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"The EU Natural Gas Market and Ukrainian Policy on Russian Natural Gas Transit – Will Ukraine Be a Gas Bridge to Europe?"

Executive Summary

The question of bringing in line domestic concerns of supply security and independence in Ukraine with the interests of gas exporters (Russia) and importers (Western Europe) is intensively discussed in Ukraine. The German Advisory Group (GAG) and the Institute for Economic Research (IER) have already studied this issue several times. The current paper discusses the impact of alternative projections for natural gas demand in Europe and the corresponding extraction of Russian and Caspian natural gas on Ukraine as the main gas-transit country. It also evaluates the importance of possible changes in organizational and institutional structure of natural gas markets in Europe. It finally demonstrates how such different projections determine the detailed specification of Ukraine's strategy to maintain the main gas bridge for Russian gas to Europe.

The European Union (EU) is one of the largest natural gas consumers in the world. Imports of natural gas account for about 42% and originate by 44% from CIS, 29% from Algeria and 26% from Norway. It is expected that both import dependency and price of the imported energy resources will continue to increase. The official EU forecast states that natural gas consumption of current EU members and applicant states will increase from 504 bcm in 2000 to 646 and 880 bcm till 2010 and 2030, respectively. In a long-run forecast made by the International Energy Agency (IEA) natural gas demand in EU is projected to grow from 442 bcm in 2000 to 812 bcm in 2030. At the same time natural gas consumption in 30 European countries (except former USSR) will be in a range 758-889 bcm depending on the GDP growth rate in 2020, as the Energy Information Administration (EIA) predicts. Furthermore, various scenarios for different degrees of competition on European gas markets in the future—from market control through boardrooms and public involvement to full liberalization with independent, consumer-oriented regulation—are expected to affect European demand by up to 300 bcm.

For gas production in Russia, the IEA expects an increase from 583bcm in 2000 to 709 bcm in 2010, and to 914 bcm in 2030. Total exports will increase from current 188 bcm to 280 bcm in 2030, of which 260 bcm will be exported to CIS and European countries and 20 bcm to East Asian countries. Total EU imports of natural gas from transition countries (Russia and Caspian states) are estimated at 343 bcm. However, the high levels of gas demand in Europe will also provide incentives for other gas-producing countries such as Algeria, which can supply its gas at lower costs to Europe.

In such an increasingly competitive world, the optimal usage of existing infrastructure will be of primary importance in order to keep costs as low as possible. In this context, Ukraine has to prove that its reliability as a secure and reliable transit country that operates at the

lowest costs possible. Given the uncertainty about future developments within the EU, there are several possibly optimal strategies for Ukraine as well as some open questions, which we derive from preliminary results of a model developed by IER/GAG:

- Financing investments at present reduces costs of gas transportation—or at least, prevents higher costs—in the future and thus, is beneficial for Ukraine's gas pipeline system under condition of increased competition with other gas-exporting and gas-delivering countries.
- Establishing a joint consortium with Russia and probably another third-party investor ties exporting, delivering and consuming countries together thus contributing to increased security of gas supply, an explicit goal of the EU's energy policy.
- Establishing such a consortium reduces costs of operation of the entire pipeline system, thus further increasing its competitiveness provided that appropriate profit- and cost-sharing agreements between the parties have been established.
- Ukraine should insist on the inclusion of an additional provision on gas transit from Russia to Ukraine and further to Europe on a non-discriminatory basis.

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1. Background

This paper describes possible future scenarios for the gas market of the European Union and related consequences for the profitability of exports of mayor gas-producing countries surrounding Europe. Based on this analysis, we identify the main implications of the expected developments on future competitiveness of the Ukrainian gas transit system and demonstrate related implications for Ukraine's strategy of maintaining the main gas bridge to Europe.[1]

Following four months of negotiations, Ukraine and Russia in fall 2002 signed agreements on creating a joint consortium through which Ukraine's gas transportation network will be managed. The first agreement signed by PM Kinakh and Russia's PM Kasyanov sets some general principles rather than details, which are likely to be agreed in 2003. The second agreement signed by Naftogaz and Gazprom specifies more details of consortium performance but the text of the agreement has not been disclosed to the public yet. The question how to join domestic concerns of Ukrainian supply security and independence with the interests of gas exporters (Russia) and importers (Western Europe) is debated vividly within Ukraine.

2. Natural gas demand in Europe: alternative projections

The European Union (EU) is one of the largest natural gas consumers in the world. It consumes far more energy that it can produce and situation will not change after its first stage of enlargement. Currently about 50% of consumed energy in EU is imported and this figure is expected to increase to 70% by 2030. Imports of natural gas account for about 42% and originate by 44% from CIS, 29% from Algeria and 26% from Norway. Only the United Kingdom and the Netherlands have large natural gas resources that allow covering domestic demand while other countries have to cover most of the domestic demand by imports[2].

It is expected that both import dependency and price of the imported energy resources will continue to increase. Thus, security in terms of energy supply will also gain more importance in the European strategies to achieve sustainable development. In an official document dedicated to energy security—the so-called Green Book—the European Commission specifies the four main risks for Pan European security of energy supply: physical, economic, social and environmental. Physical risks mean temporary disruption of supply due to the geopolitical crisis or natural disaster. Economic risks come from possible fluctuation of energy prices on European and world markets. The disruption of energy supply is also likely to result in different negative social consequences like two oil crises put the end

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[1] The German Advisory Group (GAG) and the Institute for Economic Research (IER) have already carried out several analyses on the issue of gas transit through Ukraine (IER/GAG policy paper: *"Is the Gas Obtained as a Transit Fee Used Efficiently?"*, December 2001, The Ukrainian-Russian Gas Consortium (Kishinev, October 2002)- *A Comment,* Deutsche Beratergruppe Wirtschaft: Vollgas! Zur wirtschaftlichen Zukunft der ukrainischen Gastransitpipeline. Beraterpapier N 28, March 2000 , Opitz, Petra; von Hirschhausen, Christian (2001). *Ukraine as a Gas Bridge to Europe? Economic and Geopolitical Considerations.* In: Hoffmann, Lutz, and Felicitas Möllers (eds.) (2001). Ukraine on the Road to Europe. Heidelberg, New York, Springer, Chollet, A, Meinhart, B, Hirschhausen, C.v. and Opitz, P.: Options for Transporting Russian Gas to Western Europe - A Game-theoretic Simulation Analysis. Deutsches Institut fuer Wirtschaftsforschung, Discussion Paper No. 261. Berlin, 2001)

[2] Green Paper: Towards a European Strategy for the Security of Energy Supply. European Communities 2001.

to full employment and the massive strike of truck drivers was caused by the increase in oil prices. Finally, the environment might be affected either by the increased energy consumption or by accidental damage. Minimizing these risks is a key pillar of the EU energy policy and Ukraine has to attentively examine EU energy policy in order to make its transit policy efficient.

The European gas industry has developed rapidly over the last 30 years and natural gas is accounting for 20% of Western Europe's primary energy mix compared to 5% in 1970. This tendency is expected to continue over the next 20-30 years although quantitative assessments of different expert organizations differ substantially. The main reasons for these discrepancies are different assumptions on GDP growth and price for natural gas increase during the next 20-30 years

The official EU forecast published in the Green Book states that natural gas consumption of current EU members will increase by about 112 bcm to 540 bcm and the consumption of current accession countries from Eastern Europe will increase by about 30 bcm to about 106 bcm till 2010. In the long-run forecast made by International Energy Agency (IEA) the natural gas demand in EU is projected to grow by 2.9% per year from 2000 to 2010 and by 1.6% from 2010 to 2030. Thus, the natural gas consumption will increase from 442 bcm in 2000 to 812 bcm in 2030. For non-EU OECD Europe[3] IEA forecasts increase in primary energy use by 0.9% per year while increase in natural gas consumption will amount to 69 bcm. At the same time natural gas consumption in 30 European countries (except former USSR), according to Energy Information Administration (EIA), will be in a range 758-889 bcm depending on the growth rate in 2020.

Table 1.
European natural gas demand – EU, IEA and EIA[4] forecast (bcm)

	Reference case			High growth case		Low growth case
Expert Organization	EU*	IEA**	EIA***	IEA**	EIA***	EIA***
History 2000	504	503	524			
2005			597		611	575
2010	646	642	705	644	739	652
2015			824		889	758
2020		800	965	831	1070	872
2030	880	943				

* Current EU plus applicant countries
** OECD Europe – 22 countries
*** Eastern and Western Europe – 30 countries

Source: Green Book, IEA, , The Royal Institute of International Affairs (RIIA), *Briefing Paper* No. 26, November 2001 and own calculation.

In addition to the differences given in Table 1 different development paths for the following aspects (not considered in the predictions presented so far) might create further divergence from figures presented above:

[3] Czech Republic, Hungary, Iceland, Norway, Poland, Switzerland and Turkey

[4] For the detailed forecast on natural gas consumption with all scenarios published in *Annual Energy Outlook 2002* see table 3 in the Annex.

- Increasing energy prices are expected to result in substantially lower energy demand (the Green Paper forecasts 81% increase in a price for natural gas by 2030).[5]
- Increasing incentives for energy-conserving measures (e.g. imposed through ratification of the Kyoto Protocol).
- Substantial increase in competitiveness of renewable energy due to both, price increases of traditional fossil fuels and technological progress during the next thirty years.
- Substantial structural changes and competition enforcement in energy sector.

In particular, the quantitative importance of the last aspect is of crucial importance as will be demonstrated in the following section.

3. European natural gas market: pressures of competition

During the past 30 years the structure of European gas markets has transformed towards a more mature level where the need to extract profits in order to finance large initial investments (e.g. for distribution networks etc.) has diminished as such projects have been amortized. Instead, competitive pressure increasingly gains importance. To speed up the development of competition in the electricity and gas sectors the EU adopted a Directive on gas market liberalization in 1998,[6] followed by a further Directive in March 2001. In particular, 20% of each national market must be open at present, and this share has to rise to 28% by 2005 and to 33% by 2010. Finally, in March 2002, the EU prime ministers and heads of state issued the following common agreement on key principles for electricity and gas markets:[7]

- The freedom to choose a supplier will be extended to all non-household consumers as of 2004 for both electricity and gas. Those eligible consumers must cover at least 60% of the total market for each fuel. A decision on further market-opening measures will be taken before the spring European Council in 2003.
- Transmission and distribution functions have to be separated (unbundled) from production and supply.
- Non-discriminatory access to networks will be made available to eligible consumers and producers on the basis of published tariffs.
- Every member state will establish a regulatory function to ensure, in particular, effective control over tariff setting.

Recently (November 25), the EU Energy Council reached a political agreement on the opening up of the EU energy market to competition. The agreement covers two proposed Directives for the internal market in electricity and gas. It provides for the liberalization of electricity and gas markets for non-household users by July 1, 2004, and a complete liberalization for all users by July 1, 2007.

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[5] For example, projected demand in the IEA forecast depends on prices, which in turn are exogenous and expected to increase only modestly. In particular, they are assumed to remain flat at around USD 2.80/MBtu (in 2000 Dollars) and to rise only after 2010 in line with higher oil prices (IEA: World Energy Outlook 2002, pp.50-51).

[6] Directive 98/30/EC of the European Parliament and of the Council of 22 June 1998 concerning common rules for the internal market in natural gas Official Journal L 204 , 21/07/1998 P. 0001 - 0012

[7] International Energy Agency (IEA) 2002: World Energy Outlook 2002, p. 181.

Such tendencies towards stronger competition notwithstanding, not all EU members follow a policy oriented solely towards full liberalization dedicated to strengthening competition. Rather, other intentions such as supply security or environmental considerations are of high importance for many EU countries as well. In particular, while the United Kingdom (UK) strongly pushes towards increased competition with strong and independent regulators[8] especially Germany and France have so far opposed a fast opening of the market. Therefore, the direction of future EU gas policy cannot be predicted with certainty. Instead, different scenarios are possible. Currently, predictions of alternative structural changes on European gas markets identify three major scenarios: Gradual Transformation, dominated by the traditional, mainland-Europe policy direction where market control is executed through boardrooms and public involvement in existing companies; High Competition, guided by the Anglo-Saxon model towards full liberalization with strong, consumer oriented public regulation; and Vertical Integration, a combination of the previous ones.[9] In any of these cases, it will be the joint action of public and private agents that will shape European gas markets in the future.

3.1 Gradual Transformation Scenario

This scenario assumes that the structure of the single European market will remain oligopolistic. The competition to the substantial extent will be limited to the existing transmission and distribution (T&D) companies. Companies wishing to enter the market may be left with the prospect of fighting for TPA in the courts or building their own pipeline network: both are time consuming and expensive. There will also be widespread merges and acquisition between existing T&D companies. Moreover, merges and acquisitions will also be encouraged by privatization of currently public owned T&D companies. Efforts on horizontal integration will be undertaken by forming joint ventures or acquiring companies performing similar tasks in adjacent markets (e.g. current acquisition of Ruhrgas T&D companies in Central and Eastern Europe). The threat of a merger or acquisition in turn will result on maximizing companies' value by raising their profitability. Substantial efforts will be expected to reduce costs and x-inefficiency as well as maximize producer surplus at the expense of consumers. T&D companies may try to exploit their captive markets in order to compensate for revenue losses suffered in the eligible markets. As a result the gap between prices in the eligible and captive markets is expected to increase.

The existing long-term gas contracts will continue into the future under this scenario. Gas prices for power generation will be set to make consumer more or less indifferent to choose gas or coal. Other gas sales are priced according to the costs of using oil products as energy source. Long-term contracts will set the price for base-load gas while a spot market will price swing gas.

3.2 Vertical Integration Scenario

This scenario will materialize if the companies succeed to vertically integrate and control the entire gas chain. The control of upstream reserves by downstream companies will ensure their future supplies and limit resources for their potential downstream competitors. Vertical integration may extend further on to sales of gas to the power sector and large industrial

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[8] The UK already started liberalizing its gas market in the late 1980s and currently has the by far most competitive market within the EU (IEA: World Energy Outlook 2002).

[9] For detailed description of such scenarios see: Ellis, A Bowitz, E and K Roland. Structural changes in Europe's gas markets: three scenarios for the development of the European gas market, *Energy Policy*, 28, pp. 297-309. and J Stern, The Royal Institute of International Affairs, *Briefing Paper* No. 26, November 2001

users and even into small industrial, commercial and residential sectors. Gas supplies to Europe, under this scenario, will be produced from a concentrated group of companies such as Gazprom, Statoil, Sonatrach, and Shell/Exon, which together are expected to account for around ¾ of Europe's gas production by 2020. Any integration of these companies downstream will evolve the number of existing T&D companies such that a more concentrated market structure emerges. The vertically integrated companies will attempt to exploit any monopoly power they have. However, if a company captures all the benefits in terms of profits then it also has strong incentives for cost minimization. Thus, lower cost will result in expansion of output and lower prices for certain consumers.

In this scenario, tax considerations play an important role for pricing of deliveries within the country, as it is common in multinational companies. Integrated companies will try to exploit the differences in companies' taxation in different countries to concentrate profits in countries with low corporate taxes. For example, if company taxes are low in Russia, one way to minimize taxes for downstream companies is to pay a high border price and impose low consumer tariffs in order to shift the profits upstream into the low tax country.

3.3 High Competition Scenario

Market changes according to this scenario will have the largest consequences for all market participants including producers and transit countries. In this scenario incumbents' strategies to erect barriers for new entries will be unsuccessful and the number of market participants in the supply segment of the market will increase substantially. The new companies will be able to offer lower prices to consumers as they as they will opt for lower profits. Current availability of excess supply in the short-medium term will displace existing long-term contracted volumes. Competition between gas producers will encourage one producer to increase sales in the belief that they will displace another producer's supplies most probably via a spot market at lower prices. This scenario requires the existence of a gas bubble at the market. Currently this gas bubble might be produced by UK but in the nearest future Gazprom and Caspian countries will also pose serious threat to the existing long-term contract market.

This scenario leads to a much more competitive market environment but increase in regulatory efficiency will also be essential for its achievement. E.g., regulated TPA access needs to be introduced to ensure equal access to the transmission work. Thus, the monopoly transmission segment of the gas chain should be isolated from the potentially competitive supply and production segments. Although there is currently little political will to intervene in continental Europe's gas market in the medium term it might still be introduced to provide consumers the opportunity of access to low-cost gas supplies.

In a relative short time, the price of gas will be determined by the intersection of the short-run supply and demand curve. The rapidly increasing gas supply in the nearest five years will result in a large spot market creation. Buyers will try to buy gas at the spot market and extricating from existing contracts by adding new clauses. In order to ensure stability and minimize price risk the buyers and sellers will enter into forward contracts after the initial price reduction is taken place. However, the time horizon of these contracts will be much shorter compared to the current 'take-or-pay' contracts and prices for contractual deliveries for some month or a few years into the future will be linked to the short-run gas price, determined by the intersection of supply and demand, similar to today's crude oil market.

3.4 Quantitative implications

The quantitative implications of scenarios of such kind on gas demand in Europe have for example been studied by the Royal Institute of International Affairs (RIIA) in the UK or by

the ECON Centre for Economic Analysis in Norway. As the results show (Table 2), gas demand in the Gradual Transformation and Vertical Integration scenarios coincides with the forecasts under regular assumptions concerning economic growth etc. (see Table 1) where no change in competition is assumed. Switching to High Competition however will expand demand similar to the forecasts under high external growth rates in Table 1.

Table 2.
Summary of scenarios for European gas demand in 2020

	Price	Quantity (bcm)	
Scenario		Econ Centre for Economic Analysis	RIIA
Gradual Transformation	Pegged to oil for long-term contracted base-load gas and a spot market price for swing gas	780	610-750
Vertical Integration	Depends on corporate taxes in upstream and downstream countries	780	
High Competition	Spot market price based on supply and demand, forward contracts for several month or a few years	860	900

Source: Ellis, A Bowitz, E and K Roland. Structural changes in Europe's gas markets: three scenarios for the development of the European gas market, Energy Policy, 28, pp. 297-309. J Stern, The Royal Institute of International Affairs, Briefing Paper No. 26, November 2001

4. Prospects of Russian natural gas and gas transit through Ukraine

4.1 Projected Russian natural gas exports

Gas extraction in Russia fell from 640 bcm in 1990 to 583 bcm in 2000 due to the under-investment in the upstream sector and a slump in domestic and CIS demand. Currently, gas imports from Russia account for about 20% of total EU gas consumption. Nevertheless, the inability of Russia to generate the required investments in maintaining financial sustainability of the sector will undermine the issue of security of natural gas supply in the future. However, there is a common belief among expert organizations that Russia will be able to solve these problems so that exports to Europe will increase from current 129 bcm (except CIS and Baltic states) to about 200 bcm in 2010. Following the IEA, total Russian production is expected to increase from 583bcm in 2000 to 709 bcm in 2010, and to 914 bcm in 2030. Total exports will increase from current 188 bcm to 280 bcm in 2030, of which 260 bcm will be exported to CIS and European countries and 20 bcm to East Asian countries.[10] Total EU import of natural gas from transition countries (Russia and Caspian states) is estimated at 343 bcm.

The estimated investment needs of the Russian natural gas industry for the next 20 years are about USD 164-171 bn (USD 71-73 bn in extraction, USD 76-80 bn in transportation and USD 17-19 bn in storage).[11] The country is expecting to attract the substantial share of them outside Russia, mainly from the major consumer of Russian gas and oil, the EU.

[10] However, the IEA forecast might substantially overestimate the natural gas export from Russia since it does not consider potential decoupling of prices for natural gas and oil and simultaneous Gazprom competition with countries with much lower costs at the EU border like Algerian Sonatrach (IEA forecasts an increase by 50% in 2020 in a reference scenario while the Green Paper of the EU expects prices to increase by 80% in 2030).

[11] Source: Ukrainian Center for Economic and Political Research (UCEPR) named after Razumkov, *National Security and Defence*,#3 2002

Therefore, both sides started the EU/Russia energy dialogue with the intention of setting out common interests in the energy sector and identifying potential for cooperation in the field. At the same time commercial issues like long-term agreement to supply EU member states with cheap natural gas or planning of natural gas pipelines and power transmission grids are to be solved by the private sector.

4.2 Transit of Russian gas to EU

Before 1999 about 95% of natural gas export outside CIS and Baltic states was transited through Ukrainian territory. Since 1992, Gazprom approved a number of projects to bypass Ukraine. Currently, such bypassing transit routs in the North are Yamal 1, Yamal 2 projects and North Transgas /Nordic Gas Grid (NTG/NGG) while the South route is the Blue Stream.

The Yamal project was initially designed in Soviet times and aimed at supplying natural gas from the Yamal gas fields to Western Europe as well as to Russia. After the breakdown of the Soviet Union and the consequent decline in production the project was radically changed. Connection to the Yamal gas fields is postponed at least till 2016. At the end of 1999 the first stage of the Yamal-1 pipeline (linking Nesvizh (Belarus) and Kondratki (Poland)) was completed. In 2000 Russia exported 14 bcm of natural gas through this pipeline and its planned capacity is scheduled to reach 28 bcm per year in 2004. In addition, the construction of additional trunk line will allow to expand the capacity of the Yamal pipelines to 56 bcm. North Transgas is a joint venture of Gazprom and Fortum. It envisages the pipeline construction from Saint Petersburg to northern Germany through the Baltic Sea with branches from the main pipeline to Finland and Sweden. Nordic Gas Grid is based on a feasibility study financed by the EU. It contains a large number of one route proposed but is sponsored by a different group of companies.

In 1997 the construction of the Blue Stream pipeline started in order to link Djugba (Russia) and Samsun (Turkey). Construction of the first stage of it was finished at the end of 2002. In 2003 the amount of gas export by this pipeline is planned at 2 bcm and after final completion of the project in 2008 the capacity of the pipeline is intended to reach 16 bcm per year.

4.3 Amount of natural gas transit through Ukraine

Assuming that Russia will export 260 bcm to CIS and European countries in 2030 plus at least 40 bcm of additional exports from the Caspian basin,[12] and given capacities of the Yamal and Blue Stream pipelines (56 and 16bcm, respectively) it is clear that significantly more transit capacities will be required, even if the Ukrainian system will be expanded to its maximum capacity of 170 bcm by adding new pumping capacities. Since security of energy supply is one of the main pillars of European Energy policy, it is unlikely that any new pipelines will be built in Ukraine. However, if Ukraine fails to demonstrate its credibility as reliable transit partner, e.g. through sustaining and improving the technical state of its pipeline system GAZPROM and EU countries will speed up the construction of bypassing routes, even at the expense of current transit quantities through Ukraine.

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[12] Estimates are given for Turkmenistan and Aserbaidshan in 2020 by Seeliger, A.: Angebotsoptionen fuer den europaeischen Gasmarkt. EWI-Workshop, 13.06.2002, Koeln, Germany,

Table 3.
Costs of transportation for 20 bcm/year capacity and different distances of the onshore (USD 1993 per thcm)[13]

Distance (kilometers)	1000	3000	5000	7000
Costs	10.7	32.1	53.6	78.6

Source: IEA/OECD and own calculations

Currently, the tariff for Russian gas transit is estimated at USD 1.09 per thcm/100km. This allows Naftogaz to cover all expenditures on maintenance of the transit pipeline since LRMC according to Table 3 are about USD 1.07 per thcm/100km. Moreover, taking into account that the price in EU minus transit costs is substantially higher than Gazprom's price for Ukraine in a gas transit agreement current tariff allows Naftogaz to extract substantial profit. However, as IER/GAG previously pointed out the supply of natural gas obtained as a transit fee to a number of consumers at privileged prices prevent Naftogaz from required investments in Ukrainian International Gas Transit System (IGTS).[14] Thus, underinvestments along with illegal gas siphoning in previous periods substantially undermined Ukrainian credibility as a reliable transit country. Therefore, reestablishing credibility is crucial for Ukraine to remain a large transit country in the long run.

4.4 The Ukrainian/Russian gas consortium: an appropriate future strategy?

As we mention at the beginning of this paper, Ukraine and Russia have already adjusted their strategies and established a consortium to jointly operate the gas transit from Russia through Ukraine to the EU. Nevertheless, agreements signed so far are of fairly general nature and do not yet propose any solutions to the following two major conflicts between the countries' interests. First, Russia (and the gas-importing EU countries) is interested in low transit tariffs while Ukraine wants to keep them as high as possible. Second, Gazprom seeks to prevent sales of Caspian gas to the European market in order to avoid competition[15] while Ukraine (and the EU countries) is interested in the largest possible amount of transit through Ukrainian territory (and gas supply to Europe, respectively). Furthermore, other key terms of the consortium such as the shares according to which costs and revenues are allocated, or the amounts of funds for investments etc. that each party has to contribute still need to be determined. Finally, another open question is whether or not to include a third-party investor into the consortium. Since both, NAFTOGAZ and GAZPROM face severe financial constraints[16] the last issue appears to be especially crucial.

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13 For the detailed estimation procedure of natural gas transportation costs see: IEA/OECD, *The Natural Gas Transportation Study*, 1995, pp.46-51

14 See for details IER/GAG policy paper: *"Is the Gas Obtained as a Transit Fee Used Efficiently?"*, December 2001.

15 According to UCEPR (*National Security and Defence*,#3 2002) the costs of Russian gas at the EU border are estimated to be about USD 110 per thcm while costs of Caspian gas at the EU border is estimated to be at about USD 90 per thcm.

16 After 1990, GAZPROM has proven to be unable to undertake the necessary investments in its transportation equipment. Furthermore, equipment is substantially outmoded since Soviet times and gas extraction fell from 643 billion cubic meters (bcm) to 584 bcm in 1991 and 2000, respectively. The total investment needs of GAZPROM for 2001-2020 are estimated to about USD 164-171 bn. It is expected that GAZPROM will attract the largest share from outside Russia. Therefore, it seems to be questionable that NAFTOGAZ and GAZPROM will be able to finance the necessary investment in Ukraine's transit system by themselves.

Taking into account empirical evidence from other countries,[17] the detailed obligations of all sides in the management contract system such as the duration of management contracts, possible changes in profit-sharing agreements in case of changing external conditions, employment guarantees as well as the provision of detailed procedures in case of one-side-withdrawal from the contract or one-side-failure to fulfill its commitments are very important to achieve the final goals that all sides are looking for.

In its previous work on gas transit through Ukraine, IER/GAG has developed a modeling framework[18] capable to study those questions under consideration of the three different scenarios for the EU gas market (Part 2) and possible reactions of other gas-exporting countries. Although detailed results are not yet available (mainly due to data constraints), several general conclusions are already possible:

1) Operating the gas-transit system in a joint consortium between NAFTOGAZ and GAZPROM seems to dominate a national Ukrainian strategy, simply because it precludes conflicts between the two sides and enables them to exploit their full market power as gas supplier to Europe. This is the case under current levels of EU demand and even more once European demand expands.
2) Lower transit fees for Russian gas through Ukraine (due to collusion between GAZPROM and NAFTOGAZ within the consortium) reduce the price of Russian-Ukrainian transit gas at the European border and thus, also lower the incentive for GAZPROM to invest in alternative pipeline systems to bypass Ukrainian territory.
3) Liberalization of European gas markets (e.g. through gradual replacement of long-term "take-or-pay" contracts by spot-market transactions) simplifies entry of other gas-exporting countries. In particular Algeria with the by far lowest supply costs at the European border[19] could gain substantial market shares from Russia or the Ukrainian/Russian consortium, respectively.
4) Given the expected raise in competition among gas exporters to the EU, the ability to minimize in particular transportation costs will be crucial for the competitiveness of Russian gas. In this respect, postponed investments for maintenance of the pipeline system can substantially jeopardize future profits.

Based on these results, future work includes the optimal determination of profit- and investment-sharing regulations between the Ukrainian and the Russian side (and a potential third-party investor), the quantification of investments necessary to sustain competitiveness of Ukrainian/Russian gas at the EU border and the question whether—and on which terms—such necessary amounts of investments require the inclusion of a third party.

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[17] See for details of management contract's on Kazakstan GTS failure: Opitz, Petra; von Hirschhausen, Christian (2001). *Ukraine as a Gas Bridge to Europe? Economic and Geopolitical Considerations.* In: Hoffmann, Lutz, and Felicitas Möllers (eds.) (2001). Ukraine on the Road to Europe. Heidelberg, New York, Springer.).

[18] Chollet, A, Meinhart, B, Hirschhausen, C.v. and Opitz, P.: Options for Transporting Russian Gas to Western Europe - A Game-theoretic Simulation Analysis. Deutsches Institut fuer Wirtschaftsforschung, Discussion Paper No. 261. Berlin, 2001.

[19] Gas supply costs from Algeria to Spain or Italy via Medgaz, GME, Sardinia-Corsica or Transmed account for USD 39, 48, and 59 per thcm, respectively while the corresponding costs for Russian gas through Blue Stream, Yamal1 or Ukraine are USD 91, 81 and 100 per thcm, respectively (see Observatoire Mediterraneen de L'Energie: Assessment of internal and external gas supply options for the EU, 2002, conversion from MBTU to thcm by IER/GAG).

5. Summary and possible policy implications

European countries are the main consumer of Russian gas, which in turn is mainly delivered through Ukraine's gas-transit pipeline system. Thus, future developments of the EU markets are the main determinants for a successful strategy for Ukraine as gas-transit country ("gas bridge"). However, those developments, in particular with respect to changes in structure and degree of competition, cannot be predicted with certainty. In particular, while demand is expected to expand dramatically for all scenarios it is not possible to precisely foretell timing and volumes of such changes. Possibly, liberalization and deregulation might dominate in the future, leading to increased competition and a large expansion of gas demand. Furthermore, the important role of spot markets at the expense of the traditional, long-term "take-or-pay" contracts including decoupling of prices for oil and natural gas stimulates competition between gas-exporting countries outside the EU and encourages cost-minimizing strategies. Alternatively, it might also be possible that market structure changes only gradually without strong increases in competition between existing firms while new entries remain relatively costly. In such a situation, also demand will expand less dramatically and the role of spot markets will remain low.

Ukraine's IGTS is one of the country's most valuable national assets. To sustain this value, Ukraine should undertake a number of steps in order to persuade both producers and consumers that it is a reliable partner. Globalization—including the process of European Integration—results in a more and more competitive environment and Ukraine should define a clear strategy for further maintenance of IGTS and development in order to remain a large transit country not only for today, but for many years to come. In particular, to remain competitive requires avoiding overcapacity in installed transmission capacity because premature development of new pipeline capacity will lead to pipe-to-pipe competition and consequently will increase the average costs of gas transmission. Thus, the optimal usage of existing infrastructure is of prime importance to survive in a highly competitive world. Ukraine has to prove that it is able to bring Russian gas to Europe at the lowest costs and that its capacities allow ensuring security of supply of natural gas as well.

Given the uncertainty about future developments within the EU, there are several possibly optimal strategies for Ukraine:

- Financing investments at present reduces costs of gas transportation—or at least, prevents higher costs—in the future and thus, is beneficial for Ukraine's gas pipeline system under condition of increased competition with other gas-exporting and gas-delivering countries.
- Establishing a joint consortium with Russia and probably another third-party investor ties exporting, delivering and consuming countries together thus contributing to increased security of gas supply, an explicit goal of the EU's energy policy.
- Establishing such a consortium might reduce costs of operation of the entire pipeline system, as it allows for profit maximizing along the entire system while conflicts between Russia and Ukraine on transit fees, gas delivery etc. can be avoided. Thus, it will further increase competitiveness of gas transit through Ukraine, provided that appropriate profit- and cost-sharing agreements between the parties have been established.
- Ukraine should insist on the inclusion of an additional provision on gas transit from Russia to Ukraine and further to Europe similar to the one set in Article 7 of the Energy Charter Treaty[20] in the consortium contract in order to ensure secure gas supply from

[20] As written in Article 7: "(1) Each Contracting Party shall take the necessary measures to facilitate the Transit of Energy Materials and Products consistent with the principle of freedom of transit and without distinction as to the origin, destination or ownership of such Energy Materials and

Caspian countries and from Russian oil producing companies to Ukraine. Such guarantees also allow Ukraine to fill its transit capacities with Caspian gas in case lower than projected natural gas extraction in Russia, or if Gazprom does not provide the required amount of natural gas to fully fill Ukrainian transit capacities. Also, the European Union is very interested in diversification of energy import and the question of non-discriminatory energy transit is raised in the framework of EU-Russian energy dialogue.

Given this range of different strategies and open questions, Ukrainian policy makers should seek to find the optimal response to the worst possible external developments (EU markets and other competitors). However, what this strategy might be is ambiguous and can only be specified with the aid of further, quantitative analysis.

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Appendix

Table 4.
EIA forecast for natural gas consumption (bcm, reference case)

Region	History		Reference case Projections				High growth case Projections				Low growth case Projections			
	1990	1999	2005	2010	2015	2020	2005	2010	2015	2020	2005	2010	2015	2020
Western Europe	316	456	582	652	745	876	602	683	790	946	566	624	694	801
United Kingdom	59	92	104	118	134	154	109	126	143	168	104	115	126	143
France	28	36	50	59	67	81	53	62	73	90	50	56	62	73
Germany	76	84	112	123	134	162	118	129	143	176	109	118	126	148
Italy	48	67	81	92	101	112	84	95	109	120	78	84	92	98
Netherlands	42	48	53	59	62	64	56	62	64	70	53	56	59	59
Former Soviet Union	700	563	608	672	756	843	636	734	874	1028	571	605	661	717
Eastern Europe	87	67	87	115	148	176	87	123	171	218	81	106	132	154
Turkey	3	11	14	17	22	31	14	20	28	39	14	17	22	25

Sources: History: Energy Information Administration (EIA), *International Energy Annual 1999*, DOE/EIA-0219(99) (Washington, DC, February 2001). Projections: EIA, *Annual Energy Outlook 2002*, DOE/EIA-0383(2002) (Washington, DC, December 2001), Table A13; and World Energy Projection System (2002).

Products or discrimination as to pricing on the basis of such distinctions, and without imposing any unreasonable delays, restrictions or charges."