

CIS GAS DEMAND

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Background

Natural gas has traditionally played a big role in the fuel and energy balance of the CIS countries (above 70% in some of these countries Figure 1). Absolute values of natural gas consumption are as great. Nowadays the CIS countries consume around 20% of gas in the world; this is one of the largest regional gas markets in the world. The condition of this market has a direct impact on the global gas market. However, paradoxically the CIS market is currently clearly undervalued. The importance of gas producing countries in the CIS, in particular Russia, Kazakhstan, Azerbaijan and Turkmenistan, for the world gas market is not usually doubted. However, it is crucial to understand prospective domestic demand in the CIS countries to determine future volumes of gas exports from the CIS. Meeting this domestic demand is a priority for each of these countries.

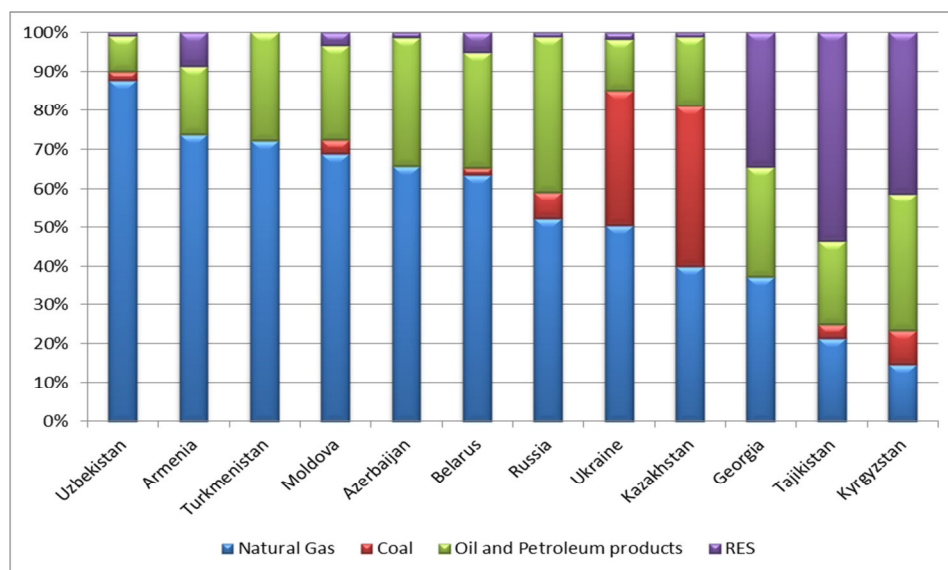


Figure 1 – Primary energy consumption structure in the CIS in 2010

Source: Providing support in the implementation of the Kyoto protocol in the CIS countries, B1.2. Evaluation of the energy saving potential and a reduction in greenhouse gas emissions in various countries – project partners. A comparative analysis of energy balances and

sectoral indicators of Energy Efficiency in the CIS Countries and the EU. Report of the ICF consortium within the framework of the European Commission's Tacis Programme implementation, 2006. February 2010.

Lack of reliable and detailed information on sectoral gas demand in these countries aggravates this uncertainty. There is a huge uncertainty concerning the future volumes of gas consumption in the CIS (Figure 2), although a few research organizations globally are providing forecasts for this particular region.

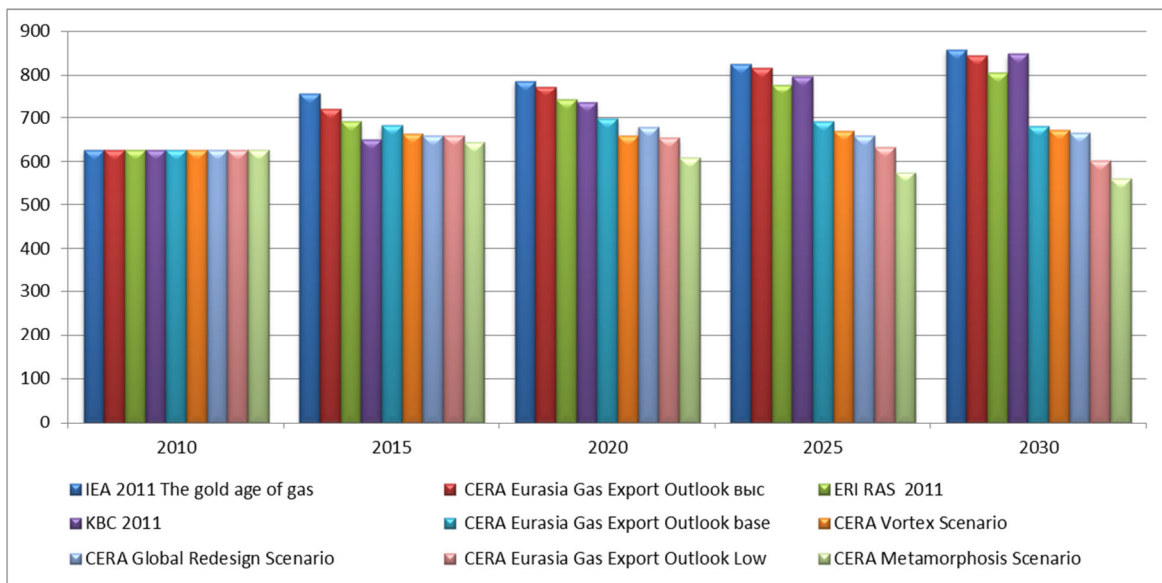


Figure 2 – CIS gas demand forecasts

Sources: CERA, Secure, ERI RAS.

The simultaneous impact of many different multidirectional gas demand drivers and the instability of regional economic development require an in depth analyses of regional gas demand specifics and the development of a valid methodology for forecasting gas demand in the CIS, which would take these specifics into account.



Aims

The aims of this research were to determine the major drivers defining regional gas demand and their impact on current and future gas consumption. We also aimed to develop a methodology for forecasting gas demand in the CIS.

Methods

An institutional and historical analysis of the CIS regional gas market development and trading between various countries was initiated. The energy policies of the main CIS countries were studied. Future development of the CIS domestic gas demand was analyzed and major drivers of the regional gas demand were assessed.

Results

Institutional and historical analyses of the CIS regional gas market development

Following the dissolution of the Soviet Union and the signing of an agreement to set up the Commonwealth of Independent States (the CIS) in 1991, all of the countries in the post-Soviet territory entered a difficult transition, linked to fundamental changes in the economic system, institutional collapses, a sharp fall in GDP and life standards. This meant that the CIS countries which produced substantial hydrocarbon resources generated most of their hard currency revenues from export sales of these resources. A large part of these revenues was generated from oil exports. Natural gas was mainly used for domestic consumption, due to the infrastructure built during the Soviet period. A system of domestic prices was created in which the gas industry in fact subsidised the manufacturing industry and households. Thus the current system of energy consumption was formed, in which gas plays a central role.

It is important to understand that despite the formation of the CIS, the unified system that existed in the Soviet times fell apart. As a result, the post-Soviet countries can be differentiated into *those producing and exporting natural gas and those importing natural gas, without gas production or with low production levels* (Figure 3).

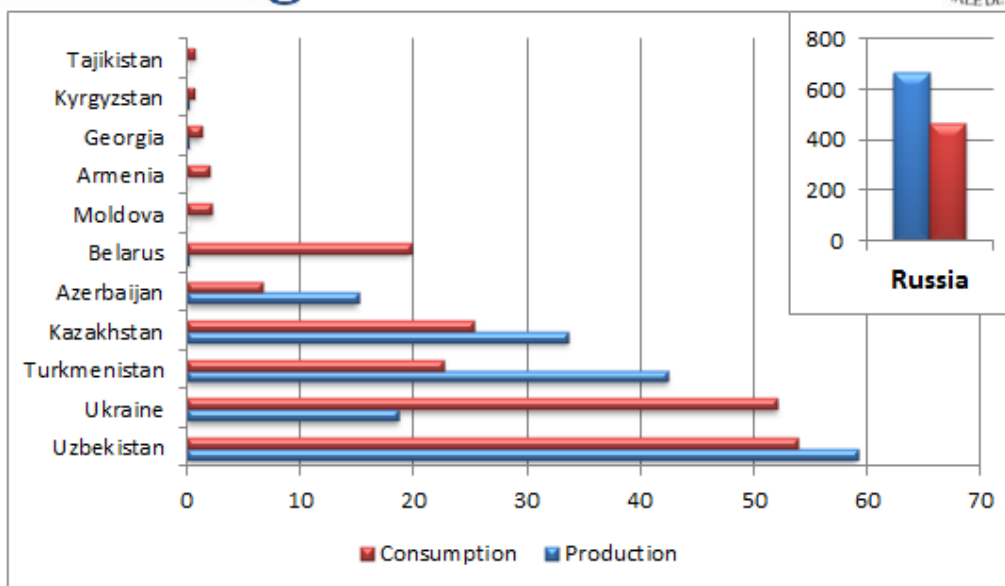


Figure 3 – Gas consumption and production in the CIS, bcm, 2010

The gas industry of the CIS member states is still undergoing a most complex transition stage and to a large extent carries the inheritance of the Soviet times. This is primarily linked to the pricing system and the gas trading system in the post-Soviet territory. During the Soviet times, energy resources, including gas, were in fact viewed as a free benefit, available to all. Following the break-up of the Soviet Union, a system of subsidising domestic gas prices was formed, with the aim to support domestic economies which were not able to pay at the level of world prices.

Subsidisation mechanisms depended on the situation in a particular country. For gas exporting countries, these were mainly subsidies from export revenues, while gas importing countries covered costs with the help of other sectors of the economy. Alternatively, gas importing countries reached political agreements with neighbouring countries which would specify low import prices.

In effect, all internal deliveries in the CIS were made at prices much below world prices. However, even this did not guarantee timely payments for deliveries. In the absence of hard currency there were significant payment delays. Sometimes payments for gas were made with other goods or services instead of money – for example, by providing transit, military equipment and even fur trees and overshoes.

Even following a 20 year transition period the gas industry in the CIS states remains one of the least “market” economic sectors. For example, just recently Russia has made a decision to sell gas to Ukraine at the European price formulae (less transportation costs). In its turn, Russia started to buy gas from Turkmenistan at the same formulae and not at the “politically agreed” prices, as was the case earlier.

Moreover it has become apparent that gas sector restructuring in the CIS countries will not proceed along the lines of the UK or continental European systems. Instead, the particular political and economic role of the gas industry in these countries will lead to a specific, post-Soviet reform trajectory, the result of which is still open.

Major drivers of regional gas demand

The main factors influencing natural gas demand include the following:

- Economic growth rates and the structure of economic growth;
- Population dynamics;
- Natural gas prices and methods of price regulation;
- Government measures for improving energy efficiency;
- Gas consumption structure by economic sectors, competitive ability of gas in each of the sectors compared to alternative fuel types and the potential to replace gas, taking into account decommissioning of old capacity.

Economic growth rates and the structure of economic growth

GDP growth and a change in the structure of the economy are one of the key factors in forecasting future demand. Economic activity in the CIS was growing steadily and rapidly in the period up to mid-2008 as world energy prices were increasing. This was reflected in the stable GDP growth rates of the countries exporting energy resources and in the growing economic activity of the countries importing energy resources. Many of the countries importing energy resources benefitted from growing prices of non-fuel primary commodities and a stronger domestic demand.



In 2007 average GDP growth rates in the CIS member states reached 7.8%. In January-September 2008 GDP expanded by around 7% compared to the same period in 2007, which was above expectation at the beginning of the year.

In 2007 the CIS became one of the most dynamically developing regions in the world.

At the same time by 2007-2008 an increase in inflationary pressure in the economy was registered in all of the CIS states (especially in the second half of the year). Growing inflation in the countries exporting hydrocarbon resources is linked to considerable hard currency revenues flowing into their economy, leading to an increase in the profits of exporting companies and the state budget.

A number of measures were adopted at this time to raise salaries and social payouts from the budget. These measures enabled to increase solvent demand of the population, including those citizens with the lowest standard of living. However, given insufficient domestic production of consumer goods, the combination of a stable high demand for these goods and an expansion in money supply in the economy led to an increase in the import of goods. To a certain extent, it also speeded up inflationary processes, which have a particularly negative effect on the economically disadvantaged population groups.

The world crisis had a significant negative impact on the CIS countries as a result of their strong dependence on global demand and prices of exported resources, international loan and investment flows and a contraction in industrial production.

The economies of Russia and Ukraine, the largest member states, were hit hardest. There was a sharp fall in industrial production, volumes of investment and construction and a quick reduction in private consumption. GDP contracted most in 2009, compared to the previous year, in Ukraine (-15.9%), Armenia (-14.4%), Russia (-7.9%), the Republic of Moldova (-7.8%). On average across the CIS GDP fell by 7%.

The following CIS countries demonstrated economic growth: Azerbaijan (+ 9.3%), Uzbekistan (+8.1%), Tajikistan (+3.4%), Kirghizia (+2.3%), Kazakhstan (+1%) and the Republic of Belarus (+0.2%). On average across the CIS industrial production fell by 10%. According to the Interstate *Statistical Committee* of the Commonwealth of Independent States, in 2009 the situation was most difficult in Ukraine where industrial production fell by 21.9%, in the Republic of Moldova (22.2%) and Russia (-8.2%). Commercial production only increased in three CIS countries: Azerbaijan (+8.6%), Uzbekistan (+9%) and Kazakhstan (+1.7%).

Despite all difficulties, in 2010 the economies of the CIS member states demonstrated a positive growth dynamics (with the exception of Kyrgyzstan). GDP growth was the strongest



in Turkmenistan (+9.2%) and Uzbekistan (+8.5%). Kazakhstan and the Republic of Belarus also posted fair results. GDP growth Azerbaijan slowed in 2010 compared to 2009 (Figure 4).

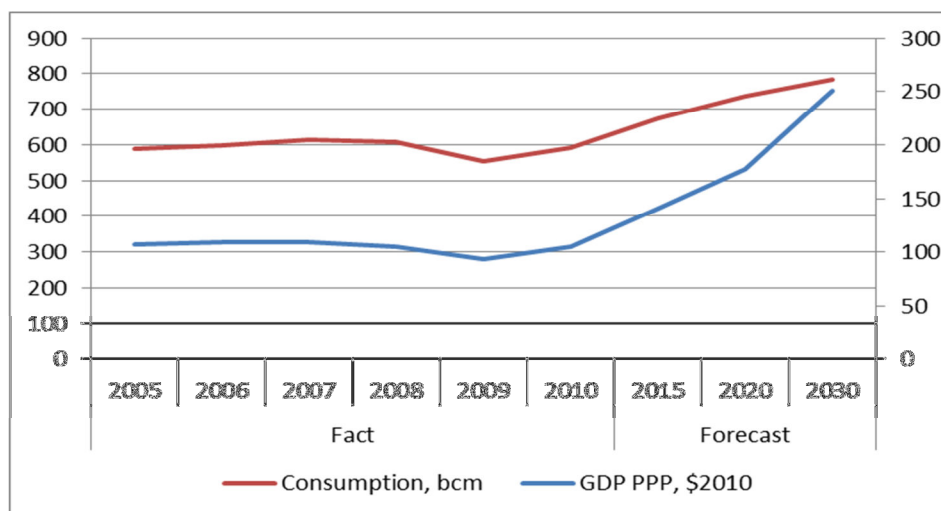


Figure 4 – Correlation between GDP growth and gas consumption in the CIS, bcm

Sources: Interstate Statistical Committee of the Commonwealth of Independent States, BP, ERI RAS

It is important to emphasise that the CIS countries demonstrated different models of the impact of the crisis on their economies:

- Countries which experienced a two-fold effect of the crisis – on net exports and investments. Example: Ukraine. Armenia is also in this category, although its net exports suffered to a lesser degree (as imports fell faster).
- Countries in which the crisis mainly affected net exports; investment share in GDP fell but remained positive for most of the time. Belarus is in this category.
- Countries where household consumption was affected most. This is a fairly rare model in a crisis, since it is consumption that typically is most resilient to economic volatility. Kyrgyzstan (in 2009) is in this category.



- Countries where the GDP components affected by the crisis changed, as the crisis spread. For example, in Kazakhstan net exports provided a negative contribution to GDP dynamics in the 1st and 3rd quarters of 2009, in the 2nd quarter of 2009 it was net exports and investments, in 2008 and the 4th quarter of 2009 - household consumption. In Moldova there was a reduction in net exports during 2008 and a reduction in consumption and investments in 2009.

In the long term it is expected that positive GDP growth in the CIS countries will continue in the period up to 2020 (Figure 5).

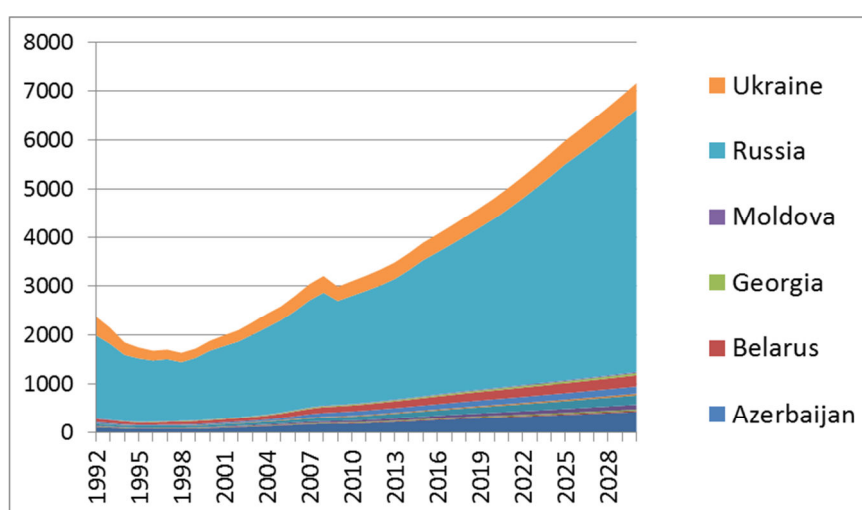


Figure 5 - CIS countries GDP PPP \$2010 growth projection

Source: ERI RAS.

In the period up to 2020 Azerbaijan, Kazakhstan, Turkmenistan and Uzbekistan will be the most dynamically developing CIS states, given fairly high world energy prices. These countries base their development on hydrocarbon exports. At the same time they are implementing plans to develop non-energy industries, such as chemical and petrochemicals industries, non-ferrous metallurgy and production of construction materials (primarily Azerbaijan and Kazakhstan).

The economic development scenario for Russia follows the hypothesis of the Energy Strategy of the Russian Federation for the period up to 2030 (ES-2030). ES-2030 envisions a post-crisis recovery of the main industrial and territorial proportions of the economy. Economic growth rates will slow down somewhat due to priority development of innovation industries in the manufacturing sector, as well as development of the infrastructure industries – transport and communications, the power sector, IT and media technologies.

The lowest GDP growth is expected in Kyrgyzstan, Tajikistan, Moldova and to a certain extent in Ukraine. These countries will primarily experience difficulties with a stable energy supply.

It is not yet clear how the financial crisis will affect the development of the Belarusian economy in the next 5-10 years.

A change in the structure of the economy is expected in all CIS countries, towards non-energy intensive industries, in particular the services industry and the financial sector.

Population

Population growth is a key driver of future energy trends, since the level of population has a direct effect on the size and composition of energy demand and an indirect effect by influencing economic growth and development. In the gas sector population dynamics has a direct impact on gas consumption not only in the residential and commercial sectors, but in the entire national economy. Across the CIS, negative population growth in the Western CIS countries and positive dynamics in the Central Asia result in a stabilized population in 2011-2030 (Figure 6).

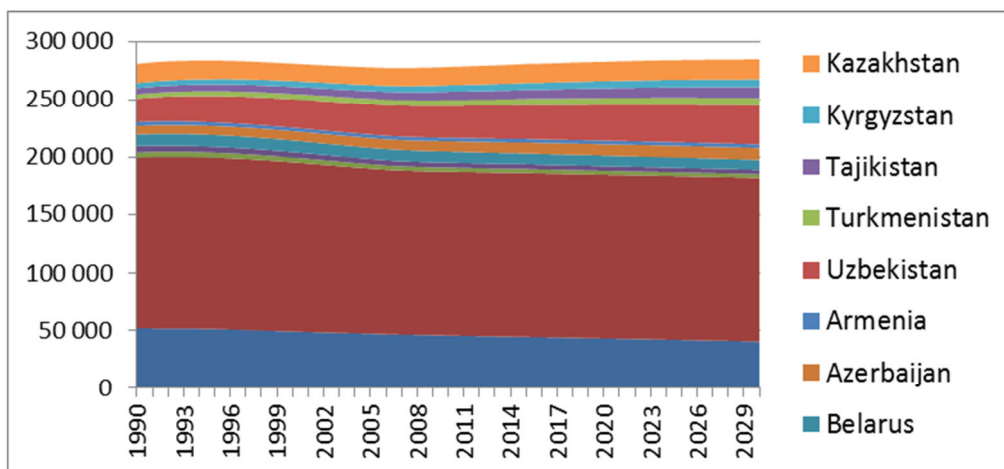


Figure 6 - Predicted population growth in the CIS member states in the period up to 2030 (thousand people).

Sources: UNPD, Rosstat, ERI RAS.

Natural gas prices and price regulation

Issues of pricing specific for the CIS countries form an important factor influencing gas demand. Since the times of the Soviet Union, natural gas prices have been set by the



government. This situation remained following the dissolution of the Soviet Union and the formation of CIS. Nowadays natural gas prices are still primarily set at the government level.

It is important to note that natural gas prices in many CIS countries are significantly below world prices as they are regulated. This promotes consumption of great volumes of gas, since it is cheaper than alternative fuels (Figure 7). The distortion between regulated gas prices and free domestic prices for competing fuels - coal and fuel oil - still effectively prevents inter-fuel competition and skews energy consumption patterns even more in favour of gas. This resulted in the dominant position of gas in the fuel and energy balance of the CIS states and in a very high level of energy waste, especially in the industry and municipal and public sector. For example, in the Russian economy gas consumption increased from 41% of primary energy needs in 1985 to over 53% in 2010, one of the highest levels worldwide.

In 2006 the Russian government made a decision to increase domestic prices to the level of “equal profitability” with export prices, with the aim to stop ineffective consumption growing. Gradual increases in domestic prices are being made for this purpose. For example, in 2012 prices will be raised by 15%. However, other gas producing countries have no such plans. In the Central Asian countries gas is supplied to the domestic market at reduced prices to maintain social stability and the competitive ability of the national economies. In Turkmenistan households have been getting 600 cubic metres of gas per person for free, following a presidential decree in 1992.

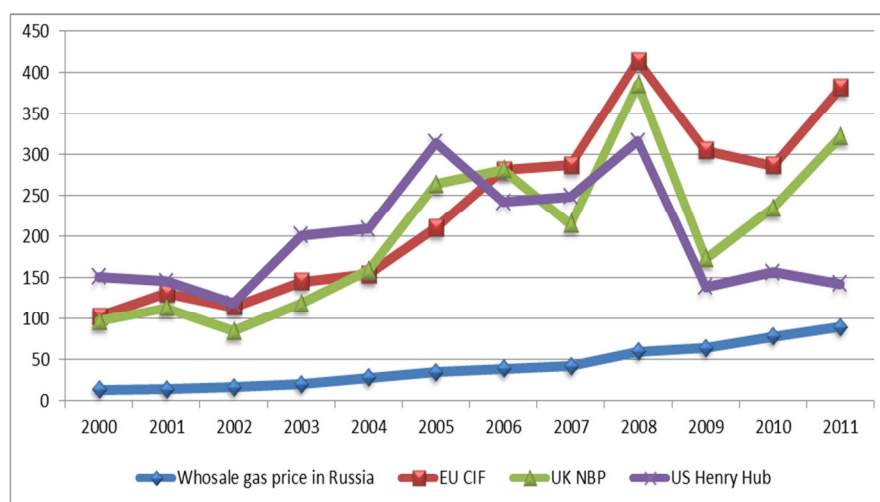


Figure 7 – Comparison between the world prices of natural gas to Russian wholesale gas prices, US Dollars / thousand cubic metres

Sources: International Monetary Fund, Federal Tariff Service of the Russian Federation, BP Statistical review 2011.

State regulation of prices also exists in the countries importing gas, particularly in Ukraine and Belarus. State regulation of prices is primarily aimed at protecting consumers from rapid increases in the prices of imported gas. Countries supplying gas, primarily Russia, have long been insisting on transferring to the European price setting formulae in their settlements with the CIS neighbours. This transition period is extremely slow and complicated, since multiple political considerations affect the changes. A number of countries have been given temporary discounts in exchange for certain conditions (sales of gas transportation assets, placement of the Black Sea Fleet, etc.).

Wholesale gas prices in Belarus are calculated as the price at the border plus a set mark-up. For example, in 2012 wholesale gas price in Belarus was 217 US Dollars / 1000 cm. This price includes the cost of import – 165.6 US Dollars / 1000 cm, a mark-up charged by Beltransgaz (9.3%, or 15 US Dollars / 1000 cm) and VAT (20%). In Ukraine in 2009 the government set gas prices for households, the municipal sector and CHPs at around 44-72 US Dollars / 1000 cm, while importing gas at prices over 300 US Dollars / 1000 cm. However in 2010, the prices rose by 50%, compared to 2009. In 2011 gas prices for households doubled again compared to 2010. In 2013-2014 prices will rise further (Figure 8).

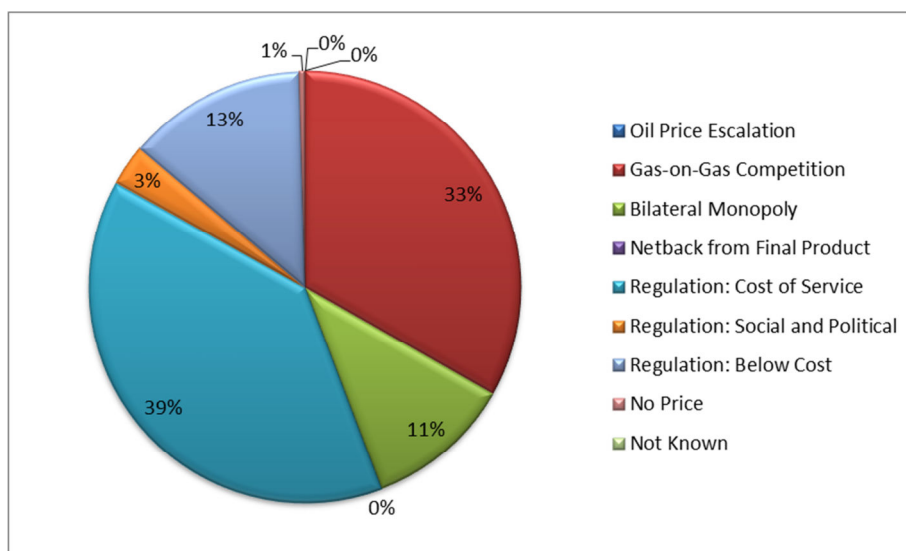


Figure 8 – Proportions of price setting for gas in the CIS

Source: ERI RAS

With higher gas prices, saving is more attractive for consumers who become prepared to implement more expensive saving measures. But their price sensitivity is very uncertain: in a regulated gas price environment and with gas supplies limited by the rationing mechanism there is no historical data on gas price elasticity in the CIS. Until now there has been no correlation between domestic gas demand and gas prices (Figure 9).

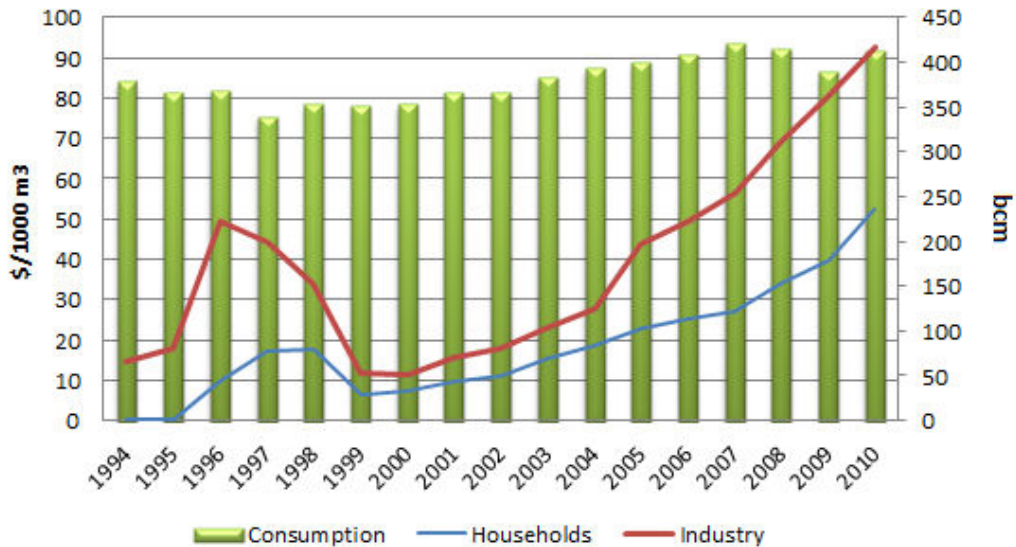


Figure 9 - Dynamics of Russian Gas Consumption and Gas prices

Sources: ERI RAS, BP

Government measures to improve energy efficiency

The next factor influencing gas demand in the CIS countries is the course towards energy efficiency, declared by the majority of the CIS states. To this day the CIS member countries remain a region with extremely high energy intensity, which points not only to difficult climate conditions but also to inefficient use of fuel and energy resources.

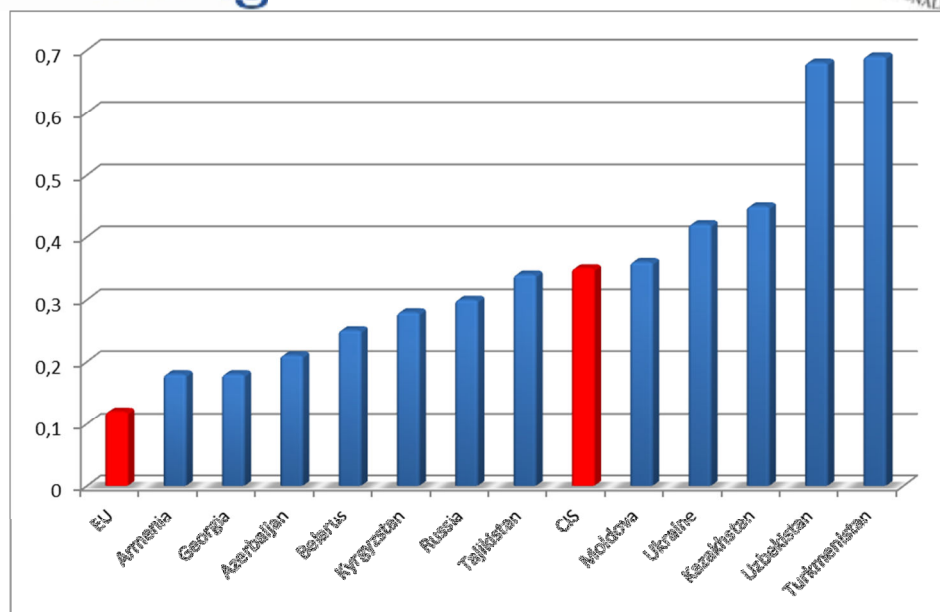


Figure 10 - Energy intensity of GDP at PPP, koe/k05p, year 2009

Sources: "World Energy Intensity Data". *Enerdata Statistical Energy Review 2010*. Enerdata.

As Figure 10 shows, gas producing countries have the highest energy intensity: Kazakhstan, Turkmenistan and Uzbekistan. In Russia this figure is lower than the figure across the region.

This is linked to the intention of the national governments of gas importing countries to increase their energy efficiency in the conditions of high prices, so that the economy can be competitive while retaining a large share of gas in the energy balance. Gas exporting countries are, on the contrary, interested in high gas prices in the world market, since they could export gas volumes which are freed up. The majority of government programmes that exist nowadays in the CIS countries aim to improve energy efficiency.

For example, Kazakhstan plans to reduce its energy intensity by 10% by 2015, Belarus - by 30%, Ukraine – by 20%, Uzbekistan – by 25%; Armenia – by 25% by 2020. However, the extent to which these plans are realistic will largely depend on the availability of economic and technological resources. Russian plans to cut energy intensity by 40% by 2020; in absolute terms Russia's overall energy saving potential is estimated at 300 mtoe (Figure 11), and overall potential of all CIS countries totals 420 mtoe per annum. The gas sector plays a significant role.

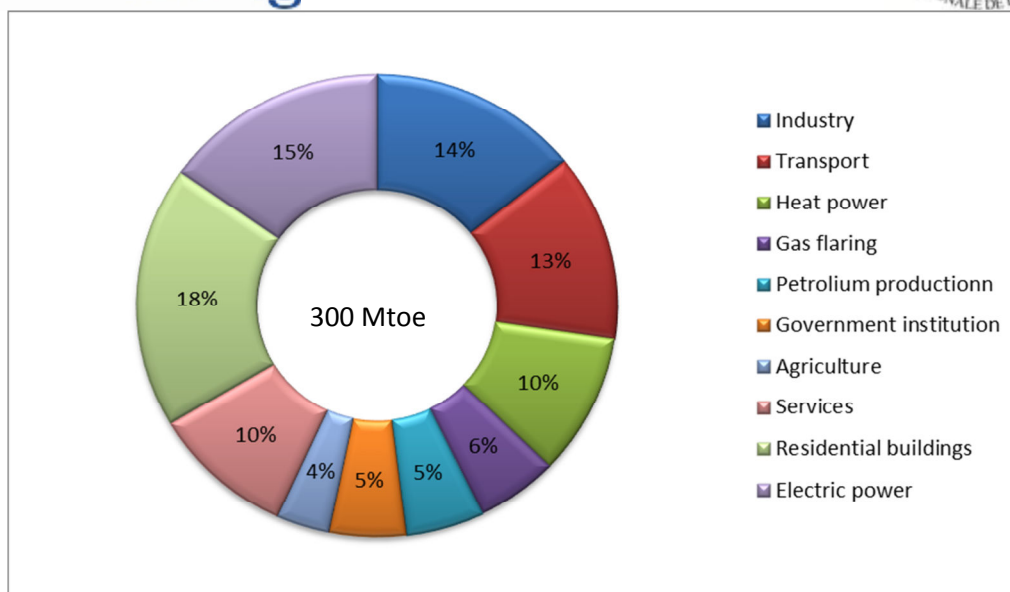


Figure 11 – Overall energy saving potential in Russia, 2008 data

Source: *Energy Strategy of the Russian Federation for the period up to 2030, approved by the government of the Russian Federation in 2009.*

Development of energy saving technologies will make it possible to cut gas consumption significantly. For example, Ukraine plans to reduce gas consumption by 18 bcm (partly due to energy saving measures, in particular, replacing gas with coal). Most of this reduction will have to be made in 2012-2013. Uzbekistan intends to cut its natural gas consumption by 7.1 bcm by 2015. Therefore in the medium term the energy efficiency factor will have a downward impact on gas demand in the CIS countries. Nevertheless, there are significant doubts that these plans are realistic, primarily due to insufficient financing of energy effective projects.

The structure of gas consumption by sectors of the economy and inter-fuel competition

As of today the possibilities to change the structure of the fuel and energy balances of the CIS countries are extremely limited, especially in the medium term. Substantial power generation capacities have been using gas as fuel since the Soviet times (the heat and electricity generation sector is a large consumer of gas). Changing the structure of these capacities will require significant investment and a strong political intent, so that they are replaced with other energy sources. This appears unlikely. Natural gas has strong competitive advantages in many consumption sectors and there are often no alternatives for gas in the environment of the CIS countries (Figure 12).

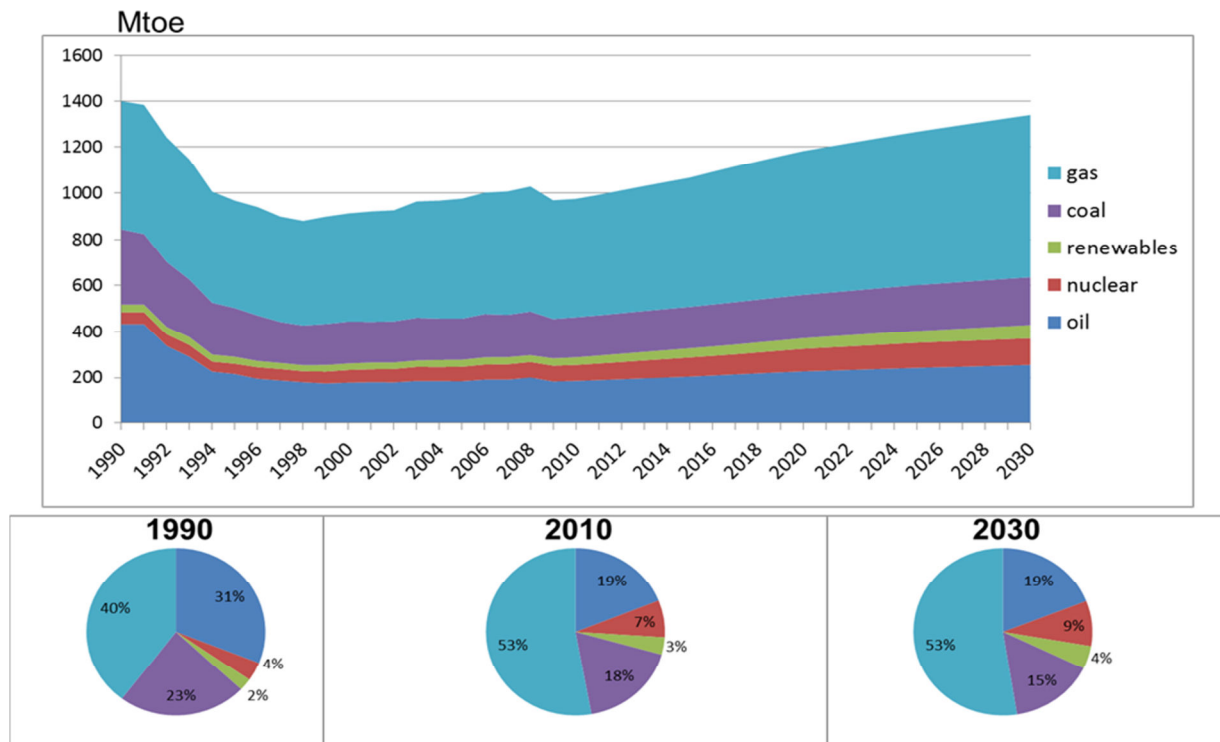


Figure 12 – CIS fuel mix dynamics

Source: ERI RAS.

Apart from price elasticity there are several other factors which determine future demand reaction. These are specific to each sector of gas consumption:

Power generation

Gas plays a very important role in the CIS power generation. For example, in Russia in 2005 natural gas accounted for 45% of the total (and 68% of thermal) electricity generated, 67% in Azerbaijan, 93.4% in Belarus, 98.4% in Moldova, 100% in Turkmenistan. The high share of gas consumption in the fuel balance of thermal power plants in the CIS is one of the strategic risks for reliability and affordability of power supply of economies. In the conditions of gas sector deregulation, such high dependence of the electric-power sector on the gas market will lead to a multiple increase in the costs of energy companies and inevitably to a significant rise in electricity prices.

Despite growing prices, natural gas remains the fuel of choice for the power sector for the following reasons:

- Existing generating capacities have a giant share of gas-fired capacities, and this structure is “fixed” given lack of financing. The cheapest and fastest option is to replace old equipment at gas power plants with more efficient one.



- Nuclear renaissance is in the official plans of several CIS countries, but it takes at least 10 years to build a nuclear block, and so far no large investments were attracted for this project. Even in Russia with its very well developed nuclear industry, capacity additions in this sector during the last decade were slower than expected.
- the policy towards renewables is declared in official documents (reaching 4.5% in the Russian fuel mix by 2030, up to 25% in Ukraine, etc.) but without state subsidies RES are completely unable to compete with hydrocarbon sources.
- coal development is questionable from the environmental point of view as there are no plans for CO₂-storage facilities.
- there is no visible strong drive to reduce CO₂-emissions, though Russia announced its goals in Copenhagen, These demand a strong energy saving and a remaining high share of gas in the fuel mix.
- energy efficiency measures in power generation are the main priority of energy strategies of the CIS countries, but so far their success is quite low due to the lack of institutional support and measures.

In this situation effective gas saving in the electric-power sector becomes a vital practical task based on strong economical (price) stimulus. It ensures that strategic goals of technical upgrading and diversification of power generating facilities are met.

Gas saving in the electric-power sector can be achieved with the help of the following technological and structural components:

- *the technological component* of gas saving is oriented towards more efficient use of gas for the production of electricity and central heating (at CHP) due to:
 - large scale technical upgrading of existing gas-fired power plants, transferring to the new, more efficient technologies (the CIS power sector has the potential for huge gas savings as its existing gas-fired capacity is almost totally made up of steam turbines, with efficiency rates 32 - 36%. If these were to be replaced by modern CCGT, there could be considerable gas savings);
 - construction of new plants working on gas only, with modern high efficiency gas turbines and a gas-steam cycle
- *structural component* of gas saving provides for replacement of gas generation in the structure of electricity production by increasing the share of power plants using alternative energy resources (hydro, nuclear and coal resources):



- changes in the structure of capacities are obtained through intensified development of alternative types of power generation, replacing new gas capacities and also partially replacing operating gas thermal power plants;
- changes in the production structure due to relevant changes in the structure of power generating facilities and, apart from that, due to a reduction in the annual load of gas power plants in favour of cheaper nuclear and coal capacities that will be fully loaded.

The price factor is of decisive importance for the implementation of structural, as well as technological components of gas saving. ERI RAS calculations made for Russia show that:

1) Given multiple price increases, prolonging the service life of operating steam-turbine equipment at gas power plants is an extremely inefficient solution. Moreover, even normal exploitation of most of the steam-turbine equipment that has not reached yet the end of its service life is linked to likely losses in comparison with the option of replacing this equipment with new gas-steam technologies. Prolonging the service life of this equipment also requires investment (though not large). Growing fixed costs due to increasing repair works costs make the difference in the prices of steam-turbine and gas-steam facilities production even greater. Thus, the new pricing policy in the gas market leads to a rapid obsolescence of operating power plants and increases the efficiency of their technical upgrading.

2) Even in view of uncertain technical and economic parameters of expansion and new construction of new coal and nuclear power plants (first of all – related relative capital investments), changes in gas prices dramatically decrease competitiveness of gas power plants (even with new, highly efficient equipment) as the main power generation source. Exploitation component in the price of new gas-based power generation is comparable to the total production costs (including capital costs) of developing nuclear power stations and thermal power stations working on coal.

Significantly higher fuel component of new and especially of operating gas-fired power plants will lead to changes in the usage modes of their capacities which will be mainly used as flexible sources. These priorities in the development of the gas-based power generation and alternative types of power generation significantly change the possible structure of CIS capacities and power generation mix and by 2020 will lead to a sharp growth in capacities of nuclear and coal condensation power plants; while gas-based power generation increase is provided mostly by gas CHPs.

Large-scale modernization of operating gas power plants and commissioning of the new capacities based only on the new technologies for using gas will provide for the significant growth in the efficiency of the gas-based power generation and the reduction of specific fuel consumption by gas power stations (according to ERI RAS estimates, in Russia - by 20% to



2020). Comprehensive use of the technological factor of the gas saving together with the structural factor (replacement of the gas-based power generation in the structure of capacities and electricity production) will provide for the comparatively slow gas power sector consumption increase or even decrease in certain countries.

Technological factors of the gas saving are of the biggest importance – large-scale modernization of existing gas-fired capacities and the development of the new gas-based power generation only on the basis of up-to-date highly efficient technologies provide for more than 50% of the total volume of gas saved in the electric power industry by 2020. The impact of the technological factors will be seen as early as 2010, because in almost all new gas projects new efficient technologies are used. The impact of the structural measures of gas saving is somewhat less. These measures provide for the replacement of the gas-based power generation in the capacities' structure by more intensified development of alternative types of power plants. The influence of the structural factors is somewhat deferred and will be seen only by 2015 as the large-scale investment programs in the nuclear and coal generation will be in process of implementation. At the same time despite the increased focus on nuclear and coal-based generation, in many regions gas has no significant substitutes: there are either no hydro-resources available, or coal is not competitive due to its transportation costs, or nuclear units cannot be built in the necessary timeframe.

Sensitivity analysis show significant elasticity of gas consumption by the power sector to the varying gas prices. The greatest influence on the dynamics of gas consumptions have the structural factors determined by the competitiveness of decisions as to the technical upgrading of existing and development of new gas capacities and alternative types of power generation. Wider range of opportunities for investments in the electric-power industry by 2020 also provides for more elastic gas demand for this period, than in 2015 (more opportunities to adapt the structure of power-generating facilities to this or that level of gas prices). Calculations show that starting investments in gas savings are economically justified with gas prices starting at 100 \$/1000 m³. Above that threshold, the economics of upgrading the capital stock becomes compelling. Due to projected gas price increases, a massive restructuring of the CIS power assets is likely in 2010-2020.

The impact of price increases for power generation will also depend on its ability to pass on cost increases to consumers.

Industry

Industrial gas consumers in the CIS play an important role in the economic growth of the member states. They also have a huge lobbying potential. Therefore their reaction to gas



price increases rise is a very sensitive issue. There are many alarmist statements concerning the future competitiveness of some industries (chemical, metallurgical and other). But so far forecasts of catastrophic consequences for the industry are not confirmed by the real state of things - CIS producers haven't lost their positions in the world market (first of all because fortunately the world prices of most important exports – steel, steel products and fertilizers – are also high).

The impact of the increase of gas prices for certain industrial branches depends on the level of the gas consumption specific to these industries. In the CIS countries the highest share of gas payments in total production costs have metallurgical and chemical industry, production of fertilizers and cement (most of them – export oriented or booming, as construction materials). But so far with low gas prices these costs have not been considerable. Moreover, during the last years, despite growing gas prices, in export-oriented industries, for example, in metallurgical industry, gas has the same percentage in the overall cost structure, as prices of metallurgical industry products in domestic and foreign markets grew more quickly in comparison with gas prices. In the future, assuming the announced price growth, these costs will rise, but still much lower, than in the power sector, for example.

Industrial consumers have resources and potential to adapt to the new price environment using such measures as energy saving, transfer of the rising costs to the prices for their final production and growth of their labor productivity. The large size of enterprises and the “rational behavior” of the industrial sector should provide for high incentives for these measures.

An important result of the gas price increases is that the majority of the large CIS companies (they are at the same time the biggest gas users) have set energy-saving plans, begun to undertake long-awaited modernization programs that will make some of the most easily-attainable savings in gas consumption. For example all the major CIS steelmakers have already announced modernization programmes, in which energy saving measures play a prominent part, including the construction of continuous casting capacity, the installation of combined-cycle gas turbine power plants and other equipment for utilizing waste gases.

The sub-industry most vulnerable to gas price increases is production of ammonia and fertilizers, where gas inputs are 40-60% of the cost of goods sold.

A major area of uncertainty during this period is the timing of gas consumers' reactions to the rising cost of gas. Some customers (especially producers of petrochemicals) may have only a fairly narrow window of opportunity to invest in replacing their energy-intensive capital stock with new, more energy-efficient equipment or introducing more energy-efficient technologies before higher gas prices will begin cutting into their margins.



Heating

In the CIS the Soviet legacy of a district heating is characterized by extremely low efficiency and huge losses. The majority of the countries face now reform of the housing sector and municipal services. Reform of the heating systems is one of the most urgent due to the particularly bad state of the assets. The expected increase of gas prices will of course foster these reforms and at the same time lead to gas saving in this sector, as there is a huge potential for saving in all stages of heat supply.

New more efficient equipment on CHP was mentioned above and possible gas saving in boiler houses is also formed mostly by increasing the efficiency of the heating facilities. In Russia the potential for the gas saving by the boiler houses with the existing structure of the heat production is about 10% of the present consumption of gas by the boiler houses.

The potential of substitution of gas by other fuels in the boiler houses is being taken more seriously as a result of gas price increases. At the moment the demand for gas from the boiler houses in general case cannot be regarded as elastic. This conclusion can also be extrapolated to the near future. Surely enough in some specific cases the price factor may play the leading role. Particularly this is true for the new industrial boiler houses. For the existing boiler houses and new heating boiler houses the decisive role in the choice of fuel non-price factors (technological, ecological and other) usually play. The transfer of the boiler houses to solid fuels is often impossible due to the technological reasons (insufficient capacities for the placement of boiler-house facilities for the burning of solid fuel, lack of space in the adjoining territory for the coal storage and ash disposal and so on). For the boiler houses located in the settlements, transfer from gas to the solid fuel is impossible due to the ecological restrictions.

Implementation of measures for making the buildings warm and hindering the cold air to enter them together with the combined regulation of the buildings heating system make it really possible to decrease for 30-35% the needs of the households using centralized heating. Significant over-expenditure of the heating energy takes place in the systems of hot water supply of buildings. Some part of it is related to the leaks of water from leaking fittings and pipes; the other part is linked to the excess use of hot water. Installation of the hot and cold water counters in the flats itself doesn't lead to the heat saving, but it creates technical conditions and economical stimulus for saving. Possible decrease of the hot water consumption, as can be judged from experience with such counters, according to the estimations is about 20-25% of the total volume of the hot water consumed by the households. Networks are another source of savings - the average percentage of deterioration in the heating network is about 60-70%. In accordance with evaluations, 80-85% of losses of the heating energy in the heating network are due to the heat losses through insulation and the



remaining 15-20% - are the heat losses related to the leaks of the thermal liquid (system water) through the worn parts of fittings, pipe joints and places where the corrosion has damaged the pipeline. Replacement of pipelines and fittings in the existing central heating systems with up-to-date pipelines and fittings can half heat losses in the networks. This is the maximum level of energy saving – it is also called the technical potential for energy saving. If converted to the gas consumed by the boiler houses (for the existing structure of the heat facilities, technical parameters of boiler houses and the structure of fuel consumed by them), this is equivalent to 4% of gas consumed nowadays by the boiler houses in Russia.

Residential sector

Despite many alarmist statements, analyses show that the sensitivity of residential consumers to gas price growth is not very high as the share of gas in their total expenses (even for the people with low income) is not significant. In fact, the average gas bill for households in CIS is low even when compared to disposable income and GDP per capita.

One visible result of price increases has been the return of the phenomenon of non-payment, which had almost disappeared from the gas sector in the early 2000s. Moreover, there are some indications of a decline in consumption levels by individual households in some countries. But it is difficult to calculate the potential reductions in household consumption as a result of price increases. Households use gas principally for heating (water and space) and for cooking. A high proportion of rural households use gas for heating. It is generally assumed that consumption by households is unnecessarily high, and that it will be reduced as gas prices rise. Major parameters for the assessment of future residential demand are:

- New energy saving equipment and higher building standards (at least for the more prosperous part of the population).
- Growing level of living standards and per capita square meters of space.
- Switching to individual boilers for heating (these are statistically added to the residential sector).

Calculations show that in the future up till 2020 the natural gas will remain the most economically attractive fuel for the households. For example, even with new gas prices the fuel component in heat production costs will be still below the modern level of the fuel component in the heat production cost when the good-quality fuel (diesel, condensed hydrocarbon gases) is used that makes it possible to turn to the highly-automatized systems of autonomous heat and electricity supply.

Theoretically, if all the existing inhabited houses with autonomous heat supply are repaired or reconstructed in order to comply with the requirement of the new construction norms and



regulations (which is close to the European standards on the heating efficiency for the inhabited buildings) it would be possible to save about one quarter of the sector's gas consumption. But it is almost impossible to fulfill these requirements. Such reconstruction requires a lot of funds and without the active participation of the government will not be made either. As the 2/3 of the existing housing facilities with autonomous heat supply are located in the rural area, there is still no answer to the question, what is better: 1) full reconstruction of facilities or 2) partial reconstruction and liquidation of the least valuable part of the facilities (villages that have no prospects, buildings with deterioration and so on) with the construction of equivalent facilities in places more suitable for life. Clearly the municipal services reform and gas distribution sector reform are vital preconditions for correcting excessive consumption.

Domestic CIS gas demand future development

Considering all these factors influencing gas consumption, a forecast of future gas consumption in the CIS was made at ERI RAS, using the SCANNER modelling complex. According to ERI RAS estimates, gas demand of the region is expected to total 770 bcm by 2030, representing around 18% of the global gas demand and making the CIS one of the biggest regional markets.

Russia

Pre-crisis demand growth in Russia was even faster than expected in the State Energy Strategy. After a 7% decline in 2009 gas demand recovered by the end of 2010. According to ERI RAS forecasts, domestic consumption of natural and associated gas in Russia will grow to 539.2 bcm by 2020 (an increase of 18.3% compared to 2010).

There will be a consistent decline in the share of power plants and central boiler houses in overall consumption of natural gas during the projected period. Comparatively low growth in electricity generation compared to other sectors of the economy is the reason for this (Figure 13). As a result, overall share of the electric power sector (including central boiler houses) in natural gas consumption in Russia will decline from 55.5% in 2010 to 50.9% in 2020. This decline will happen due to a forced increase in the share of gas used in the industrial sector (as a result of a rapid growth in the manufacturing industry). Therefore the share of the industrial sector in overall gas consumption in Russia will grow from 15.2% to 18.1% in a decade. However, in absolute terms the increase will be due to consumption by power plants and boiler houses. No significant changes are expected in the electric power sector. The

share of gas will continue to dominate over other primary energy resources and will increase insubstantially by 2020.

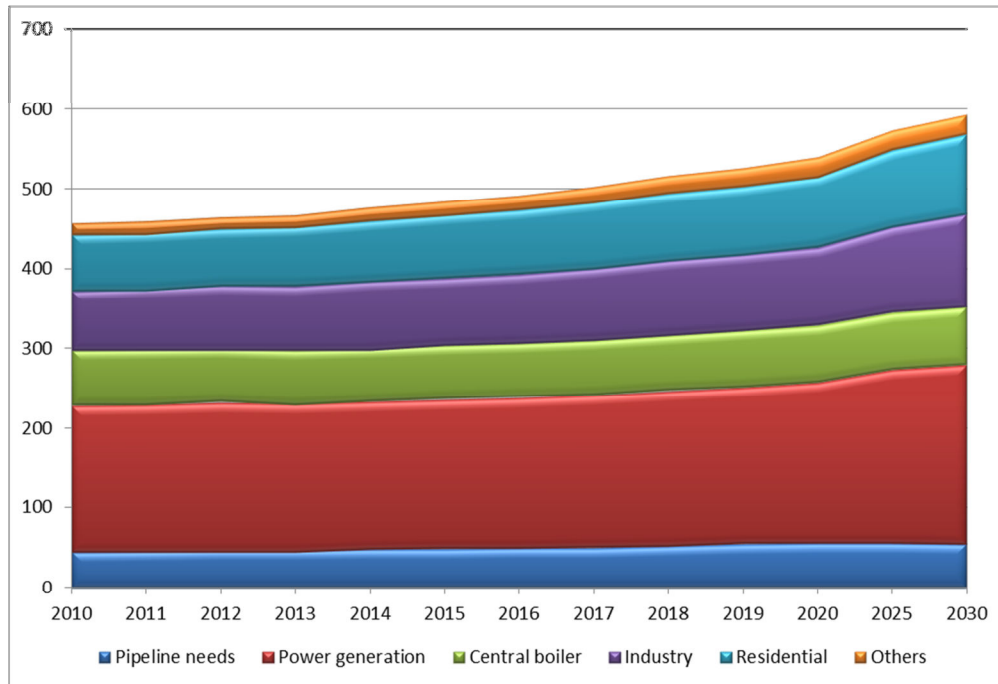


Figure 13 – Projected gas consumption in the sectors of the Russian economy, bcm

Source: ERI RAS.

Price elasticity of domestic gas demand is rather low, as alternatives to replace gas are limited.

- Residential sector: government will continue to subsidise this sector for several years after netback pricing has been introduced for other sectors, rising living standards will also reduce price response.
- Industrial sector will be able to pass on cost increases, but efficiencies will be introduced. Generally there are limited possibilities to switch fuels.
- In the Centralized heating there are limited switching options for technical and environmental reasons
- Power sector: until 2017-2020 inter-fuel competition will be limited as coal is cheaper than gas in western Russia and no competition from nuclear generation will be possible. From 2020 incremental power demand will be met largely by coal and nuclear plants.

Other CIS countries.

Projected gas demand for the rest of the CIS is shown below (Figure 14). The graph shows that by 2015 demand will grow by 19%, afterwards demand growth will slow. By 2020 demand for gas will increase by just 0.2% compared to 2015.

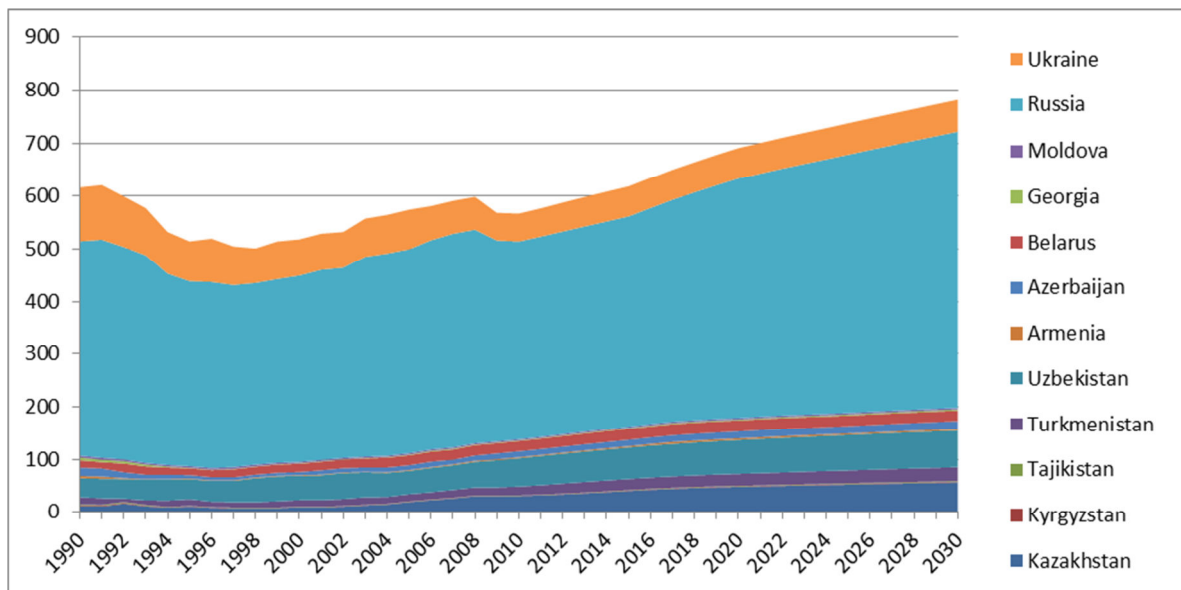


Figure 14 - CIS gas demand forecast, bcm

Source: ERI RAS.

The biggest increase in demand in absolute terms is expected in Armenia – by 67%, Georgia and Azerbaijan – by over 50%. However, in absolute terms gas consumption in these countries will grow insubstantially, maximum increase expected in Azerbaijan – 4.9 bcm.

A significant increase in absolute terms is expected in Ukraine – over 19 bcm, which is 36% in relative terms. In other countries natural gas demand will grow by 26-40%.

A reduction in demand is only predicted in Uzbekistan – by 17%, or, 7 bcm.

Table 1 below shows an analysis of gas demand in all of the CIS states, including Georgia.

Table 1 – Brief analysis of CIS future gas demand

Country	The role of gas in the overall energy balance of the country	Major gas consumers by sector of the economy	Main trends determining future gas demand
Ukraine	As of now the share of gas is around 38% of overall energy	Overall consumption in the country – 22.6 bcm. Electric power generation accounts for	Gas consumption in Ukraine is predicted to total 60 bcm by 2030. млрд. куб. м. The presented forecast shows



	consumption in the country.	22.8% of total gas consumption. Boiler houses account for 9%. Internal needs of the gas industry account for around 7.5%. Industrial consumers – 28%. The housing and public utilities sector accounts for around 25%. The remaining sectors of the economy altogether account for 7.7% of gas consumption.	planned increases in consumption in all economic sectors. This is primarily linked to lack of significant amounts of finance in Ukraine, which could be used to create inter-fuel competition in various industries.
Uzbekistan	Uzbekistan is one of the largest gas consumers among the CIS states. In absolute terms this country consumes 42.1 bcm of gas per annum. Currently the share of gas in Uzbekistan is over 91.8%.	Gas-fired CHPs make up the majority of electric power generating capacities in Uzbekistan. 29.5% of gas consumed is used to generate electric power. Maximum consumption is recorded in the housing and public utilities sector – 35%. Industrial sector of Uzbekistan consumes over 20%. Other sectors use 6.6 bcm of gas.	By 2030 demand for gas in Uzbekistan is expected to fall to 35 bcm. This will primarily be achieved by following a policy aimed at reducing domestic gas consumption, thus freeing up additional gas volumes for exports.
Belarus	The role of gas in overall energy consumption is substantial – over half of all energy used in the country (21.2 bcm).	Electric power generation accounts for most of gas consumed in the country – 53%. Heat power sector uses 28%. Industrial sector accounts for 10% of overall gas consumption. Housing and public utilities sector accounts for 7%.	By 2030 predicted gas consumption will reach 24 bcm of gas per annum. An insubstantial increase in gas demand is due to Belarus's policy, aimed at reducing dependence on energy imports and due to energy efficiency programmes. However, it cannot be said that gas consumption would be reduced. This is linked to the crisis period in the economy of Belarus, which at this stage will inhibit significant investment, development of RES and infrastructure replacement.
Turkmenistan	The share of gas in the overall energy	Power plants consume a large proportion of	By 2030 gas consumption could reach 30 bcm. Most



	balance of Turkmenistan is significant at just under 70%, or 18.5 bcm of gas per annum (in 2010).	gas- 46%. Industrial sector uses 32%. Housing and public utilities sector uses 13% of gas in the country. All other sectors, including internal needs of the fuel and energy sector, account for 1.6 bcm.	growth is expected in the public utilities and housing sector, which is linked to the system of subsidising domestic gas demand, particular to this country. Gas for households is sold at zero tariffs, which is what provides for maximum growth in consumption in the housing and public utilities sector in the projected period.
Kazakhstan	The share of gas in the overall energy balance of Kazakhstan is insignificant at 11.9%. Oil and coal play the main role in the energy balance. Gas consumption reached 26.7 bcm in 2010.	Industrial sector accounts for 60% of gas consumption. Households account for 22% of overall consumption. Electric power sector and other sectors- around 18%.	By 2030 demand for gas in Kazakhstan could more than double compared to 2010. This will primarily be due to demand by households. Electric power generation and industrial producers will demonstrate an insignificant increase in gas demand due to low production volumes and disruption to gas supplies to industrial consumers.
Azerbaijan	The share of gas in energy consumption in Azerbaijan is estimated at 65%. In 2010 Azerbaijan used 6.6 bcm of gas	Electric power sector is the main gas consuming sector in Azerbaijan's economy –at over 40%. The housing and public utilities sector consumers over 30%, industrial sector has a share of around 23% in overall gas consumption.	By 2030 gas demand in Azerbaijan could total over 16 bcm of gas per annum. An increase is expected in all sectors of the economy, which is due to substantial gasification plans and the absence of environmental limitations and energy efficiency plants.
Moldova	The share of gas in the overall energy balance is 44%, Moldova uses just over 3 bcm of gas per annum.	Electric power sector is the main consuming sector, accounting for 48% of total gas demand. Industrial sector uses 30%. The housing and public utilities sector– 15%.	An increase in demand to 5 bcm of gas is expected in the projected period. This increase is due to economic growth in the country and post-crisis recovery.
Armenia	Armenia uses 2.1 bcm of gas per annum. Gas accounts for over half of energy consumption in the	Households and small enterprises are the main gas consumers - 43%. Electric power sector and the industrial sector	Gas consumption in the projected period is predicted to increase by over 3-fold to 7.4 bcm, of gas per annum. This is mainly due to growing consumption in the housing



	country.	account for 28.5% each.	and public utilities sector and the industrial sector. Electric power sector, which Armenia plans to transfer over to nuclear power generation, will reduce consumption.
Georgia	The share of gas in the overall energy balance is 32%. Overall gas consumption in 2010 – 1.3 bcm.	Consumption is distributed across the sectors fairly evenly. Around 31% gas is consumed by the housing and public utilities sector, 30% - by the industrial sector and 23% - by the electric power sector.	It is expected that gas consumption will grow to 3.7 bcm by 2030. The majority of the increase will be after 2020, according to the forecast.
Tajikistan	Tajikistan uses 300 mcm of gas per annum. The share of gas in the overall energy balance is insignificant – just above 3%. Oil and oil products comprise the main share.	67% of gas is used by the industrial sector, by Tajik Aluminium Company. The rest serves as fuel for CHPs.	An increase in gas consumption to 2 bcm is expected in Tajikistan by 2030. Consumption growth is expected as a result of gas-fired power plants and industrial production growth.
Kyrgyzstan	Consumption of gas in Kyrgyzstan is under 200 mcm per annum. The share of gas in the overall energy balance is small - below 5 %.	Power plants account for all of the gas consumed in Kyrgyzstan.	In the future the share of gas in the overall energy balance will increase in proportion to economic growth.

Conclusions

In the long term period until 2030 natural gas will remain the dominant energy source in the CIS fuel mix.

- High energy saving potential in the region will not be fully utilised, firstly due to a lack of investment in upgrading and replacing existing capacities in the electric power generation sector. Secondly, this is due to insufficiently developed government programmes and initiatives in the area of energy efficiency and energy saving.
- Domestic gas demand will be increasing in the whole region despite price escalation due to the initially very high share of gas, slow rates of industrial and buildings assets turnover and general inertia of the sector.



- It seems that despite eventual moves toward more market-based pricing, CIS's gas industry will remain a hybrid of market mechanisms and state control during the forthcoming period.

So gas will remain “the fuel of choice” for this large part of the globe, and with increasing prices the CIS gas market has good prospects of becoming one of the most attractive regional markets in the future.