

*Marina Tsygankova*

## **Netback pricing as a remedy for the Russian gas deficit**

**Abstract:**

This descriptive study discusses the effects of increases in domestic gas prices on the Russian gas market. Domestic natural gas prices have remained below their long-run marginal cost for more than a decade since Russia's movement toward a market economy in 1991. As a result, the ability of the Russian gas sector to meet future growing demand from domestic and foreign consumers has come under question. In an attempt to avoid gas shortages in the future, Russian government wishes to introduce netback pricing of natural gas after 2011. Netback pricing refers to the process of equalizing the gas price in Russia to the gas price in Europe after adjusting for export taxes, transportation costs, and transit tariffs. The paper concludes that netback pricing can help Russia to avoid a gas deficit. However, the gas supply in Russia will remain tight until 2011. The downside of netback pricing is that it increases the ability of Gazprom to strengthen its control over the Russian gas industry.

**Keywords:** Russia, natural gas, netback price, supply shortage, deficit.

**JEL classification:** D40, L11, Q31, Q38.

**Acknowledgement:** Special thanks to Olav Bjerkholt, Eirik Lund Sagen, Knut Einar Rosendahl, Ole Gunnar Austvik, Mads Greaker and Terje Skjerpen for valuable discussions, comments and suggestions.

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# 1. Introduction

Domestic natural gas prices have remained below the long-run marginal cost for more than a decade since Russia began moving toward a market economy in 1991. At the time, it was believed that low domestic gas prices would stimulate Russian economic growth following the collapse of the planned economy. However, the downside of this policy in the longer run has been high growth in domestic natural gas demand, lower efficiency in energy use, and heavy underinvestment in the gas sector. Indeed, during the last decade, Russian gas demand grew faster than the production of Gazprom – the state-controlled gas company, which in 2007 was responsible for around 85% of Russian gas production. As a result, the ability of the Russian gas sector to meet future demands by domestic and foreign consumers has come under question; see, e.g. Milov et al. (2006), IEA (2006a), and Goldthau (2008).

Concerns that future Russian gas supplies will have difficulty in matching demand have forced the Russian government to hasten an increase in domestic gas prices. In May 2007, the Russian government passed a decision that permits Gazprom to sell gas in Russia at so-called netback prices from 2011. Netback pricing refers the equalization of the gas price in Russia to the gas price in Europe after adjusting for export taxes, transportation costs, and transit tariffs. Before 2011, domestic prices will gradually increase in order to reach the netback level in 2011. The announced pattern of price growth until 2011 and the introduction of netback prices indicate that future price increases will be more radical than those previously projected by the Russian government (Russian Energy Strategy, 2003).<sup>1</sup> The hope is that a significant rise in the domestic gas price will help Russia avoid a gas deficit. High gas prices are expected to reduce the growth of domestic gas demand, increase investment in the sector, and stimulate gas production. In addition, higher domestic prices may also affect prospects for structural reform in the Russian gas sector. The structural reforms that would bring greater competition and reduce Gazprom's dominance in the Russian gas industry have been the subject of intensive debate in Russia since 1997. The common consensus is, however, that domestic price increases should precede structural change, see Locatelli (2003), Stern (2005), and Ahrend and Tompson (2005).

This paper aims to provide a qualitative discussion of the main effects the gas price increases that have been announced will have on the Russian gas sector, and seeks to analyze whether they will help the

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<sup>1</sup> Russian Energy Strategy through 2020 is an official document that describes Russia's energy priorities in a long-run perspective, the last final edition of Russian Energy Strategy is published in 2003.

Russian gas industry to avoid a gas deficit. The paper also touches on the effect the higher gas prices may have on the incentives for structural change in the Russian gas sector. The time perspective for the discussion is constrained to the period before 2020. The reason for this is that growth in Russian gas production will only be constrained until production from the Yamal and Shtockman gas fields comes onstream; after this time, concerns about a Russian gas shortage should decrease sharply. There is no doubt that production from Yamal and Shtockman will eventually commence, however supply from these fields before 2020 is less certain than the commencement of supply before, say, 2030.

Russian natural gas is currently consumed in three markets: the Russian domestic gas market, the European gas market and the gas market of the countries of Former Soviet Union (FSU), (in the near future, consumption of Russian gas may also begin in the Asian gas market). Gazprom, independent Russian gas producers and Central Asian countries (Turkmenistan, Kazakhstan and Uzbekistan) are the suppliers of gas in the Russian gas sector. Using a descriptive approach, we discuss how the demand for Russian gas in these markets and the supply potential of the different suppliers will develop in the period before 2020, and the extent to which the announced gas price increase will influence this development. Summarizing this discussion, we then analyze the prospects of a Russian gas deficit. In this paper, a gas deficit is taken to mean a situation when the total demand for Russian gas (from both domestic and foreign consumers) exceeds total supply to the Russian gas sector (domestic gas production plus imports from Central Asia). The various projections of the needs for Russian gas by different consuming markets and the production possibilities of suppliers provide the basis for the discussion of a Russian gas deficit in the paper.

The international literature analyzing the Russian gas market is copious given the importance of Russian gas deliveries for European energy security. Several studies analyze the increase of Russian domestic gas prices in different contexts. For example, Selivanova (2004) discusses Russian gas price increases in the context of negotiation for Russia's accession to the World Trade Organization (WTO) whereas Dudek et al. (2006) discusses the environmental effects of the increase in Russian gas prices. Sagen and Tsygankova (2008) analyze how the increases in Russian gas prices can influence the allocation of the Russian gas supply between Europe and Russia. However, there have been few, if any, previous studies that discuss the effect of the introduction of netback pricing on the Russian gas market in the context of a gas deficit. As already mentioned, Milov et al. (2006) and IEA (2006a) suggest the risk of a shortage in the Russian gas supply. However, the pricing effect is not central to these studies. Spanjer's (2007) study was probably the first to analyze the introduction of netback gas

prices in Russia, though this was in the context of the relationship between Russia and the European Union (EU).

The structure of the rest of the paper is as following. Section 2 provides a description of the current structure of the Russian gas industry. Section 3 describes how the Russian gas sector has functioned and provides insight into the problem of a Russian gas deficit. Section 4 discusses introduction of netback pricing. Section 5 analyzes the ability of higher prices to restrict growth in the demand, and Section 6 analyzes prospects of future Russian gas supply. Section 7 analyzes how netback pricing can affect the capital investment in the sector. Section 8 suggests scenarios of future developments in demand and supply in the Russian gas sector. Section 9 elaborates on the prospects of structural reform. Finally, Section 10 concludes the discussion in the paper.

## **2. The structure of the Russian gas industry**

### **2.1 Gazprom**

The state-controlled gas company Gazprom, established in 1992 from the former Soviet Ministry of Gas Industry, is the dominant player in the Russian gas industry. In 1993, Gazprom was converted into a joint stock company with the government as the main shareholder. From 1993 until 2005, the government's stake in the company changed only slightly, varying between 35% and 40%, however in 2005 the government increased its stake in Gazprom from 38.4% to 51%. The government regulates the gas price, at which Gazprom sales to the domestic consumers.

Gazprom controls most of Russia's gas production and processing. It also owns all of the high-pressure transmission pipelines. Ownership of the transmission system gives Gazprom control over all Russian gas imports from Central Asia and also control over access of non-Gazprom gas producers to the Russian gas transportation system. Gazprom has also the exclusive right to export natural gas to Europe. Although, Gazprom's export monopoly was only officially legalized in 2006, Gazprom has effectively controlled Russian gas exports since its establishment because of its direct ownership of the Russian gas transportation system. Hence, the structure of the Russian gas industry and the logic of its organization have not changed much since Soviet times.

### **2.2 Independent gas producers**

Although Gazprom controls practically the entire Russian gas industry, the Russian domestic gas market can be characterized as a "monopoly with a competitive fringe". "Independent gas producers", as non-Gazprom gas producers are usually called in Russia, already existed when Gazprom was

created, however until 1999 the total share of independent gas production was rather small, at around 6%. This was mostly associated gas from Russian oil companies and natural gas from small regional companies located in distant regions like East Siberia and Far East. After 2000, and following a number of property auctions, purchases and sales in the Russian petroleum sector, the production share of non-Gazprom gas started to rise.

In 2000, Itera became the first independent Russian gas company. Itera's production peaked in 2003 when it produced about 4% of total Russian gas production, however Itera is practically out of the Russian gas market today. Under pressure from Gazprom's new management, it sold the major part of its production assets to Novatek, another independent Russian gas company, and part to Gazprom. In 2004, Novatek took over Itera's position as the largest independent gas producer. Novatek originated in 1994 as a former Soviet pipeline construction enterprise in the Samara region. The company started its own gas production in 2002, and since then its production has steadily increased.

In contrast to the gas industry, the privatization process in the oil industry in 1993 resulted in a competitive market with more than ten vertically integrated oil companies. However, after a number of mergers and takeovers in the Russian oil industry in 2003–2005, competition in the oil industry is now mainly restricted to just four companies: Surgutneftegaz, Rosneft, TNK-BP and Lukoil. These four companies are responsible for nearly all of the gas production from the oil sector. In the beginning, gas produced by oil companies was mainly associated gas, mostly used for the companies' own needs, however more recently these companies, with exception of Surgutneftegaz, have showed their interest in the gas business and acquired their own gas resources.

Independents producers are allowed to sell their gas only at the domestic market. But, unlike to Gazprom, they can sell gas at non-regulated market price. In 2006, the share of the independent producers in Russian gas production was 15%.

### **3. The functioning of the Russian gas sector**

A single company, Gazprom, controls practically all activities in the Russian gas sector. However, the functioning of the Russian gas sector is not as simple as it may first appear, and is characterized by a number of unique aspects. It should also be stressed that political motives play an important role in decision making in the Russian gas industry. This section describes how the Russian gas sector has functioned after Russia began to move toward market economy and provides an insight into the problem of a Russian gas deficit.

#### **3.1 The underpricing era**

Gas prices below long-run cost were the main non-market feature the Russian economy inherited from the Soviet era. In the Soviet Union, all energy sources, not just gas, were highly underpriced in the domestic market, as they were regarded as a “good of the first priority”. These were goods considered necessary for the Soviet Union’s industrial growth and provision to the population. Under this system, planner’s fixed prices and investment were directed to the energy sector through large direct subsidies. Loss of direct government support at the beginning of 1990 became painful for large parts of Russian industry, and higher energy prices threatened to cause an even more serious breakdown in the Russian economy. Thus, governments chose to maintain underpricing in the gas sector. In the first few years after Gazprom’s privatization, the government attempted to allow gas prices approach European market prices but, faced with the problem of large nonpayments, the attempt was abandoned and domestic gas prices were set lower (see Figure 1 in Section 4).

When the Russian economy started to recover after 2000, regulated gas prices gradually increased by 10-15% annually. Nevertheless, with annual inflation averaging 10%, annual growth in the real gas price in the period 2000-2007 was about 3%.<sup>2</sup> Hence, gas remains the cheapest energy source among all fossil fuels. So far, pricing of natural gas in Russia has reflected the government’s sociopolitical targets, rather than the costs of production. The fear is that consumers will be unable to pay high gas prices. Concern with social instability arising from unpopular price increases also accounts for the government’s reluctance to increase gas prices significantly.

Gazprom has a special role in the Russian economy, mandated by law, as the company responsible for supplying natural gas to Russian consumers in the unprofitable domestic market. Nevertheless, in practice Gazprom determines how much natural gas Russian consumers require, a figure that has often

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<sup>2</sup> Author’s own calculations

been lower than actual demand. Each year, Gazprom and the government negotiate Russia's "gas balance" for the year ahead, agreeing the quantity of gas to be supplied to domestic consumers at regulated prices (Ahrend and Tompson, 2005). Residual demand can be covered at the market price by the Russian independent gas producers. However, it is very difficult to obtain reliable information about the actual prices charged by independents and the volumes sold at these prices. Moreover, trade in the residual market is not very attractive for Russian gas consumers. This is not only because of the higher prices, but also because deliveries from independent producers are often associated with the uncertainties around independent producers' access to Gazprom's gas pipelines.

High export profits, which Gazprom earns by selling gas to Europe, cover its losses in the domestic market. During the last fifteen years, Gazprom's export prices for Europe were up to ten times higher than domestic prices (Figure 1). Accordingly, export profits appeared to help the Russian gas sector to cover both domestic and foreign demand without any noticeable difficulty for more than a decade. In addition, most of the gas produced in Russia during the last twenty years has come from the so-called "Big Three"<sup>3</sup> super giant gas fields in West Siberia where most production costs are already sunk. This feature has also helped the Russian gas sector to fulfill its supply obligations, despite low domestic gas prices.

### **3.2 Core of the gas deficit concerns**

Unfortunately, gas fields, even the largest ones, have limited capacities. "Big Three" gas fields have been in decline for several years. In addition, the demand for Russian gas has been increasing as the economies consuming Russian gas grow. Production from new fields needs to come onstream in order for the Russian gas sector to continue to satisfy growing demand.

Gas fields under the Yamal Peninsula and in the offshore Shtockman field in the Barents Sea hold large gas reserves (see map in Appendix), and are supposed to be the next center for Russian gas production in coming decades. However, the commencement of production from these fields is constantly being delayed. As they are located in difficult mining conditions, the cost of gas production from these fields will be relatively higher than the production costs from the West Siberian giants. With a low domestic gas price, Gazprom's incentive to hasten the start of production from the Yamal and Shtockman fields has been low. This is because supply from these high-cost fields may not provide sufficient profits to cover Gazprom's losses in the domestic market. The importing of cheaper natural gas from Central Asia has provided an alternative solution to the supply shortage, and has until

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<sup>3</sup> The Big Three are the super giant West Siberian gas fields of Urengoy, Yamburg and Medvezhye.

now allowed the start of production from the Yamal and Shtockman fields to be postponed. Nevertheless, if the new supply sources do not come onstream soon while the old supply sources are being exhausted, Gazprom may eventually need to cut its domestic and/or export supply. The possibility of such an outcome has generated concerns about an impending Russian gas deficit.

It can be argued, however, that if supply is reduced in a market, price will increase and clear the market. Then the problem of a deficit should not exist. If Gazprom, for example, will reduce its export to Europe, the European gas market will respond with higher prices, and gas demand will fall in order to equalize supply. On the other hand, if Gazprom will choose to cut cheap deliveries to the domestic market, it will increase the residual demand and domestic consumers can buy more gas at higher prices from independent producers. But a cut in the Russian gas supply can threaten the security of energy supply, a concept broadly discussed in the energy literature. Guaranteeing an adequate and predictable price and supply now and in the future is an important aspect of the concept of security of supply (e.g., Spanjer, 2007). Therefore, in terms of supply security, a cut in the Russian gas supply can also be described as gas deficit. Though the price will clear the market, a part of the consumers will need to give up on the consumption, which they under normal circumstances would get.

## **4. Netback pricing**

### **4.1 Moving toward high “market” prices**

Increase of the regulated Russian domestic gas prices that will make supply from the new expensive fields profitable for Gazprom will also stimulate to a reduction in domestic gas demand. Together, these effects may provide a solution to the potential problem of gas shortage.

According to a decision<sup>4</sup> passed by the Russian government in May 2007, regulated prices will gradually increase until they reach parity with European prices in 2011. From 2011, Gazprom will be allowed to sell gas at netback prices to all Russian industrial consumers. Netback pricing refers to the equalization of the gas price in Russia to the gas price in Europe after adjusting for export duties and transportation costs. Since 2007, the Russian Federal Tariff Service has quarterly calculated netback gas price using a formula that adjusts the average price that Gazprom obtains in the European gas market for transportation costs, export taxes and transit tariffs and published the results on its website. Calculation of netback gas prices prior to 2011 is aimed at preparing consumers for new pricing

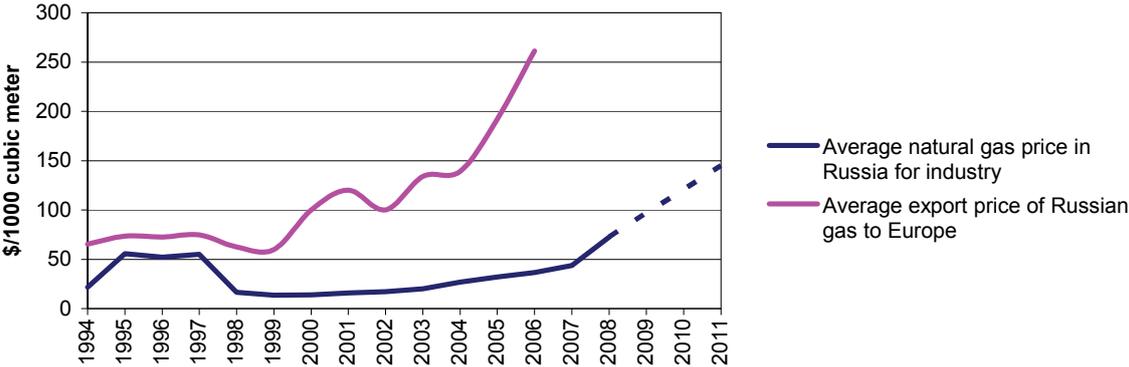
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<sup>4</sup> Decision of Russian Government N333 dated 28.05.2008.

principles. However, prices for the residential sector will not be raised to the netback level in 2011. Instead, they will remain regulated and increase more gradually. The residential sector, which stands for 29% of the natural gas consumed in Russia, is considered to be the most vulnerable to the gas price increase among the Russian gas consumers.

In 2007, the average price Gazprom earned in Europe was US\$262 per 1000 m<sup>3</sup>, whereas the average domestic regulated price for Russian industrial consumers was set at US\$44 per 1000 m<sup>3</sup>. If netback pricing had been introduced in 2007, the gas price for Russian industrial consumers would have been set at US\$145 per 1000 m<sup>3</sup>.<sup>5</sup> The estimate of the long-run marginal cost of the most expensive gas from Yamal Peninsula is reported to be US\$75 per 1000 m<sup>3</sup> (OME, 2004). Thus, it can be seen that the future price that Russian consumers will pay will be approximately twice as high as the long-run marginal cost of production.

**Figure1. Nominal gas prices for Russian gas in Russia and Europe (in \$/1000 m<sup>3</sup>)**



\*Prices, which are marked by dashed line, are the projected prices that would allow Russia to reach netback to European gas price at US\$262 in 2011.

The announced pattern of regulated price growth until 2011 and the introduction of the netback price appear to be more radical than the Russian government has projected before. For example, according to the EU–Russia WTO Accession Agreement, Russian regulated gas prices will reach US\$49–57 per 1000 m<sup>3</sup> by 2010 (Stern 2005), while according to Russian Energy Strategy (2003)<sup>6</sup> the gas price in Russia should reach US\$59–64 per 1000 m<sup>3</sup> by 2010. However, with the government’s new plan, the gas price in Russia could reach US\$120 per 1000 m<sup>3</sup> by 2010.

<sup>5</sup> See the Federal Tariff Service website at [www.fts.ru](http://www.fts.ru).

The netback principle will also apply to the FSU. Historically, Russia has had different institutional, commercial, and political relationships with the two segments comprising its gas export market: European countries and Former Soviet Republics. During the post-Soviet period, the prices paid by Former Soviet Republics were considerably lower than the prices paid by European consumers. After 2005, Gazprom changed its pricing policy toward the FSU countries. Prices were first considerably raised for Baltic countries in 2005, for Ukraine, Moldova, Armenia, Azerbaijan and Georgia in 2006 and for Belarus in 2007. In 2007, Russian gas prices more than doubled for all FSU consumers. By 2011, Gazprom plans to bring prices for FSU consumers to a level that provides equal profitability with sales to European consumers.

## **4.2 Why netback?**

In Russia, netback prices are often deceptively called market prices. The prices that Russian consumers will pay after 2011 will reflect market developments in the European gas market. However, Russian consumers are completely segmented from the European gas market, as Gazprom controls all gas flows in Russia through its ownership of the pipelines. As a result, netback gas prices will be a long way from reflecting the demand and supply equilibrium in the Russian gas market. Given currently high European gas prices, the netback prices will also be far above long-run marginal costs.

Many Russians raise the question why Russian consumers, living in a country with abundant gas resources, will need to pay for their natural gas the same high prices as European consumers. However, Russia exports a large part of its gas to Europe. This seems to be a strong justification for use of the netback pricing rule. First, Gazprom has demonstrated that it strongly prioritizes the more profitable European market over the domestic market. Although the company is obliged to deliver to domestic consumers, the scheme underlying these deliveries is opaque. This creates substantial uncertainty for consumers, since they cannot predict how much gas and at what prices they can buy next year. With netback gas prices, Russian consumers can be equally profitable as European consumers. This gives Gazprom and other producers more incentive to deliver to Russian consumers. At the same time, the cost of natural gas will be more predictable for Russian consumers.

Second, netback pricing will also equalize the returns of Gazprom and the independent producers from gas sales. Independent producers sell gas at free market prices, and will not sell directly at the netback price. However, as the market share of the independent producers is relatively small, it is likely that

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<sup>6</sup> Russian Energy Strategy Through 2020 is an official document that describes Russia's energy priorities from a long-run perspective. The most recent edition of Russian Energy Strategy was published in 2003.

the market price will be closer to the netback price (Chernavsky and Eismont, 2005). This provides a stronger justification for Gazprom's export monopoly, as keeping independent producers from export markets will appear less unfair. Finally, Russian efforts to enter the WTO are also an important explanation for the introduction of netback pricing in the Russian gas sector. The low gas prices Russian industrial consumers currently pay are argued to be export subsidies for Russian exporters whose products embody energy. Netback gas pricing is a key condition in negotiations for Russia to enter the WTO.

One important advantage of the netback price is that it is more transparent and easier to calculate for the regulator than if pricing was set using a "cost plus" principle. Whether it yields the social optimality of netback pricing is a rather more complicated issue, and beyond the scope of this paper. However, it is important to mention that a netback pricing policy is not necessarily inefficient. Brito and Rosellon (2002) analyze the netback pricing of natural gas in Mexico and show that the netback rule can be an efficient pricing policy. A European netback price can be considered as a measure of opportunity cost to Russia of consuming its gas domestically rather than exporting it to Europe. According to Brito and Rosellon (2002), an important precondition for efficiency of netback pricing is an absence of constraints on export transport capacity. Russian export transport capacity is gradually growing, and currently the lack of export transportation capacity is not a problem (see Section 5.2). However, the transit tariffs that Gazprom pays to transmit gas through Ukraine and Belarus can somewhat undermine the efficiency of netback pricing. This is because netback prices are affected by transit charges whose values often incorporate political frictions between Russia and the transit countries, and are therefore not necessarily reflective of cost.

### **4.3 Non-payments**

An important precondition for gas price increase toward European parity level is that Russian gas consumers can actually pay for more expensive gas. The Russian gas sector struggled with the non-payments during the 1990s and the beginning of 2000s and danger of non-payments was one of the reasons for the government's rigidity to raise gas prices during the last decade.

The insolvency level clearly correlated with the economic situation in the country. The non-payments in Russian gas sector peaked in the period when economic crises and fall of industrial production were raging. In 1997–1999, direct money payments for gas deliveries in Russia were less than 20% (IEA, 2002). The year 2000 brought some improvements in Gazprom's payments collection, where several factors have contributed. High export prices on oil and gas have significantly increased profitability

and liquidity in the economy as a whole, and Gazprom's management campaign aimed on the payments enforcement has improved payment discipline. According to CERA (2007), in 2006, Russian consumers paid for 94% of domestic gas deliveries.

Since 2000, the economic growth at 6–7 % in Russia was in average higher than in the most industrial economies. The projections for the next decade indicate that Russian economic growth might continue at the similar rate (MERT, 2007). If these projections will prove to be correct, it seems very unlikely that Russia can face non-payments at the strength of the 1990s. In addition, transition to netback prices will be completed in 2011 and in the meantime the regulated price is gradually climbing toward the netback level. Thus, Russian gas consumers will get a few years adapting to higher prices. The quarterly calculation of the current netback prices by the Federal Tariff Services will give consumers guiding information about future prices. In addition, netback prices will be introduced only for industries. Government will continue price regulation of the residential sector. Residential sector is the most vulnerable to the gas price increase and 68% of non-payments in 2006 was represented by households (Gazprom, 2006a). Thus, taking into the account solvency of the population, government will keep the possibility to adjust the residential gas price.

Nevertheless, it should not be ruled out that Russia's economic development might not remain as rapid and positive as it is expected. In this situation, the announced gas price increase might further slow down Russia's economy and add to insolvency in the gas sector. In addition, the current European gas price is tied through the long-term contracts to the world prices of oil products, and very rapid growth of oil price will imply very high netback gas prices for Russian gas consumers. Then Russian government might reconsider its Russian gas pricing policy and retard the movement towards the netback pricing. However, the point of departure for the discussion in this paper is that the announced gas price increase and the following introduction of netback pricing will sustain.

## **5. Demand for Russian gas**

### **5.1. Gas demand in Russia**

The Russian Energy Strategy (2003) predicts a modest but steady growth in Russian gas demand of less than 1% per year during the period 2000–2020. However, growth in global oil prices in the last few years greatly extends positive developments in the Russian economy and consequently accelerates the demand for natural gas in Russia. Thus, in the period 2000–2005 Russian gas demand appeared to increase on average by 2% annually.

In terms of gas consumption growth, 2006 was unique. During 2006, Russian gas consumption grew by 6.7% and reached 452 billion cubic meters (bcm), the highest in post-Soviet history. The main reason for such large consumption growth was an unusually cold winter. The peak of the cold period also clashed with the peak of a gas price conflict between Russia and Ukraine. The consequence of this was that several countries in Europe reported that gas deliveries from Russia were 10 and 35 percent below requested volumes on a substantial number of days in January and February, respectively (Stern, 2006a).

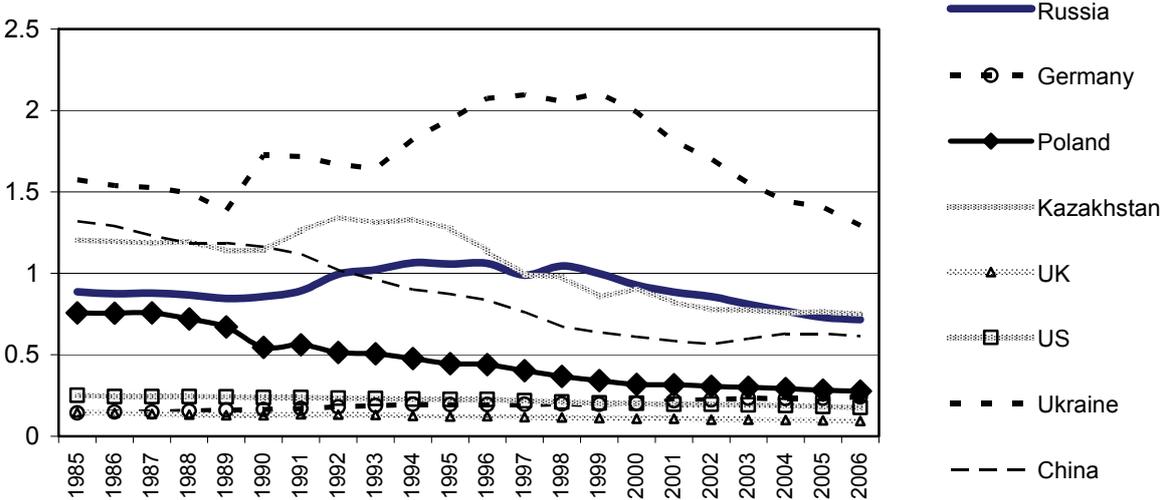
The supply shortages in winter 2006 triggered the serious concerns about ability of Russian gas industry to cover the future growing gas demands. According to a report by Ministry of Energy if such trend in gas demand growth will hold, Russia, with the largest gas resource in the world, might face a gas deficit up to 50 bcm by 2015. Projections by Milov et al. (2006) are even more pessimistic; the authors calculate that the Russian gas deficit might reach 126 bcm already by 2010. The Russian government's plan to introduce netback pricing is hoped to be, first of all, a sufficient measure to restrain domestic gas demand growth in Russia.

It is difficult to say how Russian gas demand will respond to a substantial increase in gas prices. The increase in the regulated gas price over the last few years has demonstrated that the price elasticity for Russian gas demand was almost nonexistent. This is confirmed by calculations by Solodnikova (2003), who shows that the Russian gas demand price elasticity is near zero. Although there has been an increase in regulated domestic gas prices since 2000, the price increase was rather moderate and behind of the price development stipulated by the Russian Energy Strategy (Conception, 2007). Accordingly, the growth of the industrial gas price before 2008 has not been high enough to stimulate a demand side response. As a result, many existing analyses, such as Milov et al. (2006) and Goldthau (2008), continue to apply an annual growth rate of about 2% when predicting future Russian gas

demand growth. Importantly, Russian gas consumption grew at this rate during the last few years when gas price growth was moderate.

Gas prices in Russia have to increase sharply in order to reach netback level by 2011. One direct effect of a substantial increase in the domestic gas price will be to encourage the more efficient use of natural gas in Russia. Indeed, the low efficiency of energy use is today one of the most important reasons for high Russian gas demand. Although the economic growth of the last decade has stimulated improvements in Russian energy efficiency, Russia is still one of the most inefficient energy consumers in the world. Figure 2 compares primary energy consumption to GDP for several countries. As shown, Russia is around four times less efficient than the US and countries in the European Union, and is even less efficient than China and most of the Former Soviet Republics (Ukraine is a strong exception).

**Figure 2: Dynamics of primary energy consumption per GDP for different countries**



Note: The figure is based on data from World Bank (2006) and BP (2007).

It is probably unrealistic to expect rapid efficiency improvements that can substantially restrain the development of gas demand, as 75% of domestic gas demand is from capital-intensive industries mainly equipped with outdated Soviet technology (Institute of Energy Policy, 2007). The improvement of energy efficiency in these industries will be a long-lasting process that requires huge capital investment. In the current business environment, where the rights of investors are often not protected, attracting such large investment is not an easy task.

On the other hand, it is also unlikely that strong gas price increases will have no effect on the efficiency of energy consumption in Russia during the next decade. After all, Figure 2 illustrates that

energy efficiency is slowly but steadily improving. CERA (2007), for instance, argues that Russian gas consumers have a great potential to improve the efficiency of natural gas use by 2020. According to IEA (2006a), with cost-reflective energy prices, Russia can reduce consumption of energy per unit of output by 40–50% from their 2000 level. The efficiency potential is particularly relevant to power generation. Higher gas prices can stimulate power plants to replace old gas-fired power technologies with more efficient plants that burn less gas. For example, the Russian power sector relies mostly on outdated single-cycle steam units developed in the 1960s and 1970s, many of which are currently consuming up to twice as much gas as the latest combined-cycle gas turbines (CERA, 2007).

The switch from gas-fired plants to coal-fired plants is also an increasingly discussed option in the quest to reduce gas consumption in power generation. Because of low gas prices, coal has been unable to compete with gas, and the share of coal in power generation has decreased considerably in the last few years. With the gas price at a European parity level, the profitability of coal-fired power stations may become more comparable with the profitability of gas-fired stations. Nevertheless, strong government support will probably be required in order to increase the use of coal significantly in power generation. Among analysts, there is a consensus that increases in coal use in power generation will be limited in the coming decade; see, e.g. Milov et al. (2006), Stern (2005), and CERA (2007). First, a long lead time and large investment are required for the construction of coal-fired power generation capacity. This makes a large scale switch from gas to coal very difficult in the short term. Second, because of environmental concerns, coal-fired plants are unsuitable in many large cities. In addition, transportation requirements restrict the attractiveness of coal. Because Russia's primary coal reserves are located in East Siberia and the Far East, the average distance of coal transportation required to serve the majority of consumers in Russia considerably exceeds the transportation distance of natural gas.

On this background, it is reasonable to assume that as the regulated price gradually climbs toward the European netback price, at first Russian consumers will to a very limited extent react to the price signals, and demand will continue to grow at about 2% annually. After some years with netback prices, Russian consumers will then be able to switch to technology that is more efficient, and demand will grow at a lower rate. The Russian Ministry of Energy (Conception 2007) and CERA (2007) project a similar gradually declining growth rate of Russian gas demand.

## 5.2. European demand

Russian Energy Strategy (2003) projected that by 2020 exports to Europe (except the FSU countries) will be around 160–165 bcm. However, Russian gas exports to Europe have grown faster than what the strategy foresaw. In the period 2000–2005, Russian gas exports to Europe grow on average by 3% per annum (BP, 2007). Already in 2006 Russia exported 161 bcm to Europe (Gazprom 2007a). The high export gas prices and low domestic gas prices provided a clear incentive for Gazprom to lift its European exports.

Natural gas is less carbon intensive than other fossil fuels. The Kyoto agreement and the EU's own requirements to reduce CO<sub>2</sub> emissions place stronger pressure on Europe to use more natural gas. Nevertheless, gas resources in Europe are being depleted (see Remme et al., 2008). Accordingly, European demand for imported gas, including Russian gas, will continue to grow. Gazprom has already contracted to supply 180 bcm of gas to Europe by 2010 (Goldthau, 2008). However, a number of projections suggest that by 2020, European demand for Russian gas may exceed 200 bcm, with a range between 200 bcm and 240 bcm; see, e.g. Götz (2006), Milov et al. (2006), Goldthau (2008), and Kulikov (2007).

An important factor that can restrain the future growth of European demand for Russian gas is its dependence on Russian gas imports. With the 2006 Russian-Ukrainian crisis in mind, the EU is careful about further increasing the share of Russia's gas in its overall consumption (Stern, 2006b). In 2006, 29% of all gas consumed in Europe was from Russia (BP, 2007). According to estimates provided by IEA (2007), European gas demand will rise from 540 bcm in 2006 to around 660 bcm in 2020. Then for Europe not to increase its dependence on Russian gas, demand should not exceed 190 bcm in 2020.

On the other hand, the ability of the EU to restrain gas dependence on Russia will depend on future developments in gas export projects in the Middle East and North Africa (MENA). Some MENA's countries are among the holders of the world's largest gas reserves. It is anticipated that MENA may increase exports to Europe from 37 bcm in 2006 (BP, 2007) to around 200 bcm in 2020. However, according to Stern (2006b), the projections for a rapid export increase from MENA may be overoptimistic. On the other hand, ongoing expansion of Russian gas transportation routes to Europe signals Russia's drive to maintain its position in the European gas market.

The main transportation routes of Russian gas to Europe are through Ukraine and Belarus. Gazprom transports around 80% of its exports to Europe through the Ukrainian gas transportation network,

which has a current annual capacity of 175 bcm (Pirani, 2007). The Yamal–Europe pipeline, which in 2006 reached its projected capacity of 33 bcm per year, transports Russian gas through Belarus. Combined with the Blue Stream pipeline, which can transport 16 bcm per year of Russian gas to Turkey, Russia’s current export annual capacity is some 224 bcm. Despite existing capacity being significantly above current Russian exports to Europe (161 bcm in 2006), further expansion of Russia’s export capacity is projected. For example, the North European pipeline that will go under the Baltic Sea from Vyborg in Russia to Germany is projected to start operation in 2011, and can transport 55 bcm on annual basis. Another new export route to be opened in 2011 is the South Stream pipeline that will connect Russia and Europe via the bottom of the Black Sea, with a projected capacity of 10 bcm (Oil & Gas Journal, 2008). The frequent transit frictions between Gazprom and Ukraine—hence Russia’s desire to reduce transit dependence on Ukraine—is an important explanation for Russian expansion of export pipelines. However, the strategic motives of expansion of Russia’s export capacity to Europe should not be underestimated: with an existing excess of export capacity, Russia can more easily persuade Europe to import gas from Russia.

### **5.3. Former Soviet Union demand**

Demand for Russian gas from Former Soviet Union (FSU) countries is also an important variable in the Russian gas balance. FSU countries’ imports of Russian gas fell during the 1990s. However, their economies gradually started to recover, and their demand for natural gas increased after 2000. In the period 2000–2005, the average growth rate of gas imports by FSU countries was about 0.7% (BP, 2007). In 2006, Gazprom supplied 101 bcm (including imports from Central Asia) to FSU countries, with Ukraine delivering 59 bcm and Belarus 20.5 bcm (Gazprom, 2007a).

In terms of future Russian demand, there is much uncertainty about how the gas price rise will affect the FSU countries’ economies and their ability to improve energy efficiency. It would appear that both the Ukrainian and Belarusian economies withstood the impact of the increase in gas prices better than expected. Despite projections about the negative impact of higher gas prices on the GDP of Ukraine (World Bank, 2005) and Belarus (Tochitskaya, 2007), both countries maintained high economic growth at a level of between 7–8%<sup>7</sup> after Russian gas prices more than doubled since 2006. At the same time, Ukrainian gas consumption fell by 8.8% in 2006. However, it remains to be seen how economic growth in the FSU countries, and consequently gas demand, will react to any further increase in Russian gas prices.

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<sup>7</sup> Data on GDP growth in Ukraine and Belarus are respectively available at State Statistics Committee of Ukraine (<http://www.ukrstat.gov.ua>) and at The Ministry of Statistics and Analysis of the Republic of Belarus (<http://belstat.gov.by>)

Energy consumption in Ukraine is extremely inefficient (Figure 2). According to the Ukrainian Energy Strategy, many measures taken by the government will aim at improving energy consumption efficiency and increasing its own energy production by switching part of its primary energy consumption from gas to coal. Ukraine projects that by 2020 it will reduce its gas imports from the current 66 bcm to 20 bcm (IEA, 2006b). This objective is probably overly ambitious, and has been criticized on the grounds that such a rapid reduction of gas demand is unlikely to occur (Pirani, 2007). Nevertheless, given the fact that Ukrainian gas consumption reduced somewhat after the first year of Russian gas price increases, it is reasonable to assume that FSU demand will respond to increased gas import prices, though not as drastically as the Ukrainian Energy Strategy promises.

#### **5.4. Chinese demand**

Currently, Europe and the FSU countries are the only importers of Russian gas. However, Russia also has ambitions to expand its gas exports to Asia, primarily to China, whose growing economy has a significant need for imported energy. In March 2006, Gazprom and CNPC<sup>8</sup> signed a protocol for deliveries of 60–80 bcm of natural gas per year from Russia to China starting in 2011 (WGI, 2006a). This plan places additional pressure on Russia to increase its gas production rapidly, and creates additional uncertainties around Russia's ability to fulfill all of its supply commitments. On the other hand, the Protocol between Russia and China is not a binding supply contract yet. Russia's intention to start export of gas to China in few years is often considered as rather a threat to Europe that may want to diversify their supply away from Russia (e.g. WGI, 2006a).

During the two years following the signing of the Chinese protocol, there has been little progress toward the commencement of Russian gas deliveries to China. The protocol envisages construction of two pipelines from Western and Eastern Siberia, each with an annual capacity of 30–40 bcm. Currently, practically all Russian natural gas production comes from Western Siberia. Therefore, it is supply to China from Western Siberia that can eventually challenge Russia's future ability to increase supply to other consumer markets. Although East Siberia and Far East also hold large gas reserves, the gas fields in these regions are not connected to the rest of the Russian gas transportation system and their current gas production is very low. The Asian and Pacific regions are intended to be the main market for gas from East Siberia and Far East.

Gazprom initially stated that pipeline construction would start in 2008, making the installation of the pipeline infrastructure possible by 2011. However, construction is currently a long way from

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<sup>8</sup> China National Petroleum Corporation.

commencement, and Gazprom still needs to reach agreement on prices with China (Pravosudov, 2008). In addition, Gazprom will need to wait until production from the giant gas fields in Yamal begins in order to supply the pipeline from Western Siberia to China. This is not yet the case. From today's perspective, it is readily apparent that the timetable for gas deliveries to China is highly optimistic, and will most likely be delayed. Finon and Locatelli (2008) point out that in the next 15 years, gas supply to Europe will remain the most attractive option for Russia, and will bring a more rapid and secure return on investment than any other projects. This is because the export infrastructure in Europe is in place, and the demand is already there.

## **6. Supply**

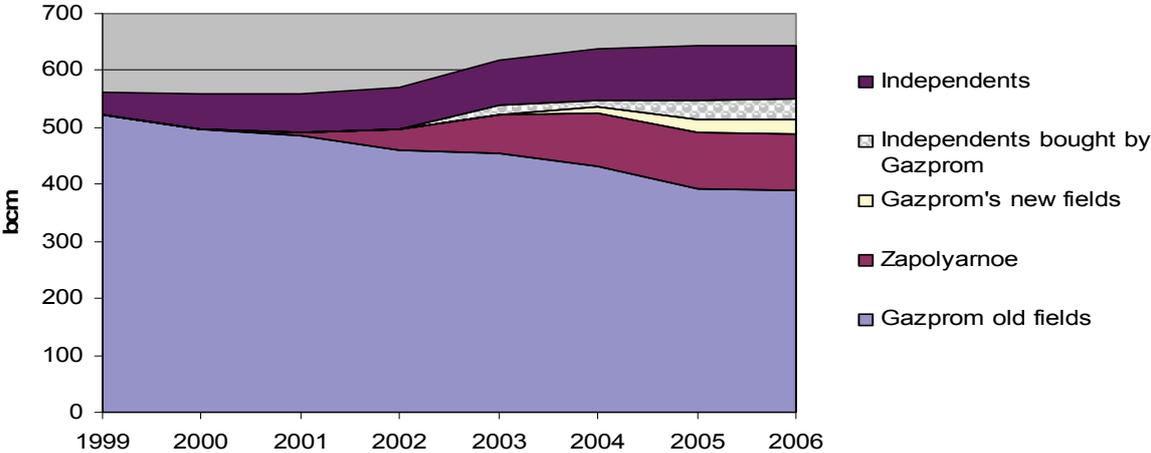
### **6.1 Old giants and new small satellites**

A major concern from Gazprom's production perspective is that most of its currently operating gas fields have already reached their production peak and are now in the declining phase. In 2006, the "big three" giant fields in West Siberia provided only 50% of Gazprom's production, while in 1999 they provided 81% of Gazprom's production. The commencement of production from the new super giant field in Zapolyarnoe in 2001 has for several years halted the reduction in production that Gazprom experienced during the 1990s (see map in Appendix). In 2005, Zapolyarnoe reached its production peak of 100 bcm. Gazprom is also gradually setting in to the operation of smaller "satellite" fields located around the big three giants. Nevertheless, the satellite fields can only impede the fall in gas production for a few years (Institute of Energy Policy, 2007).

It is also questionable whether Gazprom would have reached its current production level (548 bcm in 2006) without the aggressive acquisition of the gas assets of independent producers over the last few years. After the independent producer Northgas experienced a number of problems in gaining access to the transportation system, the company gave up and agreed to sell its 51% share to Gazprom in June 2005. After pressure from Gazprom, Itera lost its status as the second largest Russian gas producer in 2004 when it sold a considerable portion of its assets to independent gas company Novatek. In December 2006, following several unsuccessful attempts to reach agreement with Gazprom about connecting the Beregovoye field (Itera's largest producing field) to the pipeline system, Itera sold its controlling stake in Beregovoye to Gazprom. Following this deal, Itera is now practically out of the Russian gas market. Novatek, which today is the second biggest gas producer, has not managed to avoid participation of Gazprom in its business either. In September 2006, Gazprom acquired a 20% stake in Novatek. Finally, in 2007 Gazprom acquired control over the giant Kovykta gas field in East

Siberia that had previously belonged to oil company TNK–BP. Figure 3 illustrates that Gazprom would have produced about 37 bcm less in 2006 if not for the purchase of assets from independents.

**Figure 3. Russian gas production by source of production**



Note: The figure is based on the author’s own calculations.

**6.2 Shtockman and Yamal**

With the decline in Gazprom’s main operational fields and steadily growing demand, attention on and expectations of the Yamal and Shtockman projects are enormous. The proved gas reserves of the Yamal Peninsula is 10.4 trillion cubic meters (tcm) with its three largest fields (Bovanenko, Kharasevey and Kruzenshtern) together containing 5.8 tcm. Peak production can reach 140 bcm per year from Bovanenko, 38 bcm per year from Kharasevey and 33 bcm per year from Kruzenshtern. The Shtockman field in the Barents Sea contains 3.7 tcm, with peak production of 90 bcm per year (Stern, 2005).

There is little doubt that production from Yamal and Shtockman will eventually commence, however there is still uncertainty about when this will occur. Gazprom promises that the company will produce its first 15 bcm from Bovanenko by 2011 (Gazprom, 2007a) and the first gas from Shtockman in 2013. However, a number of analysts (e.g., WGI, 2007, 2008) doubt the practicality of these dates, as the projects require huge investment owing to difficult mining conditions.

For example, in 2002 Gazprom priced the development of Yamal at \$US70 billion (CERA, 2007). In 2007, this figure had already increased to \$US160 billion. So far, Gazprom’s investment in the project has been very moderate. In 2007, Gazprom spent only \$US1 billion at Bovanenko and Kharasevey,

and in the preceding years investment in the Yamal project was several times lower. Indeed, until 2007 Gazprom invested practically nothing in the development of Shtockman, the start of investment being seriously hampered because of Gazprom's delay in the decision to develop the Shtockman field with or without foreign partners.

From 2008, Gazprom's investment in the new gas giants is likely to increase. Gazprom's investment budget for 2008 increased almost by 40% compared with 2007, with the company emphasizing that the development of the Yamal and Shtockman fields will be priority investment projects in 2008. (Rossijskaya Gazeta, 2008). The increase in regulated gas prices will certainly play an important role in accelerating investment flow into these projects. According to Gazprom's own projections, production could reach 560 bcm by 2010, and with Yamal and Shtockman, Gazprom expects to raise production further to 590 bcm by 2020 (Gazprom, 2007a).

### **6.3 Production by Independent producers**

Russian oil companies and independent gas companies are capable of making a growing contribution to Russian gas production in the coming decade. Most of the studies analyzing the Russian gas market agree that independent producers have the opportunity to increase their gas production from 90.4 bcm in 2006 to over 200 bcm by 2020 (e.g., Institute of Energy Policy, 2007; Stern, 2005; IEA, 2006a; Götz, 2006). The projections made by the independent producers themselves are even brighter. These indicate that total non-Gazprom output could reach 260 to 290 bcm by as early as 2015. Independent producers have several new gas fields that they are now preparing to start gas production (Institute of Energy Policy, 2007). However, prospects for the growth of independent gas production depend on access to Gazprom's gas processing capacity and transmission system. Although independents declare that they can quickly increase their gas production, they are waiting for assurance that future transportation capacity will be available before expanding production.

Access to Gazprom's transportation system has been a tense issue in relations between Gazprom and the independents since non-Gazprom gas first appeared in the Russian gas sector. In spite of a government decree of 1997 that granted independent producers nondiscriminatory access to the pipeline system, Gazprom makes decisions about access to the pipelines.<sup>9</sup> According to the decree, Gazprom can deny access to the pipelines because of nonfulfillment of technical standards or by referring to a lack of capacity in the transportation system. Gazprom, when rejecting the access of independents to the pipeline system, most often employs the second justification.

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<sup>9</sup> The decree of the Russian Government N858, dated 14.07.1997.

Thus, the prospect of gas production growth by independents depends on free capacity in Gazprom's inlet transportation system. In turn, spare capacity will depend on the ability of Gazprom to invest in the transportation system. In 2002, the operational capacity of Gazprom's transmission system was estimated to be lower than its designed capacity, as many pipes could no longer withstand design pressure (IEA, 2006a). However, according to Gazprom's investment program, the money flow directed toward the reconstruction and expansion of pipelines has increased during the last few years. In fact, Gazprom spent about 25% of all its capital investment in 2007 on the reconstruction and expansion of its existing pipelines (Gazprom, 2007c).

#### **6.4 Central Asian gas**

Imports of gas from Central Asian countries—including Kazakhstan, Uzbekistan, and particularly Turkmenistan—will be crucial in the overall gas demand–supply balance between Russia and Europe up until 2020. In the 1990s, the gas trade between Russia and these countries fell significantly. However, as Russia's interest in Central Asian gas increased in the 2000s, Gazprom intensified cooperation with Central Asian countries, and started to invest in their energy sectors.

In 2003, the presidents of Russia and Turkmenistan signed a 25-year long-term import agreement covering the years 2003–2028. According to this agreement, Gazprom expects to buy annually 60–70 bcm in 2007–2008, while in the period 2009–2028, Turkmenistan's annual gas exports to Russia are to increase to 70–80 bcm. In 2007, Gazprom imported 51 bcm of natural gas from Turkmenistan. In 2006, Turkmenistan's total gas production was 62 bcm. Thus, Gazprom has contracted more gas imports for the years beyond 2009 than Turkmenistan currently produces. A number of analysts have raised concerns whether Turkmenistan—with gas consumption of 18 bcm in 2006—can manage to increase its production in order to supply both its domestic market and Russia (IEA, 2006a). However, during the last decade, Turkmenistan managed to treble its production. Turkmen officials project a rapid increase in gas production, and promise that the country's production will reach 250 bcm by 2030. According to projections by Dorian (2006) Turkmenistan may produce 120 bcm of gas by 2010, and 180 bcm by 2015.

Although the gas reserves of Uzbekistan and Kazakhstan are commensurate with Turkmenistan's reserves, the prospect of gas exports from these countries to Russia is much lower. While Uzbekistan's production is large (around 55 bcm in 2006), it is mostly used for domestic consumption. Alternatively, Kazakhstan's production, despite large reserves, has been historically low, with the

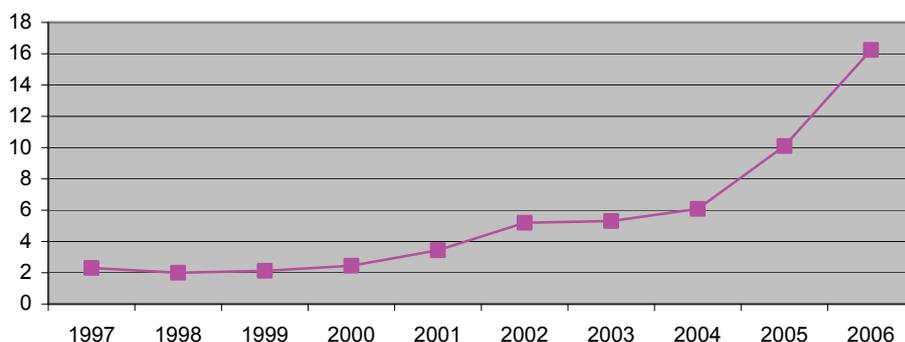
country only commencing intensive development of its gas sector relatively recently. Nevertheless, it appears that Gazprom holds tight control over the gas flows from both Uzbekistan and Kazakhstan. Today, Uzbekistan delivers gas to Russia under a 10-year agreement signed in 2002. According to this agreement, Uzbekistan will supply around 10 bcm a year to the Russian gas market until 2012. In 2007, imports by Russia from Uzbekistan were 13 bcm. Gazprom and other Russian companies participate actively in gas projects in Uzbekistan, with the intention of increasing the gas flow to Russia. If all these projects proceed as anticipated, some 25 bcm per year of Uzbek gas could be delivered to Russia after 2010 (Stern, 2005).

Kazakhstan has ambitions to expand its gas production considerably, from 20 bcm in 2006 to 50 bcm by 2015. In 2006, Kazakhstan exported 7.5 bcm of natural gas to Russia. Given the production expansion plans, Kazakhstan may have between 24 bcm and 35 bcm of spare gas available for export by 2010 and 2015, respectively (Dorian, 2006). While Kazakhstan does not currently have any export options other than Russia, it has already indicated that it is unwilling to commit itself solely to the Russian market, and is considering exports also to China. Nevertheless, Kazakhstan's foreign policy of the last decade has demonstrated that it aims to maintain good relations with both Russia and China as counterbalancing partners (Ipek, 2007). It is therefore reasonable to assume that Kazakhstan will export some, if not all, of its gas export to Russia.

## 7. Investments

During the 1990s, there was heavy underinvestment in the Russian gas sector. Low domestic gas prices, nonpayment, and the poor financial state of the gas sector generally limited the investment necessary to maintain and renew production and transportation assets. Although the flow of investment has increased (Figure 4) and the financial situation of the sector has improved in the last few years, capital investment is arguably still lower than is necessary. IEA (2002) provides figures for the investments needed by the Russian gas sector through to 2020. According to these, \$38–39 billion are needed to be invested in the Russian gas sector in the period 2001–2005.<sup>10</sup> According to Gazprom’s financial reports, its capital investment in production and transportation in the period 2001–2005 was only about \$US30 billion, that is, around 78% of what was required.

**Figure 4. Capital Investments of Gazprom in 2006 US\$ billions**



Source: Gazprom (1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006b, 2007b).

Income from gas sales is the main source, and forms the base for Gazprom’s capital investment. The low domestic prices explain part of the failure to raise investments to the required level. Accordingly, the increase in the gas price to European parity will certainly increase Gazprom’s investment base. Taking into account the influence of sale prices on the profits of the company, and that profits in turn form the base for investments in the following year, we attempt to calculate how much of Gazprom’s capital investment might be influenced by the introduction of netback pricing.

In Table 1 we make projections for future investment available for Gazprom under two different scenarios and compare these projections with investment requirements reported by IEA (2002). The first line in Table 1 replicates IEA’s (2002) figures for investments needed by the Russian gas sector

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<sup>10</sup> Investment needs are calculated in 2006 US dollars.

through to 2020. The calculations in Scenario 1 and Scenario 2 in Table 1 (for the periods except 2001–2005) are based on Gazprom’s 2006 Financial Report (Gazprom, 2007b) and Gazprom’s 2006 Annual Report (Gazprom, 2007a). Note that Gazprom’s actual capital investment during the period 2001–2005 was \$US30 billion. Therefore, this underlies both scenarios in Table 1.

**Table 1. Projections for future investments available for Gazprom (in 2006 US\$ billions)**

	2001–2005	2006–2010	2011–2015	2016–2020	Total 2001–2020
IEA (2002) requirements	38–39	41–44	48–50	57–63	184–196
Scenario 1: no netback pricing	30	59	59	59	177
Scenario 2: with netback pricing	30	95	145	145	385

Gazprom’s Financial Report for 2006 (Gazprom, 2007b) gives information on Gazprom’s income from gas sales to Russian, FSU countries and European consumers and income from other activities, including the sale of oil and gas condensate and transportation services in 2006. It also reports Gazprom’s total operational costs in 2006. In the calculation of the scenarios, we assume that up until 2020, Gazprom continues to sell the same gas volumes to its three gas markets as it sold in 2006. That is, Gazprom sells 316 bcm to Russian consumers, 161 bcm to European consumers, and 49 bcm to FSU consumers (the remaining gas volume for the FSU is imported from Central Asia) (Gazprom, 2007a). We also assume that through 2020, Gazprom’s income from other activities and operational costs remain at the 2006 level as reported in Gazprom (2007b). The difference in investments in Scenario 1 and Scenario 2 in Table 1 are solely due to different assumptions on gas pricing policy in Russia.

In Scenario 1, we calculate the volume of investment available for Gazprom until 2020, assuming that netback pricing is not introduced and that the domestic gas price remains low at the level of 2006. It should be noted that even if Gazprom chooses to keep future prices for domestic and FSU gas consumers fixed, Gazprom’s profits and hence, available investment would not remain constant. This is because gas prices in Europe, tied through long-term contracts to the world oil prices, are volatile and not directly influenced by gas pricing policy in Russia. However, because of uncertainty with future European gas prices, and in order to focus purely on the effect the introduction of netback pricing can have on Gazprom’s capital investments, we assume that in this scenario all prices, including European gas prices, remain unchanged through to 2020. Calculating this scenario, we assume that all gas prices Gazprom obtains for its gas through to 2020 remain fixed at the 2006 level. Thus, in this scenario investments available for Gazprom each year will be the same as in 2006.

Turning to Scenario 2, we calculate the volume of investments available for Gazprom until 2020 assuming that netback pricing is introduced in 2011. Again, we assume that European gas prices remain constant at the 2006 level through to 2020. However, the domestic regulated price grows in the years before 2011 (as in Figure 1) and then remains constant until 2020. The average price for FSU consumers also gradually increases until it reaches the same price as that in Europe in 2011, with the price for FSU consumers then remaining constant until 2020.

Comparison of the scenarios with IEA's (2002) investment requirements illustrates that the domestic gas price policy has a substantial impact on capital investment in the Russian gas industry. According to Scenario 1, if the domestic price remains low, Gazprom's total capital investments during the period 2001–2020 will lie somewhat below the required level reported by IEA. In addition, the fact that IEA's figures have been published in 2002 should be taken into account. Further, it is not unusual to find that earlier estimations of monetary requirements for an investment project prove to be lower than the actual requirements. Upward adjustments of the cost estimations for the Sakhalin-2 (WGI, 2006b) and Yamal projects provide relevant examples. If figures from IEA (2002) are underestimated, the policy where domestic gas prices are kept low (Scenario 1) will inevitably result in substantial underinvestment in the Russian gas sector. On the other hand, according to Scenario 2, introduction of netback prices can provide Gazprom with twice as much capital investment as that required by IEA (2002). Put differently, with netback pricing, the Russian gas sector should be able to acquire enough capital investment for the necessary increase in the Russian gas supply, and this should hold even if the IEA figures represent only half of the investments actually needed.

It should be mentioned, however, that it is impossible to know precisely how Gazprom's costs and income will develop in the future, as well as which part of earned profit will be spent on capital investment. Extrapolation of current gas volumes sold at higher prices in the future is a rather rough approach to making investment projections. However, given that there is little other information available, these projections may at least shed some light on Gazprom's future investment capability. The assumption that Gazprom's future operational costs are held constant will certainly not hold. All analysts agree that these costs will increase as Gazprom moves production activity to fields with more difficult extraction conditions, such as at Yamal and Shtockman. This will certainly have a negative effect on the investments. On the other hand, Gazprom will sell larger amounts of gas as soon the company starts to produce from Yamal and Shtockman, which will positively affect income and investment.

## 8. Supply and Demand Scenarios

Earlier discussion clearly indicates many uncertainties about the future development of the supply and demand of Russian gas. More specifically, six variables will greatly determine the ability of the Russian gas sector to meet future demand. These six variables are: *i)* domestic demand, *ii)* European demand, *iii)* FSU demand, *iv)* Gazprom's production, *v)* production by independent producers, and *vi)* imports from Central Asia. It remains to hypothesize how each of these variables will develop in the future. In Table 2 below, we consider two scenarios for the future development of Russian gas supply and demand.

In order to focus on the ability of the Russian gas sector to cover demands of the current consumers, we deliberately do not include Chinese demand for Russian gas into the scenarios. We consider Chinese demand for Russian gas as residual, as Russian deliveries to China have not commenced yet and there are a number of uncertainties about when these deliveries will eventually start. In addition, the major part of the Russian gas for the Chinese market is expected to come by pipelines from gas fields in Eastern Siberia and Far East. The gas pipelines in East Siberia and Far East are not connected to the rest of the Russian gas pipeline system and hence, China will not compete for gas from these fields with other existing consumers of the Russian gas. The production from East Siberia and Far East is currently very low and is not included into the scenarios outlined below.

We refer to the first scenario as *Demand Boost/Supply Stagnation*. The figures in this scenario are based on earlier projections for the Russian gas sector that did not take into account the introduction of netback pricing. In this scenario, we assume that the rapid growth of demand for Russian gas continues in the three consumer markets at the average annual growth rate observed in the period 2000–2005.<sup>11</sup> Here, Russian gas demand grows at 2%, exports to Europe grow at 3% and exports to the FSU grow at 0.7% annually. Supply grows only moderately in this scenario. At the same time, we assume that Gazprom fails to begin production from Yamal and Shtockman by 2020, and Gazprom's supply stagnates at 560 bcm. We also assume that the growth in supply by independent producers is moderate, and independent producers do not supply more than 150 bcm by 2020 (as Gazprom is unable to provide enough spare transportation capacity). At the same time, Gazprom does not succeed in greatly increasing imports from Central Asia. We assume here that imports from Central Asia in 2010 remain at the current level (around 60 bcm), and over the next decade they do not increase by more than 10 bcm.

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<sup>11</sup> Because of an extremely cold winter, the 2006 demand for gas in Russia and Europe increased significantly when compared with the period 2000–2005.

**Table 2. Gas supply and demand scenarios (in bcm)**

Scenarios	Demand Boost/Supply			Supply Boost/Demand		
	Stagnation			Stagnation		
	2010	2015	2020	2010	2015	2020
Russian domestic demand	477	527	582	477	514	540
European (non-FSU) demand	180	200	235	180	190	200
FSU (except Russia) demand	102	106	110	95	90	85
Total Demand	759	833	927	752	794	825
Gazprom's production	550	560	560	560	580	590
Independent producers' production	100	125	150	100	150	200
Imports from Central Asia	60	70	70	90	90	90
Total Supply	720	755	780	760	830	890
Gap	39	78	147	2	-26	-55

The second scenario is referred to as the *Supply Boost/Demand Stagnation* scenario. This scenario reflects more favorable development of the Russian gas sector, while we also presume that the introduction of netback prices mitigates demand growth, increases capital investment, and hence stimulates supply. However, Russian gas-consuming industries are unlikely to react quickly to the price increase. Thus, in this scenario, domestic demand growth gradually reduces from 2% to 1% per year. Russian exports to Europe also continue to increase, but at a lower rate. In 2010, Russian supply to Europe is 180 bcm, volumes that are known to be already contracted (Goldthau, 2008). By 2020, Russian gas exports to Europe reach 200 bcm, which corresponds with projections by Milov et al. (2006) and Götz (2006). FSU countries respond by lowering consumption with the price increase, though this does not reflect the drastic efficiency improvement Ukraine promises in its energy strategy (IEA, 2006b). We assume that by 2020 their consumption is reduced to 85 bcm compared with 101 bcm in 2006. In this scenario Gazprom, in accordance with its own projections (Gazprom, 2007), will start production from Shtockman and Yamal, and by 2020 Gazprom is producing 590 bcm. In accordance with a number of projections (e.g., Institute of Energy Policy, 2007; Stern, 2005; IEA, 2006a), independent producers manage to supply 200 bcm by 2020. We also assume that Russia will maintain its position as the main importer of Central Asian gas through good political relations between the countries, as well as investments in gas production and transportation projects in Central

Asia. In this scenario, imports from Central Asia amount to 90 bcm in the period 2010–2020. The 90 bcm includes 70 bcm contracted from Turkmenistan, at least 10 bcm from Kazakhstan, and at least 10 bcm from Uzbekistan.

Comparison of the two scenarios outlined above demonstrates completely different outcomes. While in the *Demand Boost/Supply Stagnation* scenario Russia faces a huge gas deficit, the *Supply Boost/Demand Stagnation* scenario indicates that Gazprom may have a surplus of natural gas. Table 2 clearly shows that the way to present the possible developments can be very manipulative, at the same time Table 2 confirms large uncertainty regarding Russian gas supply and demand in the future. In the first scenario, rather pessimistic projections are made for future developments in the Russian gas sector. These contrast with the more positive projections in the second scenario. However, given that the introduction of netback prices will actually occur, the *Supply Boost/Demand Stagnation* scenario is more realistic, as it takes into account the effects of price increases. The comparison of the two scenarios also highlights the price increase as an important measure against future gas shortages.

Nevertheless, both scenarios show that concerns about a shortage of Russian gas in the next several years are not groundless. In the *Supply Boost/Demand Stagnation* scenario, Russia lacks 2 bcm in 2010. Although this is a very small volume of gas, and so would not entail a serious delivery problem for the Russian gas sector, it signals that by around the year 2010, Russia's ability to cover total demand is quite sensitive to relatively small upheavals in the market. On the other hand, this scenario also indicates that by 2015, Russia should not have any major problems with gas delivery. Under this scenario, by 2015, Russia should also not face difficulties to provide gas for the Chinese market for West Siberian route.

## **9. Higher prices and incentives for structural changes**

This section discusses another effect high domestic gas prices can have on the Russian gas sector, namely the incentives for structural change. The Russian gas sector is one of the few sectors in the Russian economy that has avoided major structural change following the collapse of the Soviet Union. However, reforms that would allow greater competition in the Russian gas sector have been extensively debated since at least 1997 (Stern, 2005; Locatelli, 2003) and the core of this debate concerns the dominant position of Gazprom.

Low domestic gas prices intended to stimulate growth in the Russian economy following the collapse of the planned economy and, to some extent, justified Gazprom's dominance of the Russian gas industry. Without Gazprom's dominance in the industry, it is unlikely that the government could have maintained domestic gas prices below their long-run marginal cost over such a long period. In return for losing money on the unprofitable domestic market Gazprom kept control over all gas export revenues. Unfortunately, the long-term underpricing of Russian natural gas led to a lack of investment in the sector, and limited production growth. This also partly explains why the incentives for structural change have never gone much further than a heated discussion, as available capital investment and supply surplus argued to be an important precondition for the successful reform of network industries. The poor economic situation of the Russian gas industry at the end of the 1990s and the beginning of the 2000s has given the Russian government further grounds not to hasten structural change.

The introduction of netback pricing will result in a very new situation in the Russian gas sector. Both the domestic and export markets will be equally profitable, and Gazprom's dominance as a pledge of cheap gas for Russian consumers will be unnecessary. Furthermore, discussion in Section 7 indicates that Gazprom's financial situation can improve considerably with netback pricing and the attraction of capital investment into the industry should be a manageable task. In addition, according to Section 8, it is likely that the situation where the Russian gas sector has a surplus will be reached. Thus, conditions for a reform that restricts Gazprom's market power may become more favourable after the price increase takes place. At the same time, the growth of Gazprom's profits because of higher prices can shed light on the call for structural incentives from another angle. The considerable funds that Gazprom will accumulate following the introduction of netback pricing do not need to be deployed entirely in capital investment. The company will have the potential to continue to acquire different financial assets, and intensify its control of both domestic and foreign energy markets. Restructuring will then avoid the fear that one company becomes too dominant in the Russian economy.

On the other hand, although the increase in gas prices is likely to improve conditions for structural changes in the Russian gas sector, the acceptance of the reform by the government as well as by Gazprom is an important criterion for the implementation of structural changes (Locatelli, 2003). The ongoing liberalization of the Russian power sector is a good example (Pittman, 2007). For instance, Anatoly Chubais, head of RAO ES of Russia—the monopolist Russian power generator—spent almost a decade seeking government support for power sector liberalization. Unlike RAO ES, Gazprom has strongly defended its dominant position in the Russian gas sector during the whole debate on gas market reform. In addition, the position taken by the government regarding gas market restructuring has apparently changed in the last few years. Given that Dmitry Medvedev, Gazprom's chairman, became Russian President in March 2008, it would appear that the government's interest in reforming the gas sector has become doubtful.

The performance of the industry is another important aspect that can influence the government's decision to undertake structural change. During the debate on gas reform in the 1990s and at the beginning of the 2000s, opponents of Gazprom's dominance in the Russian gas sector questioned the efficiency of the company by noting the inability of the gas industry to attract investment and hence increase gas supply. However, with netback prices, this situation would appear to change and the Russian gas industry may then tackle the meeting of future demand. This can then support Gazprom's assertion that the structure of the Russian gas industry, where it has practically absolute dominance, is efficient, and the main reason for the poor performance of the industry is the low regulated gas prices. In this situation, both the government and certainly Gazprom can interpret the restructuring of the Russian gas sector as inexpedient.

Until now, Russian government has showed to be very delicate and cautions in the question concerning the structure of Gazprom. This is partly because Gazprom has significant influence on the political decisions in Russia and it is often difficult to separate interests of Gazprom and the government. Thus, although increases in gas prices will weaken a number of factors currently limiting the development of the gas industry, and the sector should be able to adjust more easily to changes that the reforms will introduce, incentives for structural change are likely to be determined by the government in conjunction with Gazprom.

## 10. Conclusions

Concerns that future Russian gas supply will have difficulties in matching demand forced the Russian government to hasten increase in domestic gas prices. From January 2011 netback pricing of Russian gas is expected to be introduced. Before 2011 prices will gradually increase in tempo that allows the netback level to be reached in 2011. This article discussed the effects of increase in domestic gas prices on the Russian gas market, and whether the price increase will help the Russian gas sector to avoid gas shortages in the coming future.

Currently, the geography of Russian gas supply is changing. Over 30 years practically all natural gas in Russian gas sector came from few super giant fields in Western Siberia. Enormous reserves of these fields accustomed consumers of Russian gas not to worry about future supplies. Now, when West Siberian giants are under decline, more gas supply sources are required to cover growing gas demand. Then Russian gas deliveries depend not only on Gazprom but also on the independent gas producers and imports from Central Asia. Gas is coming not only from West Siberian giants, but from small satellite fields in Western Siberia, Central Asia and soon it will come from Yamal Peninsula and Barents Sea. Naturally, the larger is the number of supply sources, the larger is the uncertainty related to supply possibilities and hence, more concerns are raised about the ability of the Russian gas sector to cover future demand.

The paper concludes that price increase is necessary if Russia does not want to face gas deficit in the coming years. Introduction of netback pricing will increase the Russian gas price significantly and can help to attract capital investment, which is viewed necessary for supply growth in tact with demand growth. Nevertheless, as consumers and producers will need time to react to the price increase, Russian gas increase in the years around 2010 can be tight.

The downside of the netback pricing is higher possibility that Gazprom will further strengthen its control over the Russian energy sector. If the world oil prices, and hence, gas prices in Europe, will remain high, Gazprom will have greater prospects for acquiring assets of other companies. Thus, the company will easily continue its aggressive expansion in the Russian gas market and will further increase its influence on Russian politics as well as on Russian and foreign business. The history has repeatedly confirmed that in the long run such monopolies are not efficient.

It should be noticed that discussion in the paper is based on the assumption that announced gas price increase will actually happen and that the Russian consumers will be able to pay for gas that is more

expensive than before. Although introduction of netback pricing from 2011 is an official decision of the Russian government, given the historical suddenness and inconsistency of Russian economic reforms, there are still substantial uncertainties related to how gas prices might evolve. The down slow of economic growth, either it brought about by high gas prices or not, can force the Russian government to reconsider the gas pricing and retard introduction of the netback pricing.

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# Appendix

Map: Main gas fields and gas pipelines in Russia.



Source: Götz, 2006.