

# The future of Croatia's natural gas supply from the perspective of import infrastructure

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REVIEW

After successful realization of the first natural gas import to Croatia back in 1978, three other projects for additional supply were contemplated in the past thirty years, but never realized: import of Algerian gas (negotiations lasted from 1980 to 1988), the first LNG terminal project (1990 - 1995); the second LNG terminal project (activities commenced in 2003). Unfortunately, none of them materialized.

Along with these projects, after the year 2000, several international projects were initiated: Nabucco Pipeline, South Stream, Trans Adriatic Pipeline (TAP) with Adriatic Ionic Pipeline (IAP) as a branch line. Each of the above projects, if implemented, could provide additional gas supply to the Croatian gas market. However, the problem is timing. All the above projects have long completion time. On the other hand, Croatia might be confronted with shortage of natural gas after 2014 when the import agreement concluded between INA and ENI expires. In addition, the government must amend the existing energy strategy or design a new strategy. Moreover, in the context of imminent EU membership in July 2013, with significant effects on further opening of the energy market. Such numerous commitments and milestones require quick response by the government, action plans and reorganization of energy sector within the Ministry of Economy.

Lessons learnt from the past cast certain doubts on suitability of the existing infrastructure for import of additional volumes of gas for domestic market. The conceptual solution offered by experts from Plinacro d.o.o., Croatian natural gas transport system operator TSO (in the form of regasification vessels and floating LNG terminal), passed without any reaction, even from the relevant ministry. The LNG terminal project on the island of Krk has not been entirely abandoned. Formally, in 2013 the consortium of investors should reconsider the investment and possible continuation of the project. However, in the meantime natural gas market has undergone significant changes: economic crisis caused decline in natural gas consumption in Croatia and elsewhere; the existing LNG terminals in Europe operate with minimum capacity. Planned LNG terminal on the island of Krk was dimensioned to ensure export of two-thirds of its capacity to other European markets. Today, European market has sufficient natural gas supply, fed through new additional infrastructure such as the North Stream. In addition, it remains to be seen whether Europe will see the boost of natural gas exploitation from unconventional reserves as it happened in the United States.

*Key words:* Natural gas supply, liquefied natural gas - LNG, unconventional gas reserves, diversification of sources and routs of supply

## 1. INTRODUCTION

For more than fifty years Croatian oil and gas industry has been a generator of large and complex projects. Sufficiently long work experience in oil industry provided me an insight in the fate of many ideas and projects. Some had (too)long preparation phase and eventually lost market opportunity. Some projects with great potentials and profitability have never been realized. Among them were the projects for additional supply of natural gas for the Croatian and regional markets. It is certainly worth mentioning the three projects that entered into advanced stage of completion.

Immediately after successful realization of natural gas import from Russia for the Croatian and Slovenian markets in 1978, INA and the predecessor of today's Geoplin from Slovenia, initiated negotiations for import of Algerian gas. The negotiations with the suppliers and transporters ended in 1987. Unfortunately, the former Yugoslavia's administration did not approve the deal. The new possible supply option appeared in the form of LNG import terminal on the Croatian coast. The project

commenced in 1990 and was suspended in 1995 due to the war activities in the region. It was renewed after 2000 with some new members in the consortium and improved technology solutions.

In the last twelve years several international gas pipeline projects were put on the table. Some of the routes would cross the SEE region and could ensure additional supply to Croatian market, but their outcome is still uncertain. Such large projects are expected to meet several criteria such as: accessibility, availability and affordability, including diversification of sources and routes of supply. The comments in the media frequently mention advantages of this or that project, without sufficient knowledge about commercial or geopolitical background of the proposed projects. Frequently, there are also speculations about lost opportunity or profit if the country missed a chance to participate in the project. It is forgotten that revenues go to investors, with considerable indirect benefit to the country on whose territory such large infrastructural project is built. The concerns of the public over certain ambiguities are normal. However,

when government administration is torn by dilemmas, it is a serious problem. Failure to make important decisions on time and seize attractive opportunity, results in unrealized or shelved projects. It reminds of the story about Buridan's donkey who found himself halfway between two equally big and delicious piles of hay. He could not decide which one to eat, and eventually starved to death.

It all points to the lack of proper strategy.

## 2. SHORT HISTORY OF GAS SUPPLY PROJECTS FOR THE CROATIAN MARKET

In the past thirty-two years several projects for additional supply of the Croatian natural gas market were initiated. In the early 1980s, the only Croatian producer and supplier of imported natural gas was INA-Naftaplin. Together with the Slovenian natural gas importer, INA-Naftaplin entered into negotiations with Sonatrach and Italian transporters with the aim to organize import of Algerian gas (through Tunisia and Transmediterranean gas pipeline and then across Italy to Slovenian border and then to Croatian gas system). The negotiations were concluded in 1987. According to then effective regulations, it was necessary to obtain approvals from the relevant federal authorities on long-term foreign currency commitments. All this happened at the time when dismantling of Yugoslavia began. The tensions between the former republics were already present and the approval was unjustly denied. Slovenian republic authorities ignored denial of federal approval and signed the agreement with Sonatrach. As a result, after 1990 Slovenia commenced the import of 400 million m<sup>3</sup>/year (14 153 million ft<sup>3</sup>/year). Croatian republic government took legalistic approach and did not sign the contract on import of 600 million m<sup>3</sup>/year (21 230 million ft<sup>3</sup>/year) for covering demand of the Croatian market.

By the end of 1989, after halting of Algerian gas import project, the initiative for the construction of LNG terminal on the Croatian coast was launched. It came from the following companies: Metalimex from Czechoslovakia, Austrian OMV and INA, the first members of the consortium. Later on, the consortium was joined by Total, Czechoslovakian Transgas (later taken over by RWE), Hungarian OKGT (later MOL) and Slovenian Geoplin. Before the war in former Yugoslavia, Serbian Naftagas and Bosnian Energoinvest were also members of the consortium. The consortium organized exploration activities in order to find to most suitable location for the construction of the terminal. The surveys were carried out on ten locations, three on the island of Krk. The project documentation was also prepared. Total costs of that phase were around ten million dollars. Break up of the war in former Yugoslavia and its spreading to Bosnia and Herzegovina, resulted in freezing of the project. The financial and economic study of the project was finalised in 1994 with the conclusion that in the war situation no financial institution would provide funding. In 1995 the consortium members made decision on shelving of the project until indefinite time. Despite the fact that from May to September 1995 Croatia regained authority on its entire territory, the LNG project remained hibernated. The market conditions in 1995 were quite different than

in 1990. Majority of partners in the LNG consortium contracted new import of gas, mainly from Russia, and to a lesser extent, then expensive Norwegian gas. Slovenia was in consortium, but it did not need additional gas; neither Croatia, at the time. Exhausting war, then transition had their toll. Large industrial complexes disappeared, entrepreneurship was weak. Demand for gas declined.

It is to be noted that Russia was against the LNG project on the island of Krk, although it was never explicitly said. It was certainly one of the facts that facilitated consortium members to conclude new import contracts under favourable terms. They acquired better negotiating position. Thus, the terminal remained without sufficiently large market.

At this point one notorious fact should be emphasized, the fact that is frequently forgotten. Any project must meet certain criteria to be implemented and put into operation: a) it must have the market with sufficient demand to sell the product - in this case natural gas; it must have sufficient supply - in this case natural gas; c) investors ready to invest in the project and d) capital to finance the project. In addition, a project is determined in time and space. If project completion is not defined and remains uncertain, the investors will seek other solutions elsewhere.

High degree of uncertainty caused delay and shelving of LNG terminal project in the 1990s, and then again ten years later, although it was based on a new concept.

During 2002 and 2003 through high level bilateral contacts between Croatia and Qatar, Qatargas expressed interest for building an LNG terminal in the North Adriatic and offered considerable funding. The President of Croatia at the time, Mr. S. Mesić and Minister R. Čačić directed further talks to INA. The negotiations continued, however, the market survey indicated that natural gas markets of Croatia, Bosnia & Herzegovina and Slovenia with their current and expected demand were not big enough to ensure break-even capacity of the terminal, around 4.5 billion m<sup>3</sup>/year (159.2 billion ft<sup>3</sup>/year). It was crucial to find new markets on the west, north and east of Croatia.

In the meantime Qatargas forged a partnership with ExxonMobil for the construction of LNG terminal in Rovigo, Italy. They estimated that the Italian market was strong and sufficiently liberalised, contrary to the countries in transition, with attractive prices and annual consumption of over 70 billion m<sup>3</sup> (2.5 trillion ft<sup>3</sup>). Contacts with INA stopped. The Rovigo terminal has been constructed and it is in operation. However, its operation is not without problems. During very cold weather in February 2012 when several European countries, including Italy, experienced shortage of gas, LNG terminal in Rovigo was out of operation because LNG vessels could not be unloaded due to bad weather.

In 2004, large Germany energy company E.ON contacted INA with the proposed renewal of LNG terminal project on the island of Krk. After having acquainted the new potential partner with the contract obligations and preference rights of the original consortium members, further meetings were organized. The consortium mem-

bers expressed readiness to renew activities on the project. In the two years that followed, a new consortium agreement was concluded between old members and E.ON. Consequently, in 2006 a series of activities were undertaken for preparation of the project documentation. The Croatian government was continually informed on all phases of the project. It was also informed about the fact that it was unrealistic for INA to keep the 22% share in the project. Instead, in compliance with gas market needs, INA was ready to keep 10% share, and assign the remaining ownership share to other domestic or foreign investors. As there was no reaction from the government, the remaining share was offered to other consortium members by internal resolutions. In June 2006 the president of the Croatian government required amendment of the consortium agreement 'to grant minimum 25% share in the project for Croatian companies'. After three to four months of negotiations, the consortium members were ready to provide consent even to this requirement. In addition to INA, they accepted Croatian companies HEP and Plinacro to take part so that the share of Croatian companies in the project be 25%. Preparatory project activities continued, along with considerable expenses of more ten million Euros for preparation of project documentation and preliminary works. After completion of the project documentation, it was submitted to the relevant authorities for obtaining location permit.

In 2008 the financial crises began in the United States. The following year it spilled over to Europe with negative effects felt in all sectors of economy. During 2009 and 2010 natural gas demand declined on segmented international market (USA, Europe and Far East). In Europe the demand dropped by 6%. LNG import was the first to decline. In the last three years European LNG terminals operate below 50% capacity utilisation.

The location permit for the LNG terminal on the island of Krk was not issued, although it was not entirely denied. In such circumstances, the consortium stopped all activities on the project, with an obligation to re-examine its renewal in 2013.

According to the data, in 2010 the EU natural gas consumption was 570 billion m<sup>3</sup> (20.2 trillion ft<sup>3</sup>) with market recovery forecasts ranging from 630 to 650 billion m<sup>3</sup> (22.3 trillion ft<sup>3</sup> to 23.0 trillion ft<sup>3</sup>) in 2025 and about 700 billion m<sup>3</sup> (34.8 trillion ft<sup>3</sup>) in 2030. However, in the meantime, some new events emerged on the supply side that could make the planned 15 billion m<sup>3</sup>/year (531 billion ft<sup>3</sup>/year) capacity LNG terminal on the island of Krk unnecessary for a longer time.

In the period between 2000 and 2005 the US gas producers commenced development of unconventional reserves. These reserves were known even before. It is the so called shale or tight gas. Exploitation of these reserves required new technology which was developed in the United States and successfully applied. Between 2006 and 2010 the US production from unconventional reserves grew from zero to 123 billion m<sup>3</sup> (4.4 trillion ft<sup>3</sup>). EIA source quotes even 136 billion m<sup>3</sup> (4.8 trillion ft<sup>3</sup>). Import of LNG to the US terminals stopped. Today they even consider transforming of existing LNG terminals into export terminals for their surplus gas. American

success in exploration of unconventional gas formations and production of shale gas, particularly the technology and experience in drilling horizontal wells and massive hydraulic fracturing to increase permeability, are quite unknown to a wider public<sup>12</sup>, so they are frequently subject of mystification (Note 1). This lack of knowledge frequently gives rise to various speculations and 'green activists' protests. Instead of detailed elaboration of shale gas extraction techniques, let us focus on the consequences of successful unconventional gas production reflected in the news provided below (INA Newsletter dated 23 January 2012):

- US electricity prices fall as a result of cheap natural gas,
- NextEra Energy froze plans for wind farms construction.

The above information is only for illustration, not recommendation. But the data are quite significant. Will the shale gas success story repeat in Europe? Expectations are great (not only in European Union), not without ground. For example, Poland expects commencement of shale gas production in 2014 and hopes to become self-sufficient in natural gas by 2035.<sup>13,15</sup> Just as a remainder, in 2010 Poland produced 4.1 billion m<sup>3</sup> of gas (145 billion ft<sup>3</sup>) and consumed 12.9 billion m<sup>3</sup> (456 billion ft<sup>3</sup>). Some experts point out that geological formations with shale prospects are much deeper in Poland than in the USA. The depth (from 2 300 m to 4 250 m) makes drilling and other operations more complex and expensive. Estimated reserves in Polish part of the Baltic basin are around 50 000 billion m<sup>3</sup> (1 769 trillion ft<sup>3</sup>). Significant shale prospects have been discovered in Ukraine as well. Experts are optimistic and it is expected that in the next ten years Ukraine could become exporter of gas. (In 2010 Ukraine produced 18.6 m<sup>3</sup> and consumed 46.9 billion m<sup>3</sup> of natural gas (686 billion ft<sup>3</sup>, respectively 2.1 trillion ft<sup>3</sup>).

Wood Mackenzie estimated European production of natural gas from unconventional reserves at 60 billion m<sup>3</sup>/year (2.1 trillion ft<sup>3</sup>/year).<sup>9,14,16</sup> If this forecast come true before completion of the planned gas supply projects (LNG terminal, Nabucco, etc.), such projects will be abandoned.

National interests of individual EU members and high expectations from exploration and production of unconventional gas reserves, particularly in Germany, France, Great Britain and Poland, as well as common EU goal to decrease dependence on energy imports, in this case natural gas import from Russia, and in the last but not least, geopolitical interests, provide additional push for pursuing unconventional gas production. Experts are optimistic about unconventional reserves prospects, despite forecasts on higher exploration and production cost per well in Europe than in the US. Estimated costs per shale well in Europe range from US\$ 10 - 15 million, compared with around US\$ 5 million in the US. In case of tight gas the costs in Europe are estimated even higher - US\$ 18 to 28 million.



According to global forecasts, it was expected that in total 35 000 wells (Note 2) would be drilled in 2011, out of which a large number in China.<sup>3</sup>

All the above facts have been quoted as reasons why in 2013 further activities on the LNG terminal on the island of Krk could be postponed or completely suspended. So, the additional supply from this source is highly uncertain, but on the other hand Croatia needs additional supply after 2014. In this context, it is really surprising that there is no reaction from expert and public community on the solution proposed by Plincaro's experts on alternative, more advanced from technology aspect, cheaper and sustainable solution in the form of floating regasification technology. But this topic will be further elaborated in the Conclusions.

### 3. OTHER REGIONAL GAS SUPPLY PROJECTS AND 'BURIDAN'S DILEMMAS'

In the last decade large energy companies promoted new gas pipeline projects for natural gas supply to different regions in Europe. Some projects, like North Stream for example, ensure supply for northern Europe, with indirect impact on SEE markets, including Croatia. Some transmission pipeline routes cross the neighbouring countries, like Nabucco. In the initial phase, Croatia was offered an opportunity to participate in the South Stream project and offtake certain volumes of gas transported through this route. No agreement was reached and the route was changed. The only remaining option is the Trans Adriatic Pipeline - TAP with Ionian-Adriatic spur.<sup>1,4,5,6</sup>

Nabucco pipeline was conceived in 2000 by OMV, Austria, as a European project. The consortium was formed and included the following companies: MOL, Hungary, BOTAS, Turkey, Bulgargas (today Bulgarian Energy Holding) and Transgaz, Romania. Later on it was joined by RWE, Germany. It was expected that Bayerngas, Germany would also participate in the project, but it did not happen. From the very beginning Nabucco consortium counted on Caspian reserves of natural gas. Azerbaijan, Kazakhstan and Turkmenistan had huge natural gas reserves of tens billion m<sup>3</sup>.<sup>1,4,10,11</sup> The Nabucco pipeline's planned capacity was 20 to 28 billion m<sup>3</sup>/year (707.7 to 990.7 billion ft<sup>3</sup>/y) and its length 3 300 km. At the beginning estimated investment was US\$ 5-6 billion, today it is Eur 7.9 billion, but some experts think it is much higher. (EU official mentioned Eur 14 billion and Hungarian minister for development mentioned even Eur 26 billion.<sup>7,10,11,16</sup> According to original plans, 11 - 12 billion m<sup>3</sup> (389.2 - 424.6 billion ft<sup>3</sup>) of gas would supply markets along the pipeline route and 13 - 14 billion m<sup>3</sup> (460 - 495 billion ft<sup>3</sup>) would go to the gas hub in Baumgarten. In initial phase of the project the target completion date was 2011/12. However, some tensions within the consortium were felt since the very beginning as some participants flirted with other projects and interests. Then, some five years ago, it was announced that Gazprom concluded a long-term agreement for purchase of all surplus gas in Kazakhstan and Turkmenistan. Azerbaijan alone could offer only some ten billion m<sup>3</sup> of its gas. Iran, as another supply option is in permanent conflict with the interna-

tional community and thus it remains uncertain and risky source of supply. Iraq could hopefully become a potential source after recovery from the long war. In 2009 it was announced that OMV and MOL, relentless rivals in recent years, purchased shares in Iraq's natural gas producer Pearl Petroleum. MOL acquired 10% of shares (and paid it by its own shares?). Pearl Petroleum owns the Khor Mor gas field in the Iraq part of Kurdistan in which it invested (together with Dana Gas PJSC from UAE) US\$ 605 million (source: Croatian business daily paper Poslovni dnevnik, 19 May 2009, page 10). Estimated production from the field is 2.57 million m<sup>3</sup>/day or 950 million m<sup>3</sup>/year (90.9 million ft<sup>3</sup>/d or 33.6 billion ft<sup>3</sup>/year), with 33 times higher output expected in 2014 (Note 3). Iraq is still a potential source of supply for the Nabucco project, if it survives. Another Croatian daily paper reported (Vjesnik, 20 July 2009, page 20) that Iraq offered about 15 billion m<sup>3</sup>/year of gas for the Nabucco project. Iraq certainly has significant export potentials because they produce large volumes of dry gas but also significant volumes of associated gas (extracted during oil exploitation). During 2009 the Nabucco project and sources of its supply were extensively covered by other papers and media (Note 4). But then suddenly there was a complete silence.

In December 2011 during the 20<sup>th</sup> World Petroleum Congress in Doha, the Nabucco pipeline was again an interesting topic in the press, discussions and articles.<sup>7,10,11,16</sup> It seemed likely that its implementation would start eventually. What would be the effects of its implementation for Croatia? In the early phase of the project the Croatian energy companies were not contacted with any proposal to join the project. On the other hand, Croatia's official policy makers did not express any interest for this project. Nevertheless, the realization of Nabucco pipeline would have significant positive impact on the entire SEE region from the aspect of security of supply but also in price of gas. In the medium-term, before all sales volumes are contracted and full capacity determined, there is still an opportunity to ensure certain supply volume from this route. Even if this does not happen, the very existence of this infrastructure would represent a cornerstone of reliable supply of the region and dissociation of the current (too)strong suppliers, and eventually, a possibility to ensure supply of gas in emergency situations (shortage of gas in very cold weather) as we faced again in February 2012.

Nabucco project had its best chance for the start of its implementation in 2009 when Europe was hit by the second Ukraine - Russian dispute on gas prices which ended with suspension of Russian gas deliveries for Europe. However, the project did not receive full political support. Was it only due to uncertain source of supply? Possibly. Availability of some ten billion cubic meters of gas is not sufficient for giving green light for the construction of three times higher capacity pipeline. Nabucco might have stronger EU support, but the fact is that several projects count on the same sources of supply. In addition, South Stream is a serious competitor to Nabucco, although this project is also quite uncertain. The winner will be a project capable to ensure fast implementation and concluding of firm contracts with consumers. Rivalry games will

not help. During March 2012 relevant government bodies in Austria gave advantage to Nabucco instead of South Stream. Then Gazprom commented that their project will circumvent Austria.

Time (2006) and place (president V. Putin in Moscow) were carefully selected for the announcement about the launch of the South Stream project. Intensive diplomatic and economic activities followed, particularly in the countries where South Stream appears as a rival to Nabucco, with the aim to achieve competitive advantage.

According to public data shared during the 20th World Petroleum Congress, it is expected that Nabucco consortium will contract the first quantity of 10 billion m<sup>3</sup> (353 billion ft<sup>3</sup>) of gas with partners in Azerbaijan (counting on the 2<sup>nd</sup> phase production from the Shah Deniz field), and considers contracting of further 10 to 15 billion m<sup>3</sup> (353 to 530 billion ft<sup>3</sup>) in Turkmenistan, however, transport of this gas will be possible only when Trans Caspian Pipeline (TCP) is constructed. It is believed that Turkmenistan is capable to offer the above volumes for Nabucco, in addition to commitments it has toward Gazprom and recently China, as new growing production is expected to be on stream in 2018 (Note 5) which is the target year for start up of Nabucco pipeline.

At the beginning of February 2012 it was published that the Nabucco project leaders submitted to Turkish authorities the Environmental Impact Study of the project. If the study is approved, and the mentioned gas supply contracts signed, it will be a good sign for the project's future, although many uncertainties are still present.

On 21 February 2012 INA's Newsletter published information saying that Nabucco consortium proposed decrease of the pipeline capacity by half and 'laying of pipeline from Bulgaria to Austria due to the lack of interest by investors and lack of gas to feed original capacity'. Is it a requiem for the Nabucco project? Probably not. The project still has strongest ever support in Austria.

Nabucco's key competitor for the supply of the same regions is the South Stream pipeline. Formally, its target completion of the first phase is still 2015 and overall completion in 2018. This project foresees laying of pipelines from Novorosijsk, across the bottom of the Black Sea to Burgas in Bulgaria. From Burgas one spur is to branch toward Greece and Italy (subsea pipeline across the Adriatic Sea (in Otranto) and the north spur is to go across Serbia, Hungary, Slovenia to northern Italy. Since 2006, this project is a typical example how geopolitics can be used as leverage, but also as a carrot for countries through which the pipeline could go. Moving of the route for several hundred kilometres to the north or south, re-directing the trunk line to some countries in order to obtain other concessions, has nothing to do with rational investor's behaviour in selecting the most cost effective route (Note 6). It is likely that some experts warned Kremlin that the original transport capacity of the South Stream of around 35 billion m<sup>3</sup>/year would not cover operating costs at possible transport tariffs. As a result, the planned capacity is increased to 63-65 billion m<sup>3</sup>/year (2.2 - 2.3 trillion ft<sup>3</sup>/year). This decision was made in the midst of financial crises in the United States and later all over the world. The six-year history of the South Stream project might impress only inexperienced people. Those

who have sound expertise in this field will remain sceptical.

In February 2009 it was published, following Gazprom's presentation, that the investments in the South Stream (Energy in East Europe, February 27, 2009, page 24) will amount to Eur 25 billion for the northern spur (from Bulgaria, through Serbia, Hungary, Slovenia to Italy) and Eur 15-20 billion for the south spur from Bulgaria through Greece to Italy. Apart from Gazprom, the other investor is ENI, Italy. Investments in underwater pipeline through the Black Sea are estimated at Eur 4 billion. However, the above information is still based on the original transport capacity of 31 billion m<sup>3</sup>/year (1.1 trillion ft<sup>3</sup>/year)! Considering the size of investment, it is no wonder that capacity had to be increased to 63 billion m<sup>3</sup>/year (2.2 trillion ft<sup>3</sup>/year). The target completion deadlines remain the same, for now. From the point of view of Gazprom's interest to ensure the highest possible share in Europe's gas supply and economic viability of the project, it is understandable that they increased capacity. However, the question is whether Europe wants to increase its dependence on one source of supply to the level of monopoly situation? It is not likely, and this is one of the factors that pose considerable risk for realization of the project.<sup>9,12,13, 14,15</sup> The other factor is prospective development and production of unconventional gas. The third risk is reflected in delayed recovery in energy consumption, including natural gas, in Europe. Gas consumption recovery does not depend only on economic growth rates. Energy efficiency programmes should also be taken into account. They render considerable results in the EU countries, particularly in buildings, resulting in lower energy consumption for heating. Hence, natural gas demand growth rate will continue to decline in Europe. Considering all the above facts, the South Stream project might undergo further changes.

Trans Adriatic Pipeline (TAP) and the Ionian-Adriatic Pipeline (IAP) to interconnect the existing and planned gas transmission system of Croatia with TAP, represent a potential new route for the supply of Croatian market from other sources and/or transportation routes. These are the projects with good prospect for development, but yet, with a degree of uncertainty. Croatia, Montenegro and Albania signed a declaration on construction of the above pipeline on 25 September 2007 (on ministerial level) (www.business.hr.25.09.2007). The realization of the TAP project, 880 km-long pipeline, extending from Thessaloniki to Vlore, with initial capacity 10 billion m<sup>3</sup>/year (353.8 billion ft<sup>3</sup>/year) and final capacity of 20 billion m<sup>3</sup>/year (707.6 billion ft<sup>3</sup>/year), foreseen pipe diameter 48 inches (around 1 200 mm), depends on several preconditions. In the initial stage of the project, the investors EGL from Switzerland and Statoil from Norway talked about US\$ 2.2 billion investment. Further go ahead depended on the construction of the interconnector between Turkey and Greece (ITGI) in 2008, and signing of agreements for laying 28 inches (over 700 mm) IAP pipeline for transport of 5.5 billion m<sup>3</sup>/year (194.6 billion ft<sup>3</sup>/year) in 2012. The distance from Vlore to Ploče is about 400 km (170 km in Albania, 100 km in Montenegro and 130 km in Croatia). As gas

markets along the route will not have the level of consumption to justify planned investments, optional extension of the pipeline to northern Italy was also considered. Nevertheless, economic viability of the investment is questionable. At the time when the project was launched, it was announced that EGL counts on the gas from Iran and Azerbaijan, actually from the Shah Deniz field in which Statoil is one of the partners. However, in 2012 the supply of gas from Iran is equally uncertain as it was in the early phase of the project.

In 2008 ENI and Gazprom announced (Petroleum Argus, vol.XII, 26 June 2008, page 1) joint construction of southern spur of the South Stream thorough Greece to Italy. This was the first announcement of the project competing with TAP. In addition, TAP has another competitor for the supply of Italian market. Italian Edison and Greek DEPA, initiated joint venture for the construction of ITGI but also the second interconnector (Greece-Italy subsea pipeline called Poseidon) to be constructed by j.v. company IGI SA. They also rely on natural gas supply from Azerbaijan - in total 14 billion m<sup>3</sup>/y (495.4 billion ft<sup>3</sup>/year), of which 8 billion m<sup>3</sup>/y (283 billion ft<sup>3</sup>/year) for Edison's Italian market, while Georgia would take around 3 billion m<sup>3</sup> (106 billion ft<sup>3</sup>/year) and Turkey 3-4 billion m<sup>3</sup>/year (106 - 141 billion ft<sup>3</sup>/year) of gas for their respective markets. The question is who will come first and be served first - who will be the first to acquire capacity in ITGI interconnector - IGI, Poseidon or IAP?

Competition for potential supply of the Caspian gas begins on the very source of supply between Nabucco, ITGI, IGI, Poseidon, TAP and, from November 2011, the announced SEEP project (South-East European Pipeline). As mentioned above, ITGI & TAP, count on the supply of the first 10 billion m<sup>3</sup> (353.8 billion ft<sup>3</sup>) of natural gas from the Shah Deniz field, as does Nabucco. For the time being, ITGI & TAP could be more attractive to the suppliers in Azerbaijan because they have the highest degree of certainty. But if both projects are implemented, will there be enough gas for contracting? Moreover, considering BP's plans for the construction of the SEEP pipeline and interconnector Azerbaijan-Georgia-Romania (which foresees construction of LNG export terminal on the Black Sea east coast, transport of gas by LNG carriers to the regasification terminal on the west coast in Romania, and further transport by pipelines through Romania to Hungary). However, some other information mentions BP's intention to construct SEEP together with Statoil and SOCAR through Turkey and Romania to Hungary. Is this a blow to Nabucco? Or alternative? As for the feed supply for SEEP, the investors also count on the 2<sup>nd</sup> phase of the Shah Deniz field. Just as all other mentioned projects.

In 2010 Azerbaijan produced 28.5 billion m<sup>3</sup> (4.0 trillion ft<sup>3</sup>) of natural gas, but by 2020 production volumes should double. The Shah Deniz field has crucial role in this boost (Note 7). The field was put into production in 2006 and in 2011 it reached production of 9 billion m<sup>3</sup>/year (318 billion ft<sup>3</sup>/year), while in 2017 expected production is expected to rise to 16 billion m<sup>3</sup>/year (566 billion ft<sup>3</sup>/year).

Various interests and goals are mutually interwoven both in pipeline projects and in production concessions,

which is also reflected in the composition of various consortia leading the projects. Probably this is the reason why EU administration is quite cautious in regard to all the above projects. May be the scene will clear up in 2012. Already in the first quarter it is to be decided with whom the supply contract will be concluded for 10 billion m<sup>3</sup> (353.8 billion ft<sup>3</sup>) from the Shah Deniz field. Whichever project wins, some countries have firm position in any case; Turkey is well established as energy corridor (both for oil and natural gas) in west - east direction; Hungary strengthened its position as CEE gas hub; Austria already has gas hub in Baumgarten. These countries have in place, or will have, transport infrastructure, interconnectors and underground gas storage capacity for regional use.

In Croatia, the notion of 'Croatian energy hub' has already been forgotten. Croatia had some advantages a decade ago, but they are lost. Commitments stemming from enforcement of the Third Energy Package and their impact require urgent analysis and taking a stance in the new reality. Therefore, it is essential now to redesign the existing energy strategy or design a new one; however, it is most important to break several-year inactivity with serious consequences on security of supply. Also, it would be useful to set up an expert group, a think-tank, which could help in providing comprehensive assessment of all available options and their consequences.

#### 4. CONCLUSIONS

For the time being, the Croatian market has sufficient natural gas supply. Due to economic crises the consumption declined in the last three years, while domestic offshore production increased. In 2009, after dragging and unsuccessful negotiations between Gazprom and INA on extension of the long-term contract on import of Russian gas, another partner was selected as the most favourable - Italian ENI. So, the contract was concluded with ENI for the supply of 750 million m<sup>3</sup>/year (26.5 billion ft<sup>3</sup>/year) for the period from 2010 to 2013. However, what will be after 2013 - it is not clear. Will this contract be extended? It depends on ENI, on Croatia's government gas pricing policy, on the share INA will be allowed to have in total supply volumes. Eventually, it will depend on competition among supply options. In any case, it is very likely that after 2013 gas consumption will significantly grow, as new consumers will be connected to the grid in the regions with developed distribution and in the newly gasified coastal regions, refineries will be connected and consume more gas, and additional volumes will be used for power generation. Consequently, it is quite certain that the Croatian market will need additional volumes of imported gas, whoever the importer will be. According to estimations, additional demand will range from 1 to 2 billion m<sup>3</sup>/year (35.4 to 70.8 billion ft<sup>3</sup>/year), and depending on the outcome of the current import contract (will it be extended, for what volumes), additional volumes will have to be contracted from other sources. Some foreign companies expressed general interest for the supply of natural gas from their portfolio. Also, there are some Croatian legal and physical entities interested in organizing supply of natural gas for industrial consumers. However, the supply of necessary volumes of gas for the



Croatian market practically depends on a single free available import pipeline, the interconnector between Croatia and Hungary. Use of this infrastructure for new import limits the selection of source of supply. With all due respect of open market principles, declarative or real, reliance on long-term supply through mediators is not sufficiently reliable. In addition, it is extremely important to implement the diversification principle. Uncertain completion time of the regional supply project discussed above, make the decision process even more difficult. Which of the projects will be realized, it is not certain now? Some projects might involve commercial surprises. South Stream more than others.

In order to ensure sufficient volumes of gas after 2013, and make an independent choice of the most favourable source of supply, and avoid nicely packed 'blackmailing deals' of various benefactors, a serious attention and consideration should be given to the proposal laid out by Plinacro's experts for innovative LNG supply, which could be briefly outlined as follows: i) in the first phase a buoy mooring system is to be constructed together with facilities for unloading of regasified LNG from regasification vessels (RVs). Such regasification vessels are commercially viable for emergency or peak supply of LNG. ii) in the transitional phase of the project up to realization of the second phase, such a supply would have significant importance because it would contribute to security of supply. Total investments are in the range of US\$ 20 to 50 million with completion time around one year. iii) In the second phase (instead of dreams about costly and large conventional onshore LNG terminal project, which can be justified only for large markets, and/or strong partners), the right solution could be floating storage and regasification (FSR) units. Shipyards in the Far East have adopted the technology for converting former LNG carriers (which became uncompetitive with launching of large carriers with lower fixed costs and consequently lower transport tariffs) into smaller RVs, around 100 000 tonnes capacity. Such LNG carriers with added regasification unit and storages onboard, become floating terminals with annual capacity of around 4 to 4.5 billion m<sup>3</sup> (141.5 - 159.2 billion ft<sup>3</sup>/year). According to available data, the price of such FRS is about US\$ 250 million. Delivery date is approximately three years after contract signing. The above FRS capacity is still too large for the Croatian market, but part of the capacity could be offered to other countries in the region.

While the solution proposed for the 1<sup>st</sup> phase, as explained, is for emergency supply or for covering peak consumption, because so delivered LNG, particularly in winter season, is more expensive than pipeline gas, the 2<sup>nd</sup> phase solution is cost effective and competitive. In addition, floating terminal has another important advantage compared with fixed terminal: if the situation in the market or on the supply side changes, it can be moved to another location similarly to any other vessel - for example from the north to south Adriatic.

## AUTHOR'S NOTES

**Ad 1)** It was announced recently that Bulgarian government banned hydraulic fracturing of shale collectors. Some experts retain that the government was persuaded

to take such action by some Russian companies eager to prevent exploration and development of unconventional reserves and to maintain their position in the supply of Russian gas. This interpretation, based on knowledge of geopolitical relations and actions, might be interesting to advocates of various conspiracy theories. But, how to comment protests against fracturing by some NGOs in the EU countries, allegedly due to concerns about drinking water protection. However, fracturing operations are carried out on greater depths where shale gas formations are situated. In addition, the collectors in which shale gas is trapped have impermeable floor and roof. Otherwise gas reserves would not be trapped in formation and there would be no pressure. Materials used for fracturing are water, sand and propan. On the other hand, drinking water reserves are situated in shallower layers up to 600 m, while deeper layers contain salt water. Fossil water, if it is found on the well drilling path is also sealed in an aquifer and should not be endangered.

**Ad 2)** Recently Shell highly positioned official shared information about establishing of a company for well operations (drilling, workover, and well testing) jointly with a Chinese company with the aim of drilling over hundred thousand wells in China.

**Ad 3)** OMV purchased shares from Pearl Petroleum and Dana Gas PJSC for US\$ 350 million with forecasted increase of production to 79 500 m<sup>3</sup>/day (500 000 boe/day) in 2015. It is not known what the share of produced gas is (Vjesnik, 19 May 2009, page 8). The interesting hint is that this gas could be transported through Nabucco pipeline.

**Ad 4)** During the talks between German Chancellor Angela Merkel and Russian President Vladimir Putin on the Nabucco project Mr. Putin said: "What is good for Europe is good for us, because we are also Europeans". But then he could not resist adding that, yet, it is not clear where they would procure gas for that project (Slovenian daily paper Večer, Ljubljana, 22 July 2009, page 11).

**Ad 5)** Petroleum Economist (November 2011, page 4-5) quoted Cediga's forecast on Turkmenistan's gas reserves of 8 340 billion m<sup>3</sup> (295 trillion ft<sup>3</sup>), according to which it would be the fifth ranked country with the highest natural gas reserves. Independent appraiser (Gaffney Cline & Associates) estimated reserves of a single new field Iolotan at 13 100 to 21 200 billion m<sup>3</sup> (463.5 to 750.1 trillion ft<sup>3</sup>). If so, it is the second largest field in the world after South Pars in Iran. It is estimated that by 2030 Turkmenistan could quadruple its production (in 2010 total Turkmenistan gas production was 41.61 billion m<sup>3</sup> (1.5 trillion ft<sup>3</sup>) so that it could grow to 230 billion m<sup>3</sup> (8.1 trillion ft<sup>3</sup>), of which 180 billion m<sup>3</sup> (6.4 trillion ft<sup>3</sup>) for export. (According to some sources in 2010 Turkmenistan exported 40 billion m<sup>3</sup> (1.4 trillion ft<sup>3</sup>) of gas to Russia and 4 billion m<sup>3</sup> (141.5 billion ft<sup>3</sup>) to China. Already this year, in 2012, export to China should increase to 17 billion m<sup>3</sup> (601.5 billion ft<sup>3</sup>) and in 2015 to 20 billion m<sup>3</sup> (707.7 billion ft<sup>3</sup>) of gas).

**Ad 6)** By the contract signed between Serbia and Gazprom in 2006, Serbia invested its assets in natural gas network, in addition to the offset amount of clearing debt (for unpaid natural gas import from Russia amounting to US\$ 188 million), while Gazprom committed in-

vestment in the South Stream pipeline through Serbia (around 450 km of pipeline) and additional investment in underground gas storage in Banatski Dvori (R. Petković: "Serbia Ensured Its Energy Future", *Poslovni dnevnik*, 21 May 2009, page 11). So Gazprom entered into ownership structure of the national gas transporter and natural monopoly. (In 2002 Republic of Croatia bought natural gas transport system and set up the company Plinacro as system operator, in order to protect this natural monopoly from privatisation.) During 2006 a number of articles were published which talked about the revenue of US\$ 200 million earned by Serbia together with Gazprom, and regrets that the South Stream pipeline would not go across Croatia. It is forgotten that pipelines are laid along the shortest and most cost effective route. If concessions are made, they must be paid. Serbia paid it through low price of NIS (national oil company) and Gazprom's share in Serbian gas transportation system. As for transport system operation revenues, they are collected by investors!

Ad 7) Concession rights on the Shah Deniz field are held by the following partners: BP (25.5%), Statoil (25.5%), SOCAR, Lukoil, Total and Iranian NICO each 10% and Turkish TPAO 9%.

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