24th World Gas Conference
Buenos Aires, Argentina
5-9 October 2009

LNG VS. RUSSIAN NATURAL GAS DEPENDENCY IN THE SOUTH EASTERN EUROPEAN REGION

Main author:

Mr. Roland Lajtai
Energy and Utilities Advisory Services, KPMG in Central and Eastern Europe
Budapest, Hungary

Co-authors:

Mr. Ákos Lex
Energy and Utilities Advisory Services, KPMG in Central and Eastern Europe
Budapest, Hungary

Mr. Márk Laczkó
Strategy and International Management, Research Center, Budapest Corvinus University
Budapest, Hungary

Keywords: *LNG, Economic Viability, Natural Gas Market, South Eastern Europe, Import Dependency*

1 Abstract

The global natural gas market is evolving as natural gas has become the second largest and fastest growing energy source of the world. From a European perspective, natural gas is the second largest energy source due to the continuously growing energy consumption and, in parallel, the European Union (EU) is becoming increasingly dependent on natural gas imports. Although a sufficient amount of potential natural gas import sources is available, the EU is required to diversify its import sources to avoid economic and political challenges due to the import source concentration and market uncertainties. We will introduce the diversification alternatives of the EU, and through our environmental, strategic and quantitative analysis we will focus on the liquefied natural gas (LNG) potential.

Focusing on competitiveness, it will be shown that one of the key determinants of the infrastructure development is technological enhancement. There are no constraints on the transportation of natural gas in liquefied form as opposed to pipeline transportation, where the costs and margins of individual TSOs are added to the cost of transportation. As the EU is concerned about importing natural gas and diversifying its import sources, significant investment projects are planned and are already on track in expanding regasification capacities. The South Eastern European (SEE) region is also examining its potential in terms of LNG usage; however, the opportunities are significantly lower due to the dominance of Russian gas.

In this discussion paper we will demonstrate the vital importance of the Adria LNG project in the diversification from Russian natural gas in the SEE region. According to the latest estimate, the Adria LNG project will start operation in 2012, with 10 billion cubic meter (bcm) capacity per year increasing later to 15 bcm.[1] During the past couple of years the project has been moving ahead slowly and the study will introduce an environmental, industrial and strategic analysis to examine the circumstances of the project development.

After showing that Adria LNG could be strategically the right answer for satisfying the growing natural gas demand in the SEE region while reducing the Russian dependency, the economic viability of the project will be examined in comparison to the economic viability of pipeline transmitted natural gas. We will introduce how important the specific costs of LNG are in determining its viability. With the help of a high level price and cost estimation, we will analyze and measure the competitiveness of the LNG imports compared to the Russian pipeline imports.

Overall, it will be indicated that LNG is not only considered to be a transportation alternative, but also an alternative supply source for the SEE region. As demand is growing more steadily than production, the importance of LNG in supplying Europe is continuously growing. The SEE region is in the doorway of LNG diversification, which is seen to be a very important step towards natural gas security of supply.

[1] *Official website of Adria LNG, http://adria-lng.hr/*

CONTENTS

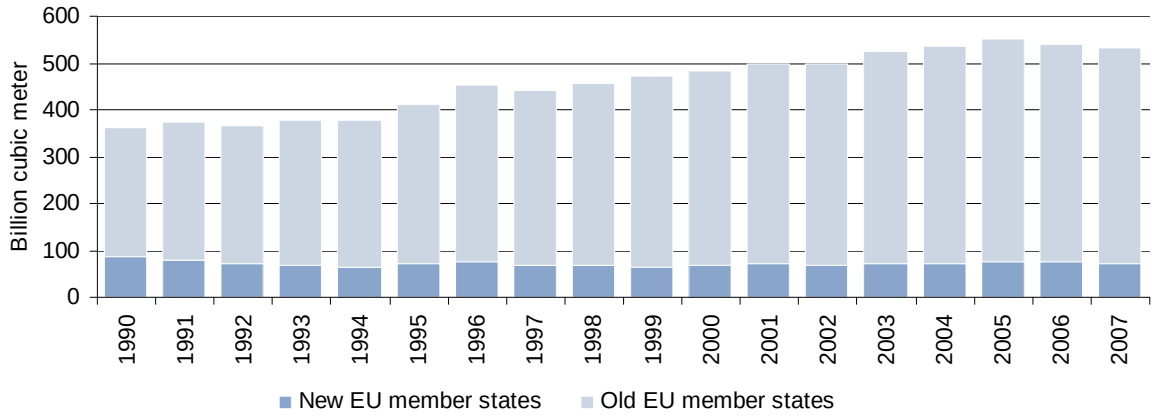
2 Introduction

Natural gas – as one of the most important energy sources – plays a major role in fueling economic and social development all around the world. The gas industry is determined by the infrastructure realities restricting it as natural gas becomes more popular and demand for it rises dramatically. Transportation of natural gas from the extraction location to the consumers is challenging due to its economic aspects. As natural gas is a highly infrastructure intensive commodity, consumer regions differ in their level of investment and the resulting characteristics. In addition to infrastructure, the economics of the natural gas market is determined by the demand and supply balance, the portfolio of available gas sources, and the gas prices. The South Eastern European (SEE) region must be examined before further analysis can be conducted on the economic viability issue of natural gas.

2.1 Natural gas demand and supply in the SEE region

In the European Union and especially in the SEE region natural gas is an increasingly important energy source as it is one of the energy sources that facilitate the development of the newly joined and candidate European Union (EU) member states. Currently, significant differences can be observed between the original 15 member states of the EU (EU-15) and the recently joined 12 new member states. This is supported by the comparison of the natural gas consumption of the 27 EU member states (EU-27), illustrated in the below chart.

Figure 1: Natural gas consumption in the EU 1990-2007



Source: Eurostat, June 2009

The EU-27 gas demand amounts to 19 percent of the world demand.[2] In recent years, the EU natural gas demand has gradually increased due to the growing natural gas utilization in electricity and heat generation. Even though an economic recession has fallen upon the EU, the future natural gas demand is expected to continue to increase. It is anticipated that the developing member states will be one of the main drivers of further natural gas demand increase in the European region. The SEE demand is expected to grow to meet the requirements of its economic and social development. However, appropriate security of supply measures are required to support the growth.

On the supply side the EU is unable to meet the demand of its member states. There are only two member states capable of exporting natural gas, namely Denmark and the Netherlands. Additionally the United Kingdom and Romania are extracting a considerable volume of natural gas; however, their internal demand consumes it completely. The rest of the member states are 70-100 percent dependent on natural gas imports, which amounts about 64.5 percent of total natural gas consumption.

The EU imports 39.1 percent of its natural gas from the Russian Federation, 23.5 percent from Norway, 11.6 percent from North Africa, and 9.9 percent from other Asian and LNG sources.[3] Even though these values would justify a healthy portfolio of import sources, there is considerable difference between source diversification per regions of the EU. From the total imports 85 percent reaches the EU through the pipeline network and only 15 percent in LNG form.[4] Imports of LNG are most common in the western European member states.

[2] *World Energy Outlook 2008*
[3] *BP Statistical Review 2009*
[4] *BP Statistical Review 2009*

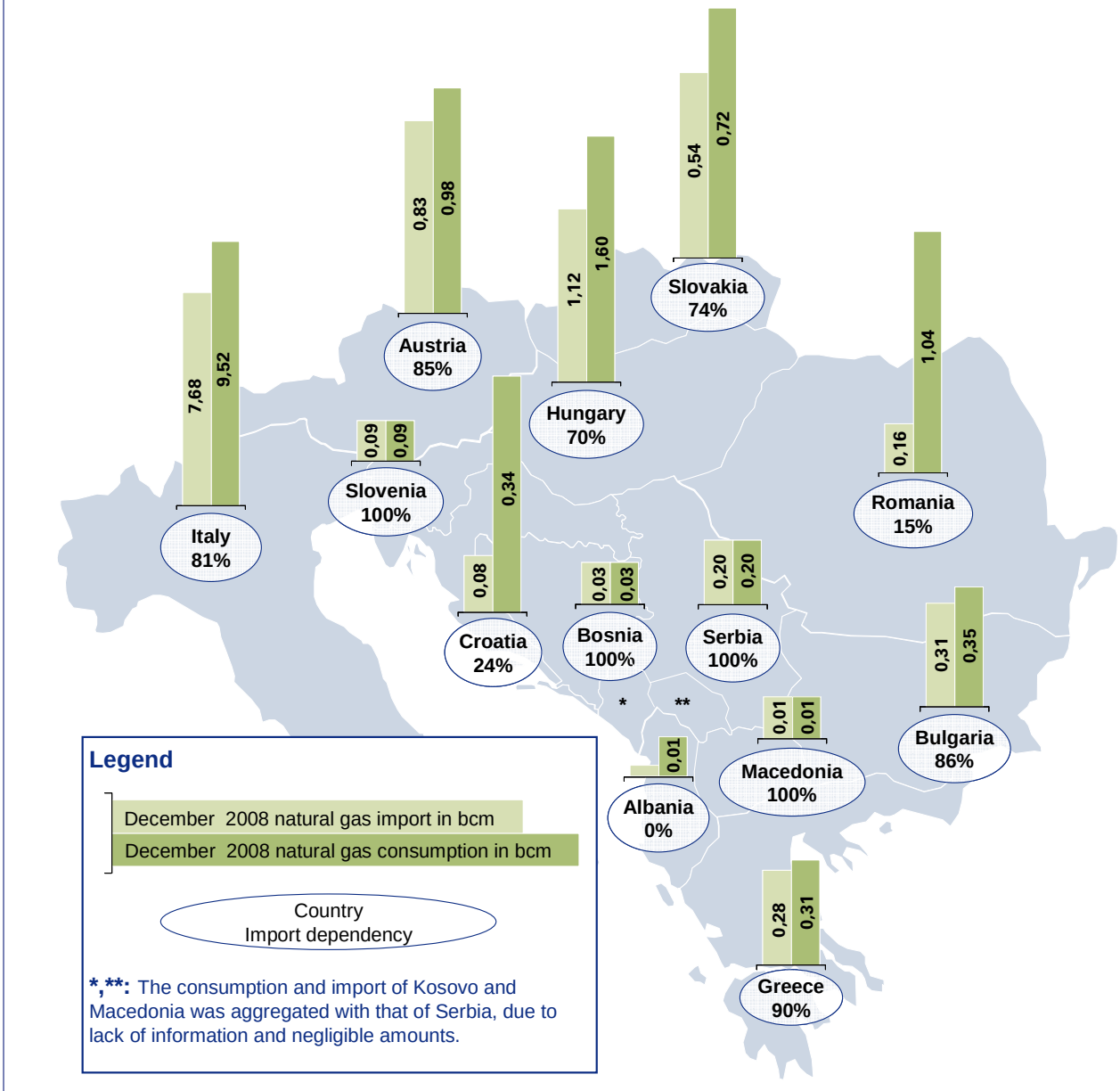
2.2 Special situation of the SEE region

The countries of the SEE region are in a special and unfavorable situation regarding the natural gas security of supply as a result of the following concerns[5]:

- Excessive reliance on one single source
- Lack of interconnections,
- Insufficient storage,
- No gas in the form of LNG,
- High prices due to lack of competition,
- Poor energy efficiency, and
- Lack of regional natural gas production.

As a result, many of them have limited access to natural gas, even though the developing trend of the SEE region estimates further increases in natural gas consumption. As the below map illustrates, all of the SEE countries – except Croatia, Romania, and Albania – are dependent on natural gas imports of more than 70 percent. Besides the SEE countries the values for Italy are also illustrated as the largest gas consumer of the EU, even though only its consumption and not its supply is considered in the analysis. Such a high import dependence, especially on the solely dominant Russian source, results in critical outages in the event that the supply is delayed, limited or interrupted due to any technical malfunctions or political disagreements.

Figure 2: Natural gas consumption and import in the SEE region in December 2008



Source: Eurostat, 2009; KPMG, 2009; CIA World Factbook; IEA, 2009

[5] *MOL Group, February 2008*

Besides the dependence on Russian import, the underdeveloped supporting infrastructure also results in a weak security of supply for the SEE region. It can be stated that the SEE region is separated from western and northern Europe as there are mostly major one way transmission lines heading from east to west, while there lacking lines from west to east and north to south. Those countries that have links towards the western European regions or have their own resources are able to survive for a short period of time.

It is of vital importance to improve the security of supply in the region to allow further economic and social improvement in the countries. As the security of supply is measured by the supply-demand balance, the production source reliability and the infrastructure availability, these areas should be strengthened in SEE. Considering these factors of security of supply, an alternative solution would be the diversification through LNG, which has an impact in all three categories.

2.3 Introduction of LNG

Liquefied natural gas (LNG) is natural gas cooled to -162 degrees Celsius at atmospheric pressure. In this state, natural gas is perfect to transport – considering the significant (600:1) volume reduction gained through the process – in tanks at a competitive cost by sea to areas and distances where pipeline transport is impossible.

The first LNG import arrived in Europe in 1965. The first customers were the UK, France, Spain and Italy, while the first supplies came from Algeria and Libya. As the gas transportation through pipelines became more competitive, the LNG industry almost stagnated until the late nineties. As new LNG producers such as Nigeria, Trinidad and Tobago, and Qatar appeared and security of supply concerns came into the spotlight, the global LNG industry grew by an impressive 29 percent[6] in the last five years due to the growing demand. However, the supply side was unable to keep up with this pace, which had a serious impact on LNG price and its economic viability.

LNG technology differs greatly from the accustomed pipeline technology, resulting in many areas to explore with regard to viability.

2.4 Key issues of LNG in competing against the pipeline gas supplies in the SEE region

The differences in transportation of natural gas via pipelines and in the form of LNG have a significant impact on their competitiveness. All the previously detailed special characteristics of the SEE region have to be reviewed and analyzed as these can act either as supportive or preventive factors for any of the technological approaches.

The most important factors playing a vital role in the competition of the technologies are the following:

- Political and economic support of the project, the involvement of states and shareholders,
- Strategic considerations behind introducing LNG in the SEE region,
- Security of supply concerns,
- Demand and supply balance with respect to the growth potential of the region,
- Infrastructural and technical developments,
- Technological differences,
- Cost of gas considering the value chain differences between LNG and pipeline gas,
- EU legislation and EU accession impacts,
- Diversification of import sources as a main goal of the EU, and
- Dependence on a sole import source especially in the event of another gas dispute in the region.

The main advantages and disadvantages of an LNG regasification terminal should be identified in order to measure the economic viability and competitiveness of the project. Examples of supportive factors would be the opportunity to access multiple suppliers, easy expandability of capacity, and participation in global LNG spot trading. Disadvantages include: the capital intensive nature of regasification terminals compared to pipeline projects, a longer value chain of the operation which drives up the price of gas, dependency on local distribution infrastructures, and security of the operation is tied to long-term take-or-pay supply contracts.

Compared to LNG, the main advantages for pipeline transportation would be the shorter value chain and the minimal operational cost requirements associated with pipelines. On the other hand, pipelines are only capable of transporting gas from a fixed source with no flexibility, it is difficult and capital intensive to extend them to new sources, and the need for transit countries could hinder the security of supply as has been experienced in the case of Russia and Ukraine.

[6] *Official website of Adria LNG*

3 Objectives

Russian pipeline transported natural gas introduces the most significant competition to any LNG project in the SEE region. The purpose of this study is to analyze the viability of an LNG terminal from two points of view. First, by analysis of the relevant external and internal strategic factors, we will identify the most important elements of strategic viability besides price. Additionally, the economic viability of LNG versus pipeline will be evaluated with the main emphasis on price as one of the most significant factors.

4 Development

First, the importance of LNG diversification is considered by examining the current natural gas situation in the SEE region, the diversification alternatives, and the Adria LNG project in details. The analysis of the Adria LNG project focuses on the competitiveness of the project in the SEE region. The competitiveness analysis is split into four major categories: environmental, industrial, competency, and economic viability.

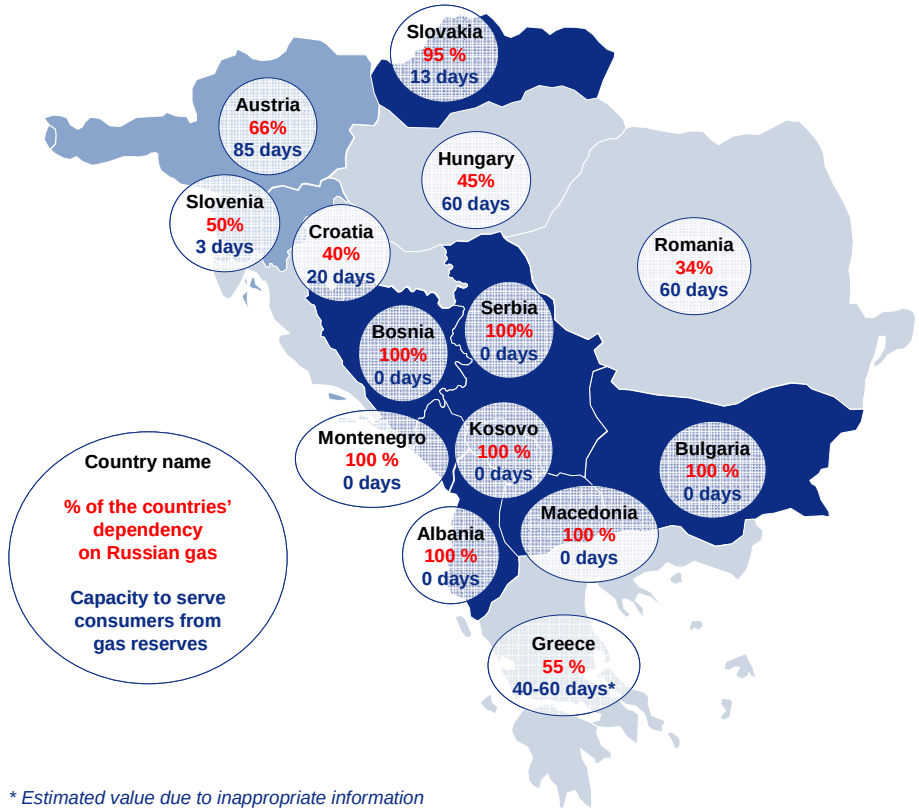
In the environmental analysis the political, economic, social and technical influencing factors are analyzed, while the industry analysis focuses on the bargaining powers of customers and suppliers, entry barriers, substitutes, and competition issues. After the external analysis the project specific factors are considered in the form of a competency analysis. This area is again split into three topics, namely the competitiveness creation, competitive advantages, and sustainability of advantages. Finally, the economic viability of the project is analyzed, when indicative LNG price estimates are compared with the pipeline gas prices at three substations in the SEE region.

Based on the analysis conducted in the development phase, a competitiveness overview – including the internal and external influencing factors – is provided in the results section. As an illustration of the potentials of the LNG terminal, a scenario analysis is introduced indicating the supply capacity of Adria LNG in case no other import would be accessible. Finally, the prerequisites of a successful diversification demonstrated through the scenarios are considered as a vital backing for the project.

4.1 Importance of LNG diversification

Due to the low regional supply capacity, the import dependency is very high and the countries of the SEE region experience much higher economic and social cost of gas supply security issues. The portfolio of import sources is limited, largely dominated by the Russian Federation, which determines the dependency in the region. According to the recent analysis – illustrated in the below map – many of the countries of the SEE region would not be able to hold out even for a day in the event that the import from Russia was cut off.

Figure 3: Dependency on the Russian natural gas in the SEE region



** Estimated value due to inappropriate information*

Source: Figyelő, 2009; BP Statistical Review 2009; KPMG, 2009

Besides the dependence on Russian import, the underdeveloped supporting infrastructure also results in a weak security of supply for the SEE region. In order to guarantee the security of gas supply in these states, the internal network interconnections should be improved, the import source portfolio should be increased and the dominance of the Russian gas should be decreased. The goal is to increase competition and provide the chance of selection for the customers.

4.1.1 Overview of alternative diversification projects in the SEE

Nabucco Project

The purpose of the transmission pipeline is to increase source and route diversification by providing access to the natural gas supplies in Azerbaijan, Turkmenistan, Kazakhstan, Egypt, Russia, Iran and Iraq. It is planned with the involvement of OMV (Austria), MOL (Hungary), Transgaz (Romania), Bulgargaz (Bulgaria), BOTAŞ (Turkey), and RWE (Germany) as well as with the support of the EU. Initially the pipeline would provide 8 bcm of gas yearly to the European customers with a possibility of a further extension to 31 bcm yearly capacity after 2014.[7] The planned length of the pipeline would be around 3,300 km.[8] The construction has been planned to start in 2010, however, neither the financing nor the source of the transmitted natural gas have been finalized yet.

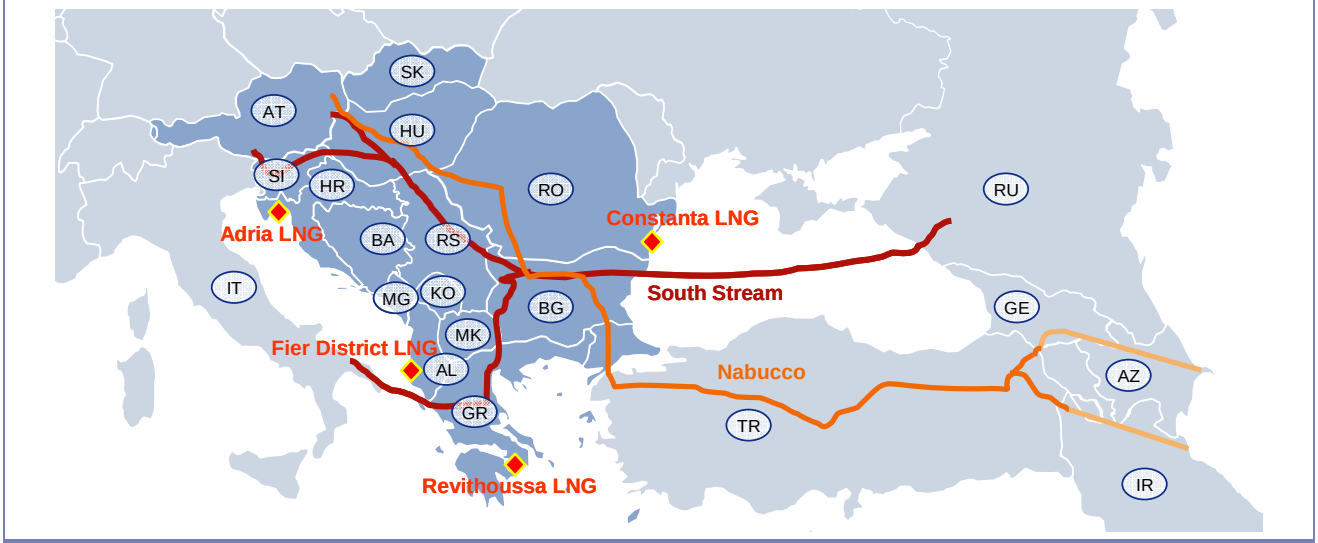
South Stream Project

The main concern about the South Stream pipeline is that it provides a route diversification while it does not provide a source diversification option. South Stream would transport mostly Russian origin natural gas to Europe. There are discussions on transporting CIS origin gas also, yet still under the Russian label.[9] The project developers are Gazprom and Eni, but all of the governments are invited to be partners in their national segment. The planned initial capacity of the pipeline is 30 bcm yearly with a possible extension to 60 bcm yearly capacity. The operation of the pipeline was planned to start in 2013, however, due to the financial crisis and the delays in agreements of the potential parties involved, the pipeline now might only be commissioned in 2015. This is considered to be an optimistic scenario as the route is not finalized yet.

LNG terminals in the SEE region

Currently LNG supply in the SEE region is limited and planned projects are in a preliminary planning phase. The only regasification terminal already in operation is the Revithoussa terminal in Greece which started operation in 2000 with an annual capacity of 2.26 bcm. This terminal does not affect the diversification of the SEE region since all of the imported natural gas is consumed domestically. Apart from the proposed Adria LNG terminal there are two proposed terminals, one in Fier in Albania with a planned 10 bcm capacity and the other in Constanta in Romania without any specifications yet. The purpose of the planned terminals is to provide diversification alternatives for the SEE region, even though they are only in a preparatory phase.

Figure 4: Overview of alternative diversification projects in the SEE region



Source: http://newsimg.bbc.co.uk/media/images; KPMG

NETS project

At the end of 2007, the Hungarian natural gas TSO initiated the foundation of a new, independent regional gas transmission company with the purpose to integrate the gas networks in the SEE. Consultations started with the gas transmission companies of Slovenia, Croatia, Bosnia-Herzegovina, Serbia and Romania, and a Memorandum of Understanding has been signed by Hungary, Slovenia and Romania, while others are still expected to join. Integration of the gas transmission assets that are at present operating in isolation would create significantly higher value for the shareholders than operated separately by the national companies. In addition, a higher level of supply security would be realized as a result of an integrated gas supply platform.[10]

[7] *Official website of Nabucco Project, 2009*
[8] *Sofia Echo, 2009*
[9] *B92.net, 2009*
[10] *KPMG and László Varró: Unbundling experiences in Hungary (EPP-ED Public Hearing, 13 February, 2008)*

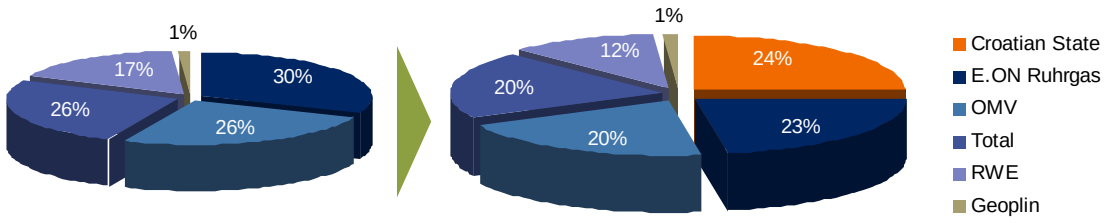
4.1.2 Introduction of the Adria LNG project[11]

From the above detailed diversification plans in the SEE region Adria LNG is the most developed and most promising project from a security of supply point of view. The new regasification terminal could meet its purpose by introducing both source and route diversification as well as could commence operation in 2014.

The new Krk Island terminal is proposed to have an initial 10 bcm capacity increased to 15 bcm per year in the second phase. The estimated investment costs are USD1.03 billion excluding the additional national pipeline connections. Through the terminal Croatia could import almost four times its annual gas import, which offers an opportunity to provide a significant amount of supply for the SEE region. In order to provide access to distant gas sources independent from existing pipeline networks, Croatia plans to receive approximately one hundred in average 265,000 cubic meters capacity LNG tankers annually.

The current members of Adria LNG d.o.o. international consortium in the project are E.ON Ruhrgas, OMV, TOTAL, RWE, and GEOPLIN, however, their ownership shares are going to be proportionally reduced. A package of 25 percent shares is reserved for three Croatian companies, namely Ina (Petroleum Refining and Sales Enterprise), HEP (Croatian Electricity Board), and Plinacro (Gas TSO). By the end of 2009, the shareholders are going to create a new company with the new shareholding structure indicated in the below chart. An increase in the Croatian influence is expected to be interpreted positively especially in the negotiations for long term LNG supplies.

Figure 5: Ownership structure of Adria LNG



Source: Official website of Adria LNG

4.2 Competitiveness analysis of Adria LNG in the SEE region

4.2.1 Environmental analysis

As part of the competitiveness analysis, the macro environmental circumstances are reviewed as political, economic, social and technical influencing factors.

4.2.1.1 Political

The political and legislative background is one of the most determinant factors of an investment project. An infrastructural development plan, like Adria LNG, takes a key place in supporting the politics in reaching their objectives, such as equal access to natural gas sources, security of gas supply, reaching of environmental and health targets, and providing the requirements for economic growth.

In the current situation where the Russian Federation has a significant dominance on the gas supply of the SEE region as well as the European Union, the value and importance of political support is augmented. The dependency on a sole import source could result in serious economical and social consequences in the case of an obstruction of supply, as happened in 2006 and 2009. Expansion of the Russian dominance is expected to commence as far as the plans of Russia and Gazprom indicate. A unified political power is required in the EU to withstand the endeavor of Gazprom to increase the market share of Russian gas in Europe. Consequently the ambitions of the EU to develop one integrated market, to amalgamate the efforts of the member states, and to initiate diversification alternatives – like investing in LNG terminals – are observed to be crucial steps in standing against the Russian influence.

One of the major concerns of the developers is whether the terminal would be viable and the imported gas marketable at a price bearing the multiple costs arising all over the value chain. Since an LNG terminal usually is not a viable investment without vertical integration, a joined political will is required to push forward with such a project. Considering the fact that the proposed terminal's annual capacity of 10 bcm would be dwarfed beside the Russian import, it results in insignificant competition against the Russian gas. The purpose of Adria LNG is not to substitute the Russian imports, but to provide security in case of unforeseen delay or obstruction of the Russian imports. Taking into account this dependency the governments and

[11] *Official website of Adria LNG*

political forces must ponder supporting the diversification through the Adria LNG thus providing a cushion for the gas supply in case of unpredicted events.

4.2.1.2 Economic

In the past, demand for natural gas in the SEE region was relatively low due to the scarcity of supply. Since many of the countries in the SEE region have joined the EU, they have started on the path of development to fall in line with the western European developed economies. These emerging economies are expected to deliver high growth rates in all economic aspects involving energy consumption and the demand for new energy sources. Consequently, the demand for natural gas is expected to increase among the SEE countries resulting in the need for increased supply volumes in the future. Even though the global financial crisis has led to a minor reduction in the natural gas consumption of households, industrial and transportation sectors, the trends point beyond this recession and an increase in demand is foreseen. In the forthcoming years though, the demand for LNG is expected to fall into a recession. The global LNG spot prices have fallen from record heights of USD 24/MMBtu in 2008 to around USD 4/MMBtu in 2009 so far.[12] The prices are not expected to rebound to such high levels until 2011.

On the infrastructural side, the global regasification growth rate is expected to drop significantly from 21.25 percent to 15.81 percent between 2008 and 2011, while liquefaction growth rate is anticipated to decrease only slightly from 22.36 percent to 21.66 percent during the same period.[13] This trend is likely to rationalize the gap between the present LNG demand and supply. The introduction of a short term LNG supply surplus could positively influence the Adria LNG project as the required long term supply contracts are expected to settle easier as well as at more favorable conditions. While some regasification projects have been postponed due to stagnating natural gas demands, liquefaction projects have been delayed due to non-availability of adequate capital investments. There is a significant difference between the required investment costs of these facilities as the regasification plant costs approximately USD600-700 million, while a liquefaction plant costs around USD5-6 billion.[14] The related industrial characteristics are largely determining the outcome of the negotiations and the decision on whether a project will be realized or not. These factors are examined in the next level of the analysis.

For the project to be economically viable it has to be competitive with pipeline gas in terms of price as well as in security of supply. Since the SEE region is primarily consisting of emerging economies any disruption in the gas supply could cause significant consequences as there is little or no domestic gas production. As the LNG value chain is longer than that of the pipeline transmission, it introduces additional costs, thus raising the final gas price and setting back economic viability. In the economic analysis it is analyzed what the difference would be between pipeline and LNG related gas prices, and whether that difference is comparable with the value provided through the improvement of the security of supply.

4.2.1.3 Social

Generally natural gas is recognized as the most environmentally friendly and sustainable fossil fuel with the lowest greenhouse gas (GHG) emissions. As a result of this, the spread of natural gas application in contrast to coal reduces the level of GHG pollution, thus improving the environmental and living standards for the society.[15] However, currently there are countries in the SEE region with little or no natural gas consumption due to the drastically low penetration level. Many households do not have access to natural gas due to the lack of supply and insufficient distribution networks. This also sets back the development of commercial and industrial activity in the countries, which affects the living standards.

The introduction of an additional amount of natural gas supply through the Adria LNG terminal could improve the living standards in the SEE region through the development of the commercial and industrial activities, increasing of national competitiveness, increasing the employment level, increasing the natural gas penetration, as well as providing an environmentally friendly substitute for coal and heavy oil used for heating and electricity production. As many of the eastern European countries are relying on largely pollutant coal sources, the promotion of natural gas usage by governments may be observed as one of the most effective pollution control programs. Clearly, the most efficient and environmentally friendly solution would be the spread of renewable energy, however, its potential differs greatly and renewable sources would not be able to substitute for fossil sources. Combined with political backing the natural gas penetration would have a positive impact on a country's social acceptance and thus economic performance. The Adria LNG would provide the countries of the SEE region with an additional opportunity to boost their development in many areas simply due to the availability of supplies.

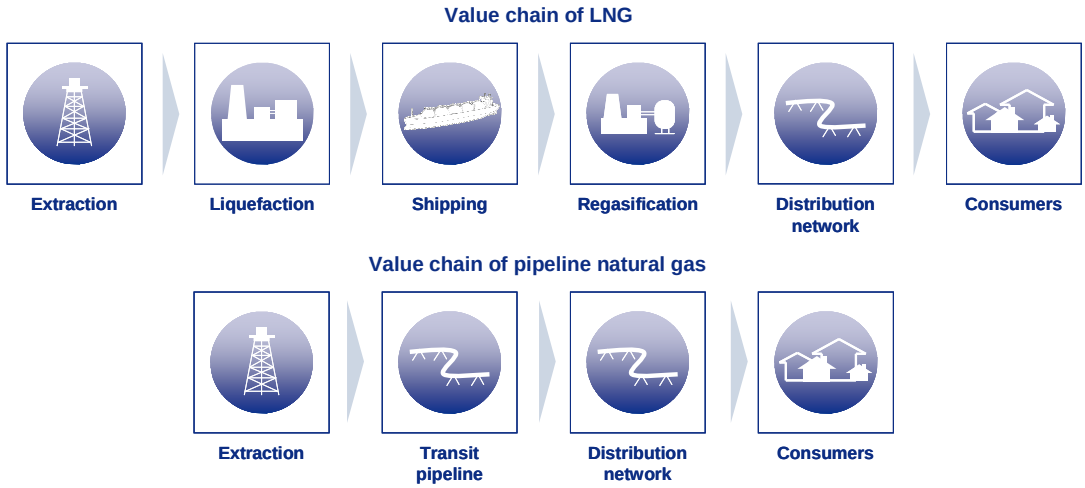
[12] *The future of LNG in Europe and potential impact on the market power of gas suppliers: Thomas Fredric Palm*
[13] *The future of LNG in Europe and potential impact on the market power of gas suppliers: Thomas Fredric Palm*
[14] *GlobalData: The effect of financial crisis to LNG industry*
[15] *Marcogaz 2008: The Natural Gas Industry in Europe*

4.2.1.4 Technical

As it was introduced, LNG is natural gas cooled to -162 degrees Celsius at atmospheric pressure. In this state, one LNG tanker is the equivalent to 600 tankers, which makes transportation several times cheaper and simpler. With this technology, LNG represents a true alternative for transportation via pipelines, which is considered to be viable over distances of 3,000 to 5,000 kilometers.

Compared to pipeline transportation, LNG transportation has a longer value chain as it is illustrated in the figure below. The LNG value chain poses challenges in reaching economic viability. The liquefaction process transforms natural gas into LNG form, which requires a significant amount of energy resulting in the consumption of 5-15 percent of the gas. The capacity of the liquefaction train is expected to increase in the near future which would increase the output on the supply side. LNG is transported in special purpose cryogenic tankers with a capacity of 130,000 – 265,000 bcm per ship. The recent upgrade in the tankers' size contributes to economic viability. During the regasification of LNG the regasification plant uses direct-fired heaters, which requires much less energy than the liquefaction process. The fact that the plant has to contain storage facilities for LNG increases the cost for reception terminals. The most recent development in regasification is the introduction of floating type regasification and storage platforms, which also contributes to the economic viability of LNG.

Figure 6: Comparison of the LNG and pipeline value chains



Source: Official website of Adria LNG, 2009; NaturalGas.org, 2009

4.2.2 Industry analysis

As the next level of the competitiveness analysis, unique industrial circumstances in the SEE region are reviewed such as the bargaining power of customers and suppliers, entry barriers, substitutes, and competition issues.

4.2.2.1 Customer bargaining power

The analysis indicates that potential SEE customers of LNG possess relatively low bargaining power, if any. The current LNG market is dominated by the suppliers as there is an excess demand for LNG. It is difficult for customers to achieve economies of scale through negotiating for larger volumes as currently there are bottlenecks not only on the liquefaction but on the shipping sides also. Considering the value chain, customers do not have the ability to integrate backward, due to the nature of the industry and unavailable resources in the region. In addition to the scarcity of alternative suppliers, customers are limited in changing suppliers on the short term due to the associated high cost. This is due to the rather underdeveloped LNG spot market, which is the result of the binding commercial relationships between market players through long term supply and purchase agreements. Minor bargaining power is provided by the price differences of LNG compared to the available pipeline gas supplies in many regions. Due to the present market situation, prices might give an opportunity for customers to negotiate better conditions in the short term.

4.2.2.2 Supplier bargaining power

As it was shown earlier, the present market is a supplier market as a result of the following factors. The LNG supplier industry is dominated by only 13 engineering companies capable of constructing LNG terminals and 13 shipyards capable of building LNG tankers. Liquefaction facilities are the most expensive components of the value chain. Until now, investing in liquefaction plants has been driven by excess demand to secure a high utilization rate of the facility. Also there are relatively few countries in the world with sufficient natural

gas reserves to export significant amounts of LNG on the long term. The uniqueness of LNG as a product strengthens the position of suppliers further since substitutes to LNG are in general not readily available. LNG suppliers are geologically concentrated around major natural gas reserves and they export vast quantities to several countries, while a single buyer purchases only a limited amount of their product.

4.2.2.3 Entry barriers

The LNG technology is more specific and the LNG value chain is longer compared to the pipeline solutions. In the SEE region entry barriers are associated with the investment costs, lack of supply, inflexible supply due to long term contracts, technological requirements, licensing requirements, pipeline requirements, and competition against the less expensive Russian pipeline gas. A potential predatory pricing behavior of the Russian natural gas would be a significant entry barrier for Adria LNG in the region; however, such a strategy is unlikely to occur due to the significant difference in terms of volume. On the contrary, Gazprom is applying the opposite strategy as it is targeting to increase the export prices of natural gas to Europe. This development could positively influence the economic viability of the Adria LNG project.

Taking into account the above criteria, new entrants besides the currently proposed terminal projects are not anticipated in the SEE region in the short term. If this situation changed, there would be sufficient amount of time available to prepare an adequate response as an LNG development project lasts 4-5 years.

4.2.2.4 Substitutes

In many of the countries in the SEE region, the market is not concentrated around natural gas utilization, but around other energy carriers like coal, oil and wood. This is due to lack of infrastructure and insufficient access to supply sources. In these countries a transition from pollutant fossil source to natural gas is expected, however, in the present situation these energy sources are strong substitutes of natural gas.

In the more developed countries with sufficient infrastructure and access to transit pipelines, this transition has already happened or is in progress resulting in cogeneration plants that generate electricity and heat and industrial consumers being strongly dependent on natural gas. Their numbers are rising year after year due to the state subsidies in place in the region. Mostly these countries represent the steadily growing market for natural gas, which is expected to be followed by the other emerging countries currently lacking natural gas access.

Natural gas fired power plants are considered to be utilizing the cleanest fossil fuel technology and their numbers are growing accordingly, hence the demand for natural gas is going to increase in the region as well. These plants can fire backup fuels as a substitute but their efficiency will drop significantly and their emission levels will rise at the same time rendering fuel substitution to a mere instrument of necessity.

4.2.2.5 Competition

Competition in the SEE region is low as domestic productions are low, the market is not transparent, liberalization is under progress, there are no gas trading hubs operating in the region, and there is only one gas exporter in the vicinity of the region, Russia. As a result of these factors, the dependence of each country on Russian gas in the SEE region is above 70 percent on average[16].

Access to a broader portfolio of supply sources and infrastructural developments would be required for the countries of the SEE region in order to provide the minimum requirement for further economic and social development and growth. Only after the supply portfolio and the necessary infrastructure is under development can an efficient gas hub be formulated to unite the liberalized markets and encourage competition. As currently there is no such phenomenon present in the SEE region as gas-gas competition, every opportunity should be targeted to capitalize on diversification. Adria LNG would be able to introduce competition or even offer a substitute to Russian gas by providing access to various natural gas sources all over the world. Consequently, it would be able to seize an appropriate market share, thus bringing benefits to the customers. The economic viability of the LNG in the SEE region should be measured and compared against national and social interests of the countries, like security of supply.

4.2.3 Competency analysis

After the external analysis the project specific factors are considered in the form of a competency analysis. This area focuses on three topics: the competitiveness creation, competitive advantages, and sustainability of advantages.

[16] *Please refer to Figure 3 on page 8*

4.2.3.1 Competitiveness creation

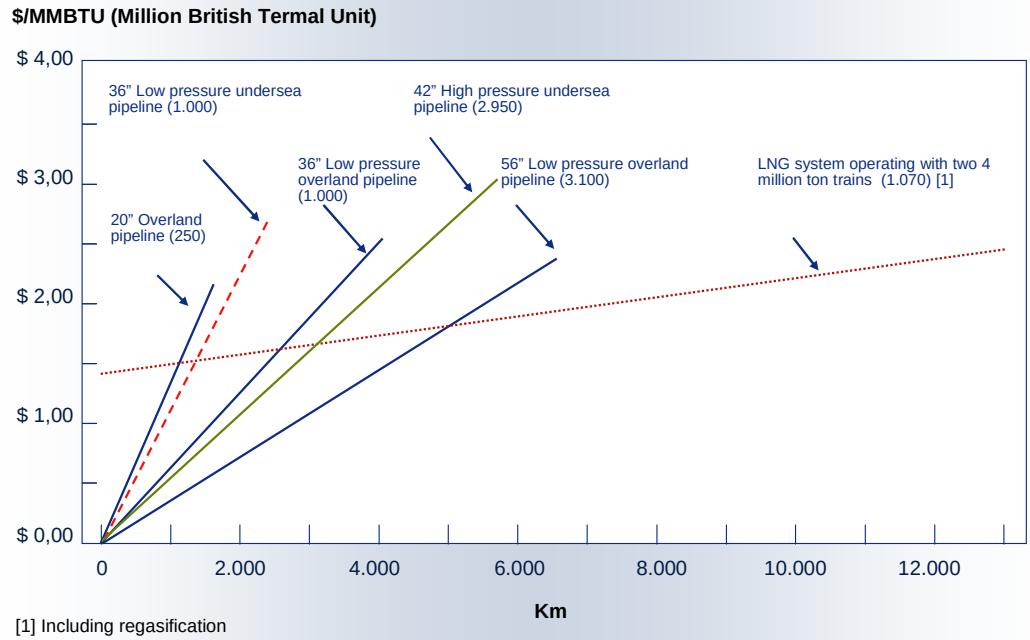
There are several regasification systems in operation today that are differentiated based on key factors like operational costs (fuel consumption, maintenance), environmental costs (rate of emissions), and availability of the equipment suppliers on the market. One of the unique ways the Adria LNG can create competitiveness is through the LNG technology due to multiple factors.

- Technical and infrastructural exclusivity,
- Coverage and speed, and
- Investment costs and capital intensity over the value chain.

As the technical and infrastructural side largely determines the competitiveness of LNG projects, the supply bottlenecks have to be analyzed. On the technical front, the 600:1 compression ratio provides a competitive edge for LNG. This could mean that a 200,000 cubic meter capacity tanker could transport annually roughly 1/10th of a 30 bcm/year capacity pipeline. If both the transmitting and receiving capacities are provided, 10 tankers could create a competing situation. Regrettably, considering the infrastructural background, currently there are only 13 engineering companies worldwide that have the capability and experience to construct LNG facilities. Similarly, there are only 13 shipyards that are capable of building LNG tankers in the world. Five shipyards are located in Japan, five in Korea, one in China and two in Europe. Consequently, the availability of new shipbuilding capacity for launching new LNG routes is limited as at least two tankers are required for one LNG train. The risk of ship unavailability is expected to be somewhat mitigated by the current economic crisis as the dominance of the supply market is expected to subside. As mentioned earlier, the current economic situation provides an edge for launching the Adria LNG project.

Besides the identified technical bottlenecks, other important factors that influence competition are the speed and coverage of LNG transportation. LNG carriers voyage considerably fast at an average speed of 18-20 knots compared with the14 knots of a standard oil carrier. Also loading and unloading of LNG carriers do not take more than 12-18 hours on average. As LNG tankers are very capital intensive (costs about USD200 million) they cannot afford to have idle time.[17] Considering the coverage related issues, LNG can satisfy distant demands as it can be shipped over oceans, as well as the fact that a receiving terminal can have access to multiple supply sources at the same time. Alternatively, the transmission pipelines are only able to connect a predetermined source with a predetermined set of customers. Based on technological factors, LNG transportation is only competitive at distances greater than 3,000 – 5,000 kilometers, as it is shown in the below figure. This can be explained with the differences between the value chain of the pipeline gas and the more extensive value chain of LNG.

Figure 7: Cost of LNG transportation versus oil and natural gas



[1] Including regasification

Source: Jensen Associates Inc., KPMG

[17] *Fostering LNG Trade, Energy Charter Secretariat, 2008*

The analysis indicates that pipeline construction costs grow almost linearly with distance and there are only small fixed costs that are not related to distance. The major cost component of a pipeline project is the pipeline itself. While there are no economies of scale with respect to distance, there are substantial economic benefits from constructing a pipeline with larger diameter. On the contrary, in LNG the major cost component is the liquefaction, while a regasification terminal is the least capital intensive link in the value chain. Overall, the shipping operation accounts for 30-40 percent of the total transportation cost, and the remaining fixed capital costs are related to liquefaction and regasification. In LNG the transportation costs increase with distance, but considerably less then pipeline costs. This is due to the fact that when the distance increases the fixed costs of liquefaction and regasification are spread over more kilometers.[18] As a result, the initial costs of LNG transportation are higher than of pipeline transportation; however, the LNG provides a significant economies of scale on large distances. Consequently, the competitiveness of Adria LNG is expected to increase as the gas fields lying less than 3,000 kms drain, and natural gas has to be transported to Europe from a larger distance.

4.2.3.2 Determination of competitive advantages[19]

Besides the competitiveness creation, an analysis of the strengths and weaknesses of Adria LNG was performed to determine competitive advantages of the project.

Strengths

- The project company is owned by multiple shareholders, who are acknowledged and powerful market players of the European gas market.
- The shareholders possess proven management, superior technological skills and core competencies in the natural gas industry with relevant previous experiences to implement and efficiently operate an LNG terminal.
- Vertical integration of shareholders in the natural gas industry and in the LNG value chain.
  - E.ON Ruhrgas could act as a potential supply for Adria LNG as E.ON Ruhrgas is active in exploration, production and is a partner in the Train II project in Equatorial Guinea.
  - Total is one of the world's top three players in LNG aiming to forward integrate over the LNG value chain. Total has interests in the world's largest liquefaction plants as well as in many new liquefaction projects. On the downstream, Total is also involved in four regasification terminals.
  - RWE, through acquiring 50 percent shares in the U.S. based Excelerate Energy, is in possession of three LNG import facilities and five vessels through long term charters.
- The shareholding intension of the Croatian national companies is expected to give a boost to the project in terms of supply and financing negotiations.
- The shareholders are financially stable entities, which supports the implementation chances of the terminal.
- The technological aspects of the terminal are offering core competencies compared to pipeline transport according to the following:
  - A regasification terminal is the least capital intensive component in the LNG value chain.
  - Regasification terminals are usually planned for a larger capacity to provide a reliable receiving point for natural gas in peak periods. This unused capacity can be exploited in case the demand rises, without further investments. Additionally, the excess capacity can be utilized to tap into the LNG spot market.[20]
  - Through a regasification asset the customers can gain access to various sources of natural gas basically from anywhere on the globe.
  - The Adria LNG can achieve economies of scale over longer distance compared to pipelines, which leads to cost advantages.
  - LNG offers flexibility in selecting suppliers and to target markets with the optimum gas price.
- The project is backed by shareholders with significant political and a vast lobby power.
- The project focuses on a relatively isolated market mostly supplied by Russian gas. The customers are well defined and the imported gas could be a marketable product in the neighboring countries.

Weaknesses

- As there are powerful and influential shareholders in the project company, there might be different approaches and strategic directions to harmonize.
- When shareholders need to coordinate actions, each may wait for the other to take the first important steps, which can result in delayed reaction times.
- The financing of the project is also dependent on the agreement of the shareholders, which might be influenced by their interests and willingness to invest in the actual market situation.

[18] *The future of LNG in Europe and potential impact on the market power of gas suppliers, Thomas Fredric Palm, 2007*
[19] *Official website of Adria LNG*
[20] *The future of LNG in Europe and potential impact on the market power of gas suppliers, Thomas Fredric Palm, 200*

- Even though many of the shareholders may be able to guarantee supplies through their involvement in other projects, the supply negotiations have not resulted in the required supply capacity yet.
- Some of the technological aspects of LNG are also serving as weaknesses compared to pipeline transportation.
  - As regasification terminals are planned for a larger capacity, the initial investment must be planned for larger volumes which contribute to costs significantly.
  - As discussed earlier, LNG has a longer value chain that increases the minimum price of the natural gas for the customers. As a result, LNG imports have lower chance to be competitive with gas imports on pipeline of less than 3,000 km distance.
  - Due to caloric specifications, the importable natural gas sources might be limited.
  - In addition to the LNG value chain consideration, the distribution network is weak in the region, which weakens the competitiveness of gas imported through the Adria LNG.
- Natural gas utilization is not that common in the targeted region, which might result in the market image of LNG not being strong enough to compete with pipeline gas.

4.2.3.3 Sustainability of advantages

Based on the previous assessment, four core competencies of the Adria LNG project could be identified compared to pipeline transportation. These are the economies of scale with the range of transportation, complicated technology and infrastructure, access to multiple natural gas supply sources, and the ability to utilize its unused capacities to import LNG spot cargoes to exploit price differences between supplying regions. In relation to the SEE region, there is the core competency of Adria LNG being distinctive in comparison to pipeline gas. These distinctive competencies are the technology and infrastructure processes introduced in sections 4.2.1.4 and 4.2.3.1, and the access to multiple supply sources. The durability and imitability of these distinctive competencies are analyzed to verify their sustainability.

Durability of distinctive competencies

The technological and infrastructural processes are considered to be durable. The LNG transportation technology is a unique industry, which is totally different from the pipeline technology. Improvements and technological developments are expected in the LNG industry, which would strengthen the industries durability through potentially reducing its capital intensity, thus lowering the entry level of economic viability.

With respect to the SEE region, access to multiple supply sources is also counted as a durable competency. Considering the available natural gas resources of the world, there are sufficient supply sources available in the long term. For example, the Middle East holds a significant 40 percent proportion of the global natural gas reserves. Additionally, the Middle East suppliers are also counted as drivers of the development of the LNG industry. Compared to LNG, the pipeline technology would not be able to link the SEE region customers with as many natural gas resources mostly due to the economic viability and investment sensitivity. On the contrary, it should be noted that the Adria LNG will only be able to utilize its access to multiple sources as the market turns from take-or-pay contracts to take-or-release contracts. The requirements of this transition is the development of a competitive market with a large source portfolio and the development of spot trading over bilateral trading based on long-term contracts.

Imitability of distinctive competencies

Imitability of a competency is determined by its transparency, transferability and replicability. The imitability of the technological and infrastructural competence is considered to be medium as it is more and more transparent, however, only partly replicable. As it was referred to previously, there are only a limited number of companies capable of constructing terminals and tankers. In the SEE region Adria LNG is only threatened by another LNG terminal. Currently there are only one operating and two proposed in the region. Even though, the LNG technology is imitable, the current market situation does not encourage new entrants due to the required capital investments and insecure economic viability.

Imitability of the potential access to multiple supply sources is counted to be medium as the accessible supply sources are transparent and replicable. On the other hand, supplies are secured mostly in long term contracts, which are not transparent, transferable, or replicable. Even though theoretically LNG could be acquired from many sources all around the world, the supply is limited and difficult to allocate due to the significant excess demand in the LNG market segment. In relation to the SEE region, natural gas from distant sources will be able to be transported only in form of LNG, rendering this competency as inimitable by the competing pipeline technology.

As it was shown, the Adria LNG possesses significant competencies of which many are also sustainable. The identified competencies are only relevant if considered together with the economic viability.

4.2.4 Economic viability analysis

Economic viability is one of the most important determinants of an LNG project. Even though strategic considerations are supporting the implementation of the Adria LNG terminal, the inspection of expected end-user prices might decide the investment especially in the case of an economic and financial recession like the one affecting the world's economies nowadays.

Introduction of prices and viability check

Like the natural gas markets we can distinguish between two types of contracts in LNG, spot and long-term contracts. The Asian Pacific markets are dominated by oil-linked long term contracts; in North America the share of long-term contracts in total LNG purchases is 56 percent, while in Europe (since LNG competes directly with pipeline gas on the end-user market) LNG prices are indexed to a similar mix of product prices. Europe is in competition with North America and Asia for LNG, where the highest gas priced market should attract spot LNG cargoes providing price arbitrage for LNG producers. In order to understand the nature of contracts, it is essential to understand the key differences between monopolistic and deregulated markets, using the analysis of IPF Panorama[21]. The monopolistic markets are using long-term contracts (20-25 years) with take-or-pay clauses (this is an obligation usually allowing for 10 or 15 percent volatility compared to the contracted volume), which is favorable for limiting investments and price risks. On a deregulated market, standard contract characteristics are different. The term of contract is shorter; the contracted terms are varying from 1 month, 18 months and over 18 months (like in the United States). Additionally, the "Take or Pay" clause is changed by a "Take or Release" clause allowing resale of excess gas on the spot market. The price is set with reference to the gas market, which depends on the supply/demand balance and not on alternative heating fuels, usually crude oil. Taking into consideration the differences of LNG markets and the nature of the European market, our analysis should consider a crude oil indexed market.

Besides the market differences, the price characteristics have to be taken into account. Reasons for upward cost pressures on LNG are found to be the following:

- Currently, due to the worldwide financial crisis steel and key specialty material prices are decreasing. However, the rising price of steel and key specialty materials will be the trend in the next five years.
- The shortage of qualified EPC companies and experienced personnel will expectedly come up stronger in the next few years due to the high level of demand.
- It is expected that the years of 2010-11 will bring price pressure relief with many investments being completed, for example in the Middle East.
- The cost of liquefaction has increased from USD150-300/t/y capacity in 2002 to USD500-800/t/y in 2006, which means that the share of liquefaction in total costs is an increasingly important factor.

Based on the price characteristics, we have deemed it necessary to include a control variable in our examination in estimating the share of each element of the LNG value chain, i.e. upstream, liquefaction, shipping, and regasification. According to the analysis of Energy Information Administration (EIA), LNG projects are among the most expensive energy projects. EIA identifies the four major price components of an LNG project from the gas field to the receiving terminal to be the following:[22]

- Gas production: from the reservoir to the LNG plant, including gas processing and associated pipelines amount to 15 to 20 percent of the costs;
- LNG plant: gas treating, liquefaction, LPG and condensate recovery, LNG loading and storage amount to 30 to 45 percent of the costs;
- LNG shipping amount to 10 to 30 percent of the costs; and
- Receiving terminal: unloading, storage, regasification and distribution amount to 5 to 25 percent of costs.

We have prepared forecasts for each of the value chain elements. In our forecasts we have estimated the costs of the given value chain element by using historical market trends and inflation corrections. In our cost analysis we have used the following assumptions:

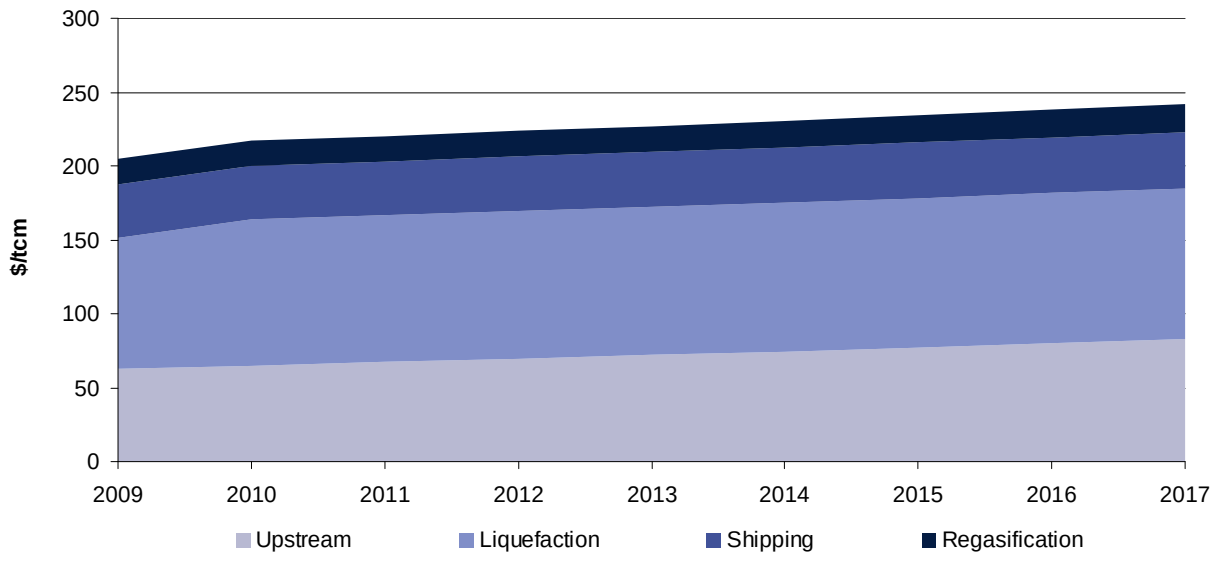
- Future excess demand leads to increased upstream costs,
- Tanker costs decline rapidly,
- Liquefaction costs will be a bottleneck in the LNG industry; the effect may be moderated as new companies enter the business and the learning curve takes effect.

Based on this analysis, as illustrated in Figure 8, we can conclude that liquefaction still represents a significant part of the total LNG costs, and also the importance of upstream remains solid. This cost analysis has a control function in the case of forecasts, since in the case of LNG prices falling below the aggregate

[21] *The Ties between Natural Gas and Oil Prices, IPF Panorama 2006, Retrieved on 15., July, 2009, www.ipf.com*
[22] *The Global Liquefied Natural Gas Market: Status and Outlook, Energy Information Administration, December 2003, Retrieved on 15. July, 2009., http://www.eia.doe.gov/oiaf/analysispaper/global/lngindustry.html*

costs of the full value chain, suppliers would be expected to stop delivering to Adria as well as to all other terminals, which is reasonable taking into account the cost-income comparison.

Figure 8: Estimated costs of LNG according to value chain components



Source: EIA, December 2003; The future of LNG in Europe and potential impact on the market power of gas suppliers, Thomas Fredric Palm, 2007; Fostering LNG trade, Energy Charter Secretariat, 2008; KPMG analysis

Requirements of a model

It should be noted that the prepared model is used only as a viability check of the Adria LNG project, to take into consideration those risks that have an important effect on the economic reliability. This rough analysis is only a high level check to understand the important external factors of the project, and to realize the sensitivity of the projects to these factors.

Our high level economic analysis includes the approximated comparison of the prices of imported Russian natural gas and LNG arriving through the Adria terminal in SEE countries. The scope also involves a rough analysis of how in the long run the fluctuation of crude oil prices influences the project's return on investment through the price of incoming LNG. We have specified high level linear regression forecasts with the volatility factor by analyzing the LNG price volatility level in different countries. Based on the varying volatility levels of 5 percent to 11 percent we have fitted an average of 8 percent volatility to the linear curves resulting in intervals. The use of linear regression without intervals would result in finding only one single linear curve intersection and would cause long-term forecasts to be inaccurate. By applying of intervals the reliability and accuracy of the forecast increases significantly.

Required assumptions

In our analysis we prepared an LNG price forecast with the assumption also verified by additional research that there is an almost perfect positive correlation between LNG and crude oil prices, which exists due to the oil price indexing mechanism of the long-term contracts. For the LNG price reference market, we have chosen the historical values of the Spanish market, where the share of short-term contracts in total LNG purchases is 23 percent. Due to the important role of LNG in the Spanish market, competition among LNG suppliers is a strong price influencing factor. In our analysis we have fitted the Spanish LNG prices (IEA Statistical Review)[23] to the historical Brent oil prices with 1-5 months delays, and have tested at which delay period we reach the highest correlation. Based on our results it was the 5 months delay which gave the highest correlation of 97 percent. Based on the above assumptions we have fitted a linear regression trend to NYMEX crude oil future prices for forecasting the LNG prices until 2017.

In addition, we have also assumed that the Russian gas determination will follow the global gas prices in the long-term as Russia has a strong interest for such a price convergence, which would result in market-priced sales. Even though there could have been many input requirements, for indicative purposes for Russian gas, we did not apply any other method, and we have used a simpler calculation. We have deepened the specification by using NYMEX natural gas futures until 2020, and we have performed the fitting of the linear regression for our forecast to make estimation for the potential Russian gas prices.

[23] *Energy Prices & Taxes, Annual, International Energy Agency, p. 18. 2009.*

A netback calculation was applied to determine end user prices and competition with Russian gas: We have supplemented the forecast with a netback calculation for three delivery points at Rogatec (HR), Mosonmagyaróvár (HU), and Baumgarten (AT). The result shows whether the LNG prices are competitive at the takeover point of the Adria terminal compared to the forecasted Russian natural gas prices. In this case the Russian natural gas prices are decreased by the transportation costs of LNG to the above three delivery points for comparison purposes. Transmission fees used in the calculation are high level estimations based on historical figures and consideration of distance.

In our price comparison we have put emphasis on analyzing upon what long term conditions may the economic operation at Adria LNG project delivery point be viable and competitive. In the exclusive presence of Russian gas, this may only be understood through the comparison to Russian export gas prices. Our scope did not include the analysis of individual Russian export contracts in the region, which would differ from country to country, and our assumptions applied for the modeling did not involve the analysis of the direct political environment, either. Due to our simplified assumptions, our results are valid with our previously detailed assumptions.

We have found that the forecasted LNG prices based on NYMEX crude oil indexation would only be competitive with Russian gas in years 2011 to 2013 and 2016 at Baumgarten. The differences between the Russian gas and LNG are considered to be noticeably small lying between USD1.9 and 11.7, i.e. 0.73 percent and 4.27 percent of the LNG prices respectively. At the same time, the LNG prices estimated based on the NYMEX future prices are in average 19.79 percent higher than the estimated LNG total costs, which leaves significant room for price adjustments. As a result, the NYMEX based LNG price forecast when compared to the Russian gas prices at the three transmission points gives lower total costs in all three cases, thus turning LNG competitive based on total costs. Alternatively, the LNG prices could be reduced to meet exactly the Russian gas prices at the three transmission points still providing a considerable margin of 14.7 to 19.3 percent over the LNG total costs. This amount of reduction in prices indicates that improving of security of supply through LNG diversification would cost USD100 million for the economies in the SEE region considering the total 15 bcm yearly capacity of the Adria LNG. This way the states or the shareholders could increase the competitiveness of the Adria LNG terminal and increase the security of natural gas supply in the SEE region. On the contrary, it should be noted that further investments are required to improve the supporting infrastructure as the imported LNG will not be able to reach the target consumers. The estimated cost of network improvement and expansion is not considered in the above costs.

5 Results

5.1 Competitiveness overview of the Adria LNG terminal

The results highlighted in the below SWOT table were detailed in section 4.2. Besides the assessment of a company's situation, the SWOT matrix also offers the necessary inputs to generate possible alternative future strategies. Various kinds of growth as well as retrenchment strategies can be formulated with matching internal and external factors of the Adria LNG project. Strategies can be formulated to focus on corporate strengths to take advantage of opportunities, to use strengths to avoid weaknesses, to take advantage of opportunities to overcome weaknesses, and to minimize weaknesses to avoid threats.

Figure 9: SWOT matrix of the Adria LNG project

Strengths	Weaknesses
▪ Multiple acknowledged and powerful shareholders. ▪ Proven management, superior technological skills, core competencies, and relevant previous experiences. ▪ Vertically integrated shareholders being able to support the operation. ▪ Croatian national companies involved. ▪ Financially stable shareholders. ▪ Least capital intensive terminal. ▪ Excess capacity to exploit opportunities. ▪ Access to various sources of natural gas. ▪ Economies of scale over longer distance. ▪ Flexibility in selecting suppliers.	▪ Harmonization of different approaches and strategic directions. ▪ Shareholders tend to move together. ▪ Agreement is required on financing. ▪ Supply negotiations have not resulted in the required supply capacity yet. ▪ Larger capacity increases initial costs. ▪ Longer value chain increases the price. ▪ LNG imports are not competitive within 3,000 km distance. ▪ Due to caloric specifications, the importable natural gas sources is limited. ▪ Distribution network is weak. ▪ Market image of LNG is not strong enough to compete with pipeline gas.
Opportunities	**Threats**
▪ Strong political and lobby power of stakeholders and that of the EU. ▪ Disputes between transit and supplier countries contributed significantly to the acceptance and the demand of LNG. ▪ Low or no domestic supply in the SEE. ▪ Financial crisis might free up additional LNG supplies. ▪ Clean substitute for coal and oil in SEE region. ▪ In the SEE only limited new joiners are expected in the LNG industry. ▪ Minimal threat from substitutes. ▪ If maintaining schedule Adria LNG is likely to be the first diversification source in operation from the recent alternatives.	▪ Political influence of Russia is high. ▪ Demand for LNG might decrease because of the economic crisis. ▪ Competition versus cheaper pipeline gas ▪ Technology and infrastructure is a bottleneck in the industry. ▪ Finance is not as readily available as before the crisis. ▪ Regasification capacity is ahead of liquefaction. ▪ Low bargaining power of terminals. ▪ Potential unavailability of suppliers. ▪ Significant supplier concentration. ▪ Long term contracts are hard to secure before a developed state of the terminal. ▪ LNG spot market is relatively underdeveloped.

Source: Official website of Adria LNG; IEA, 2009; KPMG, 2009

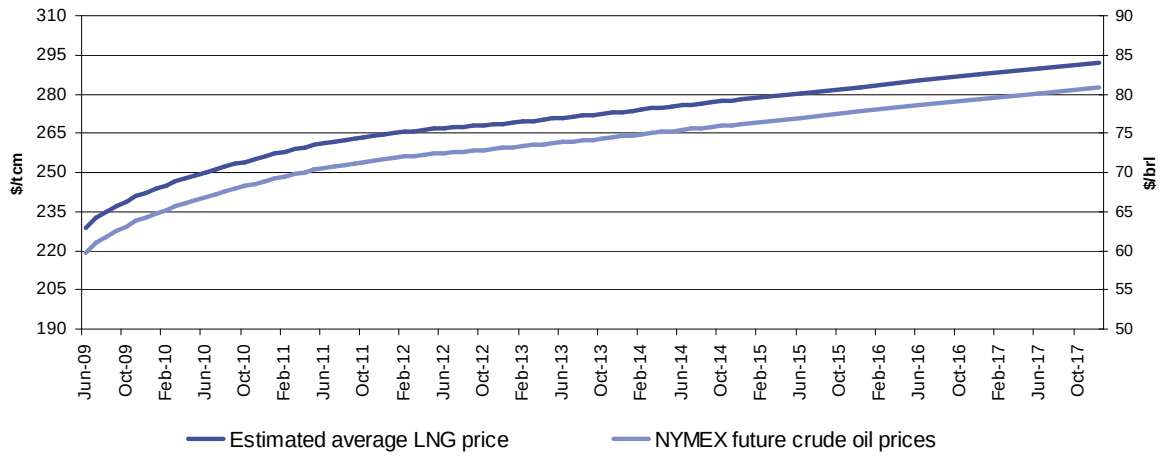
As it is shown by the results, the Adria LNG project is strategically competitive, has many opportunities and strengths to utilize, while weaknesses and threats are observed to be able to be overcome if focused on and the sufficient support is present behind the project. Nevertheless, strategic competitiveness will not necessarily justify the construction of the terminal as the economic aspects determine its viability.

5.1.1 Economic viability of LNG in the SEE

The model analysis showed that cost estimation determines a strict minimum price for LNG – each LNG value chain item has been considered following careful analysis. In our estimation for 8 years following 2010 we have calculated with 1 percent increase in case of upstream costs, unchanged costs for regasification, and a 1.5 percent decrease relating to liquefaction and shipping costs. We have corrected the cost forecast with an annual inflation rate of 2 percent. As Figure 8 on page 18 showed the regasification is the least capital intensive component of the value chain, while the liquefaction is the most capital intensive.

Following that we have established that in our Spanish reference market, LNG prices show the highest correlation (97%) in the case of a delay period of 5 months. We have fitted a linear regression trend to NYMEX futures crude oil prices, which shows the expected change in LNG prices based on the expected change in oil prices as it is shown in Figure 10. The purpose behind this approach was to reflect the European LNG market situation, which is dominated by long-term contracts.

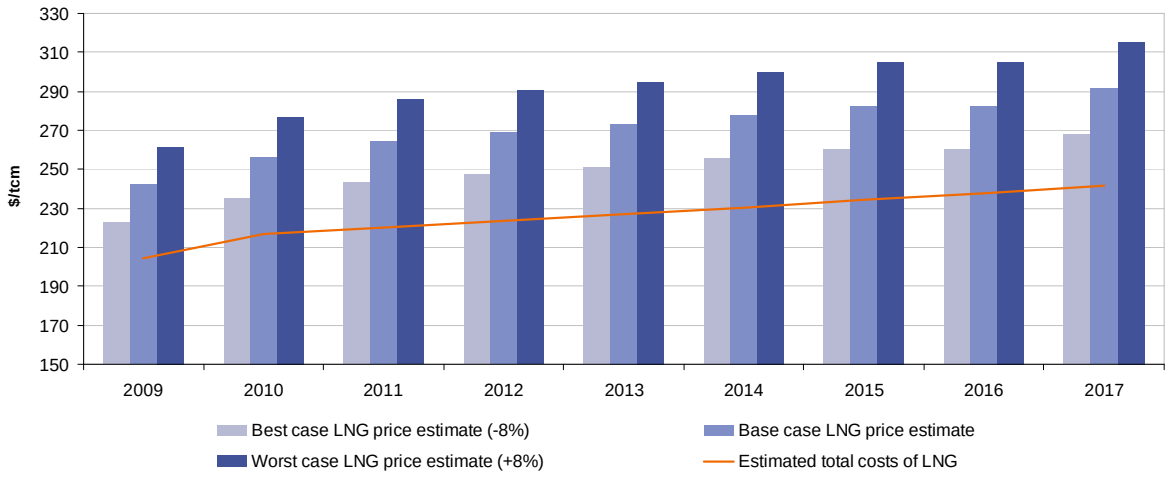
Figure 10: Estimated LNG prices based on NYMEX crude oil futures



Source: INO.com, May 2009; IEA; KPMG analysis

Figure 11 shows the estimated total cost curve forecast based on the components which were detailed in the previous section. The LNG price forecast was tested with 8 percent volatility, which is the average European LNG price volatility. The scenarios could be measured two ways. In this case, best case stands for a lower LNG price, which increases the chances of LNG competitiveness in the SEE region. In line with this, the worst case curve is 8 percent above the base case curve, while the best case is 8 percent below the base case estimate. It can be seen that LNG prices are well above costs as was previously indicated. In practice, this gives the opportunity to transporting companies, who have an interest in the Adria project as holding owners, to influence final spot market prices in line with their actual needs in order to preserve competitiveness. Naturally, we should consider the possibility that the Russian counterparty might change the Russian gas prices similarly, however, our scope did not include the analysis of this factor.

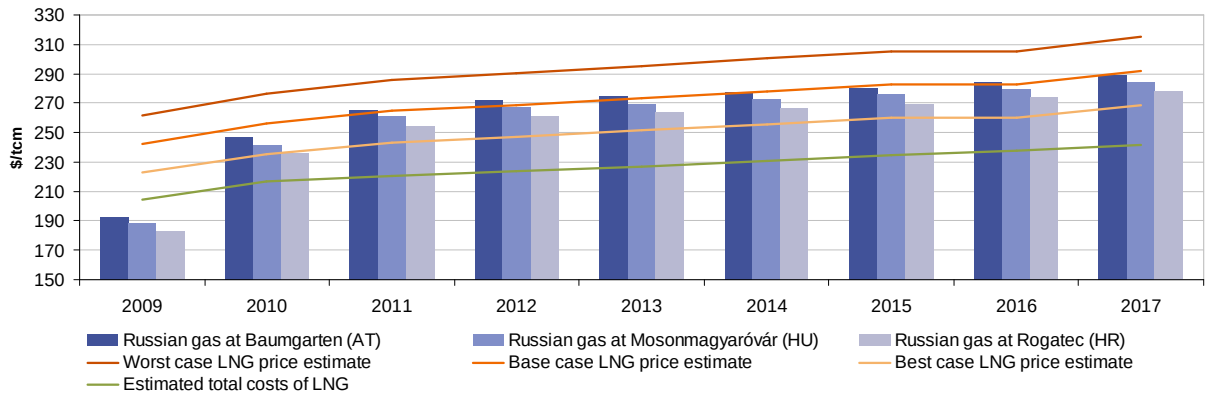
Figure 11: Comparison of estimated LNG costs and estimated LNG prices



Source: INO.com, May 2009; IEA; KPMG analysis

We have forecasted the regional Russian gas prices by using NYMEX futures gas data, with the assumption that it is in Russia's interest to put through world market export prices. This should have been assumed since the futures prices used in our forecast represent the aggregate global supply and demand expectations. Figure 12 shows the volume of Russian gas price changes in the region until 2017 as a result of the netback calculation. We used three delivery points, where we analyzed transportation costs from Trieste (Italy) to Baumgarten (in case of transportation to Slovakia), to Mosonmagyaróvár (in case of transportation to Hungary), and Rogatec (in case of transportation to Croatia). By analyzing the base case LNG graphs we can conclude that LNG is competitive at the Baumgarten delivery point between 2011 and 2013, and in 2016. In the case of the other two delivery points, the Russian gas prices compared to the LNG prices are somewhat cheaper. Differences between Russian gas prices and LNG base case prices are 0.27 - 4.27 percent, which means an opportunity for the participants of the Adria LNG project to decrease actual prices by reducing the potential margin content, and thus, maintain their competitiveness. Potential margin interval in case of the different scenarios is 6-30 percent, which serves as an opportunity to the required price cuts when necessary. Considering the best case LNG price estimate, which is still considerably higher than the total LNG costs curve, LNG imports through the Adria terminal could be competitive in all three delivery points. This clearly illustrates the economic potentials of the Adria LNG terminal in the SEE region.

Figure 12: Estimated competitiveness of LNG against Russian gas prices in the SEE region



Source: INO.com, May 2009; IEA; KPMG analysis

We can conclude that the Adria LNG project could fulfill its primary purpose of diversifying gas supply in the region in a somewhat economic way at least in the framework of the presented assumptions. Ultimately the price of regasified natural gas determines the scale of the diversification effect of the Adria LNG project. If the current trends continue, those countries that will have access to the LNG sources imported through the Adria terminal will be expected to bear additional costs in exchange for diversification. Various solutions could be identified to overcome the difference between the Russian natural gas prices and the LNG prices, like compensation in the form of state subsidies. Security of supply is often labeled to be an expensive and accentuated national interest, for which countries will have to make sacrifices. As shown before, in case of Adria LNG is would be around USD100 million annually. To support this initiative, the impact of Adria LNG must be introduced on the security of natural gas supply in the SEE region.

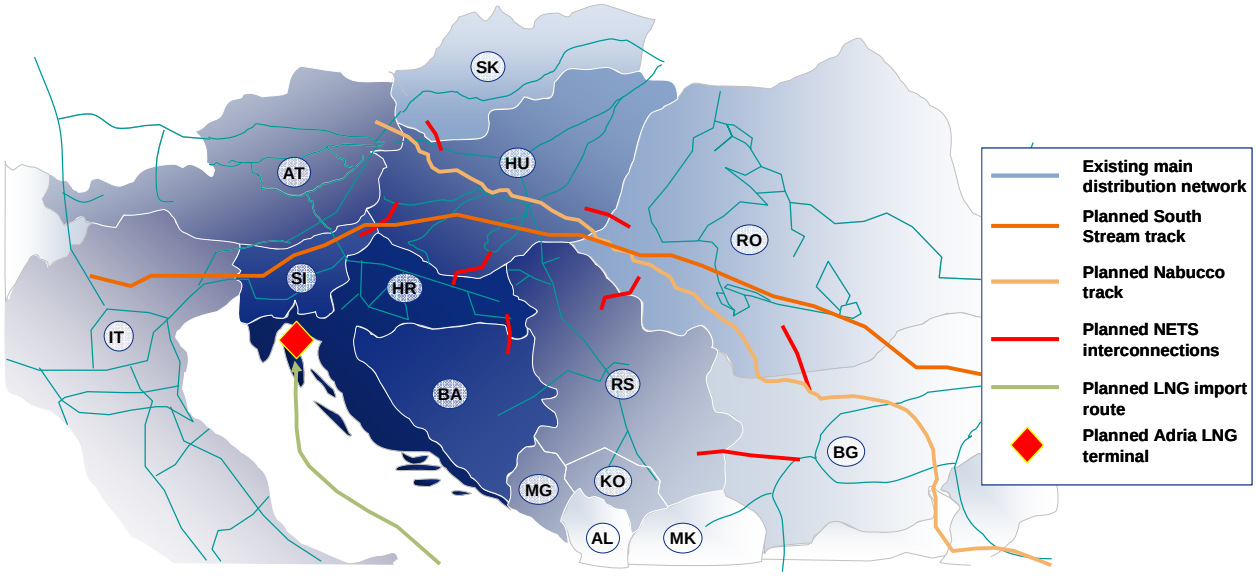
5.2 Impact on diversification and security of supply

The primary purpose of the Adria LNG terminal is to secure access to remote sources of natural gas, independently from existing gas pipeline networks. By constructing the terminal, Croatia would provide an alternative solution for natural gas supply, thus supporting a moderate competition in the SEE region. This way, they would satisfy the expected increase in gas demand and also alternative natural gas supply routes would be secured for the Central and South Eastern European markets. Croatia could become an important player on the fast-growing energy market of the SEE region, since Croatia would be able to import four times its actual natural gas import volume through the planned LNG terminal.[24]

Theoretically, all of the countries in the SEE region could take their share from the LNG imports from Slovakia to Greece and from Austria to Bulgaria. Considered the largest natural gas consumer of Europe, Italy would also be able take a moderate share from the LNG imports in Croatia. However, it should be noted that the current interconnection infrastructure has to be expanded and renovated to allow a free flow of natural gas within the region, which should be already in place before the launch of the terminal. As the shaded areas illustrate on the map below, the close and well connected neighbors of Croatia would benefit from the Adria LNG terminal the most, while the distant countries without appropriate interconnections are less likely to diversify from their current import sources with the help of LNG in the short term.

[24] *Official website of Adria LNG*

Figure 13: Expected effect of successful LNG diversification through Adria LNG



Source: MOL Zrt.; Official sites of Adria LNG, Nabucco and South Stream; KPMG analysis

In order to illustrate the real potential of the Adria LNG in terms of diversification, its supplying power is analyzed through four scenarios and the duration of supply is calculated based on the historic peak import volumes in December 2008 (please refer to Figure 2 on page 5). In all of the scenarios, the first phase considers the initially planned 10 bcm capacity of Adria LNG, while the second phase calculates with the extended 15 bcm import capacity of the terminal. In all of the scenarios it is assumed that all the required interconnections are in place to allow the transmission of the imported gas. The high level analyses provide only a snapshot of the market situation and do not consider changing factors, like an increase in demand or the limitation of consumption. The analysis also put aside the question of take-or-pay contracts in the SEE region. The purpose of the scenario analysis is to illustrate the positive effect of the terminal in the event that the natural gas import is blocked.

Scenario #1

In the first scenario it is assumed that besides the demand of Croatia, the imported LNG would be used to satisfy the demand of the 100 percent dependent countries, namely Albania, Bosnia and Herzegovina, Macedonia, Serbia, and Slovenia. As the import capacity is higher than the demand of these countries, the difference is dedicated to the neighbor of Croatia, Hungary. The analysis shows that the terminal would be able to supply the peak monthly demand of these countries plus a significant proportion of the Hungarian demand.

Figure 14: Supply potential of Adria LNG in Scenario #1

Country	1st phase	2nd phase
Albania	30 days	30 days
Bosnia and Herzegovina	30 days	30 days
Croatia	30 days	30 days
Hungary	11.3 days	22.4 days
Macedonia	30 days	30 days
Serbia	30 days	30 days
Slovenia	30 days	30 days

Note: The consumption and import of Kosovo and Macedonia was aggregated with that of Serbia, due to lack of information.

Source: Eurostat, 2009; CIA World Factbook; IEA, 2009; KPMG, 2009

Scenario #2

In the second scenario it is assumed that in addition to the demand of Croatia, the imported LNG would be used to satisfy the demand of the 100 percent dependent countries considered in scenario #1 plus Bulgaria. As the import capacity is still higher than the demand of these countries, the difference is dedicated to the neighbor of Croatia, Hungary. The analysis shows that the terminal would be able to supply the peak monthly demand of these countries including Bulgaria plus a fair amount of the Hungarian demand.

Figure 15: Supply potential of Adria LNG in Scenario #2

Country	1st phase	2nd phase
Albania	30 days	30 days
Bosnia and Herzegovina	30 days	30 days
Bulgaria	30 days	30 days
Croatia	30 days	30 days
Hungary	3.1 days	14.3 days
Macedonia	30 days	30 days
Serbia	30 days	30 days
Slovenia	30 days	30 days

Note: The consumption and import of Kosovo and Macedonia was aggregated with that of Serbia, due to lack of information

Source: Eurostat, 2009; CIA World Factbook; IEA, 2009; KPMG, 2009

Scenario #3

In the third scenario it is assumed that a set of eight countries equally share the import capacity of the terminal based on their consumption. Even though, in this case none of the countries' demand would be satisfied fully, the scenario shows a considerable supply potential beneficial for the majority of the SEE countries.

Figure 16: Supply potential of Adria LNG in Scenario #3

Country	1st phase	2nd phase
Albania	10.5 days	15.9 days
Austria	10.5 days	15.9 days
Bosnia and Herzegovina	10.5 days	15.9 days
Croatia	10.5 days	15.9 days
Hungary	10.5 days	15.9 days
Macedonia	10.5 days	15.9 days
Serbia	10.5 days	15.9 days
Slovenia	10.5 days	15.9 days

Note: The consumption and import of Kosovo and Macedonia was aggregated with that of Serbia, due to lack of information

Source: Eurostat, 2009; CIA World Factbook; IEA, 2009; KPMG, 2009

Scenario #4

In the fourth scenario it is assumed that all of the SEE countries equally share the import capacity of the terminal based on their consumption. In this case the import share by country is significantly lower than in scenario #3 due to the addition of moderate consumers, like Austria and Hungary, as well as the largest consumer, Italy. As it is shown below, the terminal would be able to provide supply for 2-3 days in case of stopped imports.

Figure 17: Supply potential of Adria LNG in Scenario #4

Country	1st phase	2nd phase
All countries of the SEE	2.2 days	3.3 days

Note: The consumption and import of Kosovo and Macedonia was aggregated with that of Serbia, due to lack of information

Source: Eurostat, 2009; CIA World Factbook; IEA, 2009; KPMG, 2009

5.3 Prerequisites of successful LNG diversification

The world is facing the challenge of transiting from a high to a low carbon based economy. This transition process should contribute to sustainable development and energy security. The increase of the natural gas demand of Europe will contribute to meet the economic development and climate goals in the next 20 years. Satisfying the increase in demand necessitates additional import capacities, thus new projects offering diverse energy suppliers, sources and supply routes for gas delivery.

For a successful diversification through LNG in the SSE region, the following criteria have to be considered:

- Political and economic support
- Demand-supply balance
- Production source security
- Infrastructure concerns

As it was shown the current support behind the LNG project is not strong enough. The major concern of the government as well as investing stakeholders is whether the project will be viable. Both the strategic and economic analysis showed that there are significant differences between the pipeline gas and the LNG in many aspects. As it was indicated the price of natural gas imported in form of LNG is highly dependent on the future crude oil and gas prices. In those scenarios when the natural resource prices increase in the future, the LNG price is expected to be slightly higher than the pipeline gas price. One of the crucial questions is whether these price differences would be accepted by the market as an extra cost of security of supply. Alternatively governments could consider introducing various subsidies to support LNG, in order to reduce the dependency and the chance of following gas crisis due to blocked supplies. Such stated intents or agreements would significantly increase the viability of the Adria LNG project.

Demand and supply balance in the SEE region is specific. The demand is relatively low with incredible potential for growths as most of the countries are in a development phase. On the other hand, the indigenous supply is limited; most of the supply is coming from Russian imports. Due to the Russian import dominance, competition on the supply side is very low. It is important for such a project to have opportunities in competing for customers. As the prices of LNG are often higher than those of the pipeline gas, the previously mentioned subsidies would also contribute to the competitiveness of LNG.

Compared to the pipeline transmission, an LNG terminal can import natural gas from various liquefaction plants and various major sources. Similarly to the pipeline construction, supply side agreements and contracts are required before the realization of the infrastructure. The allocation of LNG supplies is one of the pillars of an LNG investment. The realization of contracts would require a certain level of commitment from the demand side, which also emphasizes the importance of political and economic support.

Infrastructure is the engine of diversification, especially in the SEE region, where the internal transmission and distribution networks are underdeveloped. While there are countries with nearly satisfactory links to Western Europe, most of the countries try to survive from the transiting transmission pipelines. Certain countries, like Albania, are not even connected with their neighbors and are not able to import any natural gas. Overcoming this critical disadvantage is a prerequisite for a free flow of imported gas from an LNG. As the following map indicates, there are numerous projects under development in the SEE region, besides NETS, that are aiming to resolve this drawback.

Figure 18: Overview of infrastructural development plans in the SEE region

Planned pipeline projects in the SEE region

- Trans Adriatic Pipeline (TAP) supplying Caspian and Russian gas in Albania and transiting to Italy, through Greek gas network;
- Interconnection Greece-Italy (IGI) will allow the flow of Caspian and Middle East reserves into Italy and Western Europe through Greece;
- Ionian Adriatic Pipeline project (IAP) is going to link the Albanian gas network with Montenegro, Bosnia Herzegovina and Croatia network;
- West Balkan Ring (WBR) is a proposed international gas network system connecting 7 countries in the region improving the supply security of these countries, with supply source from either the Trans Atlantic (TAP), Ionian Adriatic (IAP), Nabucco or the South Stream pipelines;
- LNG terminal at Fier in the Adriatic coast and an undersea pipeline to supply gas to Italy.

Source: Eurostat, 2009; IEA, 2009; KPMG, 2009

6 Conclusion

Natural gas remains the key source of energy for the European Union and the biggest share of it is currently supplied by Russia's Gazprom. With energy security at the top of the EU's agenda, diversification of gas supply routes is set as a top priority for the coming years. SEE is a region expected to play a crucial role in the mid- and long-term gas supply diversification for most of Europe. Currently at stake for SEE is the advantage of becoming a new hub of gas transit from the Middle East, Central Asia and the Caspian region en route to EU consumers. The struggle for control over delivery routes going through SEE is expected to create international conflict in the interests of companies and governments on several continents from Italy to Iran and from Austria to Egypt.[25]

We have shown that the proposed Adria LNG terminal is a strategically important infrastructural development opportunity in the SEE region to link producers all over the world with the European consumer markets. Since the most significant portion of the global LNG market is still dominated by long-term contracts it is important for the Adria LNG project to secure a supply contract.

As demonstrated, the Adria LNG project has many strengths, opportunities, and competencies to become competitive against the currently dominating Russian gas imports in the SEE region. However, the strategic competitiveness will not necessarily justify the construction of the terminal. The economic aspects determined that the LNG terminal can be viable. The high level analysis estimated that in average the Russian natural gas is expected to be 1.9-11.8 percent cheaper than the imported LNG by 2017. If the current trends continue, those countries that will have access to the LNG imports will be expected to bear additional costs in exchange for diversification. The difference between the Russian natural gas prices and the LNG prices are relatively small especially compared to the estimated total costs of LNG. To overcome this difference and secure source diversification, compensation could be introduced in the form of state subsidies. Alternatively, the shareholders could allocate long-term contracts at a lower price through their involvement in other projects over the LNG value chain to reduce the final LNG price to the level of the Russian gas price.

Security of supply is observed to be an accentuated national interest. Some view diversification as an expensive luxury for which countries have to pay an extra cost, but as it was shown through the scenarios, the Adria LNG capacity would be able to provide a significant level of security for many SEE countries even in the peak consumption month, December.

Due to diversification through LNG, the achieved greater diversity, competitiveness and transparency would be able to boost system integrity, economic development, energy security, greater interconnectivity and generate greater market efficiencies. This could be further enhanced through the realization of the planned infrastructural interconnections in the region, which would reduce the infrastructural bottlenecks and would provide transparency of trading and free gas flows through the integrated transmission and distribution network.

[25] *South Eastern Europe in the Big Eurasian Gas Game: New Supply and Transit Challenges*

ANNEXES

List of Figures