dominated Algeria since the beginning. Its capacity was doubled in 1996 by a parallel gas pipeline. In 1999 the Pedro Duran Farell gas pipeline followed, which passes through Morocco, the Strait of Gibraltar, and finally reaches Spain. Since the 1990s, two pipelines connect the Saharan reserves to Europe. Greenstream was added in the 2000s. Transit problems with Tunisia have been and continue to be very significant for Enrico Mattei.[127]

South-North (EU-Africa) Gas Pipelines

Table 22: Gas Pipelines Connecting North Africa to the EU

Gas Pipeline	Route	Transit Countries	Owner / Operator	Length (km)	Capacity (bcm/y)	In service since
Greenstream	Mellitah (Libya) / Gela (Sicily, Italy)		ENI: 50% NOC: 50%	530	8	October 2004
Enrico Mattei / Transmed	Hassi R'Mel (Algeria) / Sicile / Minerbio (Italy)	Tunisia	Sonatrach: 50% ENI: 50% Sotugat for Tunisian part	2,220 of which is in: Tunisia: 370 Offshore: 380 Italy: 1,470	24(1) 27(2) (3) 30 in 2008, 33.5 in 2012(2)	1st line: 1983 2nd line: 1994
Pedro Duran Farell / Maghreb Europe	Hassi R'Mel (Algeria) / Cordoba (Spain)	Morocco	Enagas SNPP Sonatrach Transgas	1,650 of which is in: Algeria: 520 Morocco: 540 Offshore: 45 Andalusia: 275 Extre-madura: 270	8.5 (1) 8.6 (2) 12.5 (3)	1996

(1) EIA, (2) Brower, (3) Nicholls.

Algeria-Spain: Medgaz

The Medgaz pipeline, which connects Algeria and Spain, has been under construction since 2006, and is expected to be operational in

[126] World Energy Outlook 2009:500; Table: Algeria's gas export capacity

[127] Detailed study by Hayes, M., "The Transmed and Maghreb Projects: Gas to Europe from North Africa," in: Victor, Jaffe, Hayes 2006.

September 2010. This pipeline links Beni-Saf in western Algeria and Almeria in Spain, and runs over 210 km (200 of which are offshore). Sonatrach is the major stakeholder in the project with 36%, followed by the Spanish companies Cepsa, Iberdrola, and Endesa, along with Gaz de France. The initial capacity of 8 bcm per year will be progresssively increased to 16 bcm per year. Algerian gas will thus remain a minority in EU imports compared to Russian gas, even after the start-up of Medgaz, but it will play an important regional role in supplying Southern Europe.

Galsi cooperation with Gazprom?

The fourth Algerian pipeline, Galsi, is currently under review, following a governmental agreement at the end of 2007. Galsi, directed by a consortium put together in January 2003, aims to establish a gas pipeline between Algeria and Italy via Sardinia, or alternatively to join with France via Corsica. However, the sale of gas is not assured for the moment, notably because the Italian company Edison revised its initial participation in favour of Russian imports, given its strategic partnership with Gazprom. Galsi will thus only have a capacity of around 8 bcm. If construction is settled, the pipeline could begin service by the end of the decade. However, it appears that short-term gas oversupply is delaying its commission.[128]

The Trans-Saharan (Nigeria-Algeria)

Lastly, the Trans-Saharan project deserves attention.[129] It is a proposed natural-gas pipeline leaving Nigeria, passing through the Sahara to Algeria and then to Southern Europe. This project is at the very least risky given the potential for future attacks. This pipeline could eventually transport around 30 bcm per year, over 4,300 km. However, with rapprochement between Gazprom and Nigeria, this gas might be considered Gazprom gas, and Gazprom could develop along with Sonatrach an African hub at Beni Saf.[130]

[128] Brower, Derek, “Laying the Pipes,” Petroleum Economist, October 2007.
[129] See also the Ifri study on the Trans-Sahara, www.ifri.org
[130] Soarez (2007).

Table 23: South-North Projects

Gas Pipeline	Route	Owner / Operator	Length (km)	Capacity (bcm/y)	Expected operational start-up	Estimated cost ($ billion)
Medgaz	Beni Saf (Algeria) / Almeria (Spain)	Sonatrach: 36% Cepsa: 20% Iberdrola: 20% Endesa: 12% GdF Suez: 12%	210	8, possible increase to 16(1) 4 in the Begin-ning, maximum of 16(2)	mid-2010	1.2(2) €0.9 billion(1)
Galsi	Hassi R'Mel (Algeria) / Sardinia / Pescaia (Italy)	Sonatrach: 38% Edison: 16% Enel: 13.5% Wintershall: 9% Hera: 10% Region Sardinia/Sfirs:10%	900 of which 600 is offshore	8 (1) (3) (4) 10 was initially expected (1)	2012 (3) (4)	2 (2)
Trans-Sahara Gas Pipeline, TSGP / Trans- African Gas Pipeline / NIGAL	Warri (Nigeria) / Hassi R'Mel (Algeria), then Beni Saf or El Kala	Trans-Saharan Natural Gas Consortium (NIGEL): Sonatrach Nigerian National Petroleum Cooperation	4,128 of which is in: Nigeria: 1,037 Niger: 841 Algeria: 2,310		2015	more than 10

(1) Brower, (2) EIA, (3) Galsi, (4) Nicholls.

Map 12: Gas Pipelines Africa-Mediterranean

Source: *1.bp.blogspot.com*

Prospects

Energy relations with North Africa will have increasing importance in the future. In addition to hydrocarbon transport, the project of a Mediterranean electricity ring, and solar energy generation in the Sahara, the Desertec project, deserve to be mentioned. A synchronous electricity connection exists already between Gibraltar and Ceuta.

Turkey and Ukraine: Two Major Transit Countries for EU

The EU's hydrocarbon supply depends heavily on the Ukrainian transit route. Turkey emerges as a second major transit country, at the crossroads of the Southern Corridor.

The following section assesses the role of both, looks at the potential decrease of Ukraine's importance, and reveals related risks.

Transit Country at the East-West Crossroads: Ukraine

Transit has been an acknowledged symbol of Ukrainian identity ever since the country became independent at the end of 1991. It epitomises the position occupied by Ukraine on the European map, at the crossroads between Russia and the European Union. The role of Ukraine as a transit country has diminished progressively since 1991, and will continue to do so, with the opening of Nord Stream I, by 2012. The 'gas wars' that began in 2004 are then likely to come to an end. These crises incentivized Gazprom and EU companies to invest in transit-avoidance gas pipelines. And, as Pirani puts it, Ukraine could even become in the future "a residual transit route of last resort,"[131] with its transit capacities diminishing from some 113 bcm in 2010 to a projected minimum of 45 to 50, by 2020.[132]

Ukraine is not just a transit country but also a large gas consumer and producer, and possesses massive storage capacity. The production and storage are situated in the West, whereas the major consumption areas are located in the East. This implies problems, especially in the case of cuts from the East: Ukraine needs then to reverse flows, which makes transit East-West impossible.[133] Viktor Yanukovych, elected president on February 7, 2010, is considered by many to represent a new period of improved cooperation with Russia. Although there are some signs of 'normalization,' it is too early to draw a firm conclusion. However, Kiev and Moscow

[131] Pirani 2010:41.
[132] See the tables in Pirani 2010:9 and 26.
[133] This is one of the major problems that arose in January 2009.

have signed a series of agreements; for example, on April 21, 2010, they agreed a 30% gas price discount for Ukraine in return for a 25-year lease of the Black Sea naval base Sevastopol, Crimea, to the Russian fleet.[134] This is reminiscent of the crossover deals of the Kuchma period, and Yanukovych is said to represent a similar approach. It put an end to the declared desire of both parties to depoliticize their commercial and especially their gas relationship. A huge series of other proposals reinforced cooperation between the two countries, and in all fields – electricity, trains, aerospace, telecoms, etc. Indeed, there is much debate about a Naftogaz-Naftogaz-Gazprom consortium, and the future of the huge Ukrainian gas infrastructure (GTS) is of major concern here. But no agreements have been yet made, and Ukraine's entry into a customs union with Russia, as desired by Prime Minister Putin, is also open for the time being. The new Ukrainian president is aware of the related risks, and is seeking to speed up a Free Trade Area with the EU first – having adopted a gas law that introduces EU legal standards – with the objective of joining the Energy Community. These moves have been criticized by Russia.[135] Bruce Jackson, a neo-conservative formerly influential on the US Eastern Europe agenda, shared his assessment with the author: "Maybe only an Eastern representative from Ukraine can manage the Western integration of the country."[136]

A quarter of the gas consumed in the EU originates from Russia and Central Asia, and 80% of this passes through Ukraine. Naturally, the EU cannot neglect the risk that an intensified Ukrainian crisis would pose to the stability of the union as a whole, considering the size and population of the country.

Ukraine played a fundamental role in the development of the Soviet Union's gas sector, a fact that explains its current key position not just as a transit country but also as a production and storage location. Ukrainian production amounted to 30% of the Soviet Union's in the 1960s and then dropped to 12% in the 1980s.[137] The country's gas and even electricity infrastructures show great incoherence in relation to consumption areas. Because of this, maintaining the existing structure is not compatible with keeping Russia at bay, as proved to be the case during the January gas crisis when the contradictory pattern of having storage in the West for consumption in the East became a true Achilles' heel for the country. Kiev faced the dilemma of either cutting transit altogether or cutting supply to Donbass.

Since the 1990s, and even more so after Putin's accession to power in 2000, Russia has pursued a strategy aimed at acquiring the transit networks and other infrastructure of the former Soviet

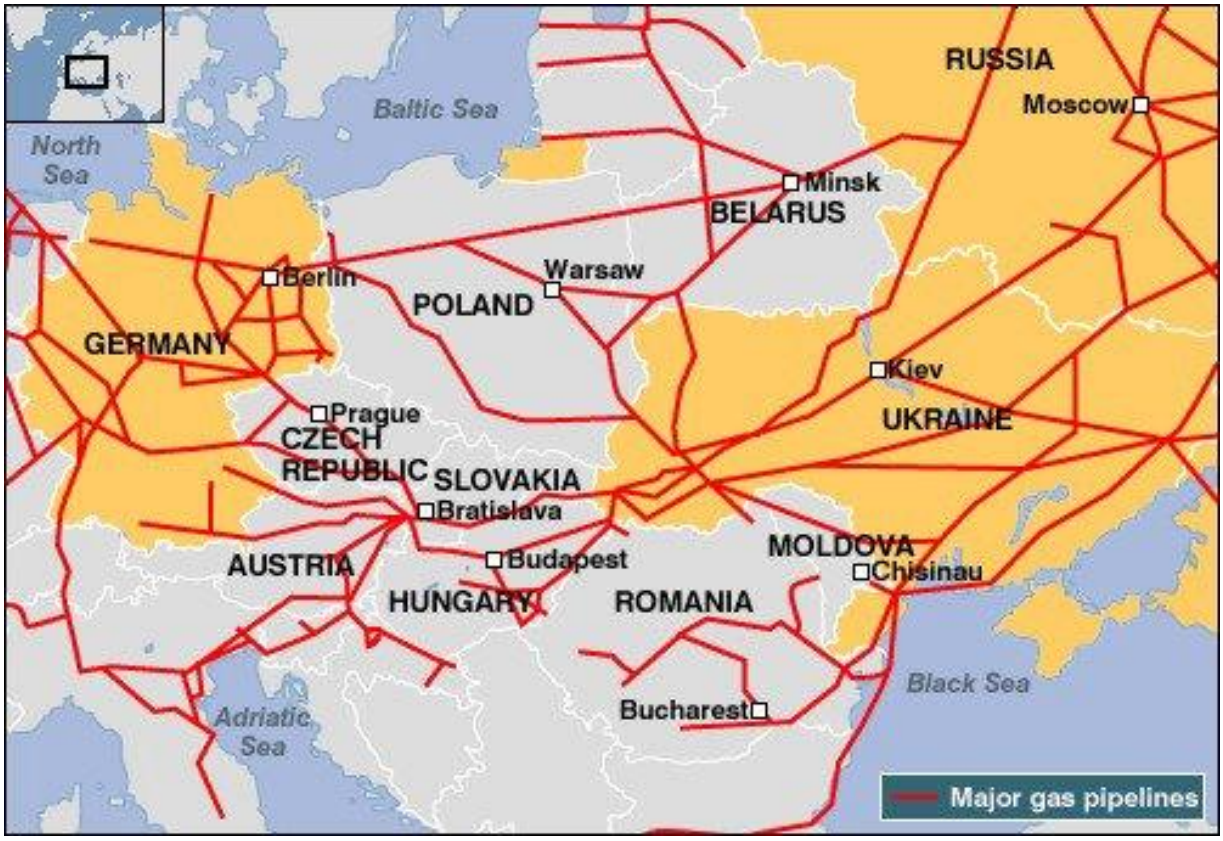
---

134 See the study of Pirani, Stern, Yafimova 2010.
135 *Kyivpost.com*
136 Exchange with the author, Brussels, July 2009.
137 For a detailed presentation, see Pirani 2007:17, chapter "Gas in Ukraine."

republics. As far as Ukraine is concerned, from 1993 onwards, a vast array of swaps have been implemented or at least offered, such as infrastructure against debt or even the Black Sea fleet and nuclear weapons. The agreements reached in 1994 concerning the privatisation of the Ukrainian energy sector would have rendered Russia's accession possible, had they not been voided by a parliament fired up by Tymoshenko and fear that the infrastructure would end up under Russian control.[138]

The following table shows a simplified scheme of the huge Ukrainian gas-transmission system, and transit pipelines.

Map 13: Ukrainian Transit Routes



Source: Energy and Capital, *Energyandcapital.com*

Russia's quest for participation in the Ukrainian network has gone through various stages, none of which was crowned by success. In most instances, the attempt to gain control of the network came under the guise of a gas consortium project; such was the case in 2002, when President Kuchma came to an agreement with Putin and Schröder in June that was ratified by a Russian-Ukrainian accord at prime ministers' level in October of the same year. The consortium was created in November as a Ukrainian legal entity, where

[138] Pirani 2007:20.

NaftogazNaftogaz and Gazprom shared ownership, at 50% each. Negotiations undertaken in April 2003 aimed at bringing Ruhrgas into the partnership did not succeed; the main point of disagreement resulted from Russia's insistence that the consortium take the full lease of the gas transport network – which NaftogazNaftogaz refused. In 2006, in view of the Russian diversification strategy, Ukrainian President Yushchenko suggested relaunching talks on a trilateral Russian-German-Ukrainian consortium.[139] But once again Ukrainian opposition to any project involving Moscow prevailed. In February 2007, Putin came up with a new offer: the consortium would take control of the Ukrainian gas transport network in exchange for which Ukraine would be granted credit to Russian gas deposits. An agreement was reached with then Prime Minister Yanukovych[140] who expected to be allowed to keep gas prices in exchange for Russian participation in the Ukrainian gas network. Immediately, Deputy Prime Minister Yulia Tymoshenko submitted to the Rada a draft banning the privatisation of export pipelines. The law was passed on February 6 and since then has become a kind of religious dogma.[141]

To some extent, all of these projects reveal the will, on both sides, to move away from the situation as it existed following the end of the USSR. Their failure, however, shows both the extent of Ukrainian reticence and the cultural difficulty of 'normalising' relations. In theory, Russian-Ukrainian cooperation in the management of the Ukrainian gas-transmission network GTS could follow several paths:

Privatisation and subsequent acquisition of part of the stake by Gazprom. Russian-Ukrainian cooperation, if modelled after the 2006 accord between Russia and Belarus,[142] or the accord between Russia and Armenia, would lead to the privatisation of the GTS.

Leasing consortium for a limited term, made up 50/50 by Gazprom and Naftogaz. As in the past, this option would be likely to encounter historical resistance to any gas network contract viewed as a violation of national ownership.

---

[139] Pirani 2007:87.
[140] Dubien 2007:16, "The gas consortium or the eternal return."
[141] Pirani 2007:89.
[142] Belarusian case: this five-year supply and transit agreement postpones the application of the European price to Belarus until 2011. At the same time, the transit price was increased from $0.75 to $1.45 per 1,000 m3/100 km, from 2006 to 2007. The most important aspect of the agreement, however, is the sale of half of the Beltransgas network for the price of $2.5 bn, to be paid by Minsk in four equal cash instalments between 2007 and 2010. Progressively, by steps of 12% each time, Gazprom will acquire Beltransgas parts and secure, by June 1, 2010, ownership of 50% of the stake. From then, a joint venture will own the Belarusian network and only on that condition will Belarus continue receiving Russian gas at the Russian price. The privatization of Beltransgas was imposed on Minsk by the terms of an intergovernmental accord with Moscow concerning the 1995 customs union, and the delay that followed met with the threat of a supply cut. Beltransgas was privatized in April 2003.

A consortium including a minority shareholder – a German company, for example. The presence of a third party might partly reduce the weight of the Russian threat in the minds of the political class and public opinion, but would still come up against the imperative of national ownership.

The Belarussian example shows that the participation of Gazprom in infrastructure ownership does not guarantee attractive prices in the long run. At present, it seems unlikely that Russian accession to the management of the Ukrainian network would be carried out through privatisation. It seems more feasible that the move would be accomplished via a consortium and a lease contract for a set term. Once again, however, the economic crisis will steer the decision-making of the Ukrainian political elite as well as the attitude of the population. Cooperation with Russia – as opposed to any kind of partnership with the EU – would offer Ukraine the advantage that it would not be immediately forced to change either its economic model, its energy-efficiency pattern, or existing rules and regulations. Additionally, the country could choose to set up new nuclear power plants in close cooperation with Rosatom, and eventually with Germany (Siemens), and then try, jointly with the latter, to reach out to the European market. Nevertheless, the Ukrainian gas law is a clear move into the EU legal space, and shows the new government's commitment to join the Energy Community.

A conference was held in Brussels, on March 23, 2009, during which Ukraine stated its readiness to cooperate with the European and other IFIs, and to reform its gas network in 2010 and 2011 according to a detailed plan based on European legislation, to be submitted by the government by the end of 2009. Also, in March 2009, a joint statement stressed the fact that national ownership of the GTS would be respected. These projects have not resurfaced in 2010, and the EU Commission seems to be reluctant about them. Commissioner Oettinger mentioned potential projects in Odessa, in summer 2010, hoping that concrete projects could be discussed in early 2011. The modernization program does not contemplate a consortium, but rather the implementation, one by one, of a number of projects summarily described in the master plan. The modernization effort will especially concern the upgrading and reconstruction of three Western transit corridors (Soyuz, Urengoy-Uzhgorod and Progress), the Southern Corridor, two storage sites (Bilche-Volytsko-Ugerske and Bogorodchany), and finally a number of gas measuring stations (Uzhgorod, Berehove, Drozdovychi, Tekovo and Orlivka). A master plan, Ukrainian Gas Transmission System (UGTS) Priority Objects, Modernisation and Reconstruction, presented at the March 23, 2009 conference in Brussels, is available on the site of the European Commission.[143] It forecasts an investment need of about 3 bn over seven years and includes an extension of the Ukrainian gas

[143] *Ec.europa.eu*

network as well as an increase in its transit capacity of about 60 bcm – especially via the route Novopskov-Uzhgorod. The modernization effort mostly aims at increasing the reliability, efficiency, and profitability of the gas transit, tempering the impact on the environment, and reducing any risk to the security of supply for European consumers.

The government, Naftogaz, and the transport network operator Ukrtransgas will be responsible for the projects. In this sense, the Western scenario is clearly distinct from the Eastern one to the extent that it focuses on the introduction of rules, and excludes any kind of participation, even a temporary one. The next stage concerns the creation, within Naftogaz, of a technical unit with the mission to develop a complete master plan for modernization and to put forth other relevant technical proposals made by Ukraine upon which a schedule could be planned, to oversee the construction works, and to organise the IFIs cooperation project by project.

The European Commission and the IFIs will be available to provide technical assistance to this Naftogaz unit, and the Commission is even ready to assist the Ukrainian government in its task of reforming the gas sector. Following the installation of the technical unit, the private and public participants will specify the nature and extent of their respective roles; additionally, the European Commission will allow Ukraine to benefit from the Neighbourhood Investment Facility financial tool. During the author's visit to Kiev, interlocutors from the EU and Ukraine both confirmed that the project is on the right track and that delays can be expected to be minimal[144] – surprising statements considering the significant delays that are noticeable in the sector's reform. The project does not exclude the participation of other parties, Russia among them.

Assessment

Considering that funds for the gas infrastructure projects (new pipelines) will be limited, both from the private sector and the IFIs, and that existing long-term gas contracts between Russia and EU enterprises run up to 2025/2030, the succinct calculations of the master plan submitted by the Ukrainian transmission-system operator (TSO) clearly demonstrate that the modernization of the existing network makes more financial sense than the creation of new pipelines, whether it be Nord Stream (8 bn), South Stream (approximately 20 bn) or Nabucco (about 8 bn). The overall amount required for the modernization plus the extension of the network, including storage capability, is almost 8 bn, while modernization alone, without any extension, would require only 3 bn. Compared to that, new infrastructure for the three pipelines would amount to 36 bn. The

[144] For example, Pavlusha, Deputy Minister of Fuel and Energy, and Sokolovski, energy advisor to the president, on October 7 and 9, 2009; or Faouzi Bensarsa, DG Reflex, on September 15, 2009.

extension of the European 'regulatory territory' will increase security of supply and stabilize Ukraine as a sustainable transit country, obviously on the condition that the signing of the agreement is followed by implementation.

Nevertheless, Ukraine's role as a transit country has already diminished, and will diminish further. There is not much support in Russia nor in the West to maintain its role as such. The main interest for Kiev is to stay in the picture, and to stay there as an important player. Today, the following pipelines and options exist to bypass Ukraine as a transit country, with Jamal and Bluestream being operational already, and Nord Stream to follow suit by 2012:

- Jamal-Europe: opened in 1999, it crosses Belarus and Poland (Russian-Belarusian relationships are not at their best at present, though) and has a capacity of 33 bcm per year.
- Blue Stream: opened in 2003 and 2005, it links Russia to Turkey through the Black Sea and handles a current volume of 16 bcm per year. So far, Blue Stream feeds only the Turkish market.

The following alternatives are under consideration and could be operational from 2015 onwards:

- Nord Stream: a direct link via the Baltic Sea connecting Russia to Germany and subsequently to the rest of the European market, with a final volume, for two parallel gas pipelines, of 55 bcm. At present, this project is the one at the most advanced stage: the feasibility studies have been completed, and the pipe is already under construction, with the first gas expected by 2011.
- South Stream: a link that will connect Russia to South-East Europe and then to the EU markets via the Black Sea, bypassing Turkey, with a capacity of 63 bcm. This project will be a competitor to the EU's Nabucco link that plans to bypass Russia and establish a direct connection between the Caspian region, Central Asia and the EU.

If Ukraine becomes a 'residual transit country,' its current economic model will be doomed, since it is based on cheap and available energy, and since especially energy-intensive industries, such as steel, have been retained in the country.

The Transit Country at the Crossroads of the Southern Corridor: Turkey

Turkey holds a very important geopolitical role in the EU's supply, first because of the straits, which are transit sites for Russian and Caspian oil, but also because of its strategic location; it is a crossroads for gas

as much as for oil, these supplies originating from sources as diverse as northern Iraq, Iran, and the Caspian. Turkey is thus becoming, through these East-West (Caspian and Iranian resources transported to the EU) and North-South corridors (Russian resources) an energy bridge, connecting several producing countries to the EU. It was Turkey that put an end to the confinement of Caspian resources by opening the BTC, and it is again through Turkey that the South Caucasus Pipeline passes, as well as through the region between Iran and Azerbaijan. Finally, Turkey's Ceyhan port is globally crucial as it leads in Iraqi oil exports. Ceyhan is a transit port for a number of raw materials and an arrival point for gas and oil pipelines.

In projects such as Nabucco, Turkey's attitude and position are decisive.[145] And, if South Stream was meant, initially, to bypass Turkey, the option of crossing Turkish waters is currently being studied. Finally, the recent agreements between Turkey and Azerbaijan on the pricing for the Shah Deniz II gas are decisive step forward for the Southern Corridor.

Ankara and the EU share considerable dependence on Russia, dating back to Soviet times. Although Turkish gas consumption has nearly tripled since 1999, from 12.4 bcm to 32.1 in 2009, the economic crisis induced a 10% cut, and uncertainty is high concerning future gas demand in the Turkish market.[146] In 2008, 62.4% of Turkish gas imports were of Russian origin.[147]

Oil transport

As for domestic supplies, Turkey covered its oil needs with supplies coming primarily from Iraq (around 30%), then, after UN sanctions, it turned to Saudi Arabia, Iran and Libya. As for the existing oil network, it has three principal links, the most important being the Iraq-Turkey oil pipeline, which doubled in 1987 but was blocked by sanctions in the 1990s, and has restarted operations in a reduced manner since the end of the 1990s. The Batman and Kirrikale refineries are connected to Iskenderun Bay by the North-South system.

The opening of the BTC in 2005 opened up Caspian resources for deliveries to Turkey and then, via the sea, to Western markets. With this project Turkey intended to strengthen its influence and control over the Caspian region and Central Asia.

The Bosphorus: an oil transport problem for all Europe

The EU should pay particular attention to the Bosphorus. This strait, with a length of 13 km, has approximately 3.1 billion barrels per day

[145] "Turkey pressed to fall into line over gas project." Visit from the EU project coordinator to Turkey, Financial Times, 11.2.2008.
[146] BP Statistical Review of World Energy 2010:27.
[147] Turkish Ministry of Energy, *Energy-community.org*

channelled through it, to Western and Southern Europe and on to the global market. Among the 50,000 boats that go through it per year, around 550 are oil tankers, of which only half are up to modern standards.[148] Since the fall of the USSR, we have witnessed a spectacular increase in the volumes transported through this route. The Montreux Convention (1936) guarantees the right of free passage through the straits, and, since 2002, the only restrictions the Turks have had at their disposal have been bad weather and ecological problems. While Ankara gains nothing financially from these passages, they do however assume all risks, thanks to a contract that was written 80 years ago in a context that has since changed. Istanbul's economic activities, with a population of 12 million, account for 60% of Turkey's GDP. Any incident on the Bosphorus or in the city would thus have an immediate effect on all of Turkey. Indeed, there have been many accidents in recent history: the Romanian oil tanker Esperanza in 1979, or the Cypriot tanker Nassia in 1994, to cite two major accidents. A total of 155 accidents happened between 1988 and 1992. While a new navigation scheme (Traffic Separation Schemes, TSS) was introduced in 1999 and the International Maritime Organization (IMO) advocated a Vehicle Tracking System, the dangers remain quite high. It is estimated that each year 20 tons of pollutants per km2 contaminate the Black Sea, which is nearly six times the pollution of the Mediterranean, at some 3.8 per km2 [149] Many plans to bypass the Bosporus – each having merit – have been proposed, but all face the same problem: none is competitive compared with the free passage offered by the straits.

Planned projects to bypass the Bosphorus

Other than Samsun-Ceyhan, in the east, the following options have been proposed: a connection between the Romanian port of Constanta and the Adriatic port of Omisalj, or Trieste in Italy; alternatively, also west from the straits, an oil pipeline project from Constanta or from the Bulgarian port of Burgas, either through Macedonia to the Albanian port of Vlore, or even to the Greek port of Alexandroupolis, or finally a shorter oil pipeline from the Turkish port of Kiyiköy to Ibrikkaba or Saros. As for the Burgas-Alexandroupolis project, Bulgaria vetoed the project in June 2010, for environmental reasons, although an "agreement between stakeholders on setting up a company for the project to build the Burgas-Alexandroupolis oil pipeline" had been signed in January 2008. All these plans to bypass the Bosphorus from the west or east, however, are costly in terms of freight and transit fees, and their implementation is not guaranteed. But the advantage of decongestioning the straits can not be overestimated. Nevertheless, the EU has not put any of them on the list of priority projects.

---

[148] Cf de Waal, Thomas, "Bottleneck at the Bosphorus," Financial Times 5.1.2008:2.
[149] Muizon, Gildas, 2000: 63.

Table 24: Alternative Routes to the Straits

Oil Pipeline	Route	Operator	Length (km)	Capacity	Estimated operational start-up	Cost
Samsun-Ceyhan Pipeline (SCP) / Trans-Anatolian Pipeline	Samsun (Turkey) / Ceyhan (Turkey)	Trans-Anadolou Pipeline Company (TAPPCO): ENI: 50% Calik Energy: 50%	555	initial capacity: 1 "design capacity": 1.5(1)	2012	1.5-2(1)
Burgas / Alexandroupolis	Burgas (Bulgaria) /Alexandrou-polis (Greece)	Consortium: Russia (Transneft, Rosneft and Gazprom in equal parts):51% Bulgaria: 24.5% Greece: 24.5% (Bulgarian and Greek parts are likely to be sold)	279	0.7Mb/d, potential of 1 Mb/d(1) 1st phase: 15-23 Mt/y, 2nd phase: 35 Mt/y(2), 35-50 Mt/y(3)	2010-2011	$1 billion (3) $0.9 billion (1) €0.8-0.9 billion (4)
Constanta / Trieste (South East European Line, PanEuropean Oil Pipeline)	Constanta (Romania) / Trieste (Italy)		1,300-1,400 of which is in: Roma-nia: 650 Slove-nia: 29	60-90 Mt/y(5) 0.48-1.8 Mb/d(1)	2011-2012	$2.3 billion (1) $3 billion (5) €1.5-2.62 billion (6)
Albanian-Macedonian-Bulgarian Oil Pipeline (AMBO)	Burgas (Bulgaria) / Vlore (Albania)	AMBO Pipeline Cooperation	894 of which 273 is in Mace-donia	30-40 Mt/y(7) 0.75 Mb/d(1) (7)	2011	$1.1-1.5 billion (1)(7)
Constanta / Vlore	Constanta (Romania) / Vlore (Albania)		900	38 Mt/y		$1.1 billion (8)
Kiyiköy / Ibrikhaba, Trans-Thrace	Kiyiköy (Turkey) / Ibrikhbaba (Turkey)	OJSC AK Transneft	193	60 Mt/y		$0.9 billion (8)

1) EIA, (2) Transneft, (3) RBC, (4) bridge-mag, (5) Reuters, (6) ENS, (7)SET, (8) Götz

Turkey will complete by 2012, as already mentioned, an oil pipeline that is 560 km long, from Samsun to Ceyhan. It entrusted its completion to Calik Energy (Turkey) and ENI (Italy) through a presidential order (April 2006). Russian companies are expected to

join in, after a MoU signed in August 2009. This route, according to Ankara, will help decongest the straits by up to 50% and will transport Russian oil. A parallel gas pipeline is planned.[150]

Gas pipelines to and through Turkey

Russia has played an increasing role in Turkey's gas supply since the 1980s, although gas demand in Turkey has been overestimated and thus been reviewed recently. It tripled between 1999 and 2008, from 12.4 to 36 bcm, but decreased by 10.6% between 2008 and 2009.[151]

Following an agreement in February 1984 between Botas and Soyusgazexport, 5 to 6 bcm per year for 25 years has been delivered by the Bulgarian gas pipeline, traveling from Bratstvo's southern branch up to Ankara. These deliveries began in 1987 and 70% of the gas was paid for with Turkish goods (by barter). The capacity of the Bulgarian pipeline doubled in 1997 following a framework agreement between Gazprom and Botas. A Russian-Turkish joint venture called Turusgaz was created in 2000, following the visit of Tchernomyrdin, the then Russian Prime Minister.[152]

Setting up a direct link: Blue Stream

Nevertheless, unpleasant experiences with transit countries led Russia and Turkey to plan a direct link through the Black Sea: Blue Stream. In fact, Ukraine had interrupted deliveries in 1994, with the hope of making the Russians pay their transit debts.

The interpretation that Turkey was becoming an important regional consumer, and that it was now necessary to be active in this market and to form a strategic partnership with Turkey, led the Yeltsin government to construct the Blue Stream gas pipeline. This line runs under the Black Sea and was completed in extremely difficult geological conditions due to the very uneven nature of the sea bed. This strategy was also aimed at preventing potential competition from Turkmenistan. Blue Stream was the first direct link between the two countries. A major error was made in assessing the Turkish market, as the directors at Gazprom would eventually admit. Indeed, during the intergovernmental agreements between Ankara and Moscow in 1997, Moscow believed that there would be a large increase in Turkish demand, which did not occur. A phenomenon rarely seen in consumer countries concerned with guaranteeing supply security would be observed in Turkey: putting several potential suppliers into competition with each other, in this case Iran and Russia, so as to lower prices. This gas-gas conflict began in Turkey in 2003, a few months after Blue Stream's opening. The Turkish government thus

[150] Swann, Richard, "ENI joins Turkey's Calik in Plan to Build 1 Million/brl/day Line Bypassing Bosphorus," Platts Oilgram News, November 10, 2005.
[151] BP 2010 : 27.
[152] Muizon 2000: 25-27.

demanded a revision of the contract and price concessions. In April, Gazprom stopped deliveries, only two months after the gas pipeline began operating. This pipeline turned out at first to be a financial disaster for Moscow.[153] The crisis has since passed and is now forgotten. A new inauguration ceremony took place at the end of November 2005, with the Russian, Italian, and Turkish heads of state attending. Nevertheless, Blue Stream has never reached its maximum capacity.

A potential Caspian transit gas pipeline to European and Western markets was opened at the end of 2006: the BTE, which runs parallel to the BTC, and which bypasses Russia, as does the BTC. For the time being, the BTE transports gas exclusively to Turkey. Nabucco would be build on the BTE, extended, and take then Caspian gas up to the EU. The two projects have considerably strengthened Turkey's transit role (for details, see Chapters 2 and 3 on oil and gas respectively).

Nabucco and Turkey

Turkey plays a major role in the conundrum of gas infrastructure projects in the Southern Corridor: as for Nabucco, but also TAP and ITGI, the decisive breakthrough is considered to be the agreement between Baku and Ankara on June 7, 2010: both heads of states as well as Socar and Botas, the Azeri and Turkish hydrocarbon enterprises, agreed on the price for Azeri gas sold in Turkey, export quantities from Shah Deniz II, and rules on transit to Europe through Turkish territory. While the company Botas is part of Nabucco's consortium, Turkey has for a long time refused to accept the financial framework agreement for the pipeline's use, cut supplies to Greece following a reduction of its own supplies coming from Iran, and prevented, for political reasons, Gaz de France's participation in the Nabucco consortium. The European coordinator for gas pipeline projects in South Europe warned Turkey during a visit in February 2008, while openly criticizing its lack of cooperation.[154] And the former German foreign minister Joschka Fischer was appointed by the Nabucco consortium precisely to broker an agreement with Turkey. Indeed, the Nabucco consortium came up, in July 2009, with an intergovernmental agreement on the gas transit issue. The improvement in Turkish-Azeri relations, demonstrated by the agreement one year later, is nevertheless of major importance. Diplomatically, the context remains more than fragile: it seems impossible to normalize relations with Armenia – even though Turkey was seeking to do so – without heading into conflict with Azerbaijan, which is culturally and historically close Azerbaïdjan. Meanwhile, the issue of Turkish EU accession remains an explosive background for all projects and has

[153] For details of the negotiations, see Victor and Victor 2004: 19.
[154] Crocks, Ed., "Turkey pressed to fall into line over gas project," Financial Times 11.2.2008: 5.

provoked cross-links, very much like those we are familiar with in Ukraine. This is the reason why some observers have termed Turkey 'Southern Ukraine.'

The Greek-Turkish Interconnector (ITGI)

Lastly, the Greek-Turkish interconnector, mentioned already in the context of the Southern Corridor, must be mentioned. Passing through the Dardanelles, this bridge connects two networks and should, according to Turkish Prime Minister Erdogan, bring two peoples together. The capacity being 8 bcm, ITGI will be extended, by 2012, to 11, with 8 bcm being delivered to Italy through the Italy-Greece interconnector, which is to be open by then.[155]

Conclusion

Although many doubts remain among EU member states about Turkey's EU accession, the country's energy integration is undoubtedly progressing, as much through Turkey's participation in the Energy Community and its electric synchronization, as the recent breakthroughs in negotiations on transit and gas, with Azerbaijan, which are decisive for the EU at large.

The role of Turkey, a key link for European energy supplies, can hardly be overestimated. Ankara's impact will continue to grow following the evolution of relationships established throughout the Caspian region, Central Asia and Iraq – and, one day, maybe Iran.

[155] Fink 2006: 2.

Conclusion and Prospects

The preceding chapters have presented existing and planned gas and oil infrastructures. This final section aims to present an overarching view of both. There will be a discussion of the key elements of infrastructure projects that allow them to either develop or perish. What does the map of connections and pipelines teach us? What needs are the successful links responding to, and what about the abandoned ones? Hayes and Victor (2006) identified four factors that determine (beyond a purely commercial logic) the completion of projects: the investment context, the market risks (quantity and price), the geopolitical relationships between producer, transit country, and consumer, and, finally, the transit countries. These factors were touched on in the preceding analyses and will be discussed further in this conclusion.

The Overhaul of our Energy Mix

We are currently witnessing a major debate on the future of our energy and electricity mixes. Many questions all point to the one certainty that hydrocarbons will increasingly be limited by climate policies and the objective of decarbonization. The development of CCS technologies or clean coal could prolong the use of hydrocarbons. Developing CCS would translate into setting up new infrastructure for transporting CO2. A changed energy mix will lead to different infrastructure requirements. On an EU level, we observe a certain contradiction: on the one hand, it is up to member states to decide on their energy mix; on the other, the RES targets of 20% by 2020 represent a massive intervention by the Community. We can see similar tendencies regarding targets for other sources, such as nuclear, in the medium term.

In any case, it seems likely that gas, which is considered relatively less polluting than oil or coal, will play an important role, be it as a transitory commodity, or in a more stable sense, at least up to 2050. Therefore, the gas infrastructure debate will remain highly topical in all scenarios.

The Community Context

Energy infrastructures – an agent for integration

The European gas and oil transport infrastructure, set up step by step since the 1950s, is a strong factor in integration. These infrastructures, as Europe's capital, must be looked after. They require investtment, innovation, and completion. Energy infrastructure barely makes sense in an exclusive national frame – it requires a regional approach. This is especially true in times of an increase of RES (many of which are intermittent) in the energy mix.

Improving the gas market

Gas – with its specificities (difficult to stock, regional markets) – is, with electricity, the major infrastructure concern in the EU, and not oil. The EU gas market is, as it stands today, far from optimal. There is a need to improve market functioning. LNG puts long-term contracts under pressure, and shale gas could become part of the picture, too.

Why do we need any indexation for gas once the commodity and its commercialization are mature? The author believes that there is no reason any longer to tie oil and gas together; this should be left to the market.

As for long-term contracts and spot markets, the innovative operational concept of pipelines such as Nabucco, with one part being sold through long-term contracts and the other on the spot market, point surely in the right direction to ease markets, and could be the start of a transitory phase from the Groningen system to the true gas market.

Setting up the Southern Corridor

To improve the EU market, to diversify, but also to start new international partnerships, and to support development in Central Asian countries and the establishment of the Southern Corridor (especially the link with Turkmenistan) has to be a priority.

Hasty labelling should be avoided, since pipelines are commercial projects, and the Commission should thus set the frame and incentivize, but not privilege a particular option, such as Nabucco, over others, such as ITGI and TAP. The role of the Commission is to give overall momentum to the project – the Southern Corridor – and not to particular projects. As energy infrastructure straddles commercial and politico-diplomatic thinking, the EU must progress cautiously in this area in order to protect its image.

Technology and energy efficiency in producer countries

European infrastructure and innovative technologies should be at the top of the EU's agenda. The Lisbon Strategy, the Europe 2020

strategy and the Strategic Energy Technology (SET) Plan come into play here. The slogan that came out of the first oil crisis is extremely applicable to this situation; “We don’t have oil, but we have ideas.”

Priority should be given to support for increasing energy efficiency in producer countries through technology transfers, and for normative and environmental actions protecting the Bosphorus through a common effort to find alternative routes to the straits.

The European context: energy links in the post-Cold War era still on the move

What can help us to make sense of the large number of projects, especially gas projects, covered in this study?

We are in a time of increased direct sub-sea links, as with Blue Stream and Nord Stream, a time of diversifying dependencies, and of putting transit countries into competition. The collapse of the Soviet bloc accentuated the issue of transit in Europe and transformed Turkey – termed ‘Southern Ukraine’ by some skeptical experts – into a new transit state for Europe’s energy supplies.

It is crucial for the EU to develop an active policy towards its two major transit countries, Ukraine and Turkey. The Energy Community in Vienna is a useful tool for harmonizing the legal frameworks and encouraging the habit of cooperation – in the Western Balkans, as well as Ukraine and Turkey.

At the same time, the renegotiation of the Partnership and Cooperation Agreement with Russia, including a new energy chapter, should also be a priority.

Energy solidarity within EU

The heterogeneous situation of the EU member states makes solidarity a prominent issue. With Article 194 of the Lisbon Treaty, reinforced by the gas security regulation, this issue is now part of the EU legal framework. Even though commercially interesting for those companies that sold their stocks, solidarity was clearly practiced during the gas crisis in January 2009. Lessons have been learnt, such as the urgent need for reverse flows on some borders, or even the establishment of new infrastructure. But before any community relief, member states have to prepare individually through adapted energy governance: diversification, stocks, etc. The regional response is important as a second step. Brussels clearly feels that interconnection, market integration and reverse flows are the best protection against the risk of energy blackmail. A balanced energy mix in all member states, energy efficiency, and a coordinated approach towards producers are key here.

A complicated relation with Russia

All of today's debates and concerns are directly or indirectly tied to Russia. Polls show that Europeans fear Russia and Gazprom's intentions.[156] The question of Russia and its giant gas enterprise Gazprom has dominated Europe's energy debates for nearly two decades now and is likely to continue for a while. As a matter of fact, the European Community and the USSR, later the EU and Russia, have successfully developed an interdependent relationship since the 1970s, based on security of supply and the guarantee of consumption. Russia is just as dependent in this situation as the EU. It relies on the EU consumer for its position as the number one gas exporter. But, for the EU, the security of supply has changed since the 2004 and 2007 enlargements. It took time to integrate this new reality into Brussels thinking and Russian consciousness. The EU harmonized its energy security landscape overall with Article 194, the solidarity clause, and gas security regulation.

Beyond security of supply issues, the design of the market matters. The EU is interested in having a mix of suppliers and to add in the Central Asian suppliers. There are conflicting interests with respect to the common neighborhood area, especially concerning the Caspian region and Central Asia, but potentially also Ukraine and its degree of dependency on Russia. The newly independent states stemming from the former Soviet bloc are and will remain, for some time, at the very centre of Russia-EU diverging views and conflicts. Ideally the EU would be able to engage with Russia. But the EU, as a community of values, should not be afraid to be outspoken if the independence of these new states and their right to define their own politics and interests is at stake.

***

Perhaps future generations will view gas and oil pipelines in the way we regard ancient aqueducts and the Roman Empire – above all, as a legacy from the past. But just as aqueducts were important in shaping international relations and contributed to the progress of civilizations, so energy links do today. The 21st century will add new links, reflecting the development of new technology, such as CCS. To conclude, for the Euroskeptic and the convinced European alike, the impressive number of links, the vast European energy networks – though invisible in everyday life – and the instruments of mutual aid are a matter of fascination. Perfecting Europe's energy map, on which Cold War divisions are still etched as if on a phantom wall, remains a challenge.

[156] Thornhill, J., "Western fears on Russian Energy," Financial Times, 2.18.2008.

Annexes

I. Glossary and Abbreviations

IEA	International Energy Agency, founded in 1974 within the OECD framework.
BAM	Baikal Amur Mainline: railway going from Western (Baikal Lake) to far-eastern Russia (Amur River) through Siberia.
Bbl	Barrel (unit of crude oil): international unit of measurement for quantities of crude oil, equivalent to 159 liters of crude oil; one metric ton equals 7 to 7.5 barrels. Production is generally measured in barrel per day (bbl/d). Kbbl/day: 1,000 bbl/d; mbbl/d: 1 million barrels per day. Origin of barrel: 1860-70, when oil was transported in barrels used for other substances (cooking oil, salt, fish, etc.) equivalent to this size.
Bcm	Billion cubic meters, usually calculated per year.
BOE	Cf TOE/BOE
BPS	Baltic Pipeline System
BTC	Baku-Tbilissi-Ceyhan pipeline
Brent	Name of a crude oil field in the North Sea, with its stock quote in London Stock Exchange (pars pro toto: the name Brent is used for the region).
BTU	British Thermal Unit: unit of heat used to measure the calorific power of natural gas; a unit to calculate the price of natural gas in dollars per millions of BTU.
CCS	Carbon Capture and Storage
Choke points	Straits through which oil tankers (and gas tankers) and seaborne transport usually pass. Examples: Hormuz in the Persian Gulf; almost all oil from the Middle East passes through this point. Malacca between Malaysia and Singapore; principal transport route of oil, LING, and other products from the West towards China and South-East Asia. Other less important choke points are: Suez, Bosphorus, and the Panama Canal.
CPC	Caspian Pipeline Consortium
DG Ener	The European Commission's Directorate-General for Energy appeared in 2010 as a result of the split of the DG TREN, European Commission Directorate-General for Energy and Transport, into two directorates.
Downstream /upstream	Downstream is access to markets, upstream is access to sources.

EIA	Energy Information Administration (United States): US Energy Department statistics center in charge of establishing data, forecasts and analyses to help in decision-making on energy issues. EIA carries out area-based and country-based analyses.
ECS	Energy Charter Secretariat, in charge of missions under the Energy Charter, in order to implement energy security through multilateral agreements.
ETS	Emissions Trading Schemes. The EU Emissions Trading Scheme (EU ETS) is the largest multinational, carbon market in the world.
FSU	Former Soviet Union
IFI	International financial institution
Inogate	Interstate Oil and Gas Transport to Europe: accord between countries of the former USSR on principles of cooperation in the transport of gas and oil towards Europe, signed in 2001. Members: Albania, Armenia, Azerbaijan, Belarus, Bulgaria, Croatia, Georgia, Kazakhstan, Kyrgyzstan, Macedonia, Romania, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, Latvia, Serbia, Montenegro, Slovakia, and Turkey (www.inogate.org, Secretariat in Kiev)
LNG	Liquefied natural gas: obtained by freezing natural gas to -162 degrees Celsius, which reduces the volume of gas to 1/600 of its initial volume.
Mbd	Million barrels per day: measurement of crude oil, 50 Mbd = 1 million tons; more exactly, 49 mbd = 1 million tons of crude oil (calculating error of 2%).
MoU	Memorandum of Understanding
Mt	Million tons, usually calculated per year
Mtoe	Million tons of oil equivalent
NEGP	North European Gas Pipeline, now Nord Stream
PSA	Production Sharing Agreement
RES	Renewable Energy Sources
Reserves	Distinction, for reserves of hydrocarbons, as follows: Three categories of reserves: proven, probable, and possible reserves. Proven = existing and retrievable with today's technology (90% certain). Probable = additional quantities proven with geological information and techniques (50% certain). Possible = oil fields not known today, or unconventional petroleum (sand, schist, etc.) (10% certain).
Spot	Short-term energy transaction (one to three days); spot = sale of a given quantity of a given product extracted on a precise date, at a precise place, at an agreed price (different from the long-term price). The petroleum market is dominated by spot markets, while the gas market is regional, and characterized by the existence of spot markets, and above all the indexing of the price of oil, and long-term contracts.

TEN	Trans-European Network: created by the European Union by Articles 154-156 of the Treaty of Rome (1957), with the stated goals to create an internal market and to reinforce economic and social cohesion. The network is separated into TEN-E or Trans-European Energy Network, TEN-T or Trans-European Transport Networks, and eTEN - Trans-European Telecommunications Network.
Toe	Tons of oil equivalent. Different energies are calculated according to their energy content in TOE. The equation is: 1 toe = 7 barrels of oil = 1.5 tons of coal = 1,000 cubic meters of natural gas. The units of measurement vary in the gas industry; conversion tables are usually used (see next section). It is more common to work in barrel of oil equivalent (BOE): the energy value of a barrel of petroleum is equivalent to 170 m3 of gas. Approximation: Around 1 liter of petroleum equals one cubic meter of natural gas. 1Gm3=5.9Mboe.
TPA	Third-party access
TOP	Take or pay: the buyer commits to buying a determined amount each year. It is paid for even if it is not recovered. Guarantee for the producer, contract for long term.
TNK-BP	Joint venture Tjumenskaja Neftjanaja Kompanija - British Petroleum
US ton, short ton, long ton	907.1847 kg (2,000 lb) 1,016.0469 kg (20 hundredweight or 2,240 lbs)

II. Conversion Table of Gas Units

As opposed to crude oil, which is measured in barrels or in tons (1 barrel = 0.136 tons), the gas sector uses a great variety of measurement units. According to the country and origin, the following are used as criteria:

- gaseous volume, in cubic meters or feet
- energy content, which can be measured in metric tons, equivalent oil (toe) or in equivalent barrels (boe), in joules (Australian and New Zealand industries), in British Thermal Units (BTU), in therms (thm), (thermies in French), or even in kilowatt hours
- mass, expressed either in metric tons, gallons, or American tons (907 kg). Measurement by mass is common for the capacity of LNG terminals
- volume, once liquefied, measured in cubic meters, gallons, or cubic feet – this is the common unit to measure the capacity of gas carriers

The biggest problem in using different units is the volume/energy conversion: the latter is not constant, ranging from one cubic meter of gas removed from gas fields to one cubic meter of pure methane.

Conversion tables (for pure natural gas, almost methane) allow for the establishment of the equivalent of a billion cubic meters (G.m3) into other units.

III. Statistics on Oil

This section shows the latest statistics from the European Commission concerning imports to the European Union in 2008, measured in tons for the EU-27, plus Croatia and Turkey.

Statistics are then shown on the production of oil, within the EU as well as in countries that export to the EU, and on proven reserves and refinement capabilities. Because of the nature of petroleum transport and of the oil market, it is not possible to give exact and absolute data on imports. Imported oil can be re-exported, etc. Thus, this data varies according to the source.

EU-27: Imports of Crude Oil by Origin, 2008 (in 1,000 toe)

Origin	2008	Share of total in 2008
Russia	179,061	36
Norway	86,636	17
Libya	57,404	11
Saudi Arabia	38,912	8
Iran	30,734	6
Kazakhstan	28,563	6
Nigeria	22,786	5
Irak	18,851	4
Algeria	16,878	3
Mexico	8,759	2
Syria	6,953	1
Kuwait	6,012	1
United Arab Emirates	664	0
TOTAL	502,213	100
Where:		
OPEC	201,135	40
Near and Middle East	96,433	19
Africa	133,080	26

Source: Eurostat (2010)

Croatia: Imports of Crude Oil by Origin, 2008 (in 1,000 toe)

Origin	Quantity
By region of origin:	
OPEC	20
Near and Middle East	-
Africa	20
By country of origin:	
Russia	3,453
Libya	20
Other*	238
TOTAL	3,711

*Author's calculation
Source: Eurostat (2010)

Turkey: Imports of Crude Oil by Origin, 2008 (in 1,000 toe)

Origin	Quantity
By region of origin:	
OPEC	12,932
Near and Middle East	13,448
Africa	0
By country of origin:	
Iran	7,698
Russia	6,860
Saudi Arabia	3,373
Iraq	1,861
Syria	516
Kazakhstan	811
Other*	606
TOTAL	21,725

*Author's calculation
Source: Eurostat (2010)

Crude Oil: Primary Production in EU-27 (in 1,000 toe)

2000	2001	2002	2003	2004	2005	2006	2007	2008
166,553	155,664	158,145	148,457	138,079	125,838	114,549	113,128	105,398

Source: Eurostat (2010)

World Oil Production (million tonnes)

(Includes crude oil, shale oil, oil sands and NGLs; excludes liquid fuels from other sources such as biomass and coal derivates)

	1970	1980	1990	2000	2005	2006	2007	2008	2009	2009 share of total
Russian Federation	n/a	n/a	515,9	323,3	470,0	480,5	491,3	488,5	**494,2**	12,9%
Saudi Arabia	192,2	509,8	342,6	456,3	526,8	514,3	494,2	515,3	**459,5**	12,0%
US	533,5	480,2	416,6	352,6	313,3	310,2	309,8	304,9	**325,3**	8,5%
Iran	192,6	74,2	162,8	191,3	206,3	208,2	209,7	209,9	**202,4**	5,3%
China	30,7	106,0	138,3	162,6	180,8	183,7	186,7	195,1	**189,0**	4,9%
Canada	70,1	83,3	92,6	126,9	144,9	153,4	159,5	157,7	**155,7**	4,1%
Mexico	24,2	107,2	146,3	171,2	187,1	183,1	172,7	157,7	**147,5**	3,9%
Venezuela	197,2	117,3	117,8	167,3	151,0	144,2	133,9	131,5	**124,8**	3,3%
Iraq	76,3	131,1	105,3	128,8	90,0	98,1	105,2	119,3	**121,8**	3,2%
Kuwait	151,8	86,8	46,8	109,1	129,3	132,7	129,9	137,2	**121,3**	3,2%
United Arab Emirates	36,9	84,2	107,5	119,3	129,0	139,0	135,1	137,3	**120,6**	3,2%
Norway	-	25,0	82,1	160,2	138,2	128,7	118,6	114,1	**108,3**	2,8%
Brazil	8,3	9,3	32,3	63,2	84,6	89,2	90,4	93,9	**100,4**	2,6%
Nigeria	53,4	101,7	91,6	105,4	122,1	117,8	112,1	103,1	**99,1**	2,6%
Angola	5,1	7,4	23,4	36,9	69,0	69,6	82,5	92,2	**87,4**	2,3%
Kazakhstan	n/a	n/a	25,8	35,3	62,6	66,1	68,4	72,0	**78,0**	2,0%
Algeria	48,2	51,8	57,5	66,8	86,4	86,2	86,5	85,6	**77,6**	2,0%
Libya	159,5	88,3	67,2	69,5	81,9	84,9	85,0	85,3	**77,1**	2,0%
United Kingdom	0,2	80,5	91,6	126,2	84,7	76,6	76,8	71,7	**68,0**	1,8%
Qatar	18,1	23,7	21,1	36,1	47,3	50,9	53,6	60,8	**57,9**	1,5%
Azerbaijan	n/a	n/a	12,5	14,1	22,4	32,5	42,8	44,7	**50,6**	1,3%
Indonesia	43,1	79,0	74,4	71,5	53,0	49,9	47,4	49,9	**49,0**	1,3%
Oman	16,4	14,1	34,2	46,4	37,4	35,7	34,5	35,9	**38,5**	1,0%
India	6,8	9,4	34,2	34,2	34,6	35,8	36,1	36,1	**35,4**	0,9%
Egypt	16,4	29,8	45,5	38,8	33,9	33,7	34,1	34,6	**35,3**	0,9%
Colombia	11,2	6,5	22,3	35,3	27,3	27,5	27,6	30,5	**34,1**	0,9%
Argentina	20,0	25,3	25,4	40,4	36,2	35,8	34,9	34,1	**33,8**	0,9%
Malaysia	0,9	13,2	29,9	33,7	34,4	33,5	34,2	34,6	**33,2**	0,9%
Ecuador	0,2	10,5	14,9	20,9	27,6	27,7	26,5	26,2	**25,2**	0,7%
Sudan	-	-	-	8,6	15,0	16,3	23,1	23,7	**24,1**	0,6%
Australia	8,2	20,6	28,8	35,3	24,5	23,4	24,1	23,8	**23,6**	0,6%
Syria	4,2	7,9	20,2	27,3	22,4	21,6	20,6	19,8	**18,7**	0,5%

	1970	1980	1990	2000	2005	2006	2007	2008	2009	2009 share of total
Vietnam	-	-	2,7	16,2	19,4	17,8	16,4	15,4	**16,8**	0,4%
Equatorial Guinea	-	-	-	4,5	18,6	18,0	18,6	17,4	**15,2**	0,4%
Rep. of Congo (Brazzaville)	^	3,2	8,0	13,1	12,7	13,5	11,5	12,9	**14,1**	0,4%
Yemen	-	-	8,7	21,3	19,6	17,9	16,3	14,4	**14,0**	0,4%
Thailand	-	-	2,5	7,0	10,8	11,8	12,5	13,3	**13,6**	0,4%
Denmark	-	0,3	5,9	17,7	18,4	16,7	15,2	14,0	**12,9**	0,3%
Gabon	5,4	8,9	13,5	16,4	11,7	11,7	11,5	11,8	**11,4**	0,3%
Turkmenistan	n/a	n/a	5,7	7,2	9,5	9,2	9,8	10,2	**10,2**	0,3%
Brunei	6,7	11,7	7,3	9,4	10,1	10,8	9,5	8,5	**8,2**	0,2%
Trinidad & Tobago	7,3	11,1	7,8	6,8	8,3	8,3	7,2	6,9	**6,8**	0,2%
Peru	3,7	9,7	6,4	4,9	5,0	5,1	5,1	5,3	**6,4**	0,2%
Chad	-	-	-	-	9,1	8,0	7,5	6,7	**6,2**	0,2%
Italy	1,5	1,7	4,7	4,6	6,1	5,8	5,9	5,2	**4,6**	0,1%
Uzbekistan	n/a	n/a	2,8	7,5	5,4	5,4	4,9	4,8	**4,5**	0,1%
Romania	13,7	12,0	8,1	6,3	5,4	5,0	4,7	4,7	**4,5**	0,1%
Tunisia	4,2	5,6	4,5	3,7	3,4	3,3	4,6	4,2	**4,1**	0,1%
Cameroon	-	2,8	7,8	4,5	4,2	4,4	4,2	4,3	**3,7**	0,1%
Total World	**2356,6**	**3089,3**	**3171,7**	**3609,0**	**3898,6**	**3910,0**	**3901,4**	**3934,7**	**3820,5**	**100,0%**
of which: European Union #	34,1	109,8	127,6	166,3	125,7	114,6	113,1	105,4	**98,7**	2,6%
OECD	660,0	817,1	892,0	1011,1	931,8	912,0	897,7	864,4	**860,1**	22,5%
OPEC	1131,5	1286,9	1158,5	1507,6	1666,7	1673,7	1654,4	1703,8	**1574,7**	41,2%
Non-OPEC £	872,1	1199,3	1442,7	1708,0	1654,7	1635,5	1622,9	1604,0	**1602,0**	41,9%
Former Soviet Union	353,0	603,2	570,5	393,4	577,1	600,7	624,1	627,0	**643,9**	16,9%

Source: BP (2010)

Oil: Proven Reserves (at end 2009)

	Thousand million tonnes	At end 2009 Thousand million barrels	Share of total	R/P ratio
Saudi Arabia	36,3	264,6	19,8%	74,6
Venezuela	24,8	172,3	12,9%	*
Iran	18,9	137,6	10,3%	89,4
Iraq	15,5	115,0	8,6%	*
Kuwait	14,0	101,5	7,6%	*
United Arab Emirates	13,0	97,8	7,3%	*
Russian Federation	10,2	74,2	5,6%	20,3
Libya	5,8	44,3	3,3%	73,4
Kazakhstan	5,3	39,8	3,0%	64,9
Nigeria	5,0	37,2	2,8%	49,5
Canada	5,2	33,2	2,5%	28,3
US	3,4	28,4	2,1%	10,8
Qatar	2,8	26,8	2,0%	54,7
China	2,0	14,8	1,1%	10,7
Angola	1,8	13,5	1,0%	20,7
Brazil	1,8	12,9	1,0%	17,4
Algeria	1,5	12,2	0,9%	18,5
Mexico	1,6	11,7	0,9%	10,8
Norway	0,9	7,1	0,5%	8,3
Azerbaijan	1,0	7,0	0,5%	18,6
Sudan	0,9	6,7	0,5%	37,5
Ecuador	0,9	6,5	0,5%	36,1
India	0,8	5,8	0,4%	21,1
Oman	0,8	5,6	0,4%	18,9
Malaysia	0,7	5,5	0,4%	20,4
Vietnam	0,6	4,5	0,3%	35,7
Indonesia	0,6	4,4	0,3%	11,8
Egypt	0,6	4,4	0,3%	16,2
Australia	0,5	4,2	0,3%	20,7
Gabon	0,5	3,7	0,3%	44,1
United Kingdom	0,4	3,1	0,2%	5,8
Yemen	0,3	2,7	0,2%	24,5

	Thousand million tonnes	At end 2009 Thousand million barrels	Share of total	R/P ratio
Argentina	0,3	2,5	0,2%	10,2
Syria	0,3	2,5	0,2%	18,2
Rep. of Congo (Brazzaville)	0,3	1,9	0,1%	19,4
Equatorial Guinea	0,2	1,7	0,1%	15,2
Colombia	0,2	1,4	0,1%	5,4
Peru	0,2	1,1	0,1%	21,1
Brunei	0,1	1,1	0,1%	17,6
Italy	0,1	0,9	0,1%	27,2
Denmark	0,1	0,9	0,1%	9,5
Chad	0,1	0,9	0,1%	20,9
Trinidad & Tobago	0,1	0,8	0,1%	15,1
Turkmenistan	0,1	0,6	◆	8,0
Uzbekistan	0,1	0,6	◆	15,2
Tunisia	0,1	0,6	◆	18,4
Romania	0,1	0,5	◆	14,2
Thailand	0,1	0,5	◆	3,8
Others (less than 0,5%)	8,3	62,4	4,7%	
Total World	**181,7**	**1333,1**	**100,0%**	**45,7**
of which: European Union #	0,8	6,3	0,5%	8,2
OECD	12,4	90,8	6,8%	13,5
OPEC	140,4	1029,4	77,2%	85,3
Non-OPEC £	24,6	180,9	13,6%	14,7
Former Soviet Union	16,7	122,9	9,2%	25,5
Canadian oil sands	23,3	143,3		
Proved reserves and oil sands	205,0	1476,4		

* More than 100 years.
^ Less than 0.05.
◆ Less than 0.05%.
£ Excludes Former Soviet Union.
'Remaining established reserves' less reserves 'under active development'.
Notes: Proved reserves of oil - Generally taken to be those quantities that geological and engineering information indicates with reasonable certainty can be recovered in the future from known reservoirs under existing economic and operating conditions.
Reserves-to-production (R/P) ratio - If the reserves remaining at the end of any year are divided by the production in that year, the result is the length of time that those remaining reserves would last if production were to continue at that rate.
Source of data - The estimates in this table have been compiled using a combination of primary official sources, third-party data from the OPEC Secretariat, World Gas Journal and an independent estimate of Russian reserves

based on information in the public domain. Canadian proved reserves include an official estimate of 27.1 billion barrels for oil sands ‘under active development’. Venezuelan reserves are taken from the OPEC Annual Statistical Bulletin which notes that the figure includes "proven reserves of the Magna Reserve Project in the Orinoco Belt, which amounted to 94,168mb in 2008" Reserves include gas condensate and natural gas liquids (NGLs) as well as crude oil. Annual changes and shares of total are calculated using thousand million barrels figures.

Oil: Refinery Capacities in Europe, 2009 (in 1,000 b/d)

Country	Capacity
Russian Federation	5,616
Italy	2,396
Germany	2,362
France	1,971
United Kingdom	1,713
Spain	1,377
Netherlands	1,280
Belgium	745
Turkey	613
Greece	425
Sweden	422
Norway	310
Total Europe & Eurasia	24,920
European Union	15,598
Total world	90,662

Source: BP (2010)

IV. Table of Oil Pipelines to the EU

The following table shows a selection of oil pipelines to Europe, sorted into three categories:

- 1. Norwegian oil pipeline to the EU
- 2. Russian and Central Asian oil pipelines to Europe
- 3. Oil pipelines on the European continent

Within these categories, the pipelines are arranged geographically. We have differentiated between existing pipelines, pipelines under construction, and pipeline projects still in development; this final category is very large – it includes some very concrete projects that will most certainly be carried out in the near future, while others have been proposed but firm intentions to construct them are currently lacking.

For pipelines originating in the Soviet era in Russia and CIS states in particular, the figures are often difficult to verify and vary according to the source. The system is highly complex because of branch lines, later extensions, parallel pipelines, etc. The tables are thus sometimes incomplete and it is possible that some figures are no longer accurate. We would be grateful for any comments and corrections that may be incorporated in the next edition of this study.

1. Norwegian Pipeline

1.1 Existing Pipelines

Pipeline	Pipeline Route	Transit Countries	Consortium	Length (km)	Technical Capacity	Diameter (inches)	In Service since
Norpipe Oil1	Ekofisk centre (Norway offshore) / Teesside (UK)		Owner: Norpipe Oil AS - ConocoPhillips Skandinavia: 35.05% Total E&P Norge: 34.93% Statoil: 15%	354	900,000 bbl/d (reception installations limit capacity to 810,000 bbl/d) (NPD)	34	1975 (license prolonged to 2028)

Note: 1. www.npd.no; EIA UK, May 2006; EIA North Sea, January 2007

2. Russian/Central Asian Oil Transport Pipelines Towards Europe: Existing Pipelines

Pipeline	Pipeline Route	Transit Countries	Consortium	Length (km)	Technical Capacity	Petroleum transported	Diameter (inches)	Cost of transit	In Service Since
Caspian Pipeline Consortium (CPC) 1	Tengiz (Kazakhstan) /Novorossiysk (Russia)		Owner: CPC consortium (May 20): Russian government: 31% (Transneft 24%, CPC Company 7%) Kazakhstan government: 20.75% (KazMunaiGaz 19%, Kazakhstan Pipeline Ventures 1.75%) Chevron: 15% LukArco: 2.5% Rosneft-Shell:	1,510 of which 187 is in Kazakhstan	700,000 bbl/d, projected to expand to 1.5 million bbl/d by 2014 (EIA, ECS) 28 Mt/y, increase of more than 67 Mt/y for 2008 (Götz) 22 Mt/y for mid-2004, expected 67 Mt/y for 2008 (cpc.ru)	675.000 bbl/d in 2008 (EIA)	42 between Kropotkin and Novorossijsk 40 for rest of pipeline	38$/Mt Profits for Russia and Kazakhstan would be more than $1.5 billion/year after the increase in capacity.(cpc.ru)	2001

Pipeline	Pipeline Route	Transit Countries	Consortium	Length (km)	Technical Capacity	Petroleum Transported	Diameter (inches)	Cost of transit	In Service Since
Atyrau-Samara [2]	Atyrau (Kazakhstan) / Samara (Russia)		JV KazTransOil and Transneft	695	600,000 bbl/d in 2009(EIA)	351,486 bbl/d in 2009 (17504 Mt) (KasTransOil)	27.5		
Baku–Novorossiisk pipeline /Northern Corridor / Northern Route Export Pipeline (NREP) / Northern Early Oil/ [3]	Baku (Azerbaïjan/ Novorossiysk (Russia)		Owner of Russian section: Transneft Owner of Azerbaijan section: SOCAR Operators: SOCAR in Azerbaijan, Transneft in Russia	1,330, of which 231 is in Azerbaijan	100,000 bbl/d (EIA) 15 Mt/y (Götz) 5 Mt/y (USAK)	29,000 bbl/d in 2008 (EIA, Argus FSU) 1.4 Mt in 2008 (Azerbaijan Energy Ministry)	28	15.67 $/t (ECS), since 1/1/1996	1983
Baku–Supsa Pipeline/ Western Route Export Pipeline (WREP)/ Western Early Oil [4]	Baku (Azer-baijan) / Supsa (Georgia)		Owner: Azerbaijan International Operating Company (AIOC) Operator: BP	837, of which 460 is in Azerbaijan	145,000 bbl/d (EIA) 100,000 bbl/d (ECS)	132,000 bbl/d in 2004 (BP) 100,000 bbl/d in 2005 (ECS)	24	0.17 $/bbl (ECS)	1998

Pipeline	Pipeline Route	Transit Countries	Consortium	Length (km)	Technical Capacity	Petroleum Transported	Diameter (inches)	Cost of transit	In Service Since
Baltic Pipeline System (BPS)	(BPS)5 Yaroslavl (Russia) / Primorsk (Russia)		Transneft	1,514	42 Mt/y (March 2004, Götz) 65 Mt/y since April 2006 (RIA) 1.3 million bbl/d (2006) 1.5 million bbl/d (March 2007, EIA)			2.2$/bbl in 2002 (S&P)	2001

Pipeline	Pipeline Route	Transit Countries	Consortium	Length (km)	Technical Capacity	Petroleum Transported	Diameter (inches)	Cost of transit	In Service Since
Druzhba North [6]	Tjumen-Almetyevsk (Russia)/Schwedt (Germany)	Belarus, Poland	Transneft (Russia), Gomeltransneft Druzhba (Belarussia) PERN (Poland and Germany)	Almetyevsk / Schwedt: around 4,000, of which: Russia: 2,600 Belarus: 700 Poland: 700 (entire system North and South: around 9,000)	1.3 million bbl/d (EIA) Russia: 1.64 million bbl/d Belarus: 1 million bbl/d (ECS) 2 millions bbl/d (Reuters)	More than 51 Mt/y (2005, Lang) Russia: 82 Mt Belarus: 50Mt (2005, ECS)	24-40	In Belarus - to Poland: $2.60/Mt - to Ukraine: 1.14 $/Mt - to Lithuania: 1.26-2.00 $/Mt (ECS)	1964
Druzhba South [7]	Tjumen-Almetyevsk / Samara (Russia) / Czech Republic / Hungary	Belarus (Mozyr), Ukraine, Slovakia	Owner: Transneft (Russia) Gomeltransneft Druzhba (Belarussia) Ukrtransnafta (Ukraine) Transpetrol (Slovakia) Mero (Czech Republic) Operator: Transneft	Almetyevsk / Uzhorod: around 3,550, of which: Russia: 2,600 Belarus: 300 Ukraine: 650 Slovakia/Czech Republic: around 400 Hungary: 130	Russia: 1.64 million bbl/d Belarus: 1 million bbl/d Ukraine: 380,000 bbl/d (ECS), 400,000 bbl/d (EIA) 350,000 bbl/d to Hungary,	Russia: 82 Mt Belarus: 50 Mt Ukraine: 17 Mt (2005, ECS)	21-40	In Ukraine: towards Slovakia and Hungary 5,6 $/Mt (ECS)	1964

Pipeline	Pipeline Route	Transit Countries	Consortium	Length (km)	Technical Capacity	Petroleum Transported	Diameter (inches)	Cost of transit	In Service Since
					Czech Republic and Slovakia (2009 EIA)				
Adria-Pipeline [8]	Omisalj (Croatia) / Hungary		Adriatic Oil Operator: Janaf		100,000 bbl/d (EIA)	Currently 0 (EIA)			1974
Greece-Macedonia[9]	Thessaloniki (Greece) / Skopje (Macedonia)		Management: consortium Greco-Macedonian Operator: Hellenic Petroleum	225 of which 70 in Greece	2.5 million tons/year (AFIRP)				2002
Odessa Brody / Sarmatia pipeline [10]	Odessa (Ukraine) / Brody (Ukraine)		Ukrtransnafta	674	300,000 bbl/d (EIA) 180,000 bbl/d (ECS) 9-14.5 Mt/y (Troschke)	120,000 bbl/d (ECS) 3,42 Mt in 2006, 5,3 Mt between January and July 2007 (Alexanders)	40	12.7 $/Mt (ECS) Ukraine earned $176 million in transit fees between 2004 and 7/31/2007 (EIA)	2004

Pipeline	Pipeline Route	Transit Countries	Consortium	Length (km)	Technical Capacity	Petroleum Transported	Diameter (inches)	Cost of transit	In Service Since
Baku-Tibilissi-Ceyhan (BTC)[11]	Baku (Azerbaijan) / Ceyhan (Turkey)	Georgia	Owner: BTC Pipeline Co. BP: 30.1% AzBTC: 25% Chevron: 8.9% Statoil: 8.71% TPAO: 6.53% Eni: 5% Total: 5% Itochu: 3.4% INPEX: 2.5% ConocoPhillips: 2.5% Amerada Hess: 2.36%	1,768, of which: Azerbaijan: 443 Georgia: 249 Turkey: 1,076	1 million bbl/d for 2008-2009 (EIA) 1 million bbl/d (ECS) 50 Mt/y (Götz)		46/42/34	The price for the consortium members, for transport from Sangachal to Ceyhan, is from $3.3/bbl (2005-10), $4.6/bbl (2010-16), $5.5/bbl (2016-29). Turkey should earn $140-200 million/y in transit and operation fees. Georgia stands to make $112 million from 2004-2008 and $566 million from 2009-2019.	May 2005

Pipeline	Pipeline Route	Transit Countries	Consortium	Length (km)	Technical Capacity	Petroleum Transported	Diameter (inches)	Cost of transit	In Service Since
Strategic Pipeline (NorthSouth system)[12] Kirkuk-Ceyhan[13]	Iraq / Turkey (one-way flow only Kirkuk (Iraq) / Ceyhan (Turkey))		State Oil Marketing Organization (Iraq)	966	1.4 million bbl/d (EIA) 1st line: 1.1 million bbl/d 2nd line: 500,000 bbl/d where usable only 300,000 bbl/d(EIA 2007)	Currently 0 (EIA) 150,000-550,000 bbl/d (June 2006, EIA)	1st line: 40 2nd line: 46		1975

Notes:
1. Cost of transporting Kazakh petroleum to Butinge: 11,58 $/Mt (2007 ECS). A memorandum on expansion was signed in December 2008. Construction costs: $2.5 billion for the first phase, $4.2 billion total, capacity increase would cost $1.5 billion. In November 2004, CPC began putting Russian petroleum in the system at Kropotkin. Götz 2004; EIA Kazakhstan, October 2006; EIA Caspian Sea Region, July 2002; *Cpc.ru*
2. EIA Caspian Sea Region (July 2002). The pipeline was slightly expanded in 2009.
3. Azerbaijan reduced its capacity after the opening of the BTC. AIOC stopped oil export via the pipeline and SOCAR became the operator of the pipeline in 2008. However, the pipeline was used by both during the Russia-Georgian war in August 2008. Götz 2004; EIA Azerbaijan, August 2006; EIA Caspian Sea Region, July 2002; *Bp.com*; EIA Turkey, October 2006; *Azerbaijan.az*, *Regnum.ru*
4. Construction costs: $600 million. *Bp.com*; EIA Azerbaijan, August 2006; EIA Caspian Sea Region, July 2002.
5. Götz 2004; Lang 2007; EIA Russia, April 2007; www.rian.ru; http://eng.lenobl.ru/economics/investment/principlefederalprojects/balticoilpipeline
6. Branches towards the Baltic countries, but there have been no deliveries since the end of 2002; only the branch towards Germany works at full capacity; construction of a third pipe is under way for Adamowo-Plock (this will increase the capacity to 60 million t/y); enlargement of Mozyr-Schwedt of 20 million tons and an extension towards Wilhelmshaven was under discussion. Götz 2004; Lang 2007; EIA North-Central Europe, February 2006; EIA Russia, April 2007.
7. Joins up with the Adria-Pipeline in Hungary. Götz 2004; EIA North-Central Europe, February 2006; EIA Russia, April 2007; Reuters 9/1/2007.
8. Russia would like to export petroleum via the Adria pipeline and Omisalj port. Croatia initially opposed this out of ecological concerns, but re-engaged in talks in 2009. The reversal of the flow, as well as an increase in capacity to 300,000 bbl/d, would cost around $320 million. EIA Balkans, February 2006; EIA Caspian Sea Region, July 2002; *Transneft.ru*
9. EIA Greece, August 2006
10. Pipeline completed in 2001. Ukraine first planned for a flow from Odessa-Brody in order to import Caspian petroleum, but the oil pipeline currently functions, since 2004, in the opposite direction. It could be reversed in the case that Brody-Plock is constructed; another proposal is to lengthen the oil pipeline up to Kralupy (Czech Republic). Ukraine should pay $100 million to TNK-BP if the flow is reversed. Belarus proposed in 2010 to use the pipeline to import Venezuelan oil. EIA Ukraine, August 2007; EIA North-Central Europe, February 2006; *Oei-muenchen.de*; Alexanders 11/9/2007; La Lettre du Courrier des pays de l'Est, n° 39, October 2007; Dubien 2007.
11.Construction costs: $3.9 billion. *Bp.com*; EIA Azerbaijan, August 2006; EIA Caspian Sea, January 2007; EIA Turkey, October 2006; *Iea.org*
12. Taken out of service in 1990/1991; Northern Oil Company (Iraq) estimated in 2003 that it would take a long time to get the pipeline running again. EIA Iraq, June 2006.
13. Private military companies are in charge of the security of the pipeline, which has been the target of numerous attacks. Currently, the pipeline only functions sporadically. EIA Iraq, June 2006.

2.1 Pipelines Under Construction

Pipeline	Pipeline Route	Transit Countries	Consortium	Length (km)	Capacity	Diameter (inches)	Predicted Operational Start-Up Date	Estimated cost
Samsun-Ceyhan Pipeline (SCP) / Trans-Anatolian Pipeline[1]	Samsun (Turkey) / Ceyhan (Turkey)	-	Trans-Anadolou Pipeline Company (TAPPCO): ENI 50%, Calik Energy 50% Rosneft Transneft	555	Initial capacity: 1 million bbl/d 'design capacity': 1.5 million bbl/d (Calik/ENI)	42-48	2012	$1.5 billion (Calik/ENI) $ 3 billion (Sechin Russia Energy Minister May 2010)
Baltic Pipeline System II (BPS-II) [2]	Unecha (Russia) / Primorsk (Russia)		Transneft	1,100-1,200 172 km – branch to Kirishi oil refinery	At the beginning, 1 million bbl/d, an increase to 1.5 million bbl/d is possible (EIA) 35 Mt/y (BFAI)	40-42	2012	$2 billion (Götz) $ 4 billion, Euractive 2010

Note: 1.Start of construction: 24 April 2007. Storage capacities: Ceyhan 8 million bbl, Samsun 6 million bbl. EIA Turkey, October 2006; RIA 24/04/2007; *Iea.org*; *Eni.it* Russian companies Transneft and Rosneft joined the project in 2009.
2. Project announced in January 2007, after the conflict with Belarus; feasibility study began in May 2007; despite the negative profitability report issued by Russia's Ministry of Industry, the construction of the pipeline started in June 2009. Goetz 2004; EIA; *Bfai.de*; *Transneft.ru*, Interfax.

2.3 Oil Pipeline Projects Still in Development

Pipeline	Pipeline Route	Transit Coun-tries	Consortium	Length (km)	Capacity	Diameter (inches)	Estimated Operational Start-Up Date	Estimated Cost
Kiyiköy / Ibrikhaba, Trans-Thrace[1]	Kiyiköy (Turkey) / Ibrikhbaba (Turkey)		OJSC AK Transneft Anadolu group (Turkey)	193	60 Mt/y	48		$0.9 billion (Götz)
Burgas/ Alexan-droupolis[2]	Burgas (Bulgaria)/ Alexandrou-polis (Greece)		Russian consortium Burgas-Alexandroupolis Ltd: (Transneft, Rosneft and Gazprom in equal parts): 51% Bulgaria consortium, project company oil pipeline Burgas-Alexandroupolis – BG AD (Bulgargas and Technoexportstroy in equal parts): 24.5% Greece consortium Helpe-Thraki A.E (Hellenic Petroleum 25% and Thraki 75%): 24.5%	279	700,000 bbl/day, potential of 1 million bbl/d (EIA) 1st phase: 15-23 Mt/y, 2nd phase: 35 Mt/y (www.transneft.ru) 35-50 Mt/y (RBC)	36	2011	$1 billion (RBC) $0.9 billion (EIA) €800-900 million (bridge-mag)

Pipeline	Pipeline Route	Transit Coun-tries	Consortium	Length (km)	Capacity	Diameter (inches)	Estimated Operational Start-Up Date	Estimated Cost
Constanta/ Trieste (South East European Line, Pan-European Oil Pipeline)[3]	Constanta (Romania) / Trieste (Italy)	Serbia (Pan-cevo) /Croatia (Omisalj) /Slovenia	Pan-European Oil Pipeline Project Development Company: JANAF (Croatia) Conpet and Oil Terminal (Romania) Transnafta (Serbia)	1,300-1,400, of which: Romania: 650 Slovenia: 29	60-90 Mt/y (Reuters) 480,000-1,800,000 bbl/d (EIA)		2015	$2.3 billion (EIA) $3 billion (Reuters) €1.5-2.62 billion (ENS)
Constanta / Vlore[4]	Constanta (Romania) / Vlore (Albania)	Mace-donia		900	38 Mt/y			$1.1 billion (Götz)
Albanian-Macedonian-Bulgarian Oil Pipeline (AMBO)[5]	Burgas (Bulgaria) / Vlore (Albania)	Mace-donia	AMBO Pipeline Corporation	894, of which 273 is in Macedonia	30-40 Mt/y (SET) 750,000 bbl/d (EIA, SET)		2011	1.1-1.5 billion (EIA, SET)
Sarmatia[6]	Brody (Ukraine) / Plock (Poland)		International pipeline company Sarmatia LLC: Socar: 24.75% GOGC: 24.75% Pern: 24.75% Ukrtransnafta: 24.75% Klaipedos Nafta: 1%	490-540	15 Mt/y in 1st phase 25 Mt/y in 2nd phase		2014	500 million (Lang 2007)
Bratislava-Schwechat-Pipeline (BSP) [7]	Bratislava (Slovakia) / Schwechat (Austria)		Bratislava-Schwechat Pipeline: Transpetrol, OMV	62	72,000-100,000 bbl/d	20		

Pipeline	Pipeline Route	Transit Coun-tries	Consortium	Length (km)	Capacity	Diameter (inches)	Estimated Operational Start-Up Date	Estimated Cost
Novoros-siysk / Supsa [8]	Novorossiysk (Russia) / Supsa (Georgia)							
Murmansk / Barents Sea projects [9]	Field in western Siberia (Russia) / Murmansk (Russia)		Transneft	2,800-3,900	50-100 Mt/y			$9-15 billion (Götz)
Barents Sea (alternative) [10]	Field in western Siberia (Russia) / Indiga (Russia)		Transneft	1,700	50-100 Mt/y			$12 billion (Götz)
Kharyaga-Indiga pipeline	Kharyaga (Russia) / Indiga (Russia)		Transneft	430-468	12-24 Mt/y 500,000 bbl/d (EIA)			$ 2-6 billion (EIA)
Trans-caspian[11]	Turkmenistan / Azerbaijan / Turkey		SOCAR KazMunaiGaz (KGM)	700				$ 3-4 billion
Eskene / Kuryk[12]	Eskene (Kazakhstan) / Kuryk (Kazakhstan)		Kaz-munaigaz	454	760,000 bbl/d (EIA)		2010	$ 2.5 (Kazakh Energy Ministry)

Notes:
1. Goetz 2004; *Simdex.com*; Alexanders 1/9/2004. Despite the announcement to begin construction in 2005, the project has not advanced since then.
2. Intergovernmental agreement signed by Russia, Greece, and Bulgaria on March 15, 2007; the construction should begin in October 2009; the project is still waiting for an environmental study; the investment scheme is not agreed yet; it is not decided from which sources the pipeline will be filled. Kazakh President N. Nazarbaev proposed in March 2010 to link the pipeline to a pipeline that would link Caspian oil to Constanta port (Interfax). Bulgaria's newly elected government suspended the implementation of all Russian projects in the country in 2010. According to the Greek Development Minister, Greece should make between $30 and 50 million/y in

transit fees. EIA Southeastern Europe, August 2006; EIA Greece, August 2006; *Rbcnews.com*; BBC March 15, 2007; Radio Free Europe March 15, 2007; Götz 2004; *Transneft.ru*; *Bridge-mag.com*, Itar-Tass May 2010.
3. Agreement signed by the European Commission and five affected countries in April 2007. Slovenia stated reservations for ecological reasons. Croatia froze any activities related to the pipeline in September 2009 (Reuters). Between Pancevo and Omisalj, the pipeline could use an existing section of the Adria pipeline. It will then join with TAL in Trieste, to export toward Austria, Germany and the Czech Republic. Götz 2004; EIA Southeastern Europe, August 2006; EIA Balkans Factsheet, February 2006; EIA Italy, May 2007; *Gasandoil.com*; *Ens-newswire.com*; Reuters March 26, 2007.
4. Götz 2004
5. It is estimated that Macedonia will make $30 million/y in transit fees. Feasibility study finished in 2002, MoU signed in December 2004, construction should begin in October 2008, no major information since 2008. EIA Southeastern Europe, August 2006; EIA Balkans, February 2006; Southeast European Times February 14, 2007.
6. Would link the Odessa-Brody and Plock-Gdansk pipelines, and even connect to Klaipeda. PERN estimates it would take three years after making the decision to complete the project. Agreement signed by Azerbaijan, Georgia, Ukraine, Poland and Lithuania in Vilnius in October 2007. Feasibility study of oil transportation corridor was carried out; a tender for a detailed feasibility study and environmental assessment was launched in 2010. EIA North-Central Europe, February 2006; La Lettre du Courrier des pays de l'Est, n° 39, October 2007; *Interfax.pl*; Lang 2007.
7. OMV would be able to import Russian petroleum directly with this pipeline. OMV currently imports all its petroleum for its Trieste terminal. The pipeline has provoked much opposition; the route of the pipeline is likely to be changed. EIA North-Central Europe, February 2006; *Derstandard.at*; SIta 2010.
8. Would be able to join the BTC in Supsa, otherwise construction of a parallel pipeline to the BTC to Ceyhan (Turkey); Saakashvili's proposition in February 2004. No more news since then. Goetz 2004.
9. Goetz 2004
10. Goetz 2004
11. According to Vladimir Socor, Turkmenistan and Kazakhstan would be able to construct underwater pipelines without needing the agreement of the other countries in the area: for example, a pipeline that connects the Turkmen platform deck Block 1 with the Azerbaijani fields Azeri-Chirag-Guneshli. Kazakhstan could construct a pipeline that connects to this system that would not be considered 'trans-Caspian' in a legal sense. Petroleum Economist, July 2007. The pipeline is still in feasibility study phase in 2009.
12. EIA Caspian Sea, January 2007, A feasibility study is ongoing; French President N. Sarkozy agreed to finance the pipeline during a meeting with N. Nazarbaev in October 2009; the financial side of the project remains unclear. *Inform.kz*

3. Oil Pipelines on the European Continent

3.1 Existing Oil Pipelines

Pipeline	Pipeline Route	Transit Countries	Consortium	Length (km)	Technical Capacity	Petroleum Transported	Diameter (inches)	In Service Since
Rotterdam-Rhein Pipeline (RRP)[1]	Rotterdam (Netherlands)/ Wessling (Germany)		Shell 40% Ruhr Oel 20% BP Olex Fanal Mineralöl 20% Shell Deutschland Oil 10% Chevron Netherlands10%	322	690,000 bbl/d (EIA 2008)		24-36	1960
Südeuropäische Ölleitung / South European Pipeline / SPSE[2]	Fos-sur-Mer (France) / Karlsruhe (Germany)	Switzerland	Total France: 27.84% ExxonMobil: 22% Société de Participations dans l'Industrie et le Transport du Pétrole: 15.40% BP France: 12.10% Shell: 10.32% BASF: 10% ConocoPhillips Germany: 2%	769	670,000 bbl/d (EIA)	3 Mt/y in recent years 42 Mt/y transported in 1973 (SPSE)	40	1962, capacity doubled, then tripled in 1971-1972
Trans Alpine Pipeline (TAL)3	Trieste (Italy) / Ingolstadt (Germany) / Karlsruhe (Germany)	Austria	OMV: 25% Shell: 24% ExxonMobil: 16% Ruhr Oel: 11% ENI: 10% BP: 9% ConocoPhillips: 3% Total: 2%	TAL-IG (Trieste-Ingolstadt): 465 TAL-OR (Ingolstadt-Karlsruhe): 266		690,000 bbl/d in 2004 (EIA) 36.15 Mt in 2006 (TAL) 34.19 Mt in 2009 (TAL)	TAL-IG 40, TAL-OR 26	1967

Pipeline	Pipeline Route	Transit Countries	Consortium	Length (km)	Technical Capacity	Petroleum Transported	Diameter (inches)	In Service Since
Ingolstadt / Kralupy nad Vltavou /Litvinov (ILK)[4]	Ingolstadt (Germany) / Kralupy nad Vltavou (Czech Republic) / Litvinov (Czech Republic)		Mero CR (operator)	350, of which 178 is in Germany	10 million t/y, extension to 15 million/y is possible (Mero)		28	1996

Notes:
1. EIA Germany, June 2008, *Rrpweb.nl*. The main pipeline, Rotterdam-Vanlo, splits into two branches, the northern one and the southern one, which lead to refineries.
2. EIA Germany, June 2008; *Spse.fr*
3. EIA Germany, June 2008; EIA Southeastern Europe, August 2006; *Tal-oil.com*
4. Receives oil from TAL. EIA North-Central Europe, February 2006; *Mero.cz*

V. Cross-Country Comparison of Transit Tariffs

Country	Transit tariff ($US/mt)	Distance (km)	$US/100 t/km
Belarus (Russia-Ukraine), Druzhba, 520/720 mm	1.14	245	0.47
Belarus (Russia-Poland), Druzhba, 630/820 mm	2.60	521	0.50
Ukraine (Russia-Odessa), Pridneprovskie company, 720 mm	6.30	1,097	0.57
Ukraine (Belarus-Slovakia), Druzhba, 530/720 mm	5.60	634	0.88
Ukraine (Odessa-Brody), 1,020 mm	12.70	674	1.88
Ukraine (Russia-Yuzhniy), Collide Ltd, 720 mm	12.00	1,112	1.07
Russia (Caspian Sea-Black Sea), Makhachkala- Novorossiysk, 720 mm	7.06	774	0.91
Russia (Azerbaijan-Black Sea), Baku-Novorossiysk, 720 mm	15.67	1,411	1.11
Russia (Kazakhstan, Turkmenistan oil), Transneft, 720-1,200 mm			0.73
Caspian Pipeline Consortium (Kazakhstan-Russia), 1,016 mm	30.83	1,580	1.94
Georgia (Azerbaijan-Black Sea), Baku-Supsa, 530 mm	1.48	370	0.40
Azerbaijan (Azerbaijan-Black Sea), Baku-Supsa, 530 mm	2.14	457	0.47
Kazakhstan (Russia-Russia), Altayfrakht, 720 mm	2.50	187	1.34
BTC	18.8-24.1	1773	1.06-1.36

Source: ECS (2007), p. 6

VI. Statistics on Natural Gas

This section shows statistics on imports of natural gas to the European Union, on gas production in member states and the main exporting countries within the EU, as well as a table of proven natural gas reserves.

EU: Imports of Natural Gas by Origin, 2008 in TJ (GCV})

Import of Natural Gas to the EU-27 by Origin, 2008		
Origin	**Quantity**	
	(TJ)	**% of total**
Russia	5095662	41%
Norway	3899854	31%
Algeria	1998381	16%
Nigeria	540366	4%
Libya	398006	3%
Qatar	298578	2%
Egypt	226955	2%
Oman	6895	0%
Total	12464697	100%

Source: Eurostat 2010

Imports of Natural Gas by Origin to Croatia, 2008 in TJ (GCV)

Origin	Quantity
Russia	40,097

Source: Eurostat 2010

Imports of Natural Gas by Origin to Turkey, 2008 In TJ (GCV)

Origin	Quantity
Russia	880,128
Algeria	158,994
Nigeria	38,993
Other*	345,957
TOTAL	1,424,072

*Author's calculation
Source: Eurostat 2010

Imports of Natural Gas to the EU-27, 2009

Origin	Quantity (billion m3)	Percen-tage
Russia	112	36
Norway	98	31
Algeria	46	15
Qatar	18	6
Nigeria	10	3
Libya	9	3
Trinidad &Tobago	7	2
Egypt	7	2
Others	4	1
TOTAL	312	100

Transported by gas pipeline	249	
Russia	112	
Norway	96	
Algeria	30	
Libya	9	
Others	2	
Transported in LING	63	
Qatar	18	
Algeria	16	
Nigeria	10	
Trinidad &Tobago	7	
Egypt	7	
Norway	2	
Others	2	

Source: BP (2010) and author's calculations

World Natural Gas Production in 2009 (Billion M3)

	1970	1980	1990	2000	2005	2006	2007	2008	2009	2009 share of total
US	595.1	549.4	504.3	543.2	511.1	524.0	545.6	574.4	593.4	20%
Russian Federation	n/a	n/a	590.0	528.5	580.1	595.2	592.0	601.7	527.5	18%
Canada	56.7	74.8	108.6	182.2	187.4	188.4	184.1	173.4	161.4	5%
Iran	12.9	7.1	23.2	60.2	103.5	108.6	111.9	116.3	131.2	4%
Norway	-	25.1	25.5	49.7	85.0	87.6	89.7	99.2	103.5	3%
Qatar	1.0	4.7	6.3	23.7	45.8	50.7	63.2	77.0	89.3	3%
China	2.9	14.3	15.3	27.2	49.3	58.6	69.2	80.3	85.2	3%
Algeria	2.5	14.2	49.3	84.4	88.2	84.5	84.8	85.8	81.4	3%
Saudi Arabia	1.6	9.7	33.5	49.8	71.2	73.5	74.4	80.4	77.5	3%
Indonesia	1.2	18.5	43.9	65.2	71.2	70.3	67.6	69.7	71.9	2%
Uzbekistan	n/a	n/a	36.9	51.1	54.0	54.5	59.1	62.2	64.4	2%
Netherlands	26.7	76.4	61.0	58.1	62.5	61.6	60.5	66.6	62.7	2%
Egypt	0.1	2.2	8.1	21.0	42.5	54.7	55.7	59.0	62.7	2%
Malaysia	-	-	17.8	45.3	61.1	63.3	64.6	64.9	62.7	2%
United Kingdom	10.5	34.8	45.5	108.4	88.2	80.0	72.1	69.6	59.6	2%
Mexico	11.2	25.7	27.1	37.8	45.0	51.6	54.0	54.0	58.2	2%
United Arab Emirates	0.8	7.5	20.1	38.4	47.8	49.0	50.3	50.2	48.8	2%
Australia	1.7	11.1	20.7	31.2	37.1	38.9	40.0	38.3	42.3	1%
Argentina	6.0	8.4	17.8	37.4	45.6	46.1	44.8	44.1	41.4	1%
Trinidad & Tobago	1.8	2.8	5.3	14.5	31.0	36.4	39.0	39.3	40.6	1%
India	0.7	1.2	12.0	26.4	29.6	29.3	30.1	30.5	39.3	1%

	1970	1980	1990	2000	2005	2006	2007	2008	2009	2009 share of total
Pakistan	3.5	7.2	12.2	21.5	35.5	36.1	36.8	37.5	37.9	1%
Turkmenistan	n/a	n/a	79.5	42.5	57.0	60.4	65.4	66.1	36.4	1%
Kazakhstan	n/a	n/a	6.4	10.4	22.6	23.9	26.8	29.8	32.2	1%
Thailand	-	-	6.5	20.2	23.7	24.3	26.0	28.8	30.9	1%
Others	264.5	539.3	203.4	234.3	303.3	329.0	346.9	361.6	344.6	10%
Total World	1001.5	1434.4	1980.4	2412.6	2779.5	2880.2	2954.7	3060.8	2987.0	100.0%
of which: European Union #	101.7	197.2	185.1	231.9	211.9	201.2	187.5	189.4	171.2	6%
OECD	745.2	851.6	849.5	1070.9	1072.2	1086.6	1097.1	1125.5	1127.2	38%
Former Soviet Union	179.1	393.8	747.7	654.2	737.7	759.0	772.1	793.8	694.9	23%
Other EMEs	77.2	189.0	383.1	687.5	969.6	1034.6	1085.5	1141.5	1164.9	39%

* Excluding gas flared or recyled.
^ Less than 0.05.
# Excludes Estonia, Latvia and Lithuania prior to 1985 and Slovenia prior to 1991.
Source: BP (2010)

Natural Gas: Proven Reserves, at End 2009

	Trillion cubic meters	Share of total	R/P ratio
Russian Federation	44.38	23.7%	84.1
Iran	29.61	15.8%	*
Qatar	25.37	13.5%	*
Turkmenistan	8.10	4.3%	*
Saudi Arabia	7.92	4.2%	*
US	6.93	3.7%	11.7
United Arab Emirates	6.43	3.4%	*
Venezuela	5.67	3.0%	*
Nigeria	5.25	2.8%	*
Algeria	4.50	2.4%	55.3
Indonesia	3.18	1.7%	44.3
Iraq	3.17	1.7%	*
Australia	3.08	1.6%	72.7
China	2.46	1.3%	28.8
Malaysia	2.38	1.3%	38.0
Egypt	2.19	1.2%	34.9
Norway	2.05	1.1%	19.8
Kazakhstan	1.82	1.0%	56.6
Kuwait	1.78	1.0%	*
Canada	1.75	0.9%	10.9
Uzbekistan	1.68	0.9%	26.1
Libya	1.54	0.8%	*
Azerbaijan	1.31	0.7%	88.8
India	1.12	0.6%	28.4
Netherlands	1.09	0.6%	17.3
Ukraine	0.98	0.5%	51.0
Oman	0.98	0.5%	39.6
Pakistan	0.91	0.5%	23.9
Bolivia	0.71	0.4%	57.9
Vietnam	0.68	0.4%	85.2
Romania	0.63	0.3%	57.9

	Tril-lion cubic meters	Share of total	R/P ratio
Myanmar	0.57	0.3%	49.4
Yemen	0.49	0.3%	*
Mexico	0.48	0.3%	8.2
Papua New Guinea	0.44	0.2%	*
Trinidad & Tobago	0.44	0.2%	10.7
Argentina	0.37	0.2%	9.1
Brazil	0.36	0.2%	30.4
Thailand	0.36	0.2%	11.6
Bangladesh	0.36	0.2%	18.0
Brunei	0.35	0.2%	30.7
Peru	0.32	0.2%	91.3
United Kingdom	0.29	0.2%	4.9
Syria	0.28	0.2%	48.9
Colombia	0.12	0.1%	11.8
Poland	0.11	0.1%	26.6
Total World	187.49	100.0 %	62.8
Total North America	9.16	4.9%	11.3
Total Europe & Eurasia	63.09	33.7%	64.8
Total S. & Cent. America	8.06	4.3%	53.2
Total Middle East	76.18	40.6%	*
Total Africa	14.76	7.9%	72.4
Total Asia Pacific	16.24	8.7%	37.0
of which: European Union	2.42	1.3%	14.1
OECD	16.18	8.6%	14.4
Former Soviet Union	58.53	31.2%	84.2

* More than 100 years.
Source: BP (20010)

VII. Table of Gas Pipelines to the EU

In the following tables, a selection of gas pipelines to Europe is presented, sorted into nine categories:

1. Pipelines connecting North Africa to Europe
2. Pipelines in the North Sea
3. Connections between the United Kingdom and the European continent
4. Pipelines in the Baltic Sea
5. Pipelines on the European continent
6. Pipelines between Russia and Europe via Ukraine, Belarus, and Finland
7. Pipelines between the Caspian region and Russia
8. Pipelines connecting Russia and states of the former Soviet Union with Europe via Turkey or the Black Sea
9. Pipelines connecting Iran and Europe
10. Gas pipelines in Central Asia – Asia

Within these categories, the pipelines are arranged geographically.

We have differentiated between existing gas pipelines, pipelines under construction, and pipeline projects still in development; this final category is very large – it includes some very concrete projects that will most certainly be carried out in the near future, while others have been proposed yet firm intentions to construct them are currently lacking. If nothing else is indicated, the ‘capacity’ column refers to the technical capacity. For pipelines from the Soviet era in Russia and CIS states in particular, the figures are often difficult to verify and vary according to the source. The system is highly complex because of branch lines, later extensions, parallel pipelines, etc.

As a result of this complexity, the following tables are sometimes incomplete and it is possible that some figures are no longer accurate. We would be grateful for any comments and corrections that can be incorporated in the next edition of this study.

1. Gas Pipelines Connecting North Africa and Europe

1.1 Existing Gas Pipelines

Pipeline	Pipeline Route	Transit Countries	Consortium	Length (km)	Diameter (inches)	Capacity (billion m3/y)	In Service Since
Greenstream[1]	Mellitah (Libya) / Gela (Sicily, Italy)		ENI 50%, NOC 50%	530	32	8	October 2004
Enrico Mattei/ Transmed[2]	Hassi R'Mel (Algeria) / Sicily / Minerbio (Italy)	Tunisia	Sonatrach 50%, ENI 50% Sotugat for Tunisian part	2,220, of which: Tunisia: 370 Offshore: 380 Italy: 1,470	47 onshore 26 off-shore	24 (EIA) 27 (Brower, Nicholls) (increases scheduled: see notes at the end)	1983 (1st line) 1994 (2nd line)
Pedro Duran Farell/ Maghreb - Europe[3]	Hassi R'Mel (Algeria) / Cordoba (Spain)	Morocco	Enagas, SNPP, Sonatrach, Transgas	1,650, of which: Algeria: 520 Morocco: 540 Offshore: 45 Andalusia: 275 Extremadura: 270	28-48 onshore 2x22 offshore	8.5 (EIA) 8.6 (Brower) 12.5 (Nicholls)	1996

Notes: 1. Construction costs of $6.6 billion, Edison takes 4 billion m3/y, Energia Gas and GdF 2 billion m3/y. Eni sold its 25% stake to Libya in 2010. EIA Italy, May 2006; EIA Libya, March 2006; *Eni.it*, *Greenstreambv.com*

2. There is an extension towards Slovenia; increase in capacity to 30.2 billion m3 expected for 2008 and to 33.5 billion m3 for 2012 (Brower), plan to increase to 36 billion m3 (EIA), increase to 33.5 million m3 expected for 2009 (Nicholls). EIA Algeria, March 2007; EIA Italy, May 2006; EIA Tunisia, April 2006; Hayes 2003; Brower 2007; Nicholls 2007; *Eni.it*; *Mem-algeria.org*, *Pipelinesinternational.com*

3. Extension towards Portugal (500 km, 28-inch); increase in capacity to 18.4 billion m3 expected for end 2006 (EIA). EIA Algeria, March 2007; EIA Iberian Peninsula, June 2006; ECS 2006; Nicholls 2007; *Iea.org*; *Iea.org*; *Mem-algeria.org*

1.2 Gas Pipelines under Construction

Pipeline	Pipeline Route	Transit Coun-tries	Consortium	Length (km)	Diameter (inches)	Capacity (billion m3/y)	Expected Ope-rational Start-up Date	Estimated Cost
Medgaz[1]	Beni Saf (Algeria) / Almeira (Spain)		Sonatrach: 36% Cepsa: 20% Iberdrola: 20% Endesa: 12% GdF Suez: 12%	210	24	8, possible increase to 16 (Brower) 4 at the start, a maximum of 16 (EIA)	Mid 2010	$1.2 billion (EIA), €0.9 billion (Brower, Medgaz)

Note: Agreement signed in 2001, feasibility study completed in 2002, under construction since 2007, underwater part was finished in 2008, to be commissioned in 2010. It will also supply gas to France; plan for a parallel electric line. EIA Algeria, March 2007; EIA, Iberian Peninsula, June 2006; EIA France, April 2007; Nicholls 2007; Brower 2007; *Medgaz.com*

1.3 Gas Pipelines Projects in Development

Pipeline	Pipeline Route	Transit Coun-tries	Consortium	Length (km)	Capacity (billion m3/y)	Possible Operational Start-up	Estimated Cost
Galsi[1]	Hassi R'Mel (Algeria) / Sardegne / Pescaia (Italy)		Sonatrach: 38% Edison: 16% Enel: 13.5% Wintershall: 9% Hera: 10% Région Sardegna/Sfirs: 10%	900, of which 600 is offshore	8 (Brower, Galsi, Nicholls) 10 was initially expected (Brower)	2012 (Galsi, Nicholls)	$2 billion (EIA)
Trans-Sahara Gas Pipeline, TSGP/Trans-African Gas Pipeline/ NIGAL[2]	Warri (Nigeria) / Hassi R'Mel (Algeria), then Beni Saf or ElKala	Niger	Trans-Saharan Natural Gas Consortium (NIGEL): Sonatrach Nigerian National Petroleum Cooperation	4,128, of which: Nigeria: 1,037 Niger: 841 Algeria: 2,310	20 to 30	2015	(more than) $10 billion

Notes: 1. Operational start date initially expected for 2009-2010, agreement signed in 2002, feasibility study completed in 2005, intergovernmental agreement of November 14, 2007; alternative route via Corsica; plan for a parallel electric line. EIA Algeria, March 2007; EIA Italy, May 2006; Nicholls 2007; Brower 2007; *Mem-algeria.org*; *Edison.it* 2. Feasibility study conducted by PENSPEN/IPA. EIA Algeria, March 2007; EIA Nigeria, April 2007; O'Neill 2007.

2. Gas Pipelines in the North Sea

2.1 Existing Gas Pipelines

Pipeline	Route	Consortium	Length (km)	Diameter (inches)	Capacity (billion m3/y)	In Service Since
Europipe I [1]	Draupner E (Norway offshore) / Emden (Germany)	Owner: Gassled Operator: Gassco	660	40	13-16	1995
Europipe II [2]	Kårstø (Norway) / Dornum (Germany)	Owner: Gassled Operator: Gassco	650	42	22	1999
Norpipe Gas[3]	Ekofisk (Norway offshore) / Emden (Germany)	Owner: Gassled Operator: Gassco	440	36	13-16	1977
Zeepipe I [4]	Sleipner (Norway offshore) / Zeebrugge (Belgium)	Owner: Gassled Operator: Gassco	814	40	13-15	1993
Franpipe[5]	Draupner E (Norway offshore) / Dunkirk (France)	Owner: Gassled Operator: Gassco	840	42	16	1998
Langeled (northern leg)[6]	Nyhamna (Norway) / Sleipner (Norway offshore)	Owner: Gassled Operator: Gassco	600	42	20	October 2007
Langeled (southern leg)[7]	Sleipner (Norway offshore) / Easington (UK: England)	Owner: Gassled Operator: Gassco	600	44	20	October 2006
Vesterled[8]	Heimdal (Norway) / St Fergus (UK: Scotland)	Owner: Gassled Operator: Gassco	350	32	12-13	1978
Frigg[9]	Alwyn North-Frigg (Norway offshore) / St Fergus (UK: Scotland)	Total	472	24/32	13	1977
Tampen Link[10]	Statfjord B (Norway offshore) / FLAGS tie-in (United Kingdom offshore)	Statoil: 43.9% ExxonMobil: 18.2% Shell: 12.2% StatoilHydro: 10.5% ConocoPhillips: 8.2% Petoro: 7%	23	32	9	October 2007
Tyra West-F3 [11]	Tyra West (Denmark offshore) / F3-FB (Netherlands offshore)	Owners: DONG Energy: 50% Shell Danmark: 23% Moller-Maersk: 19.5%	100	26		2004

Pipeline	Route	Consortium	Length (km)	Diameter (inches)	Capacity (billion m3/y)	In Service Since
		ChevronTexaco Denmark: 7,5% Operator: Maersk Oil&Gas				
Ireland Scotland Gas Inter-connector/Inter-connector 1[12]	Moffat (UK: Scotland) / Loughshinny (Ireland)	Bord Gáis Eireann	290, of which 200 is offshore	30 onshore, 24 offshore		1993
Interconnector 2[13]	Beattock (UK: Scotland) / Gormanston (Ireland)	Bord Gáis Eireann	195 offshore	36 onshore, 30 offshore		2002

Notes: 1. Gassled: Petoro 38.245%, Statoil 20.180%, Norsk Hydro Produksjon 11.620%, Total E&P Norge 8.086%, ExxonMobil Exploration and Production Norway 5.298%, Mobil Development Norway 4.267%, Norske Shell Pipelines 4.140%, Norsea Gas 2.839%, Norske ConocoPhillips 1.946%, Eni Norge 1.574%, A/S Norske Shell 1.115%, DONG E&P Norge 0.690%; Gassco: 100% Norwegian state. Facts 2007; *Gassco.no*; *Npd.no*
2. Facts 2007; *Gassco.no*; *Npd.no*
3. Facts 2007; *Gassco.no*; *Npd.no*
4. Zeepipe II A and B link Kollsnes to Draupner. Facts 2007; *Gassco.no*; *Npd.no*
5. Facts 2007; *Gassco.no*; *Npd.no*
6. Construction costs: $10 billion (for both branches, EIA). EIA UK, May 2006; EIA Norway, August 2006; Facts 2007; *Gassco.no*; *Statoil.com*; *Npd.no*
7. EIA UK, May 2006; EIA Norway, August 2006; Facts 2007; www.gassco.no; www.statoil.com; www.npd.no
8. Facts 2007; *Gassco.no*; *Statoil.com*; *Npd.no*
9. EIA UK, May 2006; EIA Norway, August 2006; *Total-icop.co.uk*; *Npd.no*
10. Connects with the British FLAGS system for export towards St Fergus (United Kingdom). Facts 2007; *Gassco.no*; *Npd.no*
11. *Shell.com*
12. *Subsea.org*; *Nationalgrid.com*; *Atkinsglobal.ie*; *Bordgais.ie*
13. *Subsea.org*; *Bordgais.ie*

3. United Kingdom – Continental Europe Interconnectors

Pipeline	Pipeline Route	Consortium	Length (km)	Dia-meter (inches)	Capacity (billion m3/y)	In service since
Balgzand Bacton Line (BBL)1	Balgzand (Netherlands) / Bacton (UK: England)	Gasunie: 60% E.ON Ruhrgas Transport: 20% Fluxys: 20%	235	36	15	1/12/2006
UK Interconnector 2	Zeebrugge (Belgium) / Bacton (UK: England)	Caisse de dépôt et placement du Québec: 23.5% CDP Investissements (Canada): 10% Distrigas: 11.41% Electrabel: 5% E.ON Ruhrgas: 15.09% Gazprom: 10% ConocoPhillips: 10% ENI: 5% Fluxys: 10%	230	40	Zeebrugge-Bacton: 25.5 Bacton-Zeebrugge: 20	1/10/1998

Notes: 1. With agreement on the entrance of Gasuni in Nord Stream, Gazprom obtained an option to buy 9% of BBL. The capacity is to be increased up to 19 bcm before the end of 2010. EIA UK, May 2006; *Bblcompany.com*, *Upstreamonline.com*
2. *Interconnector.com*; EIA UK, May 2006

4. Gas Pipelines in The Baltic Sea

4.1 Existing Gas Pipelines

Pipeline	Pipeline Route	Transit Coun-tries	Consortium	Length (km)	Diameter (inches)	Capacity (billion m3/y)	In service since
Oresund[1]	Dragor (Denmark) / Limhamn (Sweden)		Swedegas	20		2	1985

Note: 1. *Nord-stream.com*

4.2 Gas Pipelines under Construction

Pipeline	Pipeline Route	Transit Countries	Consortium	Length (km)	Diameter (inches)	Capacity (billion m3/y)	Estimated Operation Start-up	In service since
Nord Stream[1]	Vyborg (Russia)/ Greifswald (Germany)		Gazprom: 51% Wintershall: 20% E.ON Ruhrgas: 20% Gasunie 9%	1,200 (off-shore)	48	27.5 (1 pipe) 55 (2 pipes)	1st line: 2011 2nd line: 2012	€7.4 bn (Nord-stream site)

1. Initial agreement of September 8, 2005 signed by Gazprom, E.ON, BASF; agreement of November 6, 2007 gives Gasunie an option to buy 9% (4.5% of Wintershall and 4.5% of E.ON); exports expected to the United Kingdom (BBL) and Denmark; buying contract signed in December 2007 (in billion m3/y): Wingas (9), Gazprom Marketing & Trading (UK) (4), E.ON Ruhrgas (4), GdF (2,5), Dong (DK).
(1); Project of European Interest (TEN) since 2000, priority project since 2002; NEL and OPAL will transport the gas from Greifswald on; multiple branches were/are under discussion: toward Poland, Sweden, Latvia, Finland, Kaliningrad; Nord Stream received authorizations from Sweden, Finland and Denmark. Construction of the first line started in April 2010. EIA Russia, April 2007; EIA Germany, December 2006; Lang 2007; Eurasia Daily Monitor, Volume 4, Issue 209, November 9, 2007; *Diploweb.com*; Cohen 2006; *Nord-stream.com*.

4.3 Gas Pipelines Projects in Development

Pipeline	Pipeline Route	Transit Coun-tries	Consortium	Length (km)	Dia-meter (inches)	Capacity (billion m3/y)	Esti-mated Ope-ration Start-Up	Estimated Cost
Balticconnector[1]	Helsinki (Finland)/Paldiski (Estonia)		Gasum Eesti Gaas Latvijas Gaze Gazprom	80-120		2	2011 at the earliest (Gasum) 2014 (BFAI)	€100-120 million (Gasum)
Baltic Pipe[2]	Copenhagen (Denmark)/Poland		Energinet.dk Gaz-System	250		8-10 (Lang)	2011	€1 billion (Lang)
Baltic Gas Interconnector (BGI)[3]	Rostock (Germany)/Ave-dore (Denmark)/ Trelleborg (Sweden)		ENERGI E2 (ex-DONG Energy) Hovedstadsregionens Naturgas (HNG) Verbundsnetz Gas E.ON Sverige Göteborgs Energi Lunds Energi Öresundskraft	220	28-32	3 at start 10 at the finish (Nord Stream)	2012	€232-284 million (BGI in 2001)
Mid-Nordic Gas Pipeline[4]	Skogn (Norway) /Finland	Sweden	Pohjolan Voima Oy	880, of which: Norway: 70 Sweden: 335 Offshore: 220 Finland: 255	16-24	2.8-4.7 (PVO)	2010 at the earliest (PVO in 2002)	€1 billion (PVO)

Pipeline	Pipeline Route	Transit Coun-tries	Consortium	Length (km)	Dia-meter (inches)	Capacity (billion m3/y)	Esti-mated Ope-ration Start-Up	Estimated Cost
Skanled[5]	Karsto (Norway) / Rafnes / Sweden / Denmark. 'Exit points' expected at Rafnes (Norway), Lysekil, Vallby Kile, Bua (Sweden) and Jutland (Denmark)	-	Skagerak Energi: 20% E.On Ruhrgas: 15% PgNiG: 15% Energinet.dk: 10% Hafslund: 10% Ostfold Energi: 10% Göteborg Energi: 8% Agder Energi: 5% Swedegas: 5% Preem Petroleum: 2%	800	20-26	Maximum 20 (Gassco/DNV) 20-24 (Energinet.dk)	October 2012	€900 million (Gassco) $1,1 billion (EIA)

Notes:
1. Would extend the existing pipeline between Latvia and Estonia, in order to connect Finland to stocked reserves in Latvia. Feasibility study completed in May 2007, study on environmental impacts was expected in 2008. *Gasum.fi*; *Nord-stream.com*; *Upstreamonline.com*; *Bfai.de*
2. First project in 2001, abandoned, started up again in 2007; was expected to extend Skanled in order to transport Norwegian gas toward Poland, but the project was reviewed in 2010 after the suspension of Skanled; now it is designed to export the gas from the planned LING terminal in Poland. *Energybusiness-review.com*; *Energinet.dk*; *Nord-stream.com*
3. Construction authorizations given by Sweden and Denmark.The decision of Germany was expected in 2006. EIA Germany, December 2006; Nord Stream June 2007; *Balticgas.com*; *Nord-stream.com*
4. Pipeline project that was designed to transport Norwegian natural gas from the Haltenbanken area across Sweden and the Gulf of Bothnia to Finland. From the start, the project was considered too expensive.
5. In April 2009 the Skanled Project group decided to suspend the project due to commercial and economic uncertainties. *Gassco.no*; *Energinet.dk/*

5. Gas Pipelines on the European Continent

5.1 Existing Gas Pipelines

Pipeline	Pipeline Route	Transit Countries	Consortium	Length (km)	Dia-meter (inches)	Capacity (billion m3/y)	In Service Since
Trans-Euro-pean Natural Gas Pipeline (TENP)[1]	Netherlands / Italy	Germany, Swit-zerland	Trans Europa Naturgas Pipeline: E.ON 51% ENI 49%	968	35-37	16	1974 Upgraded in 1978 and 2009
Germany / Poland[2]	Zgorzelec					1	1992

Notes: 1. Currently transports Dutch gas, but could also transport Algerian or Libyan gas to Germany. EIA Germany, December 2006; EIA Italy, May 2006; *Eni.it*
2. Heinrich, 2007

5.2 Gas Pipelines under Construction

Pipeline	Pipeline Route	Transit Countries	Consortium	Length (km)	Dia-meter (inches)	Capacity (billion m3/y)	Estimated Operation Start-Up	Estimated Cost
Ostsee Pipeline Anbindungs/ Leitung (OPAL)[1]	Greifswald (Germany) / Olbernhau (Germany)		Wingas 80%, E.ON 20%	470	55	36	2011	

1. Construction of the pipeline began in 2009. It will connect Nord Stream with JAGAL, STEGAL and Gazela. *Osw.waw.pl*; *Wingas.de*; *Opal-pipeline.com*

5.3 Gas Pipelines Projects in Development

Pipeline	Pipeline Route	Transit Coun-tries	Consortium	Length (km)	Dia-meter (inches)	Capacity (billion m3/y)	Estim-ated Operation Start-Up	Estimated Cost
Bernau / Police[1]	Bernau (Germany) / Police (Poland)		Bartimpex E.ON Ruhrgas PGNiG VNG			2.5 at the beginning 5 maximum (EIA)		
Nord-deutsche Erdgas Leitung (NEL)[2]	Greifswald (Germany) / Achim/Rehden (Germany) / Netherlands		Wingas 70% E.ON 10% Gasunie 20%	370	48	20	2012	€ 1billion

Notes:
1. Discussions on the pipeline were suspended by the Polish side in spring 2006. The talks ended with the refusal of PGNiG to participate in the project in 2009. Lang 2007; EIA Germany, December 2006; EIA North-Central Europe, February 2006, Interfax.
2. The pipeline would connect Nord Stream with the gas pipeline Rehden-Hamburg and thus West Germany, the Netherlands, and the United Kingdom. A final investment decision has not yet been made, as talks with Germany's network operator on regulatory conditions are still ongoing. Gasunie joined the project in June 2010. *Osw.waw.pl*; *Wingas.de*; *Upstreamonline.com*

6. Gas Pipelines between Russia and Europe via Ukraine, Belarus, and Finland

6.1 Existing Gas Pipelines

Pipeline	Pipeline Route	Transit Coun-tries	Consortium	Length (km)	Dia-meter (inches)	Capacity (billion m3/y)	In service since
Yamal-Europe I[1]	Torzok / Yamal (Russia) / Frankfurt (Oder) (Germany)	Belarus, Poland	Gazprom for the Russian and Belarusian sections EuRoPol Gaz (48% Gazprom, 48% PGNiG, 4% Polish Gas-Trading S.A.) for the Polish section	4,187 of which is in Russia: 2,932 Belarus: 575 Poland: 680	56	31 (EIA) 33 (Gazprom, Yafimava / Stern) 35 (Lang) 33 in Belarus, 20 in Poland (Victor&Victor)	Belarus-Poland: 1997 Russia-Belarus: Septem-ber 1999
Northern Lights /Beltransgaz/ Siyaniye Severa[2]	Urengoy (Russia) /Uzhgorod (Ukraine)	Belarus	Gazprom for the Russian section Beltransgaz for the Belarusian section	4,500		25 (Victor&Victor) 14 in Belarus (Yafimava / Stern)	1983
Finland Connector[3]	Russia / Finland					20 (Victor&Victor)	1973, enlarged in 1999
Bratstvo (North) /Transgas (Slovakia / Czech Rep. branch)[4]	Russia / Germany	Ukraine, Slovakia, Czech Republic, Austria	Gazprom for the Russian section	2,750		30 (Victor&Victor)	1967
Bratstvo (South) /Trans-Balkan[5]	Russia / Turkey	Ukraine, Moldova, Romania, Bulgaria	Gazprom for the Russian section			20 (Victor&Victor)	1967

Pipeline	Pipeline Route	Transit Coun-tries	Consortium	Length (km)	Dia-meter (inches)	Capacity (billion m3/y)	In service since
Urengoy[6]	Urengoy (Russia) / Germany / Austria	Ukraine, Slovakia, Czech Republic	Gazprom for the Russian section	5,000		40 (Victor&Victor)	1984
Progress /Yamburg[7]	Russia / Ukraine		Gazprom for the Russian section			30 (Victor&Victor)	1986
Soyuz /Orenburg[8]	Russia / Ukraine		Gazprom for the Russian section			30 (Victor&Victor)	1978
Poland / Ukraine[9]	Drozdowicze					6 (GTE)	
Ustilug /Hrubieszow[10]	Ustilug (Ukraine) / Hrubieszow (Poland)		PGNiG, Naftogaz	17		Up to 0.5 (Lang)	2005
Sachsen /Thüringen /Erdgasleitung (STEGAL)[11]	St. Katharinen (Czech Republic) / Reckrod (Germany)		Wingas	322	32	17	1992
Mitteleuro-päische Gasleitung (MEGAL)[12]	MEGAL-North: Czech Republic / Medelsheim (Germany) MEGAL-South: Oberkappel (Austria) / Schwandorf (Germany)		E.ON	467 (MEGAL North) 161 (MEGAL South)	32	15	1979
Trans Austria Gasleitung (TAG)[13]	Baumgarten (Austria) / Arnoldstein (Austrian-Italian border), branch toward Slovenia		ENI 89%, OMV 11%	380		32	

Pipeline	Pipeline Route	Transit Coun-tries	Consortium	Length (km)	Dia-meter (inches)	Capacity (billion m3/y)	In service since
Hungaro-Austria-Gasleitung (HAG)[14]	Baumgarten (Austria) / Györ (Hungary)		OMV, MOL	120 of which: Hungary: 70 Austria: 50		4.4 (MOL)	
West-Austria-Gasleitung (WAG)[15]	Baumgarten (Austria) / Oberkappel (Austrian-German border)		OMV	245			
Budapest-Belgrade[16]	Budapest (Hungary) / Belgrade (Serbia)		MOL			3.3 (MOL)	

Notes: 1. Extended to Germany by JAGAL; branches towards the Baltic states. EIA North-Central Europe, February 2006; EIA Russia, April 2007; Heinrich 2007; Lang 2007.
2. Joins up with Bratstvo in Ukraine. Russia, April 2007; EIA Ukraine, August 2007; Victor&Victor 2004; Yafimava / Stern 2007.
3. Victor&Victor 2004
4. EIA North-Central Europe, February 2006; EIA Russia, April 2007; EIA Ukraine, August 2007; EIA Turkey, October 2006; Victor&Victor 2004.
5. Branch towards Greece. EIA North-Central Europe, February 2006; EIA Russia, April 2007; EIA Ukraine, August 2007; Victor&Victor 2004.
6. EIA Russia, April 2007; EIA Ukraine, August 2007; Victor, Jaffe, Hayes 2006; Victor & Victor 2004.
7. EIA Russia, April 2007; EIA Ukraine, August 2007; Victor & Victor 2004.
8. Joins up with Bratstvo in Ukraine. EIA Russia, April 2007; EIA Ukraine, August 2007; Victor & Victor 2004.
9. Lang 2007; *Gie.eu.com*
10. Lang 2007; *Przeglad-techniczny.pl*
11. Capacity increased in 2006; imports Russian gas to Germany. EIA Germany, December 2006; *Wingas.de*
12. MEGAL-Sud connects with MEGAL-Nord in Schwandorf; transports Russian gas to Germany and France. EIA Germany, December 2006.
13. Reuters May 17, 2007; *Taggmbh.at* 14. *Mol.hu* 15. *Bog-gmbh.at* 16. *Mol.hu*

6.2 Gas Pipelines under Construction

Pipeline	Pipeline Route	Transit Coun-tries	Consortium	Length (km)	Dia-meter (inches)	Capacity (billion m3/y)	Esti-mated Ope-ration Start-Up	Estimated Cost
Gryazovets / Vyborg[1]	Gryazovets (Russia) / Vyborg (Russia)		Gazprom	917	56		2011	€ 2.8-5.3 (EEGAS)
Novopskov / Uzhgorod[2]	Novopskov (Ukraine) / Uzhgorod (Ukraine)					Max.19 (EIA)	2009	$2.2-2.8 billion (EIA)
Arad / Szeged[3]	Arad (Romania) / Szeged (Hungary)		Transgaz	109 of which: Roma-nia: 62 Hun-gary: 47	27.5	4.4	07.2010	

Notes:
1. To connect Nord Stream to Unified Gas Supply System of Russia (UGSS); Construction began on December 9, 2005. *Gazprom.com*
2. The pipeline is part of the bigger Aleksandrov Gay-Novopskov-Uzhgorod pipeline designed by the RUS-UA consortium; signed in 2003. Construction of its Bogorodchany-Uzhgorod section (240 km) started in 2006 but was later frozen. In 2010, Ukraine proposed returning to the project for exporting Central Asian gas to Europe. EIA Ukraine, August 2007, RBK-news 2010.
3. EIA South-eastern Europe, August 2006; *Crib.mae.ro*, *Newsin.ro*

6.3 Gas Pipelines Projects in Development

Pipeline	Pipeline Route	Transit Coun-tries	Consortium	Length (km)	Dia-meter (inches)	Capacity (billion m3/y)	Esti-mated Ope-ration Start-Up	Estimated Cost
Yamal-Europe II (northern section)[1]	Yamal Peninsula (Russia) / Torzok (Russia)		Gazprom	2,500		80 (Götz)		$20-40 billion (Götz)
Yamal-Europe II (western section)[2]	Torzok (Russia) / Frankfurt (Oder) (Germany)	Belarus, Poland	Gazprom for the Russian part, Poland	1,600		33 (Götz, EIA)	2010	$2.5 billion (Götz) $10 billion(EIA)
Amber[3]	Russia / Germany	Latvia, Lithuania , Poland						

Notes:
1. Goetz 2004
2. Poland and Russia are not in agreement on the route in Poland: Gazprom wants a pipeline towards Slovakia/Central Europe, Poland wants a pipeline toward Germany; its construction is unlikely after the decision on Nord Stream. EIA North-Central Europe, February 2006; EIA Russia, April 2007; Lang 2007.
3. Alternative to Nord Stream, proposed by Poland, Ukraine and Baltic states in 2004; construction unlikely. Götz 2005.
7. Gas pipelines between the Caspian region and Russia

7.1 Existing Gas Pipelines

Pipeline	Pipeline Route	Transit Coun-tries	Consortium	Length (km)	Dia-meter (inches)	Capacity (billion m3/y)	In service since
Caspian Coastal pipeline / PreCaspian[1]	Turkmenistan / Russia	Kaza-khstan	Gazprom for the Russian section			5 (EDM) an increase of 20 is expected for 2012	
Central Asia-Center (CAC)[2]	Caspian Sea region (Turkmenistan) / Eastern Turkmenistan / Southern Uzbekistan / Alexandrov Gay (Russia)	Kaza-khstan, Uzbe-kistan	Gazprom for the Russian section	2,750		45 (EDM), 45 or 54 (Rousselot)	1974

Notes:
1. In a very poor state; renovation of the pipeline and an increase in capacity to 20 billion m3/y expected in 2012 according to an agreement in May 2007, or the construction of a new pipeline that would go parallel to the existing one. Eurasia Daily Monitor November 26, 2007; Pirog 2007.
2. Agreement on modernizing and increasing the capacity to 65 billion m3/y by building a parallel line was signed in May 2007; transports mainly Turkmen gas, but also Kazakh and Uzbek gas. EIA Kazakhstan, October 2006; EIA, Central Asia, September 2005; EIA Caspian Sea, January 2007; Eurasia Daily Monitor November 26, 2007; Petroleum Economist July 2007; Götz 2004; Rousselot 2007.

8. Gas Pipelines Connecting Russia and States of the Former Soviet Union with Europe, via Turkey or the Black Sea

8.1 Existing Gas Pipelines

Pipeline	Pipeline Route	Transit Countries	Consortium	Length (km)	Diameter (inches)	Capacity (billion m3/y)	In service since
Blue Stream[1]	Izobilnoye (Russia) / Ankara (Turkey)		Gazprom, ENI, Botas	1,218 of which: Russia: 357 Offshore: 378 Turkey: 483	47/55 onshore 24 Offshore	'design capacity': 16 quantities transported in: 2004: 3 2005: 5 2006: 7 (EIA, energypublisher) for 2010,16 is expected (RFE)	December 2002 official inauguration in November 2005
Baku-Tbilisi-Erzurum (BTE) / South Caucasus Pipeline (SCP) / Shah-Deniz-Pipeline[2]	Shaz Deniz (Azerbaijan) / Ezurum (Turkey)	Georgia	Owners: BP: 25.5% Statoil: 25.5% SOCAR: 10% Lukoil: 10% Total: 10% OIEC: 10% TPAO: 9% Operators: BP and Statoil	883 of which: Azerbaijan: 442 Georgia: 248 Turkey: 193	42	6.6 at the start could increase to 20 (EIA) maximum capacity 30 (EDM)	15 December 2006
Turkey-Greece Interconnector / Aegean / South European Gas Ring Project[3]	Karacabey (Turkey) / Komotini (Greece)		Botas, DEPA	286	36	0.75 at start, 11 by finish (Biresselioglu) 0.25 at start (NYT), 12 by finish (Reuters)	18 November 2007

Notes: 1. Construction costs: $3.2 billion, $1.7 billion of which is for the offshore part; debates on the extension toward Italy or Hungary (via Bulgaria and Romania, cost estimated at €5 billion) were replaced by South Stream project; Turkey quit delivering via Blue Stream in March 2003, began deliveries again in December 2003. EIA Russia, April 2007; EIA Turkey, October 2006; International Herald Tribune March 3, 2007; RFE/RL. August 27, 2007; *Energypublisher.com*; Pirog 2007.

2. Parallel to the BTC, construction costs $1.0-1.3 billion. EIA Azerbaijan, December 2007; EIA Caspian Sea, January 2007; EIA Turkey, October 2006; *Bp.com*; EDM May 8, 2006.
3. Transports Azerbaijani gas, via Baku-Tbilisi-Erzurum; construction costs $300 million; will be extended (by Greece-Italy), to form the Turkey-Greece-Italy Interconnector (TGI). EIA Italy, May 2006; *Edison.it*; Biresselioglu 2007a; Biresselioglu 2007b; *Reuters.com*

8.2 Gas Pipeline Projects in Development

Pipeline	Pipeline Route	Transit Countries	Consortium	Length (km)	Dia-meter (inches)	Capacity (billion m3/y)	Esti-mated Ope-ration Start-Up	Estimated Cost
Trans-caspian[1]	Turkmenistan / Turkey	Azerbaijan, Georgia	Botas	1,700 of which 230 is offshore		31(EIA)		$2-3 billion (EIA)
Nabucco[2]	Turkish/Georgian border and/or Iranian/Turkish border / Baumgarten (Austria)	Turkey, Bulgaria, Romania, Hungary	OMV: 16.67% MOL: 16.67% Transgaz: 16.67% Bulgargaz: 16.67% Botas: 16.67% RWE 16.67	around 3,300	56	initial capacity up to 8 maximum capacity 31 (Nabucco)	2014	around €7.9 billion (Nabucco) $5.35-5.8 billion (EIA)
South Stream[3]	Beregovaya (Russia) / Black Sea / Varna (Bulgaria) / Italy (and Austria)	Bulgaria and Greece (+Albania) + Ionian Sea or Romania / Hungary / Slovakia or ex-Yugoslavia	South Stream AG: Gazprom, ENI for offshore part Numerous JVs between Gazprom and energy companies for onshore part	900 (off-shore)		30 (Petroleum Economist, Platts)	2015	$12 billion (Brower 2007) $10 billion (Global Insight) €10 billion (Platts) €20 (Russian Energy Ministry 2008)

Pipeline	Pipeline Route	Transit Countries	Consortium	Length (km)	Dia-meter (inches)	Capacity (billion m3/y)	Esti-mated Ope-ration Start-Up	Estimated Cost
White Stream / Georgia-Ukraine-EU (GUEU)[4]	Georgia / EU	Caspian region / Black Sea / Ukraine / Poland-Lithuania-Slovakia; Alternative: offshore up to Romania	GUEU – White Stream Pipeline Company: Pipeline Systems Engineering (PSE) Radon-Ishizumi consulting	950 of which: Georgia (Tbilisi-Supsa): 100 Offshore : 650 Ukraine: 200	42 in Georgia, 24 offshore, 20 in the Crimea	8 to begin 24-32 if connected to the Trans-Caspian Gas Pipeline (of which the realization is uncertain, PGJ)	2016	$2 billion (PGJ)
Greece-Italy-Interconnector / South European Gas Ring Project / Poseidon[5]	Komotini (Greece) / Ottranto (Italy)		IGI Poseidon S.A: DEPA 50%, Edison 50%	800 of which: Greece: 600 Offshore : 200		8 (EIA, Platts)	2011-2012	$1,3 billion (EIA)
Trans-Adriatic Pipeline (TAP)[6]	Saloniki (Greece) /Brindisi (Italy)	Albania	EGL 42.55% Statoil 42.55% E.ON 15%	520 of which 117 is offshore	48 onshore, 36 offshore	10, expandable to 20 (TAP)	2012	€100-150 million (TAP)
Ionian / Adriatic pipeline[7]	Vlore (Albania) / Ploce (Croatia)	Monte-negro	EGL, Plinacro	400 of which: Albania: 170 Montenegro: 100 Croatia: 130	28	5 (Plinacro)	2011-2012	€230 million (energypublisher)

Notes: 1. Construction agreement signed by Botas (1999), but terminated because of the discovery of Shah Deniz and of Russia's and Iran's opposition; EIA Turkey, October 2006; EIA Caspian Sea Region: Reserves and Pipelines, July 2002.

2. IGA signed by Austria, Bulgaria, Hungary, Romania, and Turkey in July 2009. The final investment decision is expected by end 2010. Construction is to be started by end 201. EIA Iran, August 2006; EIA Turkey, October 2006; *Nabucco-pipeline.com*; EIA North-Central Europe, February 2006; *Bundestag.de*; www.nabucco-pipeline.com; Stuttgarter ZeitungDecember 4, 2007; Brower 2007; Bauchard/Therme 2007.
3. Gazprom and ENI signed an MoU on June 23, 2007; EDF signed in 2009 an MoU with ENI and Gazprom on 10% participation in the project. Preliminary agreements signed with Bulgaria, Hungary, Serbia, Greece, Croatia, Slovenia, Turkey. Bulgaria's newly elected government suspended the implementation of all Russian projects in the country. Like Hungary, it prioritized Nabucco project. www.energypublisher.com; Platts; Global Insight, *South-stream.info*
4. The pipeline would split from the South Caucasus Pipeline, and would initially transport gas from Shah Deniz. Pre-feasibility study was partially financed by TEN-E, feasibility study is expected by end 2010, if enough funds are provided. Georgia signed an MoU with White Stream Pipeline Company Ltd. Eurasia Daily Monitor, Issue 226, December 7, 2006; *Pipelineandgasjournal.com*
5. The feasibility study, funded by the European Commission, was conducted in 2003. IGA between Greece and Italy was signed in 2005. Construction was expected to begin in 2009, but the environmental impact assessment was submitted to the Greek Energy Ministry only in November 2009; 80% of gas transported will be reserved for Edison and 20% for DEPA. EIA Italy, May 2006; www.edison.it; Biresselioglu, *Igi-poseidon.com* 2007a; Biresselioglu 2007b; *Reuters.com*
6. Feasibility study concluded in March 2006; in May 2010 an MoU was signed with Albania; marine and onshore surveys were conducted. *Trans-adriatic-pipeline.com*
7. Declaration of intention signed by ministers of the three countries involved on September 25, 2007; EGL and Plinacro signed an MOU; the pipeline would be connected to the Trans-Adriatic pipeline. *Energypublisher.com*; *Doingbusiness.ro*

9. Gas Pipelines Connecting Iran to Europe

9.1 Existing Gas Pipelines

Pipeline	Pipeline Route	Transit Coun-tries	Consortium	Length (km)	Dia-meter (inches)	Capacity (billion m3/y)	In service since
Iran / Turkey[1]	Tabriz (Iran) / Ankara (Turkey)		Botas for Turkey	1,200		14 actual deliveries: 2.8-4.2 (EIA)	January 2002

Notes:
1. Turkey complained of the poor quality and recurrent interruptions of deliveries; interruptions due to technical problems and attacks by separatist Kurds on the pipeline; Turkish-Greco agreement to extend the pipeline toward Greece. EIA Iran, August 2006; EIA Turkey, October 2006; Stuttgarter Zeitung December 4, 2007.

9.2 Gas Pipeline Projects in Development

Pipeline	Pipeline Route	Transit Countries	Consortium	Length (km)	Capacity (billion m3/y)	Estimated Operation Start-Up	Estimated Cost
Sarmatia[1]	Iran / Poland	Turkey, Black Sea, Ukraine					

Note: Very vague idea, layout would be partly parallel with Odessa-Brody-Plock. Lang 2007.

10. Gas Pipelines in Central Asia – Asia

10.1 Existing Gas Pipelines

Pipeline	Pipeline Route	Transit Countries	Consortium	Length (km)	Dia-meter (inches)	Capacity (billion m3/y)	In service since
Central Asia–China gas pipeline (CAGP) Phase 1/Turkme-nistan–China gas pipeline[1]	Gedaim (Turkmenistan)/ Horgos (China)	Uzbekistan Kazakhstan		1,833, of which: Turkmenistan 188 Uzbekistan 530 Kazakhstan 1,115	42	40 (when the phase 2 completed by 2012)	December 2009

Note: Initial idea between China and Kazakhstan arose in 2003. Agreement between Kazakhstan and China on construction was signed in 2006. Turkmenistan joined the project in 2007. The gas will come from Turkmenistan, Uzbekistan and Kazakhstan when the Beyneu-Bozoy-Kzylorda-Shymkent branch (Phase 2) is launched. *Cnpc.com.cn*, *Ogj.com*

10.2 Gas Pipelines under Construction

Pipeline	Pipeline Route	Transit Countries	Consortium	Length (km)	Dia-meter (inches)	Capacity (billion m3/y)	Esti-mated Opera-tion Start-Up	Estimated Cost
East-West Pipeline[1]	Shatlyk (Turkmenistan) / Belek (Turkmenistan)		Turkmengaz / Turkmennebitgazgurlushyk (Turkmen Oil and Gas Construction)	750-900	56	30		€ 2 (Interfax)

Note: Construction began on May 31, 2010. The line is projected to run from the main gas fields in the country's east, to the Turkmen Caspian shore in the west.

10.3 Gas Pipeline Projects in Development

Pipeline	Pipeline Route	Transit Countries	Consortium	Length (km)	Capacity (billion m3/y)	Estimated Operation Start-Up	Estimated Cost
Altai gas pipeline[1]	Urengoy (Russia) / Xinjiang (China)			2,800		2011	$ 14 billion

Note: MoU on gas deliveries signed in 2006 between Russia and China. The project was suspended due to price issue.

VIII. Transit Fees

Transit fees for natural gas are the subject of recurring debates in certain countries, such as Ukraine and Belarus. Negotiations often take place at the same time as negotiations over the price of gas that transit countries must pay to the supplier. There are different models of price setting, some of which are not straightforward or clear. These agreements are not always published, or only partially disclosed. The transit fees indicated here are thus incomplete.

- Belarus: $1.45 / 1000 m3 / 100 km (agreement of Dec. 31, 2006, for Northern Lights)
- Bulgaria: $1.66 / 1000 m3 / 100 km (ECS 2006)
- Georgia: 5% of gas in transit (ECS 2006)
- Morocco (Pedro Duran Farell): 5-7% of gas in transit (ECS 2006)
- Poland: €380 million/y (estimation in Heinrich 2007), $2.47 / 1000 m3 / 100 km (in 2004, ECS 2006)
- Czech Republic: $2.9 / 1000 m3 / 100 km (ECS 2006)
- Russia: $1.7 / 1000 m3 / 100 km (agreement of Dec. 6, 2007, to be paid by Ukraine for transport of Turkmen gas)
- Tunisia (Enrico Mattei): 5.25% for the first 12.4 billion m3/y, 6% for the next two million m3/y, 6.75% for volume over 14.4 billion m3/y (APS); 5-7% of transported gas (ECS 2006); $25 million/y (Hayes)
- UK Interconnector: $2.12 / 1000 m3 / 100 km (ECS 2006)
- Ukraine: $2.7 / 1000 m3 / 100 km (agreement of Jan. 19, 2009)

Comparison table for transporting 350 km (ECS 2006, p. 65, €/hour/year):

- Austria (Penta West): €96/m3/h/y
- Belgium (Fluxys): €78/m3/h/y
- Poland (Yamal): €71/m3/h/y (estimation)
- Germany (Wingas): €63/m3/h/y
- Slovakia (SPP): €62/m3/h/y
- UK Interconnector: €55/m3/h/y (estimation)
- Bulgaria: €43/m3/h/y (estimation)
- Russia: €28/m3/h/y (estimation)

- Ukraine: €28/m3/h/y
- Belarus (Yamal): €19/m3/h/y (estimation)
- Belarus (Northern Lights): €12/m3/h/y (estimation)

Ukraine

Imported gas originating from Russia: 182 billion m3 in 2006 (RAMSES 2008)

Transit through Ukraine

- Technical/theoretical capacity: 140-175 billion m3/y, (Götz e-mail), 155 billion m3/y (Victor & Victor 2004), 140 billion m3/y (Götz 2004), 170 billion m3/y (Denysyk/Parmentier 2007), around 40 billion m3/y of unused capacity
- Gas transported through Ukrainian territory: 128.4 billion m3 in 2006, 116.8 billion m3 in 2007, 119 billion m3 in 2008, 93 billion m3 in 2009 (UkrTranzGas, according to EIA)
- 80% to 90% of Russian gas exports to Europe goes through Ukrainian territory (Denysyuk/Parmentier 2007), 80% (RFE/RL Dec. 5, 2007, Ukraine-Analysen 2)

Evolution of transit fees

- $1.09375 / 1000 m3 / 100 km (agreement of summer 2004)
- $1.6 / 1000 m3 / 100 km (agreement of Jan. 4, 2006)
- $1.7 / 1000 m3 / 100 km (agreement of Dec. 6, 2007)
- $2.7 / 1000 m3 / 100 km from 2010 (agreement on Jan 19, 2009)

IX. LNG Terminals in Europe and in Nearby Supplier Countries

Regasification terminals in the EU

Source: Gas Infrastructure Europe, European Commission, *Ec.europa.eu*

1. Status of EU-25 Regasification Terminals by Country, in 2010

Country	Existing	Under construction	Planned	Total
Belgium	1	0	0	1
Cyprus	0	0	1	1
Croatia	0	0	1	1
Estonia	0	0	1	1
France	3	0	4	7
Germany	0	0	1	1
Greece	1	0	1	2
Ireland	0	0	1	1
Italy	2	1	10	16
Latvia	0	0	1	1
Lithuania	0	0	1	1
Netherlands	0	1	2	3
Poland	0	0	1	1
Portugal	1	0	0	1
Spain	6	3	0	9
Sweden	0	1	1	2
Turkey	2	0	0	2
UK	3	1	4	8
Total	12	12	39	63

Maximum Capacity of EU-25 Regasification Terminals in 2006 (in Bcm)

Country	Existing	Under construction	Total	Proposed
Belgium	4.5	4.5	9.0	-
Cyprus	-	-	-	0.7
France	14.8	8.3	23.1	16.0
Germany	-	-	-	10.0
Greece	2.3	4.3	6.6	n.a.
Ireland	-	-	-	n.a
Italy	3.5	16.0	19.5	84.2
Latvia	-	-	-	n.a.
Netherlands	-	-	-	>12.0
Poland	-	-	-	3.0
Portugal	5.2	-	5.2	3.3
Spain	39.9	12.8	52.7	>9.6
Sweden	-	-	-	n.a.
UK	4.6	26.5	31.1	>18.9
Total	74.8	72.4	147.2	-

Regasification terminals in Europe and in nearby supplier countries

Sources: California Energy Commission (maps), October 2007, *Energy.ca.gov*; King & Spalding, LNG in Europe, 2006, *Kslaw.com*, Stagnaro Oil and Gas Journal July 9, 2007, company websites.

1. LNG terminals (liquefaction) in Europe and in nearby supplier countries in 2006

1.1 Existing LNG terminals (liquefaction)

- Algeria (4): Skikda, Arzew, Alger, Bettioua
- Egypt (2): Damietta, ELNG (Abu Qir)
- Libya (1): Mjarsa Al-Brega
- Norway (1): Snovit (Melkoya/Hammerfest)

1.2 LNG terminal projects (liquefaction) under development/proposed

- Algeria: Gassi Touil, Tinrhert
- Egypt: West of Diametta, Mediterranean South-East (offshore)
- Kazakhstan: banks of the Caspian Sea (South-West Kazakhstan)
- Libya: Ghadames, Sirte Ras Lanuf, Sirte Murzuq, North-East

- Morocco: North-West Morocco
- Norway: Nordic LING (South-West Norway)
- Russia: Shtokman (Murmansk), Ust-Luga (Baltic LING, St Petersburg region), second project in St Petersburg region, South Tambey, Yamal Peninsula

2. LNG terminals (regasification) in Europe

2.1 Existing LNG terminals (regasification)

- Belgium (1): Zeebruge
- Spain (6): Barcelona, Bilbao, Cartegena/Murcia, El Ferrol, Huelva, Sagunto/Valencia
- France (2): Fos-sur-Mer, Montoir-de-Bretagne
- Greece (1): Revithoussa
- Italy (1): Panigaglia
- Portugal (1): Sines
- United Kingdom (2): Isle of Grain, Teesside
- Turkey (2): Marmara Ereglisi, Izmir/Aliagla

2.2 LNG terminals (regasification) under construction

- France: Fos Cavaou
- United Kingdom: Dragon LNG Milford Haven, South Hook Terminal Milford Haven
- Italy: Brindisi, North Adriatic LNG offshore Rovigo, Isola Porto di Levante, Rosignano Maritomo, Livorno

2.3 LNG terminal (regasification) projects in development/proposed

- Albania: Fieri
- Germany: Wilhelmshaven, Rostock
- Cyprus: Vassiliko
- Croatia: Omisalj
- Spain: Gijon, Canary Islands, Granadilla de Abona (Tenerife)
- France: Le Verdon, Dunkirk, Antifer, Bordeaux
- Ireland: Shannon

- Italy: Augusta, Castiglione della Pescaia, Corigliano Calabro, Gioia Tauro, Livorno offshore, Muggia, Porto Empedocle, Porto Torres Sassari, San Ferdinando, Taranto, Trieste offshore, Trieste Zaule, Vado Ligure

- Lithuania: undefined location on the Baltic Sea

- Netherlands: Gate Terminal Rotterdam, LionGas Terminal Rotterdam, Eemshaven, Maasvlakte or Groningen

- Poland: Swinoujscie, Gdansk

- Romania: Constanta

- Sweden: Brunnsviksholmen

- United Kingdom: Anglesey, Barrow, Canvey Island,1 East Irish Sea, Morecambe Bay, Teesside offshore

- Turkey: Ceyhan, Izkenderun

- Ukraine: undefined location on the Black Sea

[1] Former regasification terminal of Canvey Island, Thames Estuary, opened in 1959; activity halted in 1994.

X. Oil and Gas Pipelines to Turkey

1. Gas Pipelines

1.1 Existing Gas Pipelines

Pipeline	Pipeline Route	Transit Coun-tries	Consortium	Length (km)	Dia-meter (inches)	Capacity (billion m3/y)	In service since
Bratstvo (south) / Trans-Balkan[1]	Russia / Turkey	Ukraine, Moldova, Romania, Bulgaria	Gazprom for Russian section			20 (Victor&Victor)	1987 (arrival of gas in Turkey)
Blue Stream[2]	Izobilnoye (Russia) / Ankara (Turkey)		Gazprom, ENI, Botas	1,218 of which: Russia: 357 Offshore: 378 Turkey: 483	47/55 onshore 24 offshore	"design capacity": 16 quantities transported in: 2004: 3 2005: 5 2006: 7 (EIA, energypublisher) for 2010,16 is expected (RFE)	December 2002 official inauguratio n in 2005
Baku-Tbilisi-Erzurum (BTE) / South Caucasus Pipeline (SCP) / Shah-Deniz-Pipeline[3]	Shaz Deniz (Azerbaijan) / Ezurum (Turkey)	Georgia	Owners: BP: 25.5% Statoil: 25.5% SOCAR: 10% Lukoil: 10% Total: 10% OIEC: 10% TPAO: 9% Operators: BP and Statoil	883 of which: Azerbaijan: 442 Georgia: 248 Turkey: 193	42	6.6 at the start could increase to 20 (EIA) maximum capacity 30 (EDM)	15 Decemb er 2006
Iran / Turkey[4]	Tabriz (Iran) / Ankara (Turkey)	-		1,200		14 actual deliveries 2.8 to 4.2 (EIA)	January 2002

Notes: 1. Branch toward Greece. EIA North-Central Europe, February 2006; EIA Russia, April 2007; EIA Ukraine, August 2007; Victor & Victor 2004.

2. Construction costs: $3.2 billion, of which $1.7 billion is for the offshore section; debates over an extension towards Italy or Hungary (via Bulgaria and Romania, cost estimated at €5 billion); Turkey stopped delivering via Blue Stream in March 2003, started again in December 2003. EIA Russia, April 2007; EIA Turkey, October 2006; International Herald Tribune March 12, 2007; RFE/RL August 27, 2007; www.energypublisher.com; Pirog 2007.
3. Parallel to the BTC, construction costs: $1-1.3 billion. EIA Azerbaijan, December 2007; EIA Caspian Sea, January 2007; EIA Turkey, October 2006; *Bp.com*; EDM May 8, 2006.
4. Turkey complained of the poor quality and recurrent interruptions of deliveries; interruptions due to technical problems and attacks by separatist Kurds on the pipeline; Turkish-Greco agreement to extend the pipeline toward Greece. EIA Iran, August 2006; EIA Turkey, October 2006; Stuttgarter Zeitung December 4, 2007.

1.2 Gas Pipeline Projects in Development

Pipeline	Pipeline Route	Transit Countries	Consortium	Length (km)	Dia-meter (inches)	Capacity (billion m3/y)	Esti-mated Ope-ration Start-Up	Estimated Cost
Nabucco1	Turkey / Georgia border and/or Iran / Turkey border / Baumgarten (Austria)	Turkey, Bulgaria, Romania,	OMV: 20% MOL: 20% Transgaz: 20% Bulgargaz: 20% Botas: 20%	around 3,300	56	initial capacity up to 8 maximum capacity 31 (Nabucco)	2012	around €5 billion (Nabucco) $5.35 to 5., 8 billion (EIA)
Transcaspian2	Turkmenistan / Turkey	Azerbaijan, Georgia	Botas	1,700 of which 230 is offshore		31 (EIA)		$2-3 billion (EIA)
Iraq / Turkey3	Kirkuk (Iraq) / Ceyhan (Turkey)		Botas, TPAO					
Syria / Turkey4	Aleppo (Syria) / Kilis (Turkey)			64			2011	$71 million (EAMGCC)
Samsun / Ceyhan5	Samsun (Turkey) / Ceyhan (Turkey)		Botas, TPAO					

Notes: 1. RWE could join the project; GdF was also interested; definitive construction decision carried forward in Q1 2008. EIA Iran, August 2006; EIA Turkey, October 2006; EIA North-Central Europe, February 2006; *Bundestag.de*; *Nabucco-pipeline.com*; Stuttgarter Zeitung December 4, 2007; Brower 2007.
2. Construction agreement signed by Botas in 1999, but terminated because of the discovery of Shah Deniz; EIA Turkey, October 2006; EIA Caspian Sea Region: Reserves and Pipelines, July 2002.
3. Route would be parallel to the existing Kirkuk-Ceyhan oil pipeline. Fink 2006.
4. Part of a greater Arab gas pipeline. Agreement (January 2008) to transport Egyptian gas to Turkey. The contract for construction was granted to Stroytransgaz in 2008, but canceled in 2009 because of a fall in energy prices and Syria's hope to get a better deal. Pipeline ix expected to be completed by 2011. OGJ Daily Update January 15, 2008, EAMGCC 2010.
5. Idea to construct a gas pipeline parallel to the oil pipeline currently in development, which would make transport by boat possible, while avoiding the Bosphorus detour. Fink 2006.

2. Oil Pipelines

2.1 Existing Oil Pipelines

Oil Pipeline	Pipeline Route	Transit Coun-tries	Consortium	Length (km)	Dia-meter (inches)	Technical Capacity	Petroleum Trans-ported	Transit Fees	In Service Since
Baku-Tbilissi-Ceyhan (BTC)[1]	Baku (Azerbaijan) / Ceyhan (Turkey)	Georgia	BTC Pipeline Company BP: 30.1% AzBTC: 25% Chevron: 8.9% Statoil: 8.71% TPAO: 6.53% Eni: 5% Total: 5% Itochu: 3.4% INPEX: 2.5% ConocoPhillips: 2.5% Amerada Hess: 2.36%	1,768 of which: Azerbaijan: 443 Georgia: 249 Turkey: 1,076	46/42/ 34	1 million bbl/d for 2008-2009 (EIA) 1 million bbl/d (ECS) 50 million t/y (Götz)	32.8 million tones in 2008 38.2 million tones in 2009	Fees for members of the consortium, for transporting from Sangachal to Ceyhan, is $3.3/bbl (2005-10), $4.6/bbl (2010-16), $5.5/bbl (2016-29).	May 2005
Strategic Pipeline (North-South system)[2]	Iraq / Turkey		State Oil Marketing Organization (Iraq)			1.4 million bbl/d (EIA)	Currently 0 (EIA)		1975
Kirkuk/ Ceyhan[3]	Kirkuk (Iraq) / Ceyhan (Turkey)		State Oil Marketing Organization (Iraq)	966	1st line: 40 2nd line: 46	1st line: 1.1 million bbl/d 2nd line: 500,000 bbl/d (EIA)	150,000-550,000 bbl/d in 2006 (EIA)		

Notes: 1.Construction costs: $3.9 billion. *Bp.com*; EIA Azerbaijan, August 2006; EIA Caspian Sea, January 2007; EIA Turkey, October 2006; *Iea.org*
2. Taken out of service in 1990/1991; Northern Oil Company (Iraq) estimated in 2003 that it would take a long time to get the pipeline running again. EIA Iraq, June 2006.

3. Private military companies are in charge of the security of the pipeline, which has been the target of numerous attacks. Currently, the pipeline only functions sporadically. EIA Iraq, June 2006.

2.2 Oil Pipelines under Construction

Oil Pipeline	Route	Transit Countries	Consortium	Length (km)	Diameter (inches)	Capacity	Expected Operational Start-up	Estimated Cost
Samsun-Ceyhan Pipeline (SCP) / Trans-Anatolian Pipeline[1]	Samsun (Turkey) / Ceyhan (Turkey)	-	Trans-Anadolou Pipeline Company (TAPPCO): ENI: 50% Calik Energy: 50% Rosneft Transneft	555	42-48	initial capacity: 1 million bbl/d “design capacity”: 1,5 million bbl/d (Calik/ENI)	2012	$1,5 billion (Calik/ENI) $ 3 billion (Sechin Russian Energy Minsiter May 2010)

Notes:
1. Start of construction: April 24, 2007. Will transport Russian petroleum, which will arrive in Samsun by boat. Russian companies joined the project in 2009. EIA Turkey, October 2006; RIA 24/04/2007; *Iea.org*; *Eni.it*

2.3 Oil Pipeline Projects in Development

Oil Pipeline	Route	Transit Coun-tries	Consortium	Length (km)	Dia-meter (inches)	Capacity	Expected Operational Start-up	Estimated Cost
Kiyiköy / Ibrikhaba, Trans-Thrace[1]	Kiyiköy (Turkey) / Ibrikhbaba (Turkey)	-	OJSC AK Transneft	193	48	60 million t/y		0,9 billion $(Götz)
Trans-caspian[2]	Turkme-nistan / Azerbaijan / Turkey		KazMunayGaz SOCAR	700				

Notes:
1. Goetz 2004; *Simdex.com*; Alexanders September 1, 2004
2. According to Vladimir Socor, Turkmenistan and Kazakhstan would be able to construct underwater pipelines without needing the agreement of the other countries in the area: for example, a pipeline that connects the Turkmen platform deck Block 1 with the Azerbaijani fields, Azeri-Chirag-Guneshli. Kazakhstan could construct a pipeline linked to this system that would not be considered 'trans-Caspian' in a legal sense. The pipeline is still in feasibility-study phase in 2010. Petroleum Economist, Pipeline Oil & Gas Journal.

XI. Table of Maps, Graphs and Tables

Maps

Graphs

Tables

XII. Bibliography

1. General documents

1.1 Reference documents and general statistics

European Commission and SG/HR Javier Solana (2006), "An External Policy to Serve Europe's Energy Interests", document from the Commission and the SG/HR to the European Council, available on *Ec.europa.eu*. European Commission (2005), "EU-Russia Energy Dialogue", a sixth joint progress report, available *Ec.europa.eu*

(2008) Communication – *Second Strategic Energy Review: An EU Energy Security and Solidarity Action Plan*, available on *Ec.europa.eu*

(2007) Communication – *An Energy Policy for Europe*, available on *Ec.europa.eu*

(2005), *Green Paper*: "Energy Efficiency or Doing More with Less", available on *Ec.europa.eu*

(2005), *Energy + Transport in Figures*, available on *Ec.europa.eu*

(2003) Communication – *The Development of Energy Policy for the Enlarged European Union, Its Neighbors, and Partner Countries*, available on *Ec.europa.eu*

(2000) *Green Paper:* "Towards a European Strategy for the Security of Energy Supply", available on *Ec.europa.eu*

The European Neighborhood policy - Overview, available on *Ec.europa.eu*

Devlin, B. (2004), *International Perspectives Regarding Security of Supply – Development within EU*, Istanbul.

Directorate-General Energy and Transport of the European Commission, Seminar on Natural Gas in South East Europe, May 5, 2004.

Directorate-General Energy and Transport of the European Commission, EU Energy Security and Solidarity Action Plan: Second Strategic Energy Review, available on *Ec.europa.eu*

*Directorate-General for External Relations of the European Commissio*n (2007), External Energy Policy, available on *Ec.europa.eu*

Eurostat (2004), *Energy: Yearly Statistics – 2002*, available on *Epp.eurostat.ec.europa.eu*

Interstate Oil and Gas Transport to Europe (2003), Maps – Crude oil pipelines, available on *Ec.europa.eu*

Linde, C. (van der) (2007), “Old fears and new dilemmas in a larger Union”, in A. Sapir, *Fragmented Power: Europe and the Global Economy*, Brussels, Bruegel Books.

Official Journal of the European Union (2009), Council Directive 2009/119/EC, available on *Eur-lex.europa.eu*

Official Journal of the European Union (2009), Regulation (EC) no. 663/2009, available on *Eur-lex.europa.eu*

Official Journal of the European Union (2006), Directive 2005/89/EC, available on *Eur-lex.europa.eu*

US Energy Information Administration (EIA): *Regional Indicators: European Union* (EU), available on *Ec.europa.eu*

1.2. Web pages on energy

Energy Charter: *Encharter.org*

European Commission on Energy: *Ec.europa.eu/energy*

Directorate-General for Energy and Transport: *Ec.europa.eu*, International Relations, Oil, Gas, Coal, Trans-European Energy Networks.

Jamestown foundation: *Jamestown.org*

Interstate Oil and Gas Transport to Europe: *Inogate.org*

Oil&Gas Journal: *Ogj.com*

Petroleum Economist: *Petroleum-economist.com*

US Energy Information Administration: *Eia.doe.gov*

1.3. Research centers

Centre for European Policy Studies (2007), *The EU-Russia WTO Deal: Balancing Mid-term and Longer-term Growth Prospects?* CEPS, available on *Ceps.be*

CGEMP

CERA

Clingendael Netherlands Institute of International Relations, Clingendael Energy Papers.

Clingendael International Energy Program (2004), *Natural Gas Supply for The EU in the Short to Medium Term*, The Hague, Clingendael Institute, March.

Clingendael International Energy Program (2004), “Study on Energy Supply Security and Geopolitics”, final report for the DG TREN, The Hague, Cligendael Institute, January.

Econergy/EPU-NTUA/Mediterranean Programme/Centre Robert Schuman/Oxford Institute for Energy Studies (2005), *EUROGULF: An EU-GCC Dialogue for Energy Stability and Sustainability,* European University Institute, available on *Ec.europa.eu*

European Policy Centre (EPC) (2004), “EU Energy Supply Security and Geopolitics”, in EPC Dialogue, October 4.

European Policy Centre (EPC) (2005), *Energy Security – A European Perspective*, Policy Briefing.

Geden, O., Marcelis, C. and Maurer, A. (2006), *Perspectives for the European Union's External Energy Policy*, Berlin, German Institute for International and Security Affairs, December 17.

Indiana University Southeast, *World Energy Reserves (Fossil Fuels)*, available on *Groupsites.ius.edu*

Jong, J. (de) (2004), “The Regional Approach in Establishing the Internal EU Electricity Market”, The Hague, CIEP, December.

Stern, J. (CIES) (2006), T*he Russian-Ukrainian Gas Crisis of January 2006*, Oxford, Oxford University Press, January.

Willenborg, R., Toenjes, C. and Perlot, W. (2004), E*urope’s Oil Defences. An Analysis Of Europe’s Oil Supply Vulnerability and its Emergency Oil Stockholding Systems*, The Hague, Cligendael Institute, January.

2. General energy questions

2.1. General information

Baillie, R. (2006), “Europe Seeks Secure Energy Supply as Russia Turns up Heat”, *Jane's Intelligence Review*, n°18, December, p. 6-10, III.

BP (2007), *Statistical Review of World Energy 2007*, London, BP.

BP (2010), *Statistical Review of World Energy June 2010*, London, BP: *Bp.com*

Cohen, A. (2005), “Increasing the Global Transportation Fuel Supply”, *Executive Memorandum*, n°986, Washington DC, The Heritage Foundation.

Davis, M. (ed.) (2005), “Ukraine: The Impact of Higher Natural Gas and Oil Prices”, *World Bank report*.

Eurostat (2007), *Energy: Yearly Statistics 2005*, Brussels, European Commission, available on *Epp.eurostat.ec.europa.eu*

Favennec, J.-P. (2007), G*éopolitique de l’énergie. Besoins, ressources, échanges mondiaux*, IFP Publications, Paris, Technip.

Foreign Policy in Dialogue (2007), “Dealing with Dependency. The European Union's Quest for a Common Energy Foreign Policy”, *Foreign Policy in Dialogue*, Volume 8, Issue 20, January, available at *Deutsche-aussenpolitik.de*

Helm, D. (ed.) (2007), *The New Energy Paradigm*, Oxford, Oxford University Press.

Handke, S., and de Jong, J. (2007), “Energy as a Bond: Relations with Russia in the European and Dutch Context”, CIEP Energy Paper, The Hague, Clingendael Institute, available at *Clingendael.nl*

Kneissl, K. (2006), *Der Energiepoker: Wie Erdöl und Erdgas die Weltwirtschaft beeinflussen*, Munich, FinanzBuch Verlag.

Mandil, C. (2008), “Sécurité énergétique et Union Européenne. Propositions pour la présidence française”, Prime minister’s report, April 21, Paris.

Tsakiris, T.G. (2006), “The Eurasia Energy Complex”, *Defense & Foreign Affairs – Strategic Policy*, February, available on *Global.nexislexis.com*

2.2. Oil and gas – general

Chevalier, J.M. and Stanislaw, J. (2004), *Les Grandes batailles de l’énergie,* Gallimard, Paris.

Chevalier, J.M. and Percebois, J. (2007), *Gaz et électricité: un défi pour l’Europe et pour la France*, Paris, Rapport du Conseil d’analyse économique (CAE), La Documentation française, October.

Davoust, R. (2008), *Gas Prices Formation, Structure and Dynamics*, Paris, note de l’ifri, Programme Gouvernance européenne et géopolitique de l’énergie, available on *Ifri.org*

Jong, J. (de), Toenjes, C. (2007), *Perspectives on Security of Supply in European Natural Gas Markets*, Working Paper, n°8/2007, The Hague, Clingendael Institute.

Hirschhausen, C. (von), Neumann, A. and Rüster, S. (2007), “Competition in Natural Gas Transportation? Technical and Economic Fundamentals and an Application to Germany”, *Globalization of Natural Gas Markets Working Papers*, Dresden, EFET Germany.

2.3. Oil in general (world market)

Chautard, S. (2007), *Géopolitique et pétrole*, Levallois-Perret, Studyrama.

Cordesman, A. and Al-Rodhan, K. (2006), *The Global Oil Market: Risks and Uncertainties*, Washington DC, CSIS Press.

Lestrange, C. (de), Paillard, C.A. and Zelenko, P. (2005), *Géopolitique du pétrole: un nouveau marché, de nouveaux risques, des nouveaux mondes*, Paris, Technip.

Moreau Defarges, P. (2006), “Le pétrole ? Un produit finalement comme les autres”, *Etudes*, vol.405, n°5, November, p.453-463.

Sébille-Lopez, P. (2006), *Géopolitiques du pétrole*, Paris, Armand Colin.

Stent, A. (1982), “Soviet Energy and Western Europe”, *The Washington Papers*, n° 90, New York, Praeger.

Soares de Oliveira, R. (2007), *Oil and Politics in the Gulf of Guinea*, New York, Columbia University Press.

2.4. Natural Gas – General

Angelier, J.P. (2006), "Géopolitique du gaz: les défis et les chances", *Politique internationale*, n° 111, p. 387-400, Paris, spring.

Blagov, S. (2006), Russian Moves Spark "Gas OPEC" Fears, Zurich, International Relations and Security Network Security Watch, available at *Isn.ethz.ch*

Clingendael International Energy Program (2003), *The Role of Liquefied Natural Gas (LING) in the European Gas Market*, The Hague, Clingendael Institute, CIEP Energy Paper, June, available on *Clingendael.nl*

Cohen, A. (2007), *Gas OPEC: A Stealthy Cartel Emerges*, Washington DC, The Heritage Foundation, WebMemo", n° 1423.

Czernie, W. (2006), *Structural Change in the European Gas Industry: Risks and Opportunities*, World Energy Council, available at *Worldenergy.org*, June.

Goetz, R. (2007), *Europa und das Erdgas des kaspischen Raums*, Berlin, SWP Diskussionspapier, available on *Swp-berlin.org*

Harks, E. (2006), "The Conundrum of Energy Security – Gas in Eastern and Western Europe", *The International Spectator* vol.46, n°3, available on *Eu-consent.net*

Lohmann, H. (2006), T*he German Path to Natural Gas Liberalisation: Is it a Special Case?*, Oxford, Oxford Institute for Energy Studies, available on *Oxfordenergy.org*

Victor, D., Jaffe, A. and Hayes, M. (ed.) (2006), *Natural Gas and Geopolitics. From 1970 to 2040*, Cambridge, Cambridge University Press.

2.5. Transport/Transport infrastructure/Transit/History

Brower, D. (2007), "Laying the Pipes", Petroleum Economist, October-November.

Dickel, R., Goenul, G., Gould, T., Kanai, M., Knonplyanik, A., Selivanova, Y., and Jensen, J. (2007), *Putting a Price on Energy: International Pricing Mechanisms for Oil and Gas*, Brussels, Energy Charter Secretariat (ECS).

Dickel, R. and Goenul, G. (2007), *Transit of Gas: Monitoring Report on the Implementation of the Transit Provisions of the ECT*, Brussels, ECS.

Dickel, R. and Khitarishvili, T. (2007), *Transit of Oil: Monitoring Report on the Implementation of the Transit Provisions of the ECT*, Brussels, ECS.

Dickel, R., Bielecki, J. and Gönul, G. (2006), *Gas Transit Tariffs in Selected ECT Countries*, Brussels, ECS.

Energy Charter (2007), *From Wellhead to Market: Oil Pipeline Tariffs and Tariff Methodologies in Selected Energy Charter Member Countries*, Brussels, Energy Charter Secretariat, available on *Encharter.org*

Gustafson, T. (1985), *Negotiating Strategy: The East-West Gas Pipeline Deal, 1980-1984*, Santa Monica, The Rand Corporation.

King & Spalding (2006), *LNG in Europe: An Overview of European Import Terminals*, Houston (Texas)/London.

Kneissl, K. (2006), "Die Politik der Pipelines", *Österreichische Militärische Zeitschrift*, n°3/2006 (Bundesministerium für Landesverteidigung).

Laffont, P. and Simonet, L. (2005), "La charte de l'énergie et le transit des matières premières: trop loin ? trop tôt ?" in *Annuaire français de droit international,* Paris, CNRS, p. 524-541.

Lange, K.O. (2007), *Polens Energiepolitik, Interessen und Konfliktpotentiale in der EU und im Verhältnis zu Deutschland*, Berlin, Stiftung Wissenschaft und Politik (SWP), SWP Studie, n° 13.

Simonet, L. (2007), "Les pipelines internationaux, vecteurs de prospérité, de puissance et de rivalités: oléoducs et gazoducs dans la géopolitique et les relations internationales", *Revue internationale et stratégique*, n°65, January-March 2007, p. 51-62.

Research Center for the Institute of Privatization and Management – German Economic Team in Belarus (2004), *Belarus as a Gas Transit Country*, Buenos Aires, Argentine Center of International Studies.

Smedley, M. (2006), "What Diverse New Gas Flows Might Get Into Europe", *World Gas Intelligence*, January 11, available on *Global.nexislexis.com*

Victor, D. and Victor, N. M. (2004), *The Belarus Connection: Exporting Russian Gas to Germany and Poland*, Stanford, James A Baker III Institute for Public Policy, Stanford University, Working paper 26.

3. Regional features

3.1. Norway

Ministry of Petroleum and Energy and Norwegian Petroleum Directorate (2007), *Facts 2007: The Norwegian Petroleum Sector*, available on *Npd.no*

Austvik, O.G. (2006), "Oil and Gas in the High North – A Perspective from Norway", *Security Policy Library*, n°4, September.

Godzimirski, J. (2007), "Grands enjeux dans le Grand Nord. Les relations Russie-Norvège et leurs implications pour l'UE", *Russie.Nei.Visions*, n° 25, December, Paris, Ifri.

Lie, J. (2005), *The Energy Resources of the High North; a framework for a dialogue about the prospects of German-Norvegian Cooperation,* Draft report 2004-05.

3.2. Baltic Sea/Nord Stream

Cohen, A. (2006), *The North European Gas Pipeline Threatens Europe's Energy Security*, Backgrounder, n°1980, Washington DC, The Heritage Foundation, October.

Goetz, R. (2005), *Die Ostseegaspipeline: Instrument der Versorgungssicherheit oder politisches Druckmittel?,* Berlin, SWP, SWP-Aktuell, n° 41, available on *Swp-berlin.org*

Larsson, R. (2007), "Nord Stream, Sweden and Baltic Sea Security", Stockholm, FOI, March, available on *Foi.se*

3.3. Caucasus/Black Sea/Caspian Sea/Nabucco/South Stream

Crandall, M. (2007), "Prospects for New Caspian Natural Gas and Oil Export Routes", Ifri, Paris, November.

European Commission (2007) "Black Sea Synergy – A New Regional Cooperation Initiative", COM(97) 597 final. Communication on Regional Cooperation in the Black Sea Area.

Eurasian Energy Task Force, 2nd session of seminar series, November 2007, Paris, Ifri (not published).

Fischer, S. (2007), *Verrat an Europa? Ungarns pragmatische Energieaussenpolitik im Spannungsfeld von Diversifizierung und Versorgungssicherheit*, Discussion paper, Berlin, SWP, August 19, available on *Swp-berlin.org*

Goetz, R. (2007b), *Europa und das Erdgas des kaspischen Raums*, Berlin, SWP, Discussion paper, August 13, available on *Swp-berlin.org*

Revue française de géopolitique (2006), "Géopolitique de la Turquie" (Special issue), n° 4, p. 5-144.

International Energy Agency (1998), *Caspian Oil and Gas: The Supply Potential of Central Asia and Transcaucasia*, Paris, OECD.

Janusz, B. (2005), *The Caspian Sea: Legal Status and Regime Problems*, London, Chatham House, Briefing Paper, available on *Chathamhouse.house.org.uk*

Leeuw, C. (van der) (2000), *Oil and Gas in the Caucasus and Caspian: A History*, Richmond (Surrey), Curzon Press.

Roberts, J. (2003), "Caspian Oil and Gas: How Far Have We Come and Where Are We Going?" in Cummings S. (ed.), *Oil, Transition and Security in Central Asia*, London, RoutledgeCurzon.

Southeast European and Black Sea Studies (2007), "The Wider Black Sea Region and Energy Security", (Special Issue), vol.7, n°2, June, p. 213-302.

3.4. Russia, CIS and projects

Bradshaw, M. (2006), "Sachalin-II in der Schusslinie", *Russland Analysen*, Brême, n° 116, November.

Fadeev, A. (2007), "The Energy Crisis Between Moscow and Minsk", *International Affairs*, vol.53, n°3, p. 96-103.

Finon, D. and Locatelli, C. (2007), "Russian and European Gas Interdependence. Can Market Forces Balance out Geopolitics?" *Cahier de recherche* n°1/2007, Grenoble, January, Laboratoire d'économie de la production et de l'intégration internationale, available at *Upmf-grenoble.fr*

Fredholm, M. (2005), *The Russian Energy Strategy & Energy Policy: Pipeline Diplomacy or Mutual Dependence*?, CRSC Paper n°05/41, Camberley, Conflict Studies Research Center.

Gray, J. and Soria, E. (2004), "Extending Druzhba Still Makes Sense for More Russian Oil Exports", *Oil and Gas Journal*, vol.102, n°13, April 5.

Goetz, R. (2004), *Russlands Erdöl und Erdgas drängen auf den Weltmarkt*, SWP Studie, n°34, Berlin, SWP, available at *Swp-berlin.org*

Gomart, T. and Kastouéva-Jean, T. (ed.) (2006/2007), Russie.Nei.Visions, Paris, Ifri, available at *Ifri.org*

Liuhto, K. (2010), "Energy in Russia's foreign policy", Electronic Publications of Pan-European Institute, Turku School of Economics.

Locatelli, C. (2008), "L'UE: aiguillon des stratégies de Gazprom ?" *Russie.Nei.Visions*, n°26, February, Paris, Ifri.

Paszyc, E., Loskot-Strachota, A. and Antas, L. (2007), "Nord Stream: The current status and possible consequences of the project's implementation", Warsaw, Center for Eastern Studies, *East Week*, n°104, November 14, available at *Osw.waw.pl/en/eindex.htm*

Paillard, C.-A. (2007), "Gazprom: Mode d'emploi pour un suicide énergétique", *Russie.Nei.Visions*, n°17, March, Paris, Ifri.

Pirani, S., (2009), *The Impact of the Economic Crisis on Russian and CIS Gas Markets*, Oxford Institute for Energy Studies, November 2009.

Pirani, S., Stern, J., Yavimava, K. (2010) "The April 2010 Russo-Ukrainian gas agreement and its implications for Europe", NG 42, Oxford Institute for Energy Studies, June 2010.

Pirovska, M., (2004), *Libéralisation et élargissements: Impacts sur l'organisation industrielle des marchés du gaz naturel en Europe de l'Est*, thèse de doctorat (ed. J.-M. Chevalier), Paris, Université Paris-Dauphine.

Pleines, H. (2006), “Die Energiefrage in den russisch-ukrainischen Beziehungen”, *Russland Analysen*, n°116, November, Bremen.

Smith, K.C. (2006), *Current Implications of Russian Energy Policies,* available at <action-ukrainereport.blogspot.com>

Stern, J. (2005), *The Future of Russian Gas and Gazprom*, Oxford, Oxford University Press.

Stulberg, A. (2007), *Well-Oiled Diplomacy: Strategic Manipulation and Russia's Energy Statecraft in Eurasia*, Albany, State University of New York Press.

Thumann, M. (2006), “Diversification des sources – la meilleure stratégie pour les relations énergétiques UE-Russie”, *Russie.Nei.Visions*, n°10, May, Paris, Ifri.

3.5. Turkey

Biresselioglu, M.E. (2007), *Projects and Possibilities: Turkey's Future Role as a Transit Country for Central Asian and Caspian Natural Gas to the EU*, available at *Balkanalysis.com*

Biresselioglu, M.E. (2007), “South European Gas Ring Project: Turkey and Greece‘s Role”, Thessalonic, Center of International Politics Thessaloniki.

Energy Charter Secretariat (2007), “Oil Pipeline Tariffs and Tariff Methodologies in Selected Energy Charter Member Countries”, Brussels, Energy Charter Secretariat, available at *Encharter.org*

Energy Charter Secretariat (2006), “Gas Transit Tariffs in Selected Energy Charter Treaty Countries”, Brussels, Energy Charter Secretariat, available at *Encharter.org*

ETSO (2008), “ETSO Overview of Transmission Tariffs in Europe – Synthesis 2007,” Brussels, European Transmission System Operator.

Fink, D. (2006), *Assessing Turkey’s Future as an Energy Transit Country*, Research Notes, n°11, July, Washington DC, Washington Institute for Near East Policy.

Futyan, M. (2006), *The Interconnector Pipeline: A Key Link in Europe’s Gas Network*, Oxford, Oxford Institute of Energy Studies, available at *Oxfordenergy.org*

Hayes, M. (2004), Algerian *Gas to Europe: The Transmed Pipeline and Early Spanish Gas Import Projects, prepared for the Geopolitics of Natural Gas Study*, a joint project of the program on Energy and Sustainable Development at Stanford University and the James A. Baker III Institute for Public Policy of Rice University, available at *Rice.edu*

Muizon, G. (de) (2000), *Approvisionnements de la Turquie en gaz et en pétrole: les enjeux régionaux*, Direction des relations

économiques extérieures, Ankara, Les Etudes des Postes d'Expansion Economique, September.

O'Neill, T. (2007), "Curse of the Black Gold: Hope and Betrayal in the Niger Delta", *National Geographic*, February.

Tekin, A. and Walterova, I. (2007), "Turkey's Geopolitical Role: The Energy Angle", *Middle East Policy*, spring issue, vol.14, n°1, p. 84-94.

Ifri's European Governance and the Geopolitics of Energy program

The Program aims to contribute to the emergence of a coherent and sustainable energy and climate policy through seminars, debates, and publications. This series of works covers the principal issues in the energy sector.

Notes de l'Ifri

December 2010 – Bruno Weymuller, *Les perspectives du Shale Gas dans le monde*

October 2010 – Maïté Jaureguy-Naudin, *Wind Power: A Victim of Policy and Politics?*

September 2010 – John Seaman, *Rare Earths and Clean Energy: Analyzing China's upper hand*

March 2010 – *Benjamin Augé, Trans Saharan Gas Pipeline: Mirage or real Opportunity?*

February 2010 – Maïté Jaureguy-Naudin, *Getting Carbon Out: Thougher Than it Looks. An Assessment of EU, US and Chinese Pledges*

January 2010 – Philip Andrews-Speed, *The Institutions of Energy Governance in China*

December 2009 – Cécile Kerebel: *Implementing the EU Climate and Energy Package with the Economic Crisis.*

October 2009 – Igor Tomberg: *Iran in the European Gas Market: a Russian Point of View.*

April 2009 – Sergey Seliverstov: *Energy Security of Russia and the EU: Current Legal Problems.*

May 2008 – Michel Cruciani, Jan H. Keppler, & Cécile Kérébel: *Le 'paquet énergie et climat' du 23 janvier 2008: un tournant pour l'Europe de l'énergie*.

May 2008 – Cécile Kérébel: *Le débat sur les propositions législatives de la Commission européenne concernant l'énergie*.

April 2008 – Pierre Bacher: *Les filières nucléaires*.

April 2008 – Romain Davoust: *Gas Price Formation, Structure & Dynamics.*

April 2008 – Coby van der Linde: *Turning a Weakness into a Strength: A Smart External Energy Policy for Europe.*

March 2008 – Jacques Lesourne: *Regards sur la politique européenne intérieure et extérieure de l'énergie.*

March 2008 – Clément Therme: *L'Iran: exportateur de gaz ?*

October 2007 – Valérie Niquet: *Enjeux énergétiques en Asie.*

September 2007 – Denis Bauchard & Clément Therme: *L'Iran: une puissance énergétique (ré)émergente.*

April 2007 – Jan Horst Keppler: *La sécurité des approvisionnements énergétiques en Europe: principes et mesures.*

Études

Vol 1: *Abatement of CO2 Emissions in the European Union* (2007), Jacques Lesourne & Jan Horst Keppler (ed.), 156 pp.

Vol 2: *L'Énergie nucléaire et les opinions publiques européennes* (2008), Jacques Lesourne (ed.), 141 pp.

Vol 3: *The External Energy Policy of the European Union* (2008), Jacques Lesourne (ed.), 135 pp.

Vol 4: *Gaz et Pétrole en Europe. Perspectives pour les infrastructures* (2008), Susanne Nies, 218 pp.

Vol. 5: *La gouvernance mondiale de l'énergie* (2009), Cécile Kérébel & Ian Horst Keppler

Vol. 6: *Governance of Oil in Africa* (2009), Jacques Lesourne

Vol. 7: *Energy in India's Future: Insights* (2009), Jacques Lesourne & William Ramsay

Vol.8: *At the speed of light? Electricity interconnections for Europe*, Susanne Nies (2009)

Vol. 9: *Ukraine: a Transit Country in Deadlock?* (2010), Susanne Nies.

Vol. 10: *The EU's major electricity and gas utilities since market liberalization* (2010), Christian Schülke

L'« Édito Énergie » also is available on Ifri.org