INSTITUTE OF ENERGY
FOR SOUTH-EAST EUROPE

THE ROLE OF GREECE AS A SUPPLY ROUTE TO EUROPE IN VIEW OF THE LATEST GAS DISCOVERIES IN THE EAST MEDITERRANEAN

By Costis Stambolis & Nicholas Sofianos

IENE Research Note No. 3

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Athens, Greece

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PREFACE

At a time of increased interest, and speculation we might add, of the importance of the newly discovered, and by all counts significant natural gas deposits in the East Mediterranean, it is necessary to discern fact from fiction and pragmatic analysis from wishful thinking and to be able to assess the export potential possibilities on the basis of realistic assumptions. The purpose of this IENE Research Note is to examine the role of Greece as a potential route through which natural gas from the deposits in Israel and Cyprus can be exported to Europe.

At this stage of the game we consider Greece as a likely key gas corridor which can facilitate the flow of gas from the East Mediterranean to Europe, although at a later stage, beyond 2020, it may be able to contribute some of its own gas. This Research Note focuses on Greece and considers the various available gas transiting options. Our analysis is by necessity of a strategic nature since hard economic and financial data is still lacking as a number of techno-economic feasibility studies are still under preparation by the various players involved in the Israeli, Cyprus and Greece axis. However, we believe that even with its limitations the present contribution will be useful in understanding better and appreciating the true role of Greece as a potentially competitive transit route of Mediterranean gas destined for the European markets. Furthermore, we hope that the present Research Note, will prove useful as a point of reference in the current debate concerning Greece's overall role in the region's natural gas scene.

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Costis Stambolis and Nikos Sofianos

Athens, December 2012

CHAPTER 1

INTRODUCTION

Over the last ten years Greece has been active in pursuing a role as a facilitator country in the supply of natural gas from East to West, from the gas rich FSU region to Europe. Greece's advantageous geographic location in the southernmost part of the Balkan peninsula in conjunction with its traditional good economic and commercial ties with all surrounding countries, has placed it in a unique position to act as a transit country for the supply of gas to European destinations, through the establishment of the so called South Corridor[1]. This can roughly be described as an East-West gas corridor through which, and following alternative routings, gas from the Caspian region could flow, through Turkey, to reach the gas demanding European markets.

Since 2003 a number of alternative gas pipeline projects have been proposed and formulated at design stage, including the Italy – Greece – Turkey interconnector (ITGI), the Nabucco pipeline (Turkey to Austria via East Balkans), the Trans Adriatic Pipeline (TAP) through Greece, Albania and Italy. Both ITGI and TAP rely on the Greek-Turkish gas interconnector which has been in place and underperforming, in terms of capacity, since 2007.In addition to these three pipeline projects, none of which has reached construction stage yet, is the Russian backed South-Stream pipeline which crosses underwater the Black Sea and which initially was planning to have two branches. The north one which follows a route from its launching pad in Bulgaria through Bulgaria and the West Balkans and ending up in north-east Italy; and the south one crossing Bulgaria, Greece and terminating in South Italy. South Stream proved to be the most advanced of all projects in terms of design, finance and gas supply availability.

Therefore it came as no surprise when Gazprom, which heads the consortium which will build and operate the pipeline, and includes ENI, EDF and Wintershall, announced the start of construction of the pipeline, which was scheduled for December 7th, 2012. In fact a ground breaking ceremony took place that date in the coastal town of Anapa in the Russian sector of the Black Sea. According to the announced plans the pipeline will cross the Black Sea (where it will be laid on its floor) over a distance of 940 kms and then move through Bulgaria, Serbia, Hungary

[1] Southern Gas Corridor ("SGC"): infrastructure for the transmission of gas from the Caspian Basin, Central Asia, the Middle East and the Eastern Mediterranean Basin to the Union to enhance diversification of gas supply. Proposal for a Regulation of the European Parliament and of the Council on guidelines for trans-European energy infrastructure and repealing Decision No 1364/2006/EC and amending Regulations (EC) No 714/2009 and 715/2009, ANEX I

and Slovenia to end up in Trevizo in North-East Italy. In the same announcement Gazprom, which is the pipeline's operator, made public its decision to cancel completely the south route through Greece and Italy (1).

Earlier in the year the Shah Deniz II consortium in Azerbaijan had decided to exclude ITGI from its selection procedure opting to keep both West Nabucco and TAP on hold pending a decision early in 2013. At this stage it is not at all clear if TAP will eventually be selected as the best available option and West Nabucco (which is now overlapped by South Stream) will be scrapped for good.

A detailed review of the South Corridor and a cost-benefit comparison of all South Corridor pipelines which were planned to cross Greece has been undertaken by IENE and was published in a special report (2). *Figure 1.1* shows the various South Corridor pipeline projects while *Table 1.1* presents the main technical and cost characteristics of the pipelines involved.

With the ITGI pipeline dropped by its potential Shah Deniz II supplier, the south branch of the South Stream scrapped by Gazprom and its partners and TAP in limbo, the options for Greece as a potential gas supply route to Europe have considerably narrowed down. This unfortunate situation, which at first glance appears to have stripped Greece of a role in the European gas supply scene, is further aggravated if one is to consider the negative fiscal climate of the last three years and the country's deepening economic recession. Were it not for the recently discovered significant natural gas deposits in the Israel – Cyprus axis, the role of Greece as a potential gas supply route to Europe may have been written off. However, it is now on the strength of these newly discovered major gas finds that Greece is re-thinking and re-assessing its role as a potential energy corridor through which substantial gas and electricity quantities can be transmitted to Europe. As this energy corridor is not yet clearly defined and since indigenous gas deposits will play a key role, IENE has felt it necessary to study the issue and report its findings in the present Research Note.

Figure 1.1: The South Corridor Pipeline Projects

Table 1.1.: Basic Characteristics of the Original South Corridor Projects

Project	Capacity (bcm/y)	Distance (kms)	Gas Origin	Estimated Project Cost (in Billion Euro)	Sponsors	Anticipated Start Up Date
ITGI	10-16	796	-Shah Deniz II	1.70	DEPA. EDISON	2017
TAP	10 – 20	791	-Shah Deniz II	1.70	EGL, STATOIL, E.ON	2017
Nabucco West	10 – 23	1.300	-Shah Deniz II -Iraq -Turkmenistan	5.5	OMV, TRANSGAZ, BEH, MOL, RWE, BOTAS	2017
South Stream	63	2.950	-Russian Fields	16.0	Gazprom, ENI, Wintershall, EDF	2016
White Stream	8 – 32	1.440	-Azerbaijan -Turkmenistan -Iraq	n.a	Not Disclosed	2016
AGRI	5 – 8		-Azerbaijan	4 – 6	SOCAR, GOGC, ROMGAZ, MVM	2016
SEEP	10	~1.000	-Shah Deniz II	1.0 – 1.5	BP	2017

CHAPTER 2

THE EUROPEAN GAS SCENE

Seen in perspective 2011 was a critical year for European gas as demand almost collapsed as it plummeted by 9% to levels even lower than in 2010. In particular, gas-fired plants were affected by sluggish European power demand and the strong growth of renewables, as well as increasing difficulties in competing against coal-fired plants due to both relatively high gas prices and extremely low CO2 prices. Even the decommissioning of a number of German nuclear power plants in early 2011 did not translate into increased gas demand in the German power sector. Meanwhile, the United States imported even lower LNG volumes and European LNG imports remained flat. This stability is actually remarkable considering the collapse of European demand and of its import requirements (3).

In 2011 a decline in demand occurred in most European countries, with a few notable exceptions: Greece, Poland, Portugal, Slovakia and Turkey. The highest relative increases were, quite surprisingly, Greece (+24%) driven by new gasfired generation, and Turkey, where demand grew in all sectors. Growth rates in the other countries were relatively modest, below 2%. Meanwhile, all other countries witnessed a drop – sometimes a collapse – in their consumption. Among the largest drops in 2011 was Sweden.

European gas consumption in 2011 outbid the very low performance of the European economy. Indeed, European gas demand collapsed by 9%, to reach 520 bcm against 570 bcm in 2010. This demand level is actually 10 bcm lower than 2009. A combination of reasons such as the extremely mild weather combined with weak economic growth and high gas prices, managed to erase in a single blow the growth that occurred in 2010. While in 2010, very cold weather resulted in a rapid demand recovery, this time (2011), OECD Europe gas demand plummeted when the weather component disappeared. Out of the 51 bcm drop, it is estimated that 60% is due to weather, 10% to weak economic growth impacting industrial gas demand and 30% to the power sector, where oil-indexed gas is simply uncompetitive. Conventional power generation dropped faster than power demand, while rapidly increasing renewables, as well as higher output from French nuclear power plants compensated for the German phase-out.

Table 2.1: Gas Demand by OECD country, 2010 and 2011 (bcm)

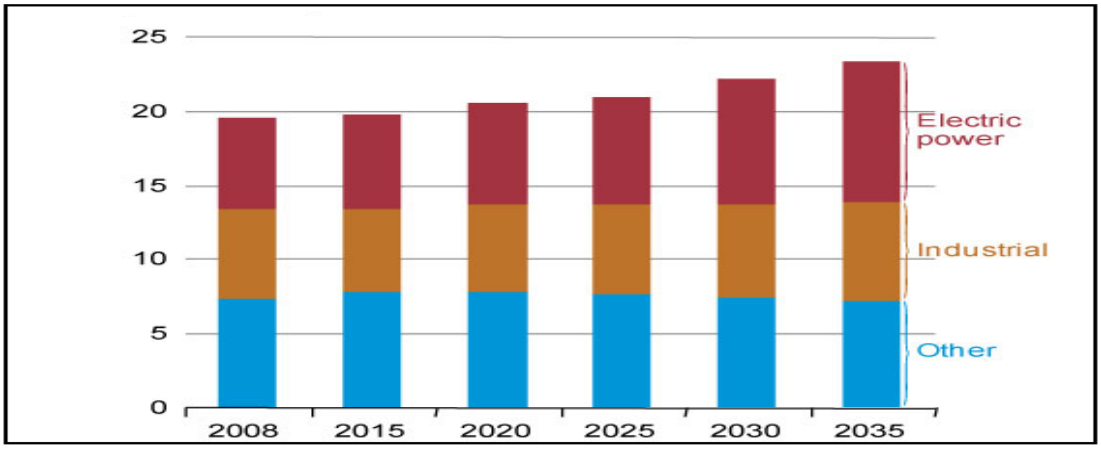
	2010	2011*		2010	2011*
Europe	570.4	519.5	*Slovakia*	6.1	6.2
Austria	9.5	9.0	*Slovenia*	1.1	0.9
Belgium	19.8	16.9	*Spain*	35.8	33.6
Czech Republic	9.3	8.9	*Sweden*	1.5	1.2
Denmark	5.0	4.2	*Switzerland*	3.7	3.2
Estonia	0.7	0.6	*Turkey*	38.1	44.7
Finland	4.7	4.0	*United Kingdom*	98.9	82.7
France	49.1	42.1	Asia Oceania	195.4	211.9
*Germany***	97.9	85.3	*Australia*	33.4	34.8
Greece	3.9	4.8	*Israel****	5.3	5.0
Hungary	12.1	11.3	*Japan*	109.0	121.3
Iceland	0.0	0.0	*Korea*	43.2	46.4
Ireland	5.5	4.9	*New Zealand*	4.5	4.2
Italy	83.1	77.9	Americas	839.9	861.6
Luxembourg	1.4	1.2	*Canada*	96.8	104.0
Netherlands	54.8	47.9	*Chile*	5.3	6.2
Norway	6.1	5.8	*Mexico*	64.7	61.4
Poland	17.2	17.2	*United States*	673.1	690.0
Portugal	5.1	5.2	OECD	1605.7	1593.0

Source: IEA, Natural Gas Medium-Term Market Report, 2012

Within conventional power generation, gas rapidly lost its competitiveness due to a combination of high gas and low carbon quota prices. The collapse of gas consumption in 2011 was particularly noteworthy, considering that Europe's largest gas consumers, namely, the United Kingdom, Germany, the Netherlands and France, tend to have a high share of residential consumption. There are a few exceptions to this trend, some of which are relatively unexpected. Greece, despite its dire economic situation, consumed roughly one-fourth more gas than in 2010 (3.9 bcm) reaching 4.4 bcm in 2011. Meanwhile, Turkish gas demand increased in most sectors, driven by one of the highest rates of GDP growth in Europe (4).

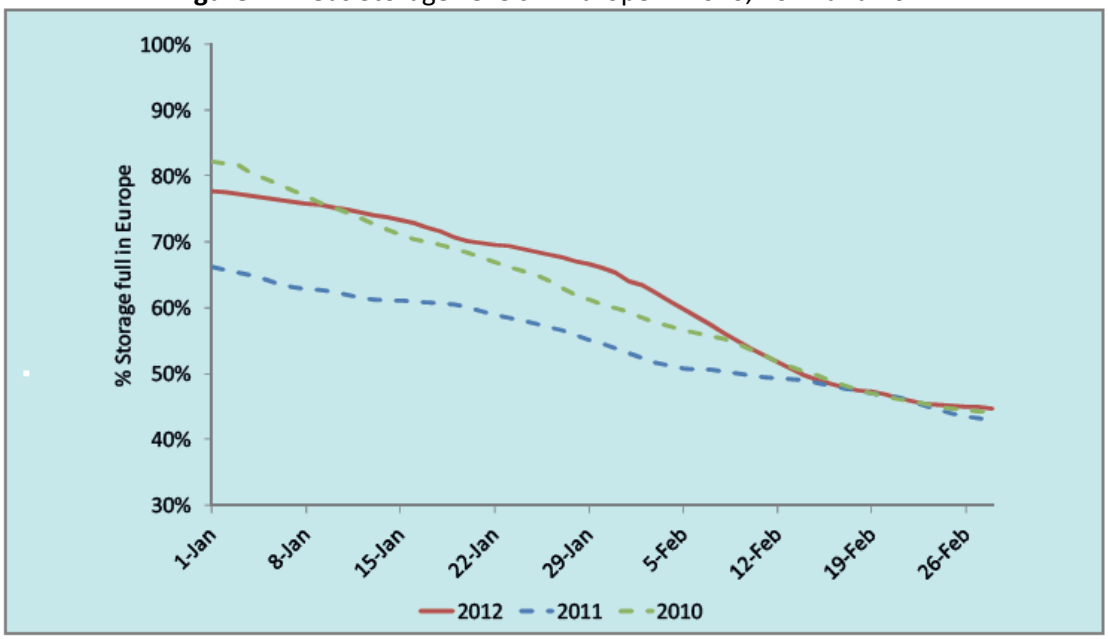
It is significant that in 2012 gas demand in Europe did not recover as it remained, according to preliminary estimations, below 2011 levels. Gas consumption was hit by low economic growth translating into slow power demand increases and sluggish development in the industrial sector, high gas prices, and the strong growth of renewables.

Figure 2.1: Natural gas consumption in OECD Europe by end – use sector, 2008 – 2035 (tcf)



Source: IEA, "International Energy Outlook 2011"

Figure 2.2: Gas Storage Levels in Europe in 2010, 2011 and 2012



Source: IEA

However, gas demand in Europe due to the anticipated economic recovery is forecasted to increase over the next two years (2013 – 2014) despite the on going economic crisis in the Eurozone. According to IEA estimates natural gas consumption in EU member states is expected to increase from 510 bcm (est) in 2012 to 547 bcm in 2015, 561 bcm in 2017 and around 585 bcm in 2020 (5).

Table 2.2: World Gas Demand, 2000-17

	2000	2010	2011	2013	2015	2017
Europe	474	570	520	529	547	561
*G4**	300	329	288	296	302	303
Americas	794	840	862	909	941	969
United States	661	673	690	728	754	779
Asia Oceania	131	195	212	211	227	241
Japan	83	109	121	121	126	129
Latin America	95	136	139	152	163	179
Africa	59	103	111	125	139	149
Middle East	179	369	389	427	444	468
FSU/Non-OECD Europe	597	690	705	722	731	735
Russia	391	473	483	493	499	501
Asia	180	399	424	489	564	634
*China***	28	110	132	176	226	276
OECD	1 400	1 606	1 593	1 649	1 715	1 771
Non OECD	1 111	1 698	1 768	1 915	2 041	2 166
EU-27	477	545	489	497	508	515
Total	2 510	3 303	3 361	3 564	3 757	3 937

Source: IEA

In the production front, European production in 2011 decreased and lost almost 28 bcm in one year. The United Kingdom is responsible for almost half of this drop as it reported a loss of 12.6 bcm production. UK gas producers have been complaining about the instability of the fiscal regime, which in their view led to lower exploration and sluggish business confidence. But other countries contributed as well to the drop in production. The Netherlands lost almost 8 bcm of gas production, which given the collapse of European gas demand, was not unusual since the country often acts as a swing producer. Denmark lost 1.6 bcm and Germany 0.7 bcm. This is largely due to the state of mature production areas whose decline cannot easily be reversed. More surprisingly, Norwegian gas production, which had been the constant driver of European gas production growth over the past ten years, slowed and lost around 5 bcm, largely due to Troll's production declining in 2011.

Further afield the Caspian region, which is having only a peripheral role in the European gas scene, gained some 15 bcm in new production but saw widely divergent trends: Turkmenistan's gas production increased by a third, driven by exports to China. Kazakh production also rose by 11% but most of the new gas was also exported East. In contrast, Azerbaijan saw a slight production decline that is also reflected in lower exports to Turkey, while Uzbek gas output also dropped by an estimated 4%. Production in other FSU and non-OECD European countries dropped slightly, the only exception to that trend being Bulgaria (6).

A detailed review of the traditional and new European gas suppliers is made in section 3.2

Europe's natural gas consumption in 2011 reached 520 bcm. Natural gas consumed in the EU originates from indigenous production and imports. In 2011 indigenous production in Europe-27 amounted to 176 bcm (33%), while natural gas imports amounted to 344 bcm (67%). More precisely imports from Russia in 2011 reached 150 bcm (and corresponded to 28% of the total European gas consumption), 81 bcm came from Norway (16% of the total European gas consumption), 80 bcm from LNG imports (15% of the total European gas consumption), and 35 bcm from North Africa (mainly from Algeria which exports around 15 bcm) and from other Middle East countries (8% of the total European gas consumption). Russia remains the largest single exporter of gas to the EU, with total annual exports of around 150 bcm. European gas imports have originated also from countries other than Russia, especially Norway, Algeria, Nigeria, Qatar and Egypt. Europe has become also a major customer in the rapidly growing market for liquefied natural gas (LNG), which is transported by sea. Since 2002, LNG imports from new suppliers such as Egypt, Trinidad or Qatar have accounted for most of the rise in EU gas imports. The share of LNG in EU gas imports has grown from 15% in 2000 to more than 25% in 2010.

CHAPTER 3

GAS SUPPLY NEEDS IN SE EUROPE

3.1 The rising SE European gas market

Natural gas is gaining ground in SE Europe which imports increasingly more quantities, mainly from Russia but also, in the case of Turkey from Iran and Azerbaijan, and also through LNG. Latest available figures (for 2011) suggest that SE European countries (including Turkey) consumed some 69.0 BCM's, of which 80% was imported. That means that a sizeable fiscal expenditure was required for these imports with efforts to discover and exploit indigenous gas deposits already being accelerated in several countries of the region.

Table 3.1: Natural Gas Production and Consumption in SE Europe (2011)

COUNTRY	GAS PRODUCTION (bcm/year)	GAS CONSUMPTION (bcm/year)
ALBANIA	0.05	0.03
BOSNIA & HERZEGOVINA	0	0.2
BULGARIA	0.2	2.5
CROATIA	2.0	3.0
CYPRUS	0	0
F.Y.R.O.M.	0	0.1
GREECE	0	4.4
MONTENEGRO	0	0
ROMANIA	10.0	12.9
SERBIA & KOSOVO	0.5	2.4
TURKEY	0.8	43.5
TOTAL	**13.55**	**69.03**

Source: IENE

Six of the SE European countries (Greece, Croatia, Bulgaria, Romania, Turkey and Serbia) already use natural gas having well established markets, with supplies coming primarily through imports from Russia and in the case of Turkey from Iran and Azerbaijan also. Two countries have a significant proportion of their demand met from domestic supplies (Croatia, Romania) and three others cover small percentage shares from domestic gas (Bulgaria, Serbia, Turkey). In projecting future gas demand for the region, one of the main issues is the extent to which availability of gas supplies would make possible the displacement of other fuels in various categories of demand such as in power generation and for residential, commercial and industrial applications. Relative prices and competing fuels lie at the heart of

analysis, although potential growth in demand for gas will also be driven by other factors, including environmental aspects and national policies.

Regarding the upstream sector, consistant efforts are now in evidence in Romania, Bulgaria, Croatia and Turkey to exploit existing fields but also identify new ones. According to the current state of play in South Eastern Europe forecasts predict that the demand will grow continuously up to 2025 at a rate of 1% per year. Italy, Romania and Greece remain the biggest markets and there will be around 12 bcma that the region shall need to source from different suppliers.

Further to the 12 bcma, the need of the region to enhance its supply security, which is heavily dependent on pipe-gas from Russia, allows even more room for new players to enter this market. Regarding the Italian market, even though it is currently oversupplied, there is a strong need for further diversification and the promotion of strong gas to gas competition. As a result Italy and the SE European region remain an attractive market with room for new sources.

Table 3.2: Gas Consumption and Production in Greece, Turkey, Romania (2001-2011)

Gas Consumption 2001 -2011 (bcm)											
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Greece	2.0	2.1	2.17	2.45	2.67	3.1	3.85	3.9	3.35	3.65	4.4
Romania	18.3	17.6	17.1	17.0	17.3	17.8	16.3	15.0	12.1	12.0	12.9
Turkey	15.0	16.4	19.8	21.1	25.8	29.5	34.6	34.7	33.9	36.8	43.4
Gas Production 2001-2011 (bcm)											
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Greece	0	0	0	0	0	0	0	0	0	0	0
Romania	13.8	12.7	11.9	11.4	11.1	12.2	11.9	11.2	10.5	10.0	10.1
Turkey	0.3	0.36	0.54	0.65	0.87	0.89	0.86	1.0	0.66	0.65	0.72

Source: BP Statistical Review of World Energy, June 2012

The following is a summary of the latest gas developments for selected countries in SE Europe:

Bulgaria

Over the last two years (2010 – 2011) natural gas demand in Bulgaria showed a significant drop compared to previous years. In 2008 Bulgaria consumed almost 3,5 billion cubic meters (bcm). Of these 0,211 bcm were covered by indigenous production, while the rest was imported from Russia. In 2010 the consumption of natural gas in Bulgaria declined sharply to 2,4 bcm, while in 2011 there was a small increase compared to 2010, as total gas demand expanded to 2,5 bcm (7).

The greatest amount of the gas in Bulgaria is used to satisfy industrial and the public sector needs, while a significant proportion is used for power generation. The forecasts are that during 2011 - 2025 the demand for natural gas will rise on average by about 3,2% per year, reaching 6,3 bcm by the end of the period. This will accelerate the development of the gas-related infrastructure and will increase the consumption rate of natural gas in the country. Bulgarian gas consumption is rising well ahead of domestic supply. Although gas output may reach 1.2bcm by 2014/15, net imports by 2016 could reach 2.3bcm, rising further to a possible 3.4bcm by 2021.

The use of natural gas accounts to about 14% of the primary energy consumption in Bulgaria. Generally, natural gas consumption in the country is on the rise, as it is being used more and more in the residential sector, but also in industry and for power generation. Currently less than 2% of the households in Bulgaria are gasified, which is far below the average rates of the European Union, which stands between 27%-50%. Furthermore, only about 16% of the municipalities in the country have access to natural gas, compared to 27% to 80% for the rest of EU (8).

Bulgaria plays an active role in regional projects such as the one to connect the gas distribution networks of the country with Serbia. Upcoming projects include the construction of interconnections with the Romanian and the Greek gas networks.

At the same time, the country participates in trans-regional initiatives such as the gas pipelines "Nabucco" and "South Stream". The realization of these projects is important for Bulgaria as it will be able to diversify its sources of natural gas, as well as the supply routes, which in turn will enhance the security of natural gas supply to the national market.

Greece

Gas consumption in Greece reached 4.2 bcm in 2008. However, there has been a sharp decline since, with demand having dropped to 3.5 in 2009 (16% less than in 2008) while a slight increase was noted in 2010 to 3.6 bcm. In 2011 gas consumption fully recovered and surpassed the 2008 level, having reached 4.4 bcm.

Gas imports account for about 100% of the total volumes of consumed gas in Greece. Most of Greece´s gas imports are being realised via pipeline, and 29% is imported via LNG through the Revithousa terminal. Greece’s gas pipeline imports come mainly from Russia and a small portion of 0.8 bcm from Azerbaijan through Turkey, while most LNG originates from Algeria and Qatar. The share of Russian gas in Greece’s gas imports contracted to 54% in 2010 (slight decrease from 2009, when

it was 57%), while the share of Algerian gas in Greece's imports increased quite significantly from 14.79% in 2009 to 20.08% in 2010 (9).

Greece has an extensive portfolio of energy exploration projects for the future, though the present financial crisis has put a damper on these for now. After a 15 year absence the Greek government has restarted oil and gas exploration activities with seismic research currently under way offshore and drilling planned for selected sites in Western Greece in 2013 (10). Greece's domestic natural gas consumption as indicated above is steadily increasing- from 2.0 bcm in 2000 to 3.6 bcm in 2010 and 4.4 bcm in 2011, according to the "BP Statistical Review of World Energy 2011." (11)

The outlook for gas consumption increase in Greece is positive from now until 2020 as there appears to be a large scale drive to use gas for domestic uses in an effort to substitute more expensive oil. The same applies for the commercial and industrial sectors which are fast adopting natural gas as their main fuel.

Croatia

Gas production looks set to peak over the next five years, with production expected to rise from 2.0bn cubic metres (bcm) in 2010 to 3.0bcm in 2015. Natural gas produced in Croatia, from 16 on-shore and nine off-shore gas fields, is currently meeting 71.9% of total domestic demand according to the ministry's 2011 annual energy report. There were 37 companies licensed for distribution of natural gas in Croatia last year.

Consumption is also set to rise, from 2.85bcm in 2010 and 3.0 bcm in 2011 to 4.3 bcm by 2015 and then to 5.4bcm by 2021, meaning that Croatia's import dependency will increase from 0.85bcm of imports to 1.28bcm over the same period. This is somewhat more than the 1.11bcm that Croatia was importing as recently as 2000, due to gas production rising from around 1.66bcm at the time. Consumption of natural gas in Croatia in 2010 rose by 9.5% to 3.2 bcm compared to 2009 (12).

Serbia

In 2010, Serbia imported 1,68 bcm natural gas representing 91.7% of its domestic consumption. All of Serbia's gas imports are being accomplished via pipeline and as it is a landlocked country there are no LNG imports. In 2010, 98.81% of Serbia's gas imports originated from Russia and similar proportions hold true for 2009 and 2008. In 2007 and 2006, all of the gas imported by Serbia originated from Russia (13).

Romania

Romania holds 595 bcm of gas reserves, the 3rd largest natural gas reserves in Europe (after Norway and the Netherlands) and the 30th worldwide. According to Cedigaz, Romania's natural gas reserves represent approximately 0.31% of the world total reserves. The reserves-to-production ratio* for Romania is 54.4 years, significantly higher than the EU's average R/P-ratio of 14 years (14).

Natural gas imports have been declining in Romania since 2006 while domestic production has remained almost the same with very small changes. In 2006 natural gas consumption in Romania was 18 bcm of which 6 bcm were imported and the rest 12 bcm came from domestic production. However, in 2008 the imports fell to 4,4 and there was a slight decrease in domestic production to 11,3 bcm reflecting an overall decrease in gas consumption In 2009 there was further reduction in imports that reached the 2,0 bcm but this was offset by increased domestic production of about 13,2 bcm. In 2010, Romania imported 2,1 bcm of natural gas representing 15.5% of its domestic consumption while domestic production reached the 10,0 bcm. Finally, in 2011, there was an increase in imports by 2,9 bcm while the domestic production remained unchanged.

All of Romania's gas imports are being accomplished via pipeline. So far there are no LNG imports. The proportion of imported gas in Romania's consumption decreased from 30.2% in 2007 to 15.5% in 2010. The vast majority of the gas pipeline imports originate from Russia. In 2010, all of Romania's gas imports originated from Russia while in 2009, Romania had imported 1.35% of its gas from Turkmenistan (the rest came from Russia). So far no exports are being realised. It must further be noted that in 2011 Romania produced 10,1 bcm of natural gas which is almost three times less than in 1973 when it produced 30.00 bcm. It must also be pointed out that according recent studies, domestic production in Romania is expected to decline by 2.0 or 3.0 bcma by 2025 (15).

However, there are some new, potentially significant, offshore discoveries in Romania but their effect on the market of the region still remains to be seen as full exploration is not yet been completed.

Two very promising offshore gas fields, Doina and Ana, are located on the continental shelf of the Black Sea in block XV. Doina was discovered in 1990 and developed by Petrom. It began production in 1995 and produces natural gas and condensates.

Figure 3.1: Romania's offshore Neptun block

The total proven reserves of the Doina gas field are around 98 billion cubic feet, and production is slated to be around 17.7 million cubic feet/day in 2008. On the other hand Ana was discovered in 2010 and developed by Sterling Resources. It began production in 2010 and it produces natural gas and condensates. The total proven reserves of the Ana gas field are around 247 billion cubic feet, and production is slated to be around 110 million cubic feet/day. According to Sterling Ltd Ana and Doina fields are vital for opening up the Black Sea gas business in Romania. Nevertheless, it is almost certain that without further offshore development and energy efficiency measures Romanian gas imports will grow dramatically from 2015 onwards (16).

Figure 3.2: Romania's offshore gas fields

On the other hand Romania appears set to start exploring its shale gas reserves in a drive for energy independence, despite local protests against the potential risks and Europe-wide concerns about the technology used to exploit unconventional gas sources.

Several oil companies have expressed interest in exploring what is believed to be the country's significant potential. According to an assessment by the U.S. Energy Information Administration (EIA), Romania, Bulgaria and Hungary may together be sitting on top of about 538 billion cubic meters, or 19 trillion cubic feet, of technically recoverable shale gas reserves (17).

The U.S. energy company Chevron has, since 2010, obtained concessions in Romania, covering a combined area of 870,000 hectares, or 2.2 million acres, in the Eastern plains and the Black Sea coastal region of the country.

Turkey

Turkey is the most important player in natural gas in SE Europe. In 2010 Turkey consumed a total of 38.10 bcm of natural gas, an 8.6% increase compared to 2009 when total natural gas consumption amounted to 35.10 bcm. Consumption in 2009 was approximately 4% lower compared to 2008, when natural gas consumption yielded 36.60 bcm. Of total natural gas consumption in 2009, 19.80 bcm were used for transformation (including power generation) and 1.56 for the industry while 7.89 bcm were consumed by other sectors. The largest amount was supplied by Russia (17.57 bcm). Turkey imports natural gas both via pipelines and LNG. The share of pipeline imports was 79% against 21% for LNG in 2010 (18).

According to Energy Market Regulatory Agency, Turkey in 2011 imported some 40 bcm gas and consumed 43.5 bcm while in 2012, the consumption is expected to reach 48.5 bcm. It should be noted that approximately 50% of Turkey's electricity is now produced from natural gas, while more than half of its gas imports are used for power generation (19).

The most important supplier of natural gas in 2010 was Russia. The imports from Iran, the second largest supplier, have been problematic. Upon failure to bridge the differences in negotiations that were in progress, the Energy Minister Taner Yildiz announced in January 2012 that Turkey had decided to take Iran to the International Court of Arbitration. The negotiations pertained to two interrelated issues. While Turkey has contracted to import 10 billion cubic meters (bcm) annually gas from Iran, it maintains that Tehran fell short of meeting that target and it has exported

around 7 bcm to 8 bcm per annum over the last three years. Ankara insists somehow to import the excess amount accumulated over the last two years.

Figure 3.3: Turkey's existing and planned oil & natural gas pipelines and infrastructures

Electricity producers argue that Turkey urgently needs to reduce the share of gas in electricity generation to around 30 percent through the greater use of renewables, domestic solid fuel resources and nuclear power. This is a problem which has been recognized a long time ago by policy makers and energy strategy documents note that it is the government's objective to reduce dependence on gas. There is a broad consensus inside Turkey on the need to significantly revise its energy policies, but it seems there is less agreement on "how" and "how soon" Turkey should achieve a more balanced energy mix.

Moreover, shortcomings in reserves were also revealed during February's 2012 crisis. Turkey's underground storage facilities in Silivri have a capacity of 2.6 bcm and BOTAS was expected to maintain 2.1 bcm in reserves, which is enough to meet Turkey's needs for around two weeks. As Turkey tapped these reserves in response to declining deliveries, it was argued that BOTAS' failure to fill it to full capacity before the start of last winter was a major mistake. However, BOTAS issued a statement, maintaining that it had stored sufficient quantities, above the minimum levels required by existing legal provisions (Zaman, February 9). Granted, this development underscores Turkey's problems in managing effectively its strategic reserves.

Turkey is also directly concerned by the latest offshore oil and gas potential in the Eastern Mediterranean. It is becoming increasingly clear that from 2017 onwards there will be substantial natural gas volumes (5-25 bcm/year) available for export from the Levantine Basin. And, as exploration continues, the companies involved believe that there will be more gas and potentially oil discoveries in the same area. As the Leviathan gas field is very close to the Cyprus A field, a common export infrastructure might be developed for the two fields.

Turkey's interest in natural gas is strong both from a customer point of view but also as a transit country to European markets. According to the "BP Statistical Review of World Energy 2011", natural gas consumption in Turkey has rapidly increased from 14.6 bcm in 2000 to 39 bcm in 2010 and to 43,5 bcm in 2011

In future, gas consumption is expected to increase as more regions in Turkey are connected to natural gas distribution networks and new gas-fired power generation capacity continues to come on stream throughout the country.

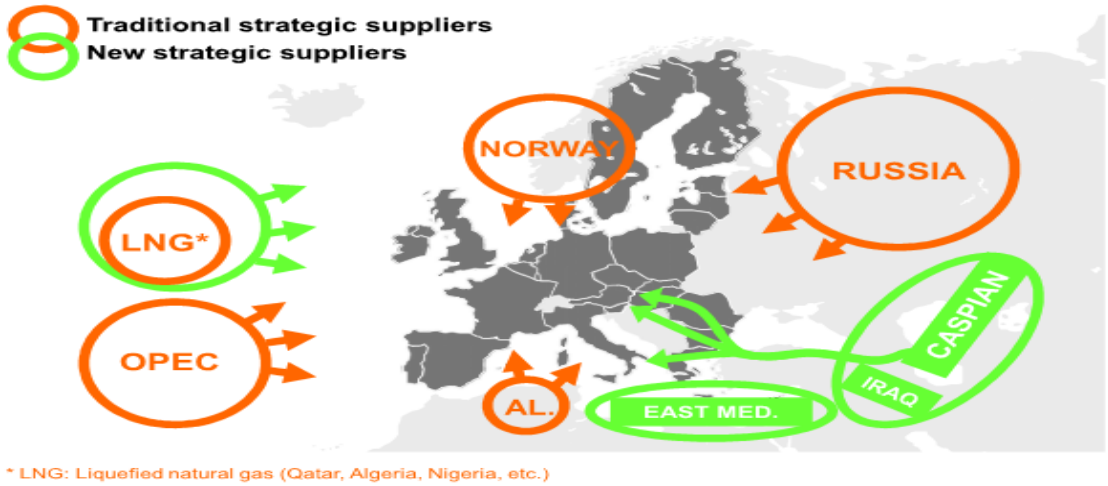
Most of the gas is currently imported by pipeline from Russia and Azerbaijan, but Turkey has also two important LNG import terminals. On the transit side, virtually all of the various pipeline projects which plan to transport Caspian natural gas to the European markets involve Turkey as a transit country – Nabucco, ITGI, TAP, SEEP, the Trans-Anatolian Pipeline, (to be built by BOTAS and by Azerbaijan's SOCAR), even South Stream (its offshore portion will pass through the Turkish EEZ in the Black Sea).

3.2 Traditional and new gas suppliers

Russia has long been, and is expected to continue to be, the key supplier of natural gas to Europe. In 2011, Russia accounted for 34% of European natural gas imports, followed by Norway (30%), Algeria (15%), Qatar (10%) and some other countries (Nigeria, Libya, Egypt, Trinidad & Tobago). Some large natural gas consumers, such as Spain, do not import any natural gas from Russia but mainly from North Africa. Germany, the second biggest natural gas consumer and Russia's largest export market, relied on Russia for almost 40% of its imports in 2011. The opening of the Nord Stream pipeline in late 2011 and Germany's planned closure of its nuclear power plants highlights Germany's potentially greater reliance on Russia.

The following is an overview of SE Europe's traditional and potential new gas suppliers:

Figure 3.4: Traditional and New European Gas Suppliers



Source: Jean –Arnold Vinois, "EU Policy for Security of Supply", 17th BBSPA Conference, Vienna, April 2011

Russia

Russia holds the largest natural gas reserves in the world, estimated at 47.57 trillion cubic meters (Tcm), about double those of Iran, the next largest. Russia is also the largest gas producer and the second gas exporter after USA. For 2011, Russia's gas production exceeded 721 bcm and exports totaled 180 Bcm

The largest Russian gas fields are Urengoy and Shtokman, the Yamal peninsula, and Sakhalin Island. While Sakhalin's 2.7 trillion cubic meters is just a fraction of Russia's overall reserves, its location and the involvement of some of the largest multinational companies make Sakhalin an important focus for Russia's natural gas industry (20), (21).

➢ *Sakhalin*

Sakhalin Island, a former penal colony located off Russia's eastern shore, is home to five oil and gas projects, each operated by a separate international consortium. Oil reserves in the area are estimated at around 14 billion barrels, in addition to natural gas reserves of approximately 3.0 Tcm. Even though each consortium has extensive export plans (including to the United States) via LNG terminals and export pipelines to the mainland, there has been little progress except for the first two projects, Sakhalin 1 and Sakhalin 2. The five projects are currently in different stages of development, but Sakhalin 1 and 2 are supposed to bring oil and natural gas production online in the near term. Both projects have targeted Asian markets. However, problems have arisen. Russian politics have caused delays, and considerable anxiety exists among the major players that the Russian government

will renege on existing contracts or place obstacles in their way. This is particularly significant given that huge amounts of additional capital will be required to develop and transport Sakhalin's gas to the market.

- ***Urengoy***

The Urengoy gas field is the world's second largest, and originally had nearly 10.0 trillion cubic meters of reserves (for years it was the largest until the North Dome in Iran was discovered). It lies in the Yamalo-Nenets Autonomous Okrug in the Tyumen Oblast, just south of the Arctic Circle, and is named after the settlement of Urengoy. Discovered in June 1966 (the first discovery well hit gas on July 6, 1966), the field started producing in 1978. In February 1981, Urengoy had already produced its first hundred billion cubic meters of natural gas. Gas from the field began to be exported to Western Europe in January 1984. It continues to produce over two hundred billion cubic meters of gas per year. Urengoygazprom, a subsidiary of Gazprom, manages the production.

- ***Shtokman***

Shtokman is one of Russia's super-giant offshore gas fields, located under the Barents Sea. The estimated reserves stand at about 5.6 Tcm. The original destination of Shtokman gas was to be the west coast of the United States, with the gas transported as LNG. However, with deteriorating relations between the U.S. and Russia, Gazprom (the sole owner of Shtokman) now plans to export the gas via the Baltic seabed pipeline (the North Europe Gas Pipeline, or NEGP) to Europe. The major recipient of Shtokman gas would be Germany. Recent announcements in Russia suggest that production won't begin until 2012 and foreign companies will not be allowed to participate.

- ***Yamal***

Gazprom estimates it will invest $69 billion in the development of the Yamal peninsula over the next 20 years. The combined reserves of Yamal's fields are estimated at 24.0 Tcm of gas with 13.0 Tcm of proven reserves. It is one of the most promising gas-bearing formations in western Siberia. However, compared to other Russian gas fields, production costs will be much greater in Yamal while the flow of foreign capital and the investments in new technology are considered as a prerequisite for the developments of this field.

Algeria

It is estimated that Algeria's reserves are the tenth largest in the world. According to the Oil and Gas Journal, Algeria had 4.5 tcm of proven gas reserves in 2011. While this amount places Algeria tenth in the world in terms of reserves, it places Algeria second in Africa.

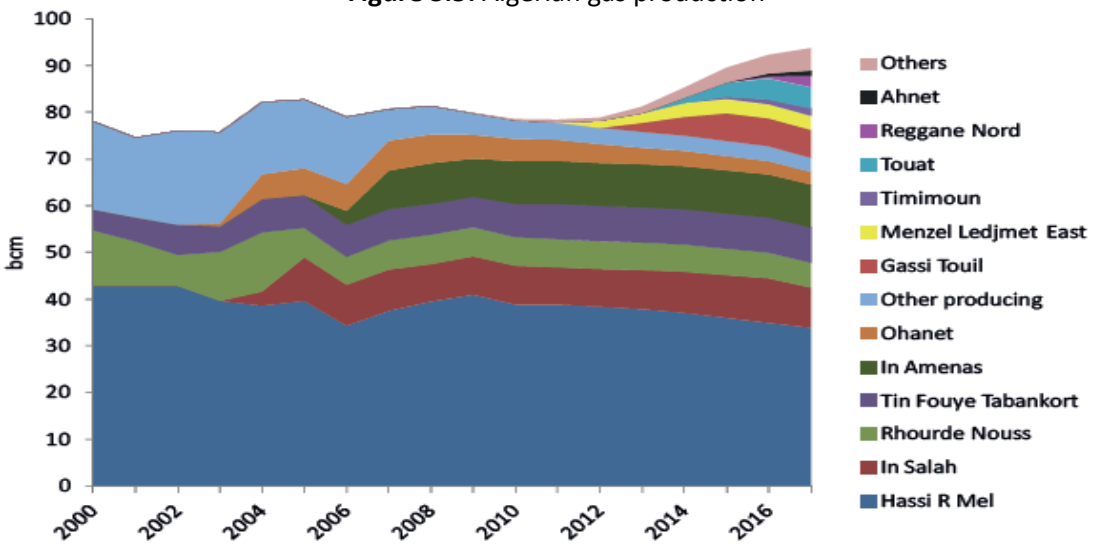
Algeria's largest gas field is Hassi R'Mel which was discovered in 1956. It holds proven reserves of about 2.4 tcm and accounts for about half of Algeria's dry natural gas production. The remainder comes from various fields in the south and southeast region of the country.

Algeria's gas production, according to some estimates could increase from 85.00bn cubic metres (bcm) in 2011 to 142.42 bcm by 2021, as ambitious new projects, mostly located in the Ahnet, Berkine and Illizibasins, come on stream. Production will be further boosted by increased output at major fields such as Hassi R'mel and by enhanced recovery rates at the In Salah Gas Project.

About two thirds of that amount moves through two pipeline connections (the MEDGAZ and the GALSI underwater pipelines) that connect Algeria and Europe. The other third is exported in the form of liquefied natural gas. Algeria is the fourth largest supplier of natural gas to the European Union. It ranks behind Russia, Norway and the Netherlands.

Liquefied natural gas makes up about one third of the total exports of Algeria's natural gas exports. Most of Algeria's liquefied natural gas exports go to Europe. In 2010, Algeria was the sixth leading exporter of liquefied natural gas. Primary customers are France, Spain, Turkey and Italy.

Figure 3.5: Algerian gas production



Sources: Oxford Institute for Energy Studies (2011), companies' websites, IEA analysis.

Gas demand is set to rise steadily on the back of solid economic growth. Business Monitor International forecasts (Algeria Oil & Gas Report Q4 2012) average annual growth of 5.36% from 2011 to 2021, with consumption forecast to rise from an estimated 30.26 bcm in 2011 to 51.18bcm in 2021. Nevertheless Algerian gas production has been dwindling over the past few years, which prompts the question: If Algerian supply, in particular, exports, will in fact grow over 2011-20 or are all the current projects barely enough to meet the growing domestic gas demand? Based purely on historical data, Algerian gas production peaked in 2005 and never quite recovered. The accident of Skikda made part of the LNG export capacity unavailable, but what remained was never fully used either. The Medgaz pipeline was delayed by two years, partly on account of the collapse of the Iberian gas market, combined with domestic issues. At the same time the internal transmission infrastructure is old and needs upgrading and international companies may be reluctant to build new pipeline infrastructure between the new fields and the processing facilities at Hassi R'Mel. Over the past two years, many industry sources have commented on the pressure drop of Hassi R'Mel, Algeria's crown jewel, representing 100 bcm of raw gas production against a total of 140 bcm.

Unless sizeable new fields are discovered in existing basins – including Ahnet, Berkine, Illizi and In Salah, which all have substantial discovery potential – gas reserves are likely to start falling from 2014 onwards. Another alternative is that new basins may be discovered in the north of the country or in the Mediterranean. There are significant projects that are due to start production by 2017 which can compensate for the loss of production from mature fields. Among them are Gassi Touil, which will support the LNG export plan starting in 2013; Timimoun, Touat, Reggane Nord and Ahnet; as well as small fields in the south of In Salah. Together these fields could add 23 bcm of gas production, if they start on time, which is less than certain, given the delays recently observed and the frequent changes at the top of Algeria's NOC Sonatrach. Alnaft's approval of Reggane Nord in February 2012 shows the need to fast-track new projects, partly to meet the ambitious (but elusive) planned export targets, but perhaps also to compensate for issues with Hassi R'Mel.

The Gassi Touil field in the East is expected to supply the new 6.4 bcm liquefaction unit at the Arzew LNG plan. The year 2013 would see GDF Suez's Touat commencing operator, which would add up 4.5 bcm/y followed in 2014 by the 1.6 bcm/y Timimoun (Sonatrach, Repsol and Total). Ahnet is foreseen to start by 2015, while Reggane Nord would start only by 2016, six years after the original starting date. It will add 2.9 bcm/y. Given the current climate, some delays have been included in this analysis for the start of the different fields. Furthermore, domestic demand keeps rising. According to demand forecasts for 2010-19 by Algeria's Commission de Régulation de l'Electricité et du Gaz (CREG), annual gas demand is expected to

increase by 13 bcm over 2011-17 in the baseline scenario, which corresponds to the incremental gas production (22).

Azerbaijan

Currently, the most realistic new source of natural gas that may come online and provide marginal export quantities to Europe apart from the other traditional suppliers is Azerbaijan and specifically the Shah Deniz 2 gas field. Azerbaijan's gas resources can meet a small fraction of European additional demand over the next few years. Even from the 1st phase of the Shah Deniz field, Azerbaijan already supplies gas to Turkey but also to Greece where it pumps limited quantities. From the 2nd phase of Shah Deniz, some 10 bcma are destined for Europe (23).

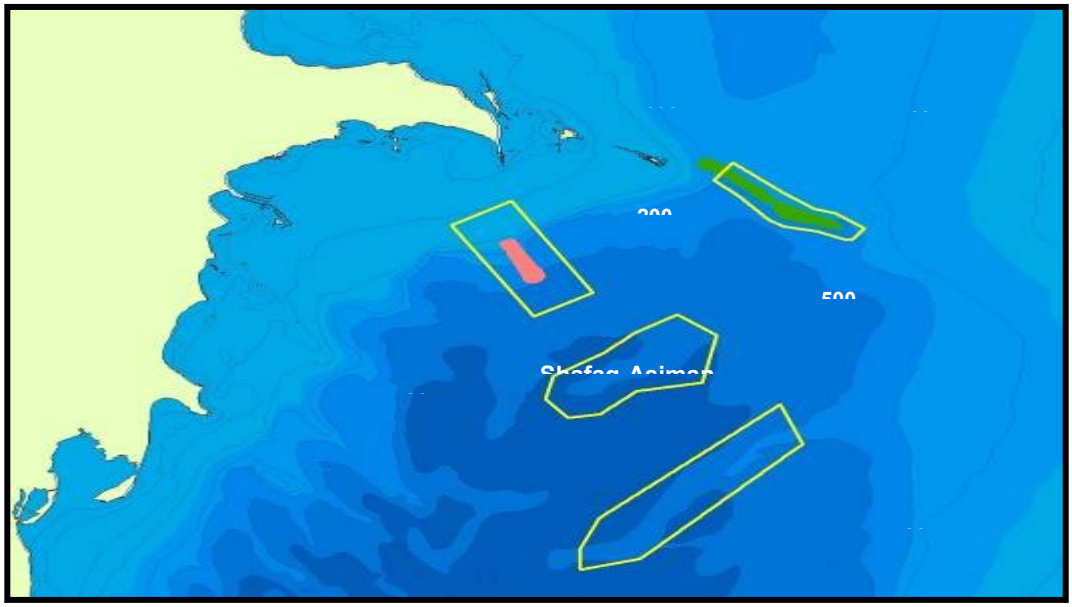
Azerbaijan produced around 27 bcm of gas in 2011 (24).Today the Shah Deniz gas field is the largest natural gas field in Azerbaijan. It is situated in the South Caspian Sea, off the coast of Azerbaijan, approximately 70 kilometres southeast of Baku, at a depth of 600 metres. The field covers approximately an area of 860 square kilometres. The Shah Deniz gas and condensate field was discovered in 1999. The Shah Deniz field is operated by BP which has a share of 25.5%. Other partners include Statoil (25.5%), SOCAR (10%), Total S.A. (10%), LukAgip, a joint company of Eni and LUKoil (10%), NIOC (10%), and TPAO (9%).

Figure 3.6: Caspian Fields

The Shah Deniz reserves are estimated to be between 1.5 billion barrels (240.000,000 m3) to 3 billion barrels (480,000,000 m3) of oil equivalent from 50 to

100 billion cubic meters of gas. Gas production was estimated to be approximately 1 billion cubic meters per year. The Shah Deniz field also contains gas condensate in excess of 400 million cubic meters. Apart of Shah Deniz field, two wholly undeveloped deposits in Azerbaijan, Absheron and Umid, have been undergoing exploration and are credibly estimated to contain some 350 bcm of natural gas each. Azerbaijan expects to increase its production to 50bcm/y by 2025 on the strength of exploiting these two news fields. Consequently, Azerbaijan current deposits hold now 2,0 – 2,5 trillion cm of exploitable gas deposits (25).

Figure 3.7: The offshore block Shafaq – Asiman in Azerbaijan



3.3 The latest gas discoveries in the East Mediterranean

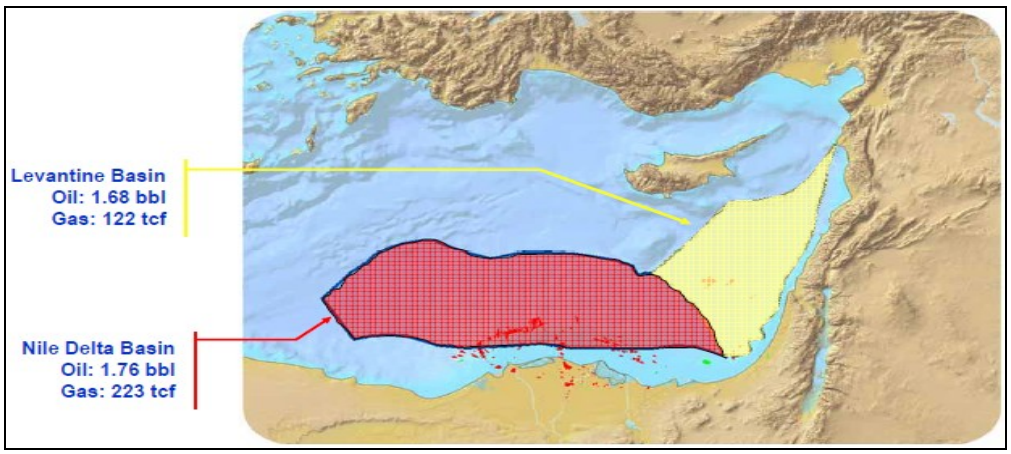
The discovery of substantial offshore natural gas deposits in the Eastern Mediterranean (mainly in Israel and Cyprus) seem to have changed completely the natural gas game in Europe and SE Europe in particular. According to the United States Geological Survey, the gas finds offshore in Israel and Cyprus belong to the massive Levant Basin Province field and could bring major changes in the energy sector of several regional countries. The United States Geological Survey (USGS) estimates the entire Leviathan Basin holds a mean approximation of 1.7 billion barrels of recoverable oil and a mean of 37 trillion cubic meters of recoverable gas or 1.2 trillion cubic metres (26).

The Mari B and Noa reservoirs of the Yam Tethys joint venture propelled the Israeli offshore into the oil and gas game for the very first time and introduced natural gas to the Israeli market. These reservoirs, Mari B (discovered in February 2000) and Noa

(discovered in June 1999) with approximately 33.5 bcm of the highest quality gas reserves marked the start of a new era. Yam Tethys has been supplying natural gas to Israeli market since 2004. Major clients include the IEC (Israeli Electric Corporation), ICL (Israel Chemicals) and other Israeli IPP. Yam Tethys's current supply is at a rate of approximately 3.0 – 3.5 bcma (27).

Israel, having demarcated her maritime borders with Cyprus in 2010, is now in the process (in 2012/13) of building the infrastructure for natural gas production in the Tamar field which was discovered in 2009. The natural gas contained in the Tamar field which is estimated at 9.0 tcf or 0,25 tcm, can alone cover the country's energy needs for at least two decades. So far, Israel is in a compromised position regarding energy supplies because the country depends 95% on imports. This is all going to change following the start of production from Tamar and later on from the giant Leviathan field.

Figure 3.8 : Regional Hydrocarbon System: Potential Undiscovered Oil & Gas Resources in the Eastern Mediterranean Assessment by USGS

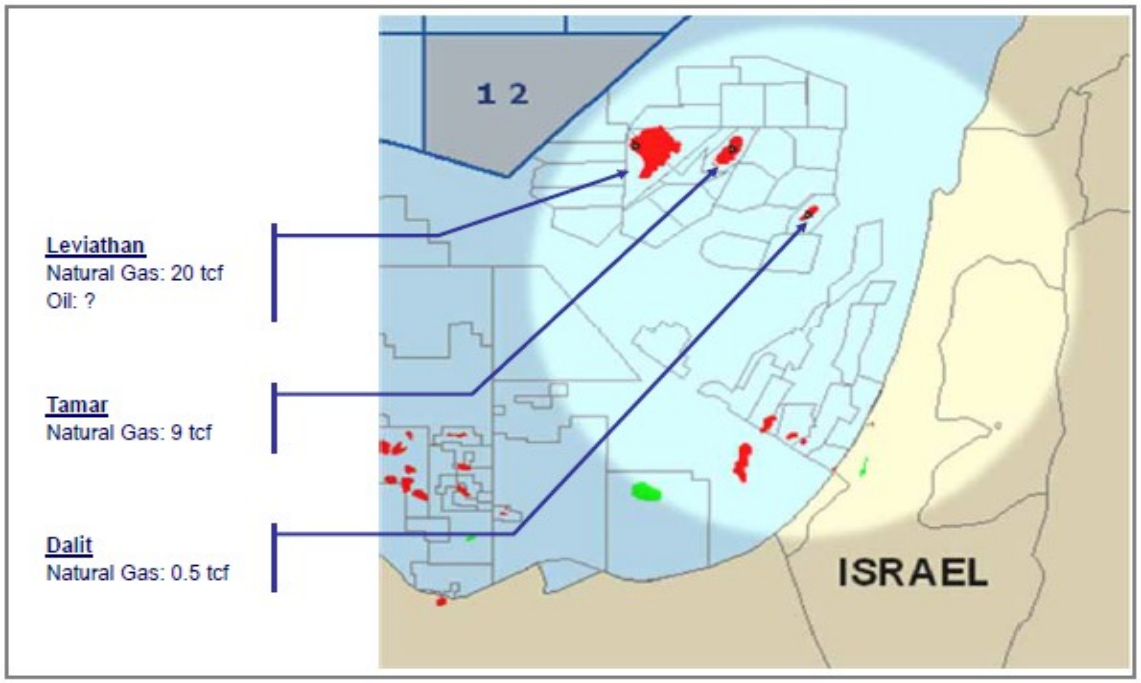


More specifically, the Leviathan Natural Gas Field, which was discovered in 2010, is situated at a depth of 1,645m of water also in the Levantine Basin, approximately 130km west of Haifa. Production is expected to commence in 2017. The Leviathan gas field's natural gas reserves are estimated to be about 0,5 tcm. Besides natural gas, the field is said to contain 600 million barrels of oil beneath the gas layer. In total Israel's estimated reserves from the Leviathan, Tamar, Tanin and Dalit fields stand at 27,6 tct or 0,77 tcm (28).

Consequently, Israel has expressed strong interest in becoming a gas export country and to collaborate with European and US firms in building the necessary infrastructure. The Israel government is also discussing the option of transporting natural gas to Europe via underwater pipeline to Cyprus and Greece. Discussions on

this project continued during the latest official visit to Greece by Israel's president Simon Peres in early August this year.

Figure 3.9: The latest main gas discoveries in Israel's EEZ



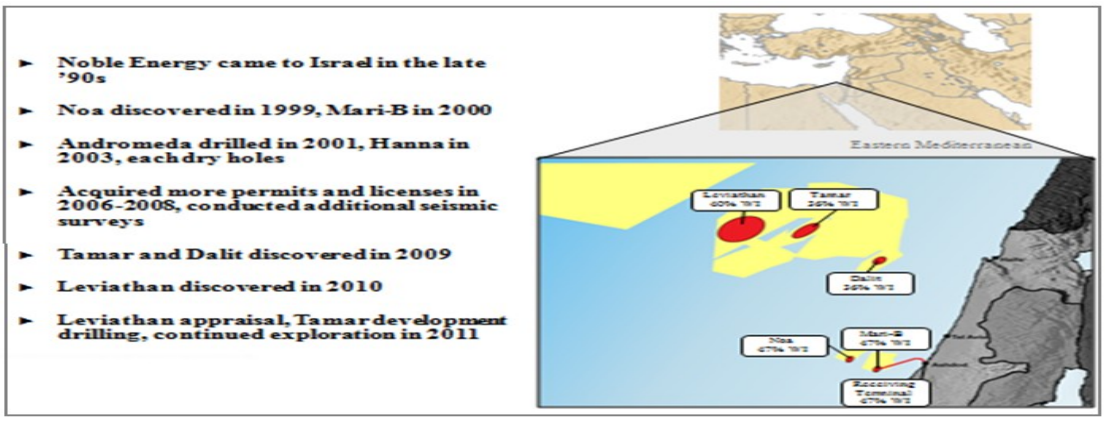
Source: Amit Mor, presentation at IENE's International Workshop, "Hydrocarbon Exploration and Production in the East Mediterranean and the Adriatic Sea", Athens, April 2012

In 2008 Cyprus licensed Noble Energy to proceed with the first phase of hydrocarbon and exploration for an offshore block south of the island and within its EEZ. In December 2011 Cyprus reported a major offshore gas field discovery in Block 12, also known as Aphrodite, whose estimated size is at 7.0 tcf or 0.20 tcm. According to Noble Energy, which holds the licence for Block 12, the find forms part of the same geological formation as that of Leviathan in Israel (29). A revised upward estimate for Block 12 is expected following a second appraisal well scheduled for drilling in the first half of 2013. The government of the Republic of Cyprus is hopeful that further gas finds will soon be reported once exploration work gets underway following a successfully 2nd licensing round which was completed earlier this year (30).

The combined Israeli and Cyprus natural gas deposits which have been discovered over the last five years, estimated at approx 3.7 tcf gross mean estimated resources, or 1.0 tcm, are significant not only in terms of size as they are of comparable size to Azerbaijan's gas deposit, but also in term of geopolitical significance. The new gas resource area, when fully explored and its full potential estimated at 3.0 tcm, will present an important paradigm shift in Middle East's so far Arab dominated oil and gas trade. For the first time we have a situation where oil and gas export flows could be envisaged outside an Arab controlled area. This promising outlook will strengthen the two countries' geopolitical role and could prove pivotal for the long term

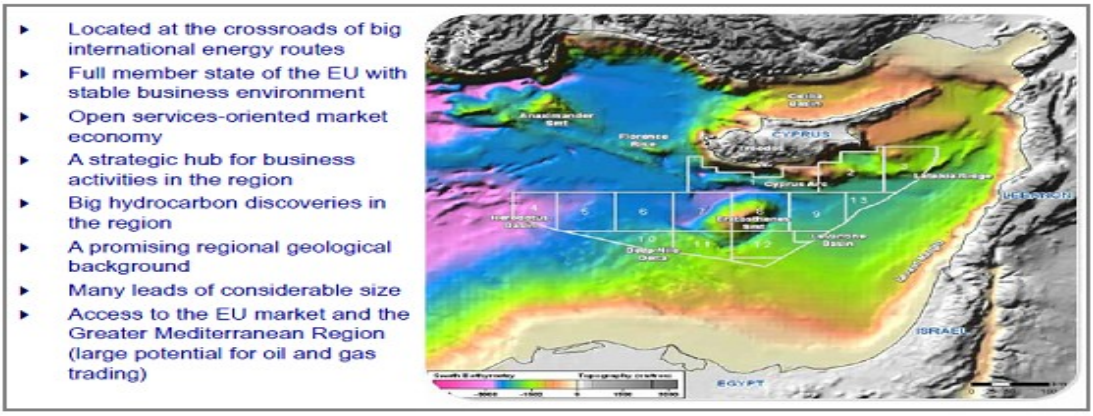
financial stability and economic growth, which is not unconnected to EU's prospects for economic recovery.

Figure 3.10: Significant recent natural gas discoveries offshore Israel by Noble Energy and its Israeli partners totalling 27 trillion cubic feet



Source: John Z. Tomich, Noble Energy International Ltd, Presentation at IENE's conference "1st Cyprus Energy Symposium," Nicosia, January 2012

Figure:3.11: Offshore Cyprus: A new frontier &emerging area



Source: Solon Kassinis, Presentation at IENE's conference "Energy and Development 2012,"Athens, October 2012

3.4 A regional strategy for security of supply

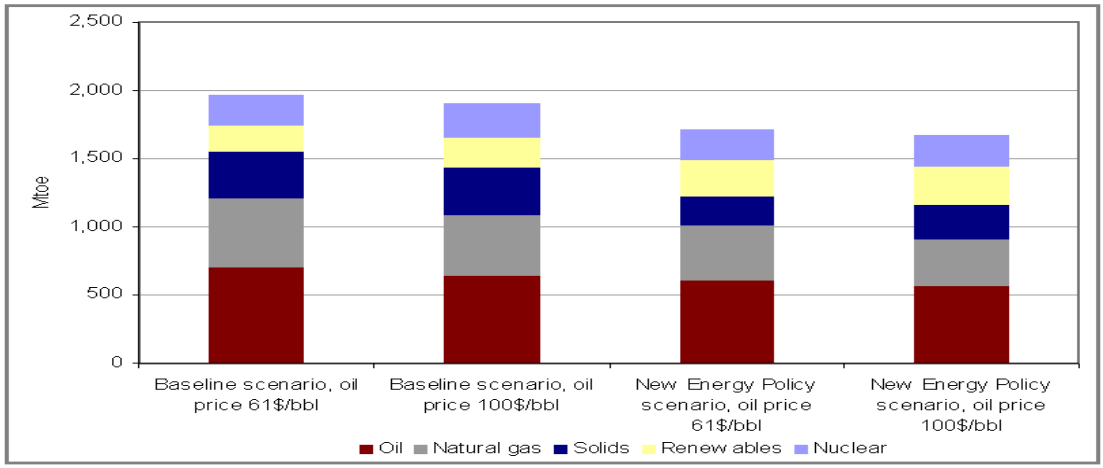
With the exception of Turkey, the SE European region is directly linked with the EU either through membership (i.e. Greece, Cyprus, Bulgaria, Romania and Croatia) or through participation in the 'Energy Community'[2], which is the case for the West

[2] A Treaty Establishing the Energy Community of the South-East Europe countries, singed in Athens on 25 October 2005, ratified by the EU and entered into force on 1 June 2006. This is the first energy related document which has a binding status, signed between the SEE countries and the EU. Ratification in the parliaments of the signatory states has created an obligation (EU plus nine partner countries) to establish a unique integrated energy market. The goals are: to create conditions to attract new investments into the energy sector, to open the energy markets of these countries in accordance to the EU directives, to strengthen conditions for unhindered environmental protection in the region energy market.

Balkan countries. That means that energy policy and gas policy in particular is governed by relevant EU decisions, directives and commitments to energy security and sustainable growth targets. More specifically according to EU policies and strategies 'security' and 'solidarity' are considered as essential factors contributing to an efficient energy policy. The EU intends to refocus its energy policy by putting the accent on these two values. The aim is to reduce energy consumption by almost 15 % and total energy imports by 26 % by the year 2020. With a view to achieving the above targets and in general the 20-20-20 objectives the EU intends to develop further significant changes to energy infrastructure. Under this framework it proposes the following six priority actions some of 'which are extremely important and most relevant for SE Europe and the East Mediterranean region:

- connecting the remaining isolated energy markets in Europe;
- developing a southern gas corridor for the supply of gas from Caspian region and Middle Eastern sources;
- making use of liquefied natural gas to ensure the liquidity and diversity of the European Union markets;
- linking Europe with the Southern Mediterranean through electricity and gas interconnections;
- developing gas and electricity interconnections crossing Central and South-East Europe along a north-south axis;
- developing interconnections between the electric networks of the North-West of Europe so as to optimise wind energy in the North Sea.

Figure 3.12: Implications of 20-20-20 by 2020 – EU energy mix (primary, Mtoe)



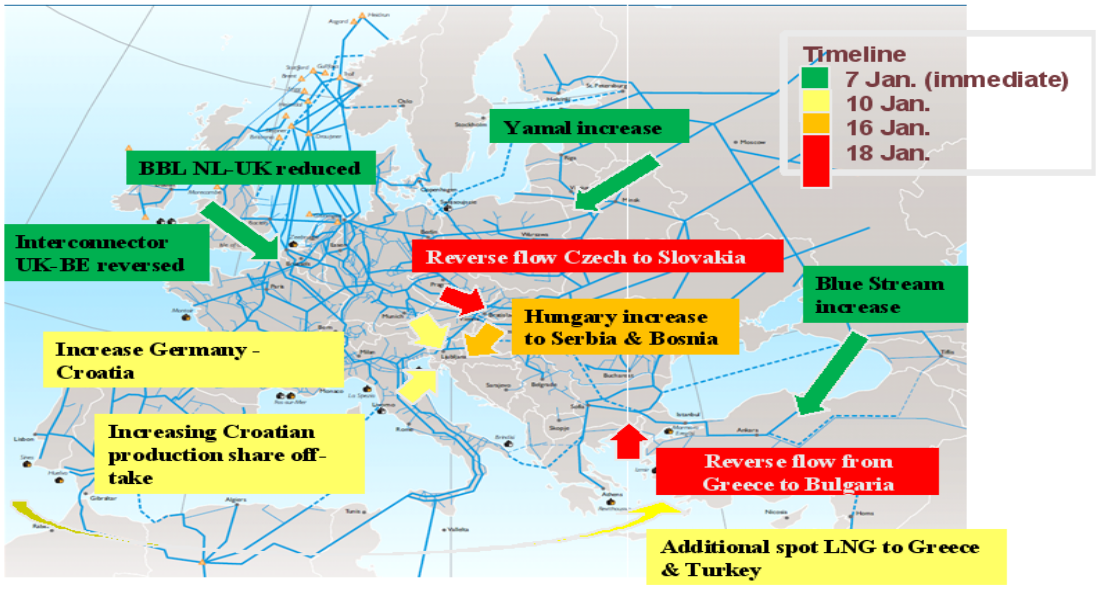
Source: European Network of Transmission System Operators for Electricity

The long-term energy strategy of the EU has reaffirmed the importance of natural gas in the future European energy mix and has accordingly drawn attention to the need for diversified gas supply through different gas routes (31). Thus, within this

framework the European Commission launched in January 2012 a draft Regulation on guidelines for trans-European infrastructure which identifies **12 priority corridors** and areas, and defines a procedure and criteria for projects to become a **Project of Common Interest (PCI)**. This Regulation intends to stimulate the construction of major new electricity, oil, gas and CCS infrastructure projects. The primary aim is to establish a number of 'projects of common interest' (PCI's) that will be able to benefit from specially designed fast-track permitting procedures. These should override the cumbersome national procedures that are now in place in various member states. The proposal further puts pressure on national energy regulators to grant extra financial incentives to investors and sets out conditions under which projects will get special EU subsidies.

According to this European Commission plan €50 billion worth of investment will be spend to improve Europe's transport, energy and digital networks. Targeted investments in key infrastructures will help to create jobs and boost Europe's competitiveness at a time when Europe needs this most. The "**Connecting Europe Facility**" will finance projects which fill the missing links in Europe's energy, transport and digital backbone. It will also make Europe's economy greener by promoting cleaner transport modes, high speed broadband connections and facilitating the use of renewable energy in line with the Europe 2020 Strategy. In addition the funding for energy networks will help to further integrate the internal energy market, reduce the EU's energy dependency and bolster the security of supply. To assist with the financing of the '**Connecting Europe Facility'**, the Commission has also adopted the terms for the Europe 2020 Project Bond Initiative which will be one of a number of risk-sharing instruments upon which the facility may draw in order to attract private finance in projects (32).

Figure 3.13: Reactions to Jan 2009 gas crisis



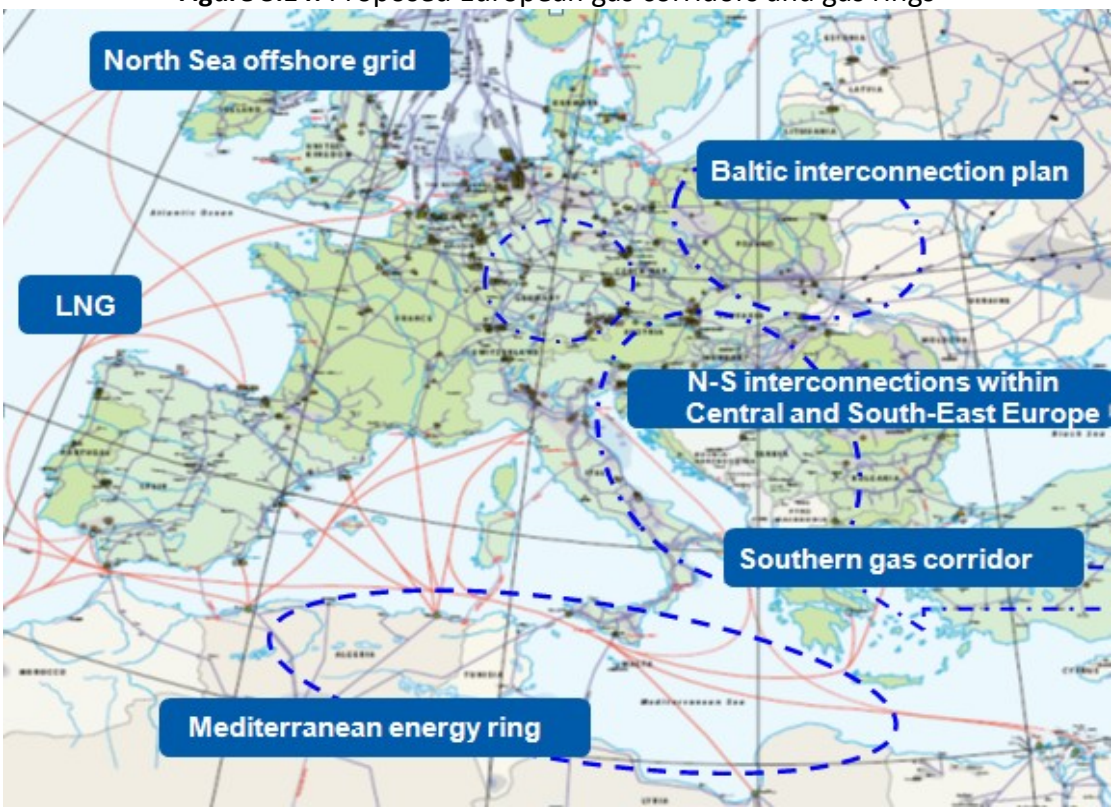
Source: IEA 2009

Nevertheless, the importance of access to funding for such a development plan cannot be overemphasized, especially in a time of global recessionary pressures and tight credit. The EU is already supporting SEE natural gas investments through a number of financial tools, but probably even more are needed. On the other hand gas interconnectors provide to the small Eastern and SE European states with options to switch gas supplies if for some reason of Russia turns off the taps. The EU infrastructure spending plan, which received informal backing from the European Parliament, allocates funds for considerable gas development in the region: €310 million of spending on regional gas interconnection projects linking Slovakia-Hungary; Slovenia-Austria; Bulgaria-Greece; Slovakia-Poland; Hungary-Croatia; Bulgaria-Romania; and Romania-Hungary. There are also plans for increased Czech gas storage capacity and equipment allowing reverse gas flows during supply disruptions.

Existing gas shortcomings have in fact constrained available intra-European natural gas flows which could otherwise have completely offset the impact of the disruption of Russian gas supplies in the Balkan region (i.e. February 2012), as was the case elsewhere in the European Union (EU), where the impact of the Russian gas supply cuts remained limited. Should the necessary natural gas infrastructure have been in place at the time, the European shortfall could have been fully compensated by increased imports from alternative sources and also by withdrawals from gas storage. The need to have reversible interconnectors was starkly illustrated during the 2009 gas crisis. Notably, Bulgaria was particularly insistent that its gas interconnection needs be addressed by the infrastructure plan. As well as the Bulgaria-Romania link, agreement has been secured to fund reverse gas flow technology in interconnectors in the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland and Slovakia - all countries that depend on Russian gas. The European Commission and the European Parliament have long subscribed to the idea of diversifying gas supplies, building extra pipelines to central Asia, North Africa and the Levant, but until the Ukraine crisis, eastern European interconnection had not been discussed seriously (33).

The European Commission believes that there must create suitable conditions must be created for alternative sources and routes in order to secure supply of natural gas from the Caspian and Central Asia countries and therefore interregional pipelines projects need to be realized giving special emphasis to Azerbaijan and Turkmenistan. In its report to the June 2011 Energy Council, the Commission estimated investment needs in energy infrastructure of European importance up to 2020 at about EUR 70 billion for high pressure gas transmission pipelines (coming into the EU and between EU Member states), storage, liquefied/compressed natural gas (LNG/CNG) terminals and reverse flow infrastructure (34).

Figure 3.14: Proposed European gas corridors and gas rings



Source: European Commission

As far as the 'Energy Community' is concerned after the January 2009 gas crisis, the Energy Community Secretariat was invited to take part to the EU GAS COORDINATION Group's[3] meetings as an Observer. On 11 August 2011, the European Commission decided (Decision 2011/C 236/09) to include the Energy Community Secretariat as a full member of the Gas Coordination Group. As the representative of the Energy Community, the Secretariat prepares at least twice a year questionnaires on the Contracting Parties' level of preparedness for the coming winter, or, summer season. It also scrutinizes the security of supply measures in relation to the households customers. This information is then shared to the other members of the Group.

[3]In 2006 the EU's Gas Coordination Group was created pursuant to Directive 2004/67 relating to measures that guarantee security of natural gas supply. These rules on security of gas supply were further strengthened by the Regulation (EU) 994/2010. Building on the lessons drawn from the **Russian-Ukrainian gas crisis** of January 2009, a more **coordinated approach** was needed at European level to provide stable and secure energy supply to European citizens. The January 2009 gas crisis also showed the **vital role of gas storages** and **bidirectional flows** as **short-term crisis response**.

CHAPTER 4

THE NEW SUPPLY ROUTE

4.1 Beyond the South Corridor

Following the Russian government's decision in early November 2012 (a), to axe the south branch of the South Stream[4] (although the decision had been taken by Gazprom several months ago), (b) the decision by the Shah Deniz II consortium in February 2012 to drop ITGI as an alternative route for pumping Azeri gas to Europe, and (c) the latest political and diplomatic problems encountered by TAP in securing a safe passage of its pipeline through Greece, the grand plan for a Southern Corridor for transporting Caspian gas to Europe, via SE Europe, appears to have been irreparably tarnished. Of course there remains the possibility of West Nabucco which may not face any diplomatic hurdles but whose usefulness is now clearly overshadowed by the magnitude of South Stream, the route of which according to latest released information by "South Stream Transport," almost overlaps the one by Nabucco (See *Figure 4.1*).

At the same time as is was clearly shown in Chapter 2 of this Note the appetite for fresh gas supplies to satisfy rising European gas demand by 2020, appears to have waned. This is largely due to subdued economic activity in the EU and the mounting problems of the Eurozone area whose growth prospects appear uncertain as the latest EU mid-term economic outlook report suggests (35). That means that the urgency, which until recently was pursued as a driving force for the realization of Southern Corridor projects, is no longer there or at least it does not appear to dominate strategic thinking.

Although the present difficulties and negative economic climate which is all pervasive in the Eurozone area does not appear to deter Azerbaijan and its partner Turkey from pursing European gas export prospects, as was clearly demonstrated

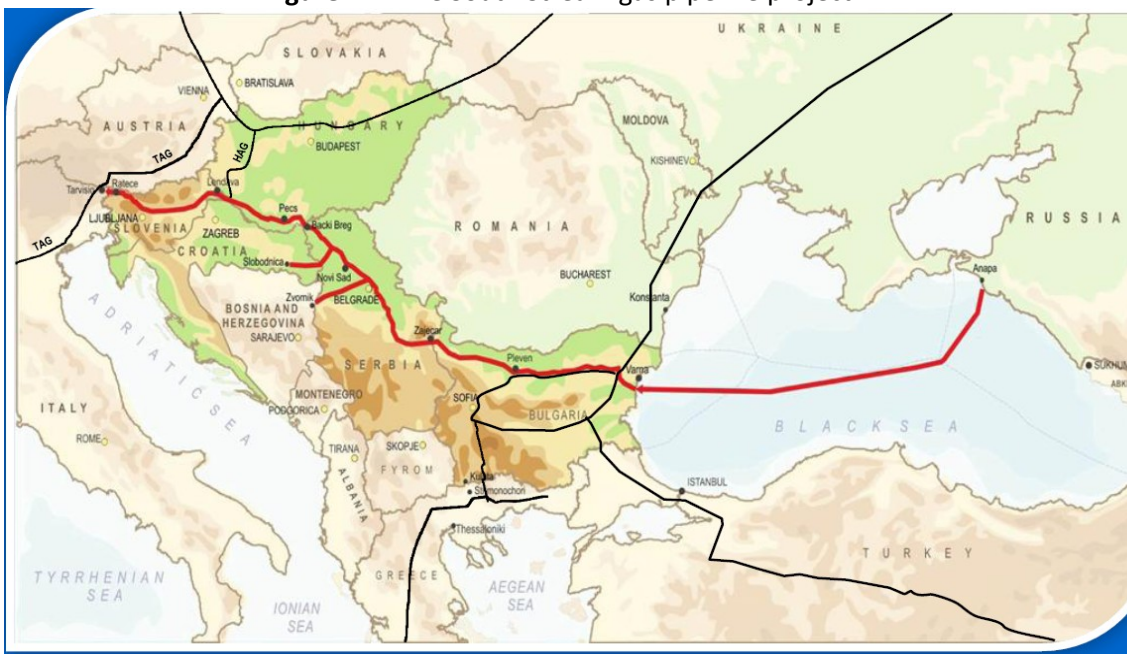
[4] However it should be noted that as it concerns the official statement of Gazprom, the Russian state-owned gas firm has not abandoned entirely plans to build a branch of the South Stream gas pipeline passing through Greece, quoting an interview by Gazprom deputy CEO Alexander Medvedev aired by English-language TV channel Russia. 22/11/2012. "There is still no final decision on this matter. Of course, construction of the main route has already begun, but we still are looking at the option of building a branch of South Stream through Greece to Italy," Medvedev was quoted as saying. Initial plans had South Stream, the pipeline that will cross the Black Sea bypassing Ukraine's gas grid, landing ashore in Bulgaria, from where it would branch north towards Austria and south into Greece. The northern branch is now expected to pass through Serbia, Hungary and Slovenia into Italy, and recent statements by Gazprom officials seemed to indicate that the southern branch has been abandoned too.

last June with the bilateral treaty between Azerbaijan and Turkey, for the construction of the Trans-Anadolou pipeline (36), the outlook for massive Caspian gas exports to Europe is not as strong, to say the least, as it was say a year ago or earlier. Although it would be unfair to say that such an outlook no longer exists, one has to take into consideration the various constraints that have come into play over the last few months and which affect the prognosis of European gas demand by 2017. According to latest analysis this is clearly curtailed to 561 bcma as opposed to earlier much higher predictions, still below 2010 levels (37).

One the one hand the new pragmatism of the South Stream, whose realization now seems fully secured, and on the other a less robust gas demand scenario for Europe lead us to the inevitable conclusion that the Southern Corridor (see *Figure 1.1*) concept as it was originally perceived and pursued by EU's planners, is no longer relevant. Does this mean that SE Europe and Europe proper will no longer require new supply routes and that the South Stream will provide fully the needed gas and shall satisfy completely the energy security requirements? The answer is far from clear as the addition of numbers and the equation between prospective demand and supply do not necessarily reflect true market conditions. Especially since inter-continental gas supply projects take many years to plan and are dependent on so many economic, political and diplomatic variables which often make detailed planning an exercise in vanity.

Precisely because there are so many unknown factors at play one has to be ready to examine alternatives and therefore must be in a position to develop fully qualified proposals. This seems to be the case of Greece whose political leadership, past and present, appear determined not to forego the county's advantageous geographical position, as a bridge between Asia and the European continent. In that sense Greece sees a role for itself, beyond the Southern Corridor, as securing a sea and land routes for the transportation of substantial gas quantities from the recently discovered offshore gas fields of the East Mediterranean, and potentially from Greece itself, to the Balkans, to Italy and further afield. Over the last few months there appears to be a consensus building up between Greece's fractious political parties and conflicting business interests that the country has indeed a role to play as part of an important new gas supply route to Europe. The requirements, the possibilities and prospects of this supply route, which is clearly different and unrelated to the Southern Corridor notion, are described in the pages that follow.

Figure 4.1: The South Stream gas pipeline project



4.2 The East Mediterranean as a potential gas supplier to Europe

Latest estimates by the IEA and other organizations (38) point to increased European gas demand by 2020 and 2025 regardless of the present economic slump which acts as a temporary break to an otherwise upward trend. The global and European scene from a gas demand and supply viewpoint has already been explained by IENE in a latest Briefing Note "Global and Regional Natural Gas Developments"(39). To recap, most long term estimates agree that European gas demand will reach 620 bcma by 2020 and 660 bcma by 2025. Latest analysis suggests that the European market may face a supply gap of 49 bcma by 2020, rising to 102 bcma by 2025.Specifically for SE Europe[5] gas demand is estimated to grow from 96 bcma in 2010 to approximately 117 bcma in 2025 which means that there will be a supply gap of 20 bcma.

European gas market's additional needs by 2025 will be satisfied from a combination of suppliers who between them are expected to produce the extra gas quantities required. On the basis of current information relevant to new field development the supply gap will be mainly filled by Russia and North Africa (i.e. Algeria and Libya) who are considered as traditional and long standing suppliers to Europe. However, the quantities anticipated will not be adequate to satisfy demand and hence the Caspian region is expected to provide an input. At this stage the only confirmed input is Azerbaijan with some 16.0 bcma slated for European exports, including Turkey, from

[5] The following countries are included: Albania, Bosnia & Herzegovina, Bulgaria, Croatia, Cyprus, F.Y.R.O.M., Greece, Montenegro, Romania, Serbia & Kosovo and Turkey.

2018 onwards. Potential supplies from Kazakhstan and Turkmenistan remain in doubt as is the case with potential gas exports from the Middle East, i.e. Iraq and Iran.

In view of the uncertainly now prevailing for the required additional gas supplies to Europe, outside the Russian and North African resource base, the prospect of securing there extra supplies from the East Med is more than appealing. With a series of confirmed new gas deposits along the Cyprus – Israel axis (~1.0 tcm) and with Egypt offering additional comfort on account of latest discoveries (~2.2 tcm), the East Med region as a whole could provide another credible diversified source of natural gas to the EU by 2020.

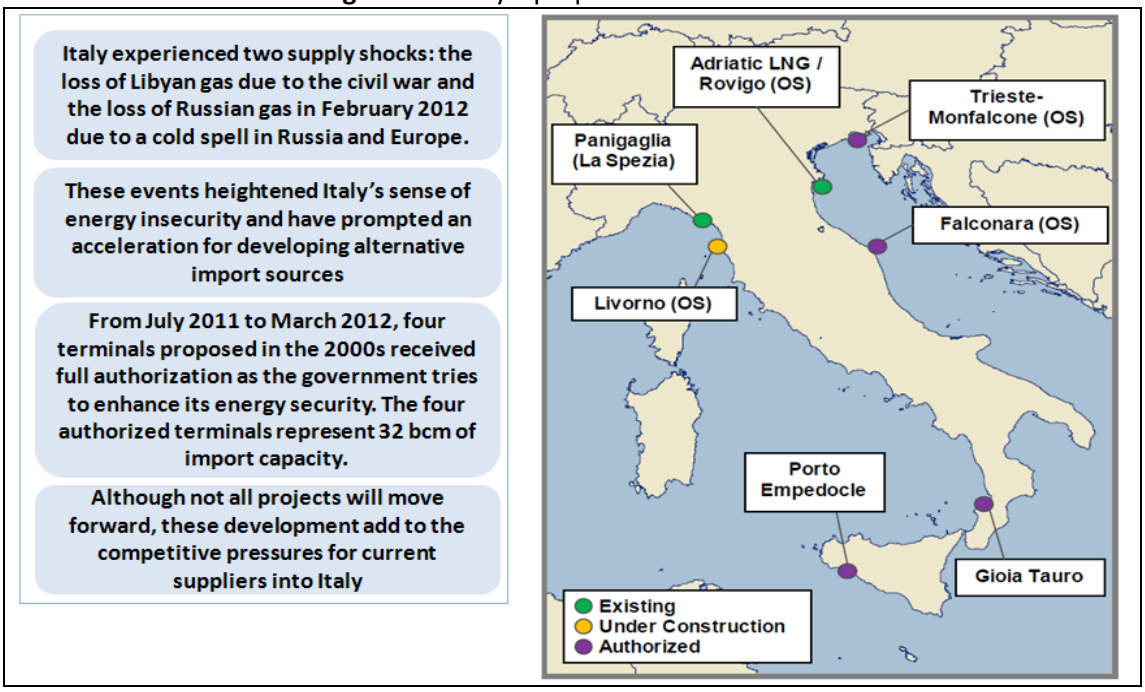
According to the USGA (United States Geological Survey) total reserves in the Levantine basin could be three times more than has already been discovered. And there may be more gas in Greece, offshore south of Crete, which is likely to be confirmed following a new round of seismic and geophysical work now in progress. The Greek government is already advancing its plans for an international round of offshore exploration in Greece's EEZ in the Ionian and Libyan sea for 2014. On the strength of findings so far in Israel and Cyprus it is estimated that more than 16.0 bcma could be exported from this region alone. In that sense the East Med is now emerging as a promising potential gas supplier for Europe (40).

It is now more than established that Israel and Cyprus aspire to become significant gas exporters on the strength of their natural gas deposits. For Israel, more so than Cyprus securing its own gas supply for domestic consumption ranks first in the order of priorities. Israel, in contrast with Cyprus, already uses gas for satisfying a wide variety of energy needs. Until recently gas was supplied from Egypt via pipeline through Sinai but also from the Mari B offshore field whose production is now declining. Egyptian gas deliveries to Israel became politically and physically insecure as a result also of the "Arab Spring", while the Egyptian gas pipeline to Israel has repeatedly been sabotaged with bomb blasts. Concurrently, Egypt's election-winning parties pressured the government to end gas deliveries to Israel. Consequently, last April (2012), Egypt's state-owned gas company suspended the gas supply agreement with Israel, citing a payment dispute. The case is now in arbitration.

Israel expects offshore gas production from its confirmed reserves substantially to increase and exceed the lost Egyptian supplies, generating export surpluses even without taking possible new discoveries into account. It should be noted that Noble Energy, which holds the license to explore and exploit gas in Block 12 in Cyprus's offshore area, confirmed on December 2011 that it had discovered as much as 8 trillion cubic feet of gas off the island's southern coast while Israel's Leviathan field (where Noble is also involved) is estimated to hold as much as 0.56 tcm of gas and

Tamar, another nearby offshore field, also thought to have 0.3 tcm. The total capacity of all the above neighbouring gas fields is estimated at approx. 1.0 tcm.

Figure 4.2: Italy's proposed LNG terminals



Source: PFC Energy

Some export routes and transportation modes currently under consideration seem costly and probably not economically viable while others seem to be most favourable. One option would involve a pipeline on the Mediterranean seabed, from Israel's Leviathan field to Cyprus, and then onward (possibly via Crete) to mainland Greece, and from there overland via pipeline to other SE European destinations but also to Italy, and hence to EU markets, via the proposed IGI (see *Section 4.5*). The proposed pipeline could carry approx. 8bcm/y and will be around 1.100km in length. Another option would entail liquefying the gas in Israel or Cyprus (both countries are vying to host this operation), shipping part of the liquefied product via LNG tankers to mainland Greece for re-gasification, and delivering the product through Greek pipelines to EU countries and the SE European region. Under both of those scenarios, Cyprus has ambitions to host a strategic gas storage site. A third and parallel option would be the straight forward exporting of liquefied natural gas (LNG) from these fields directly to consumer countries worldwide through the Mediterranean, or through the Suez Canal to East Asia.

Nevertheless, those three options involve high shipment costs for bringing relatively limited volumes to markets, where they have to compete against other suppliers with larger volumes and lower transportation costs. This would remain a disadvantage unless new offshore discoveries in Israel and Cyprus exceed the scale of the already confirmed reserves. Even in that case, the high costs of a trans-

Mediterranean pipeline construction or gas liquefaction plant would necessitate aggregating Israeli and Cypriot gas volumes, so as to generate price-competitive exports.

Thus, energy links between the eastern Mediterranean and Europe remain for the time being “pipe dreams”. More than 500 miles of deep waters lie between Cyprus to Crete and establishing a gas link would require a huge investment. For the moment, the Cypriot and Israeli governments still need to determine how much gas will be available for export, and by what means, after satisfying domestic demand. From a geopolitical point of view Israel, Cyprus, and Greece are right in their approach to strengthen cooperation in the energy sector aiming at delivering concrete benefits and to bolster confidence and trust.

Looking ahead, it is also important to realise that Israel and Turkey may in time overcome their differences and there may well be renewed efforts in future to resolve the long standing Cyprus’s division. The door should therefore remain open for cooperation with other regional players, including Turkey, when political circumstances permit. Establishing common energy projects, including a vital energy corridor, between all four countries could in the long run turn out to be the most advantageous option for all parties from an economic perspective.

4.3 Algeria as an alternative supplier to SE Europe

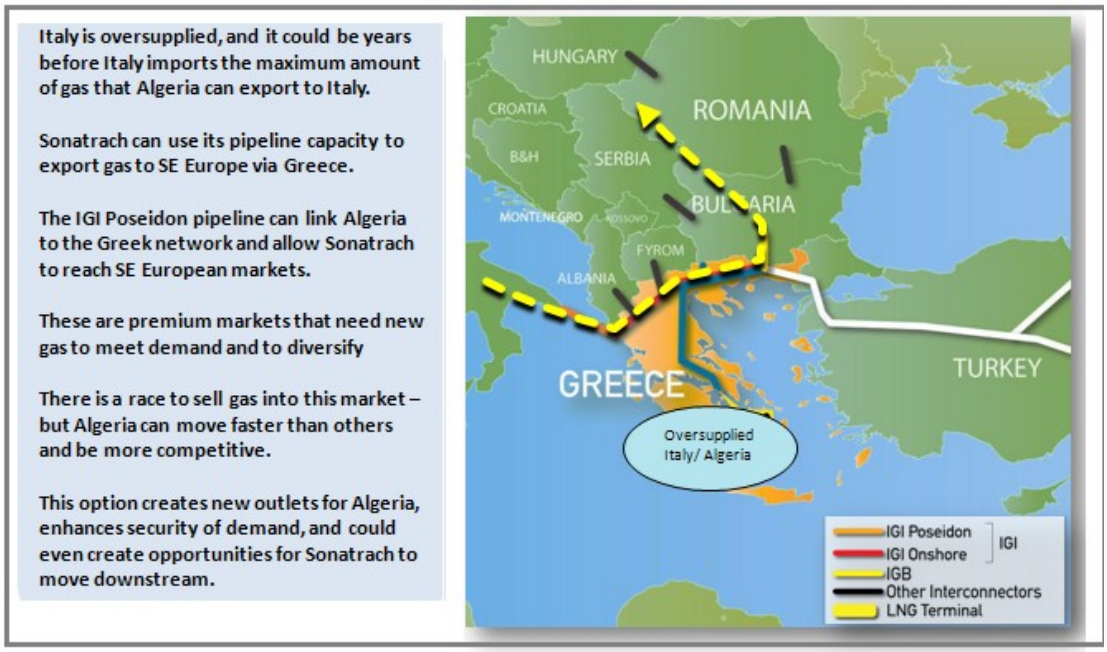
Another source of gas supply to Greece and beyond to South Eastern Europe can be Algeria as the country begins to angle for markets other than the immediate European ones (Italy, Spain). The Algerian company has been supplying the Italian gas market via the Trans Mediterranean pipeline with a yearly capacity of 30 bcm. According to market sources gas demand in Italy has decreased by 6.5% in 2011. Therefore, given the demand outlook for Italy and the possibility of new supply sources entering the market, mainly through LNG, this underutilization could persist for years.

Italy experienced two supply shocks: the loss of Libyan gas due to the civil war and the loss of Russian gas in February 2012 due to a cold spell in Russia and Europe. These events heightened Italy’s sense of energy insecurity and have prompted an acceleration for developing alternative import sources. From July 2011 to March 2012, four terminals proposed in the 2000s received full authorization as the government tries to enhance its energy security. The four authorized terminals represent 32 bcm of import capacity. Although not all projects will move forward, these developments add to the competitive pressures for current suppliers into Italy (See *Figure 4.2*).

Furthermore the massive use of renewable energy resources in Italy has resulted in a drop in natural gas consumption thus making this market less attractive for future gas import projects. With the Italian markets trending towards a slowdown, Sonatrach's capacity into Italy is clearly underutilized and therefore the company is seeking alternative and emerging markets for its gas.

On the other hand, Southeastern European markets appear to have increased supply requirements, as well as diversification policies in order to reduce their dependency on Russian gas imports. Sonatrach, which has long term contracts with DEPA (Greece's National Natural Gas Company) to deliver 1 bcm of gas annually, is optimistic it will be able to use the Greek-Bulgarian Interconnector, which is due to be operational by early 2014 and will have a final capacity of 5 bcm, to open new markets. In this scenario, DEPA as a wholesale importer would manage the exportation of gas to the Bulgarian and Romanian markets.

Figure 4.3: Algerian Gas via Pipeline to SE Europe



Source: DEPA

But there is also another likely scenario which foresees Sonatrach exporting gas to Greece through a pipeline system. More analytically, Sonatrach which already delivers gas to Mazara den Vallo at the Italian border could easily transfer its gas via the SNAM pipeline and then via the IGI Poseidon, using its reverse flow capability to Greece. IGI Poseidon will be connected to the Greek network (DESFA) and the Interconnector IGB supplying up to 5 bcma to Bulgaria and other SE European countries (41).

Sonatrach estimates that Algerian gas resources can reach the Bulgarian market with a cost of transfer around 1.4 USD per mmbtu and the Romanian market with a cost of 1.7 USD per mmbtu which it considers as an attractive pricing given today's market coditions. However, this scenario would depend on long-term contracts between Sonatrach and DEPA and the rest of the regional companies. DEPA has been anxious to advance plans to revive the ITGI project since it was rejected by the Shah Deniz consortium in March 2012. Lastly, it should be noted that Sonatrach's intention of playing a role in the supply of the region has been reinforced as it is one of the official bidders in the impeding privatization of DEPA.

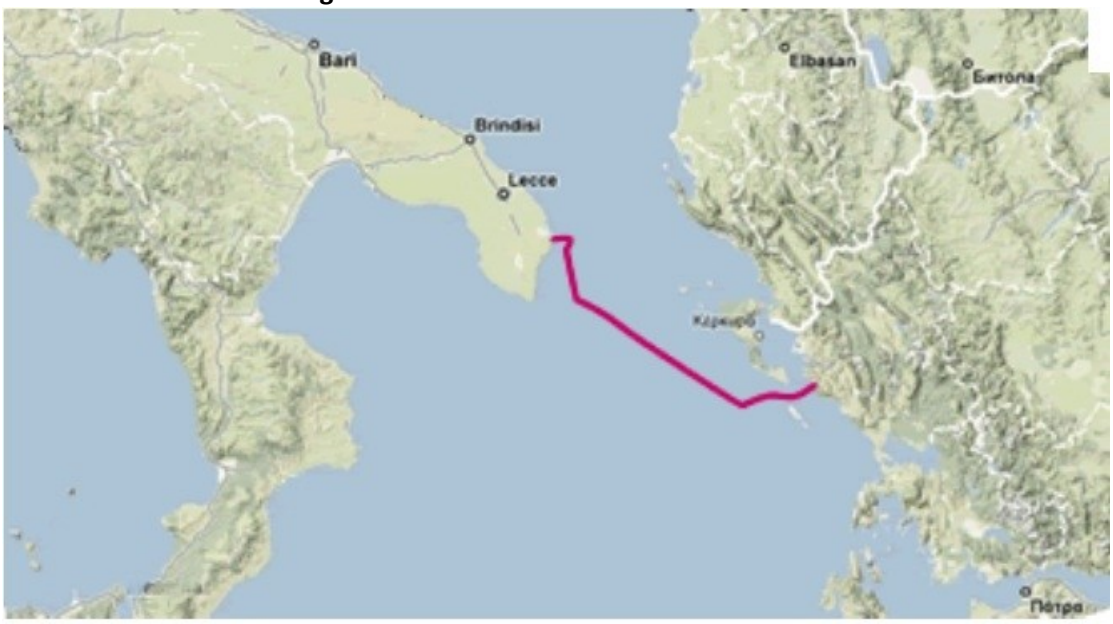
Currently Greece has three long-term gas supply contracts. The main one involves 3.0 billion cbm from Gazprom, 750 million cbm from BOTAS (Azeri gas) and 750 million cbm of LNG from the Algerian Sonatrach. Already informal communication between DEPA and the Algerians has been established with the view of increasing imports, so as to counteract any further decreases of supply by BOTAS, a move that will certainly affect Greek-Azeri gas trade. Greece is currently in the process of upgrading its Revythousa LNG terminal, with 160 million Euros contracts that will increase the capacity of the plant from 135,000 cbm of LNG to 220,000 cbm. Also vessels of greater capacity, up to 240,000 cbm of LNG from the existing 140,000 cbm, will be able to dock. According to the government's energy policy the country, regardless of the developments with the Southern Corridor is moving ahead to upgrade further its LNG capacity by establishing a floating LNG plant (Aegean LNG Import Terminal) in the north as well, increasing its reliance on that source something which will enable Greece to transfer gas quantities to Bulgaria and then to the rest SE Europe via the IGB gas interconnector.

4.4 IGI Poseidon as an integral part of the new supply route

Although the Poseidon interconnector pipeline is no longer officially part of the Southern Corridor, following SD II's decision of March 2012, it is considered by its promoters (i.e. DEPA and Edison) as a potentially key component for the transport of East Med gas to Europe or of Algerian gas to Greece and the rest of the Balkans. The Greece–Italy Interconnector (IGI) Poseidon will consist of a 210 kms offshore pipeline that will connect the Greek and Italian natural gas transportation systems with a transit capacity of 12 bcm and with reverse flow capability. IGI Poseidon was designed to ultimately form part of the Interconnection Turkey–Greece–Italy (ITGI) pipeline system which includes IGI Poseidon, IGB Interconnector and the onshore section. The 590 kms onshore section of the IGI that remains to be implemented in Greece will be constructed by Greece's Public Gas Corporation, DEPA and its subsidiary the Hellenic Gas Transmission System Operator (DESFA), and will run from

Komotini to the IGI Poseidon metering station in Thesprotia. The 42 inch diameter pipeline will have a capacity of 12 Bcm/a of gas and will include the construction of three compressor stations at Kipi, Komotini, and at Nea Mesimbria, Thessaloniki.

Figure 4.4: The IGI Poseidon Interconnector



Source: DEPA

The shareholders of IGI (DEPA and Edison) have decided to continue the development of IGI Poseidon, based on the maturity of the project and the strong belief that it is a crucial project for the security of energy supply of the entire region, despite the negative stance of the SD II consortium. Consequently IGI Poseidon remains open to export natural gas from alternative sources of gas. In that sense engineering design work continues on the Greece–Italy Interconnector pipeline, which may ultimately form part of a new strategic pipeline system for the export of natural gas from (a) the East Mediterranean region and from (b) Algeria to SE Europe via Greece.

Thus, the ITGI pipeline project, which apparently lost out in the race to carry Caspian supplies to Europe, could now find a new double role in transporting Eastern Mediterranean gas through Greece, to the rest of Europe, providing diversification and security of supply as well diversification of routes. Therefore, the IGI Poseidon is emerging as a key project that will allow, thanks to its reverse flow capability, the transfer of gas from East Med gas sources to Italy and vice versa from Algeria and through Italy to Greece and then to SE Europe.

Nevertheless, developing gas production and exports in the eastern Mediterranean area will pose some challenging technical difficulties as the waters between Israel,

Cyprus and Greece are among the deepest in the Mediterranean Sea but also in view of the political difficulties involved because of strong regional conflicts.

4.5 Feeding with natural gas the SE European countries

Gazprom's decision to remove entirely Greece and Italy from the construction plans of the South Stream pipeline, with the official but grossly inadequate explanation that these countries do not offer significant consumption prospects, has altered completely the natural gas prospects of the entire SE European region. South Stream's north-western route is expected now to run towards Slovenia and Italy via Bulgaria, Serbia and Hungary. Kremlin's latest decision marks a shift of emphasis towards the northern part. It is also very important to note that the South Stream pipeline will also bypass most of the West Balkan countries (Albania, Montenegro, Bosnia and Herzegovina and F.Y.R.O.M) by moving from Serbia and Hungary, without access to Russian natural gas at the moment.

As already mentioned Algeria for many years has supplied neighbouring Italy via the underwater Trans Mediterranean pipeline, which has a capacity of 30 bcm annually. But given the fact that the demand in the Italian market is decreasing, the Algerian Sonatrach now aspires to transport natural gas to the SE European markets through the IGI Poseidon and the ITGI natural gas system. It should be noted that there are countries in the SE European region, which are keen to import gas from sources other than Russia in order to reduce their dependence on it. The proposed IGI pipeline with its reverse flow capability can thus be used for the transfer Sonatrach's surplus gas to Greece and then to Albania and the rest Western Balkans, as well as to Bulgaria and other countries in the region. In addition, a second stage would see the construction of the necessary infrastructure to export gas to Albania and through a series of interconnectors to Montenegro, Kosovo, Bosnia and Croatia.

Another very important aspect regarding Russia's decision to build only the northern part of South Stream, thus focusing on central European gas markets, is that the competiting EU-backed West Nabucco now looks less likely to happen and the Trans-Adriatic Pipeline (TAP) which plans to transport Azeri gas via Greece and Albania and across the Adriatic Sea to Southern Italy seems more likely to be approved by the SD II consortium. But in view of the serious political and diplomatic problems that have now emerged over the territorial disputes between Greece and Ablania, there is a strong possibility that the TAP pipeline may never be built[6]. In this respect the role of

[6] There are still outstanding issues on frontier demarcation between Greece and Albania. These issues cover both land and sea areas

Greece as a transit country of gas supply both from Algeria and from the Eastern Mediterranean region to the Western Balkan countries will be further enhanced. Thus, if the plans for the Southern Corridor are further delayed, and the only reliable gas supply from Russia and Central Asia remains the South Stream pipeline, then Greece may be able to offer an important gas route in the region, provided that it manages to get the necessary infrastructure in place.

On the other hand Romania and mainly Bulgaria are likely to remain deeply dependent on Russian gas as the South Stream pipeline will further increase their dependency. The only realistic - medium term solution to reduce their dependency from Russia is to import gas from Greece via the IGB interconnector which will link Greece and Bulgaria and then to transport this gas via the Bulgarian – Romanian interconnector which will be ready by the end of 2013. Romania and Bulgaria can benefit from this route because IGB and IBR are projects in the final stages unlike other proposed solutions such as the AGRI project which is at a very early and preliminary stage. If Greece succeeds in implementing the necessary infrastructure such as Floating Storage and Regasification units, underground gas storage and the ITGI gas system, then it could emerge as an important natural gas player in SE Europe and indeed see its aspirations for becoming a regional gas hub come true.

4.6 The role of IGB

Interconnector Greece Bulgaria (IGB) which will supply Bulgaria and hence South Eastern Europe region with up to 5 bcma will be operational by the end of 2014. The project includes the construction of a trans-border reverse flow gas pipeline with length of about 168.5 km (140 km in Bulgaria, 28.5 km in Greece), connecting the Greek gas network in the area of Komotini with the Bulgarian gas network in the area of Stara Zagora. The capacity of the gas pipeline is foreseen to be 3 up to 5 billion m3/year, with a pipe diameter of 700 mm (28").

The total indicative value of this project is 150-160 million. Funding is secured from the European Energy Recovery Programme and the amount of EUR 45 million has already been earmarked (Decision C (2010) 5813 of the European Commission on 30.08.2010). The construction of the Greece - Bulgaria Interconnection Pipeline will help Bulgaria to achieve real diversification of natural gas supply source as it will allow the delivery of additional natural gas through the Southern Gas Corridor. This interconnector will also help Bulgaria access LNG gas from Greece by allowing direct purchases from suppliers. In addition the Greek – Bulgaria interconnector will help develop a more liquid market in the region (42).

Gas for the IGB interconnector may originate from:

(a) The 1st phase of Shah Deniz.

(b) As early as 2014, contracts with LNG suppliers may be made using the existing storage terminal in Revythousa.

(c) In late 2015, even more gas may be contracted through LNG, from two separate Floating Storage and re-gasification terminals, under development, to be located offshore near in Alexandroupolis and Kavala in Northern Greece.

(d) Should by 2017-2018, the link between Greece and Italy be operational it will be possible to access Algerian gas through Italy.

Figure 4.5: The IGB route

The company "ICGB" AD (asset company) was established in Sofia, on January the 5th 2011, with the purpose to design, implement and operate the IGB pipeline.

The shareholders of "ICGB" AD are:
The Bulgarian Energy Holding EAD (BEH) and IGI Poseidon S.A.. with 50% each.

Length:	181 km (31km in Greece/ 150km in Bulgaria)
Diameter:	32"
Maximum capacity:	5 bcma
Starting Point:	Komotini (Greece)
Ending Point:	Stara Zagora (Bulgaria)
Maximum Operating Pressure:	75barg
Reverse Flow Capability:	Yes
First Gas Flow:	early 2015

Source: Public Gas Corporation, DEPA S.A.

CHAPTER 5

THE NEW EAST MED PIPELINE CONCEPT AND ALTERNATIVE GAS ROUTES

5.1 Competitive supply sources

Looking at the East Mediterranean and examining its role as a potential major gas supplier to Europe and SE Europe one must be aware of the existing alternatives. At present there are several sources competing to sell gas to SE Europe and Europe proper.

These can be summarized as follows:

(i). Russia, through its existing network, and shortly, from 2016 onwards, from its South Stream pipeline

(ii). Azerbaijan, through Turkey's Trans-Anadolou pipeline and the Southern Corridor

(iii). LNG supplies from various sources including Algeria, Egypt, Nigeria and Qatar, being closer to European gas terminals

(iv). Algeria, through the MEDGAS and GALSI pipelines to South Italy.

But each of the above options faces a number of challenges:

(i). The South Stream without really contributing to supply diversification shall offer gas at relatively high cost on the basis of oil indexed contracts while there are still unresolved questions over TPA exemptions

(ii). The provision of Azeri gas relies on the further development of the Southern Corridor which relies fully on Turkey's transit system and is characterized by a history of missed deadlines. In addition there appears much uncertainty as to the selection of the eventual route, i.e. TAP vs West Nabucco

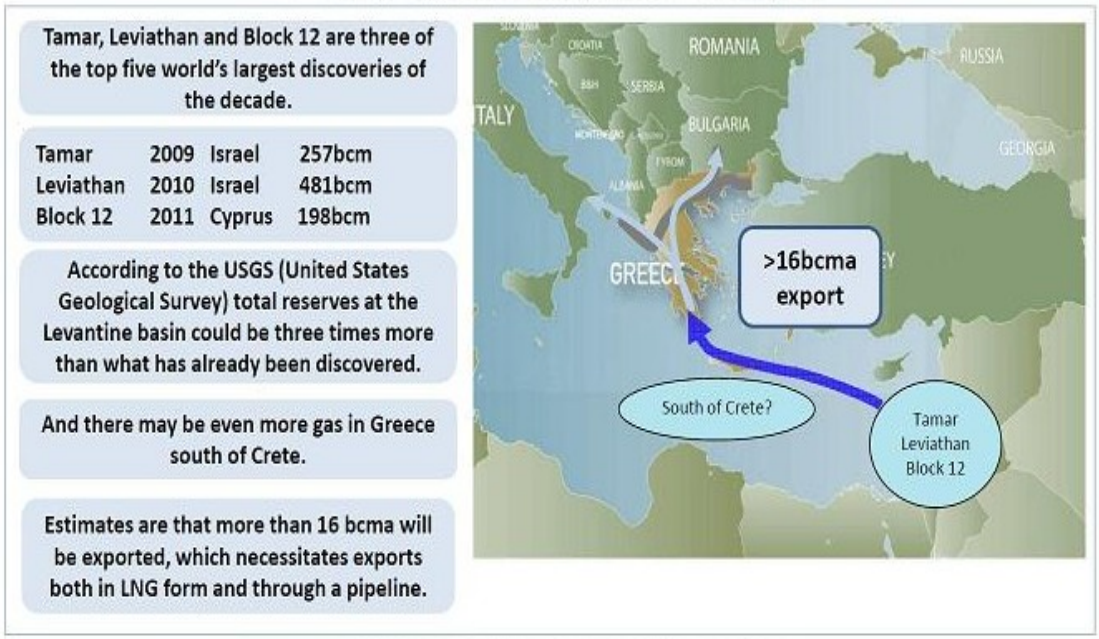
(iii). LNG is constrained by the capacity of the receiving terminals while high (premium) prices mean ability to secure LNG is lower

(iv). Algeria which has spare capacity can at present supply pipeline gas only to South Italy and therefore is more relevant to West European gas markets. However, Algerian gas may prove to be a bonus once IGI Poseidon is constructed whose reverse flow capability could be used to pump gas to SEE.

Understanding the above alternative supply sources, their expected contribution to the needs of European markets and how these interrelate between them, is of paramount importance in assessing the role and prospects of East Med gas. In this process the main regional players should be prepared to:

- Share technical information with existing suppliers about IGI Poseidon and the IGB pipeline
- Develop granular forecasts for the target markets – who are the buyers, where is the demand coming from, what are the risks involved
- Develop an in depth understanding of the competing sources of supply – how soon they might be available, what challenges do they face
- Assess the attractiveness of different monetization options (price formula, spot vs long term sales, sales at border vs downstream integration)
- Approach target buyers for exploratory discussions for gas sales agreements.
-

Figure 5.1: Eastern Mediterranean gas reserves



Source: Public Gas Corporation, DEPA S.A.

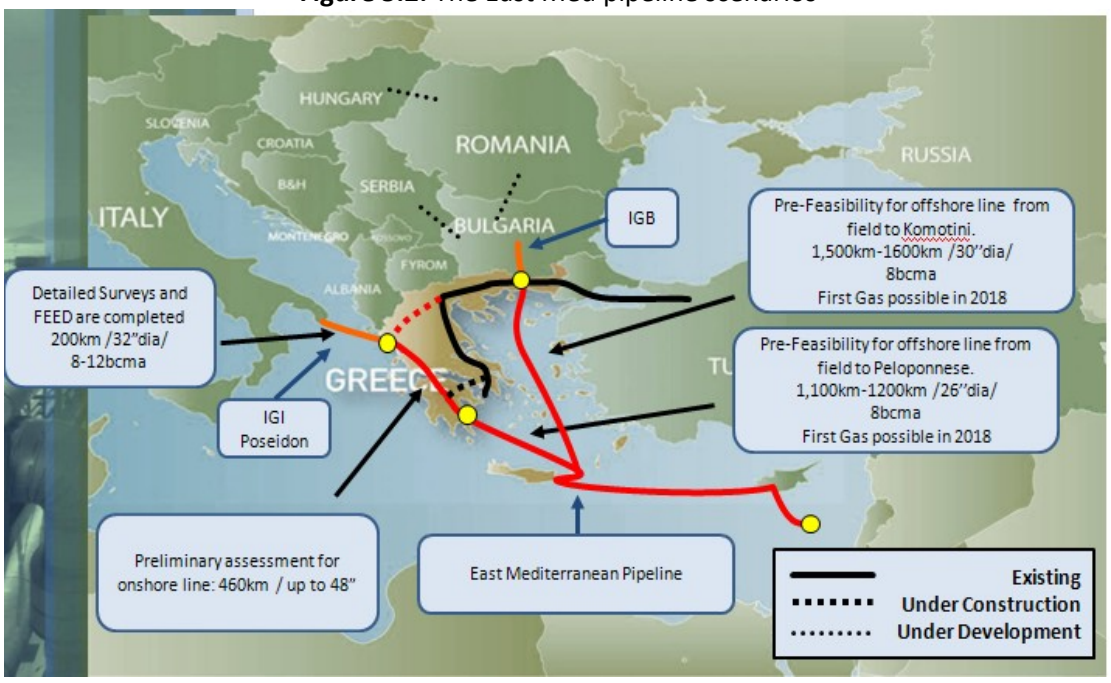
5.2 An offshore pipeline from the East Med to Greece

The broad concept developed by DEPA for a new gas corridor in the East Mediterranean based on an underwater gas pipeline is shown in *Figure 5.1.* Although several scenarios have been considered by DEPA to carry East Med gas to Europe the

pipeline scenario appears more advanced in terms of analysis, design work and financial engineering. This is to be expected in view of the economic advantages it offers in comparison to other options as this is explained is section 5.3.

The pipeline project considered by DEPA comprises, **(i)** a pipeline from the fields to offshore Cyprus, **(ii)** a pipeline connecting Cyprus to Crete and **(iii)** a pipeline from Crete to Peloponnese and (or) through the Aegean Sea to Northern Greece where the pipeline will be connected with IGB interconnector (Figure 5.2).

Figure 5.2: The East Med pipeline scenarios

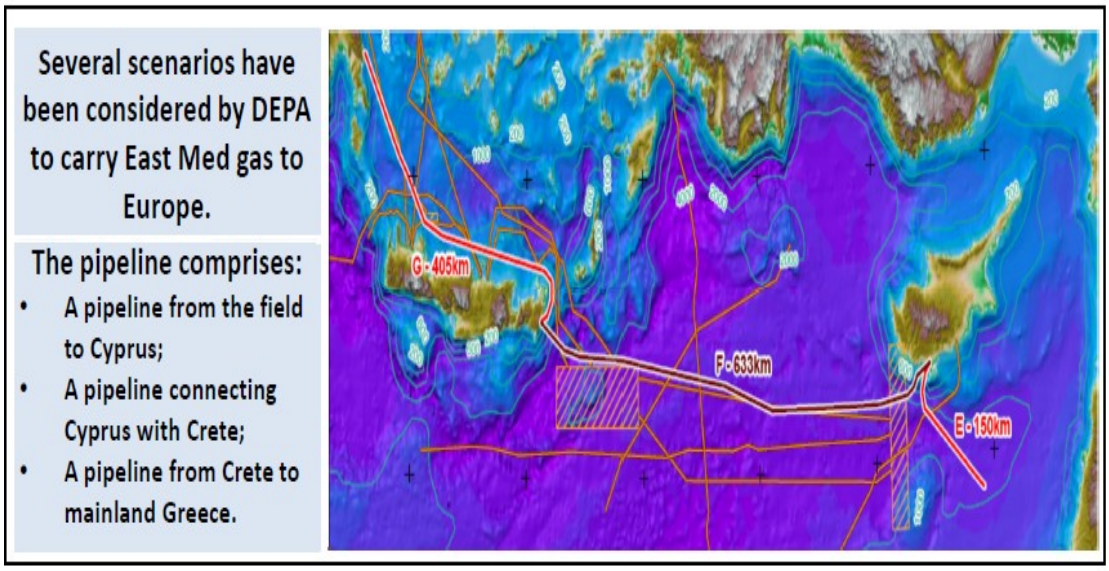


Source: Public Gas Corporation, DEPA S.A.

According to a DEPA backed study (43), the pipeline will be able to carry around 8 bcma and will have a total length of around 1150 kms. The pipeline's proposed route is shown in *Figure 5.3* and *Figure 5.4.* A feasibility study for the proposed pipeline has been carried out on behalf of DEPA by international engineering consultants JP Kenny (44). The initial design of the pipeline foresees a first leg of 150 kms connecting the Cyprus/ Israeli gas fields to Cyprus, a second leg from Cyprus to Crete of 633 kms and a third leg from Crete to mainland Greece of 405 kms, i.e. a total of 1188 kms. There are two further options for the third leg. The first one foresees that the pipeline from Crete lands in the South Peloponnese from where a 460 kms onshore pipeline will connect it to the IGI Poseidon starting point at Thesprotia. The second one, which is less developed from a design point of view, will transcend the Aegean Sea, connecting the east part of Crete to Komotini in Northern Greece (from where the IGB will start), i.e., a total distance of approx 700 kms.

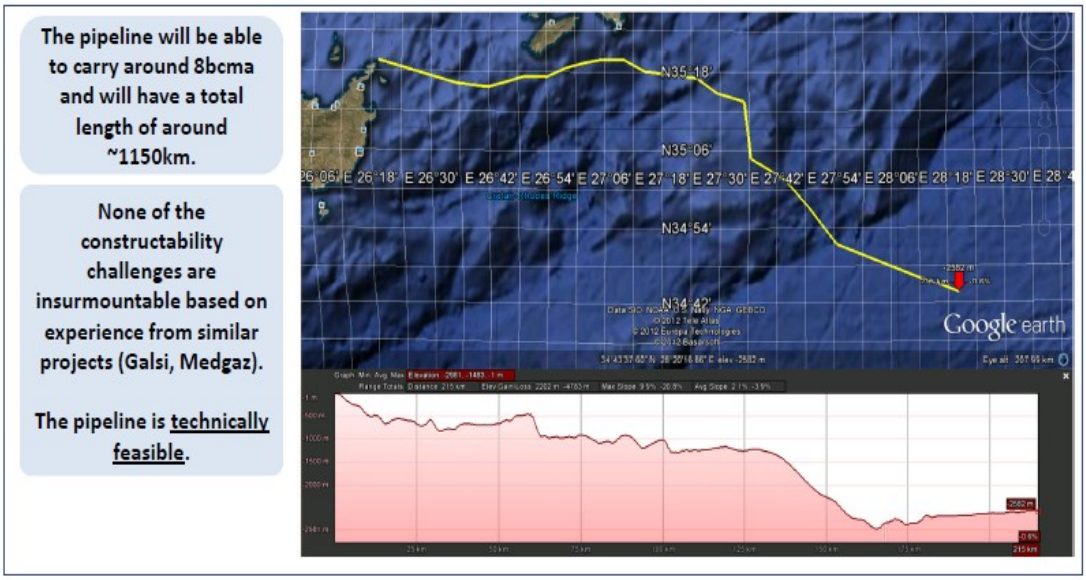
Judging from the technical characteristics and the proposed route of the pipeline none of the constructability challenges appear insurmountable, based on experience from similar projects (i.e. Galsi, Medgaz). In essence the pipeline is technically feasible. The most challenging construction aspect, which is related to the approach to Crete, has been looked into in more detail in a way that will minimize technical hurdles (see *Figure 5.4).*

Figure 5.3: Offshore pipeline from the East Med to Greece



Source: JP Kenny

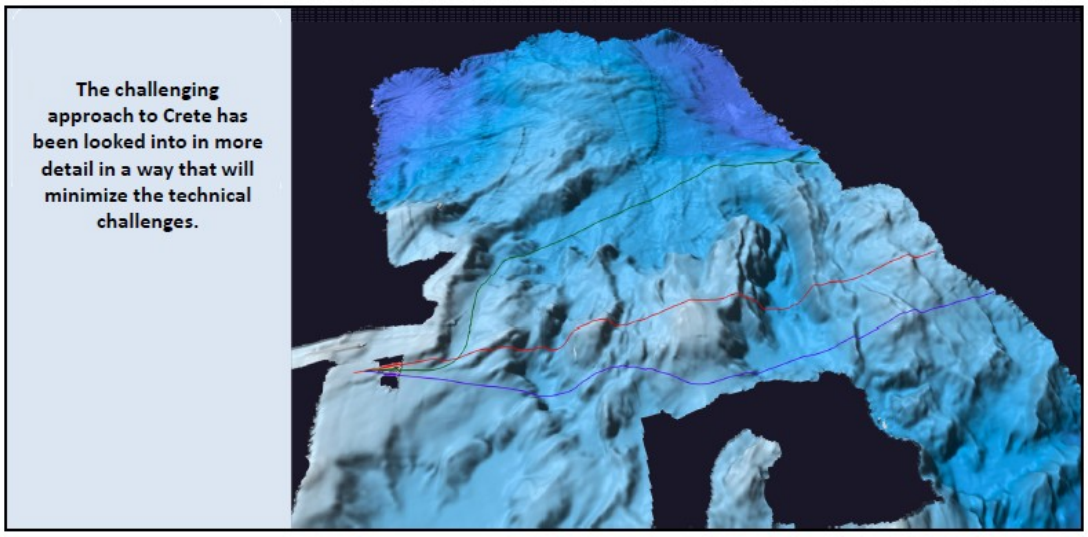
Figure 5.4: Approach to Crete – Route Profile



Source: JP Kenny

The East Mediterranean Pipeline (East Med) as it is to be called, will provide some 8.0 bcma of input capacity which is to be absorbed along three directions (a) to Italy, via the planned IGI pipeline, the Interconnector Greece – Italy, (b) to Greece, whose anticipated demand by 2020 is likely to reach 8.0 bcma from 4.5 bcma at present, and (c) to the East Balkans through the IGB, Interconnector Greece – Bulgaria, the construction of which is already underway. The IGB is expected to provide much needed alternative gas supplies to Bulgaria, and through it to F.Y.R.O.M and to Romania.

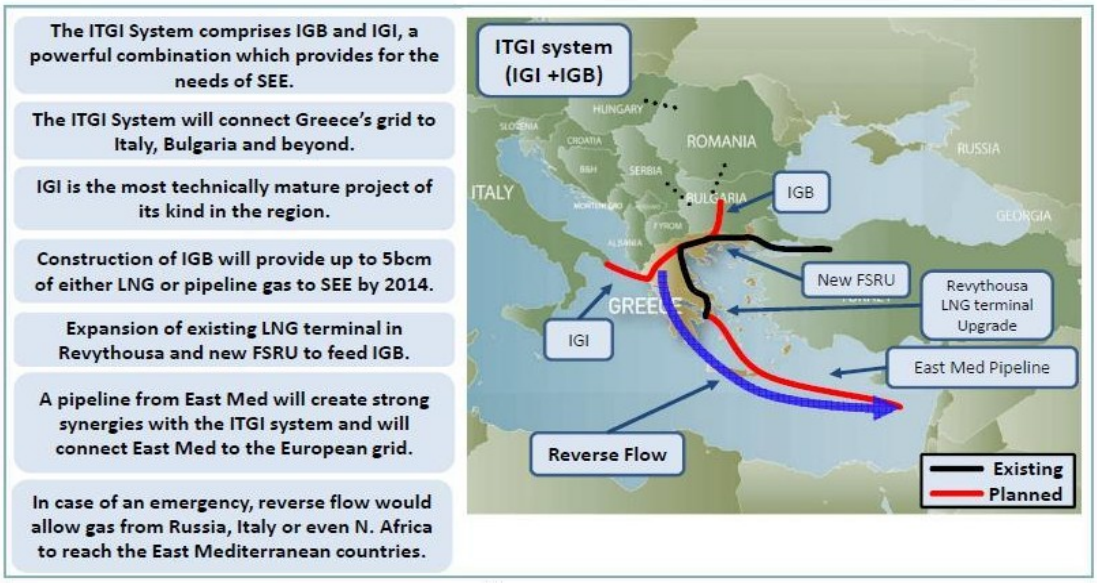
Figure 5.5: Approach to Crete - Bathymetry



Source: JP Kenny

The East Med pipeline is expected to operate in tandem with the ITGI system which comprises the IGI and IBG and thereby constitutes a powerful combination which can provide for the needs of the whole SE Europe. IGI is considered as one of the most technically mature projects of the region while the construction of IGB will provide up to 5.0 bcma of either LNG or pipeline gas to SE Europe as early as 2014. The expansion of the existing LNG terminal in Revithousa, already underway, in conjunction with the new FSRU terminal in Alexandroupolis and the Aegean FSRU terminal off Kavala are expected to feed the IGB. Therefore the proposed East Med pipeline will create strong synergies with the ITGI system and will in effect connect the Eastern Mediterranean to the European grid (see *Figure 5.6*). In case of an emergency, reverse flow would allow gas from Russia, Italy or even North Africa to reach the East Mediterranean countries.

Figure 5.6: Connecting to Europe pipeline from East Mediterranean



Source: Public Gas Corporation, DEPA S.A., Greece

In short the proposed offshore pipeline from East Med shall be on a position to:

(i) Link with the ITGI system

(ii) Allow access to the SE European and Italian markets

(iii) Offer competitive tariffs

(iv) Be operational as early as 2018

At the same time South East Europe in itself is likely to prove a key market for the new sources of gas in the Eastern Mediterranean because of its proximity to the source but also of its potential for growth.

5.3 LNG vs Pipelines

Soon after the sizes of the combined gas reserves of the Eastern Mediterranean basin were determined[7] and their net export potential was appreciated, a discussion started on the most advantageous way to transport gas to Europe and beyond. On the basis of analysis so far it is estimated that more than 16 bcma can be exported from the three main fields of the region. This appears to be a large enough gas quantity which will necessitate exports both in LNG form and also through a pipeline.

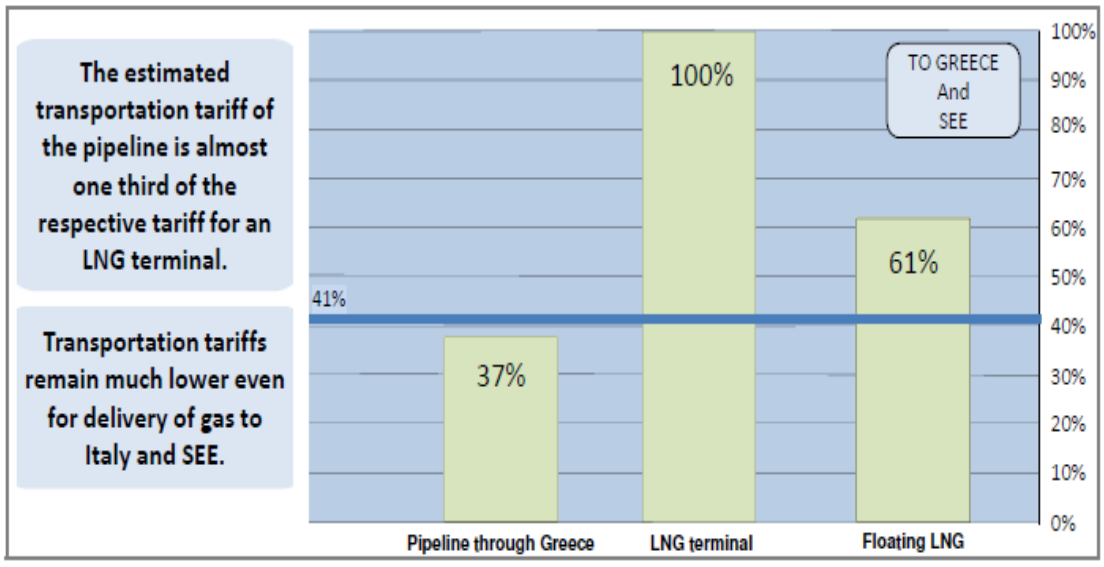
[7] We refer here to the Tamar, Leviathan and Block 12 gas fields, whose total combined reserves are 936 bcm on the basis of actual exploration appraisal wells.

Public debate so far and analysis put forward in conferences and seminars in Israel, Cyprus and Greece, over the last 12 months suggests a preference for the LNG option. According to the advocates of this option there appear to be three alternatives solutions. The fist one foresees the construction of a three train plant to be located in the Vassilikos, area in Cyprus, which will act as main export terminal for both Israel and Cyprus, and where gas from Leviathan, Tamar and Block 12 will flow. The second solution favours a separate LNG plant to take care only of Israeli gas production and to be located in the secure Eilat area, away from the volatile Mediterranean coastal strip south of Tel Aviv. The proposed location in the gulf of Al Aqaba in addition to satisfying security concerns offers a more direct export route to the SE Asia gas markets. The third alternative solution indicates the existence of two separate LNG terminals, one in Cyprus and the other in Israel which will cater independently to the export needs of each country.

Of all three options and on the basis of current thinking in Israel and Cyprus it appears that the first option, which foresees a large joint terminal in Vassilikos which will accommodate both Israeli and Cypriot export requirements is gaining wider acceptance, especially in view of latest security concerns in Israel, following the recent Israel – Hamas armed conflict in Gaza (November 2012). As gas production estimates from all the above three fields indicate production quantities in excess of 16 bcma, the parallel existence of an LNG liquefaction plant and a pipeline, linking Cyprus to Greece and hence to Italy can be considered. At this stage when gas field development is at a very early stage and government thinking both in Cyprus and Israel is far from settled, it is difficult to prioritize the eventual sequence of gas export options. However, it is useful to look at some facts concerning the relative costs involved in the case of the pipeline and LNG options.

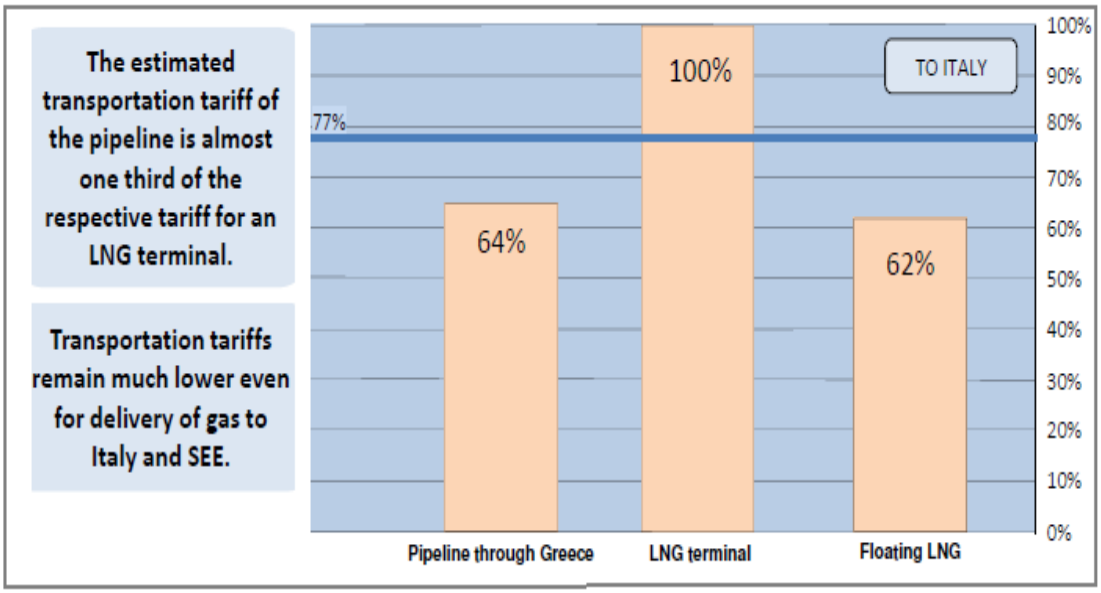
On the basis of a feasibility study conducted by DEPA (45), with technical support, by J.P. Kenny, a tariff comparison has been made between the pipeline through Greece option (for an 8.0 bcma capacity and for 1.150 kms length), a Cyprus based LNG and a Floating (liquefaction) LNG facility of equal volume capacity. *Table 5.A* shows the tariff comparison in the case that gas is transported to Greece and SE Europe, while *Table 5.B* shows the tariff comparison in the case that gas is transported directly to Italy. In the first case, for exports to Greece and SE Europe, the estimated transportation tariff of the pipeline is almost one third of the respective tariff for an LNG terminal. The second case, which deals with gas exports to Italy, the estimated transportation tariff of the pipeline is almost two thirds of the respective tariff for an LNG terminal. In both cases transportation tariffs for the pipeline though Greece option remains much lower compared to the LNG option.

Table 5.A : Tariff Comparison for Greece and SE Europe destinations – Percentage based on onshore LNG facility



Source: DEPA

Table 5.B: Tariff Comparison for Italy destinations – Percentage based on onshore LNG facility



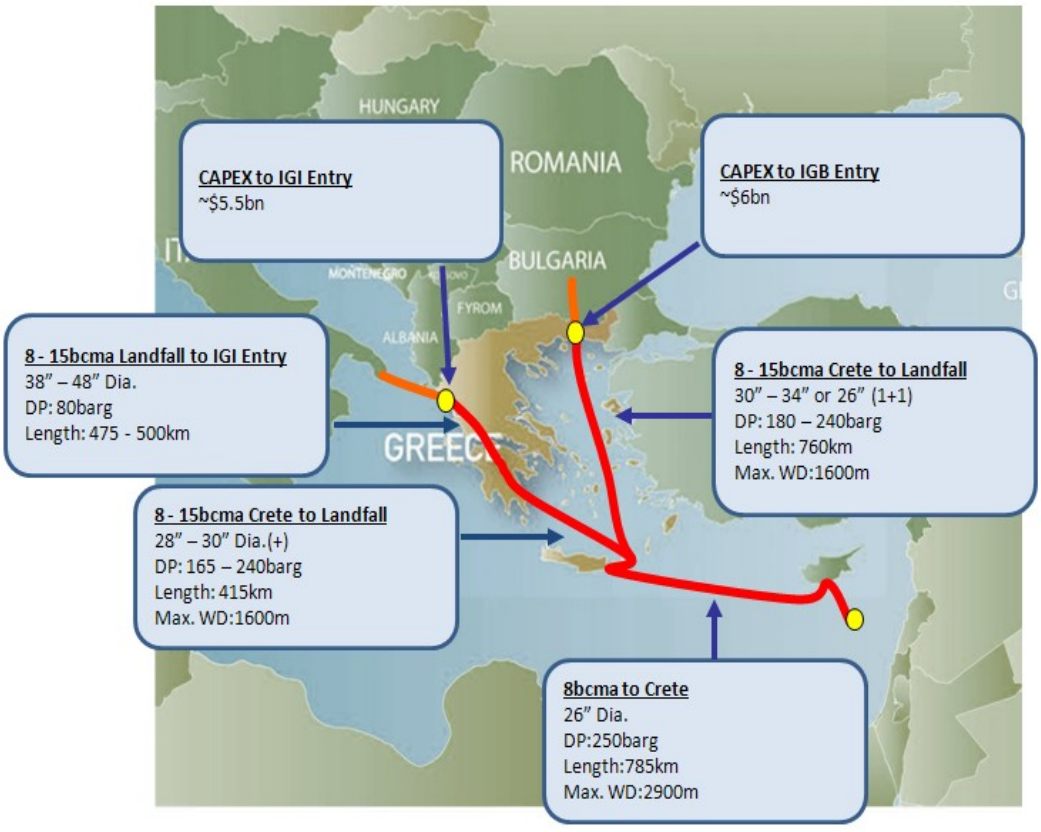
Source: DEPA

The above economic analysis which favours the pipeline through Greece option in comparison to a land based LNG terminal in Cyprus does not necessarily mean that a parallel LNG project should not be pursued. On the contrary, the existence of an LNG gas export terminal offers a wide variety of other advantages including export orientation versatility, export volume adaptation to fit production capabilities and client base diversification, which a pipeline option does not offer. On the other hand the existence of a permanent pipeline route provides additional security of supply to

the countries at the receiving end and further enhances the geopolitical importance of the supplier country. What the above initial tariff comparison clearly demonstrates is that the pipeline route option is not prohibitive in terms of cost as several analysts have repeatedly hinted but without reference to actual figures.

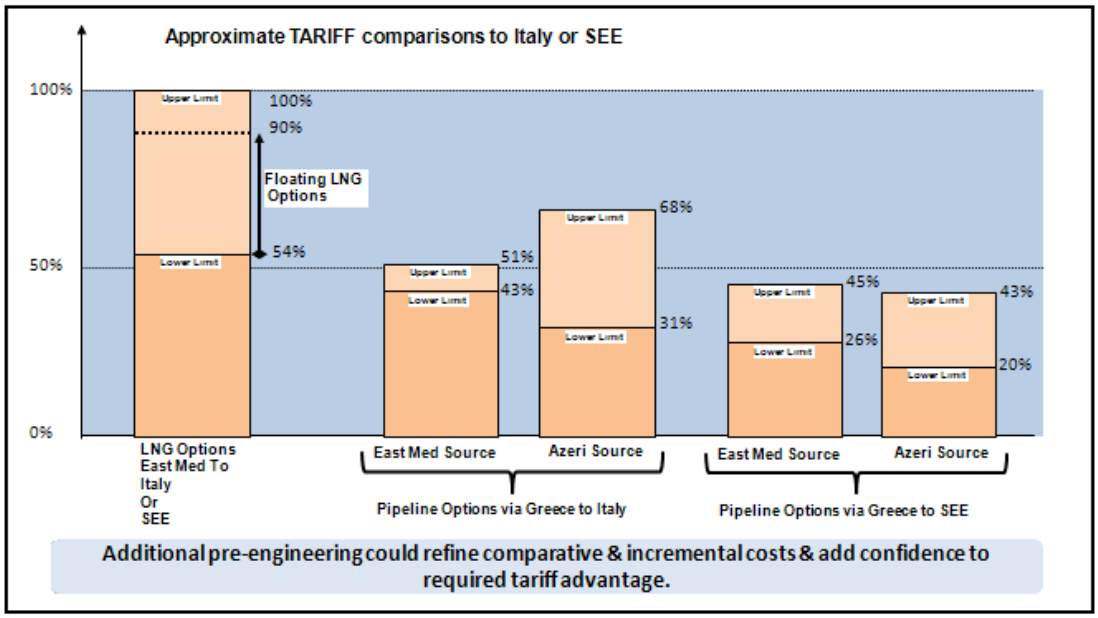
Actual CAPEX costs for the Cyprus to Greece pipeline up to IGI entry in North West Greece have been calculated at approx. $ 5.5 bn, and with the alternative route to IGI entry estimated to cost approx. $ 6.0 bn. *Figure 5.7* shows the two alternative routes along with their relevant technical characteristics. An estimation of the corresponding tariffs, in percentage terms, between the various options is shown in *Figure 5.7* Pending completion of the different feasibility studies currently being carried out by DEPA and other companies involved in this type of projects, a detailed cost analysis and cost-tariff comparisons could not be made by the authors.

Figure 5.7: Preliminary Key Characteristics of Cyprus to Greece Pipeline Options



Source: DEPA

Figure 5.8: Estimation on Tariffs, in Percentage Terms



Source: DEPA

In favour of the pipeline option for transporting natural gas from the Cyprus-Israeli gas field to European markets is the growing realization that by 2018 -2020 we may see a surplus of global LNG liquefaction capacity. A it has been recently pointed out by some analysts if all the approved projects in Australia are completed as planned, capacity will grow fourfold between 2011 and 2018. According to Citi this is a far faster rate of growth than Qatar managed[8]. If we add to the Australian capacity prospective USA and Canadian LNG exports we may see global LNG capacity increasing beyond 400 mt by 2020. And this capacity does not include the yet undetermined Israeli or Cypriot LNG export plans

[8] "Great gas in Asia," The Lex Colum, *Financial Times*, December 27, 2012

CHAPTER 6

THE CASE FOR AN EASTERN MEDITERRANEAN ENERGY CORRIDOR

Latest economic and political developments in the East Mediterranean are underpinned by renewed interest in hydrocarbon exploration and energy security. This is to be expected as several states in the Eastern Mediterranean, namely Israel, Cyprus and lately Greece are currently developing their offshore hydrocarbon resources. Results so far have been more than encouraging. The recoverable energy resources of the region, the Levant Basin and the Nile Delta Basin Province, are so large that the prospects of important economic changes are really promising. Indeed, the recent discoveries of natural gas in the Eastern Mediterranean are already altering the geopolitical map of the region, and highlighting its importance. Existing pipelines from Russia, North Africa and Norway, together with the proposed pipeline projects from the Caspian Sea Basin through Turkey, constitute the main natural gas corridors to Europe. All of these transit routes, however, are sourced from, and/or controlled by non-EU member states, some of which are not natural allies of the EU. An additional East-West energy corridor could establish a route through which the EU would be able to diversify further its natural gas supply, without being dependent on non-EU sources, and transit routes. Therefore, the prospect of an Eastern Mediterranean Energy Corridor (EMEC) should be given serious consideration, as it could prove to be of key strategic and economic importance, not only for this region, but to the EU as a whole.

Of paramount importance for the realisation of this energy corridor are a strong bilateral relationship, and a close co-operation in the field of energy between the states of Greece, the Republic of Cyprus and the state of Israel. In this respect, considerable progress has already been achieved. The constant exchange of visits in between by Greek, Israeli and Cypriot government leaders starting from Benjamin Netanyahu's historic visit to Greece in July 2010, his visit to Cyprus in March 2011 and President Shimon Peres's visit to Athens in October 2012 and several other visits by senior government officials just to mention some of the latest diplomatic moves, are indicative of the high level of economic and diplomatic ties and close co-operation in the energy sector now developing between all three countries. There appears to be a tacit agreement for joint action on national energy policy, which covers, inter alia, joint exploitation of gas, export destinations, location of terminals, etc.

A trilateral energy corporation agreement is in the making as the latest meeting between Energy ministers of all three state in Cyprus on November 10, 2012 clearly demonstrates (46). According to latest available information the three partite inter government agreement will cover all different aspects of energy cooperation including hydrocarbons, electricity, RES and energy efficiency. The signing of such an agreement is expected to firm up commitments for a joint energy strategy and speed up the implementation of the necessary infrastructure. Already Delek Energy Group, and Nobel Energy Inc., licensees of Cyprus' Block 12, have called for the construction of a liquefaction facility on Cyprus that, in its initial stages, would process and export natural gas received from the Israel's Leviathan field, and the Cyprus Aphrodite field. Consequently, a regional liquefaction facility in Cyprus would help provide other regional gas producers ready access to the European energy market, thus encouraging the further exploitation, and production of the Eastern Mediterranean gas fields.

Given the obvious advantages of having a secure source of energy, it would be in Europe's interest to be fully involved in the development of natural gas resources in the Eastern Mediterranean. In this respect, Cyprus together with Greece and Israel should seek EU Commission support. Greece and Italy, as well as other Southern EU countries could be of help in securing EU involvement. It must be stressed that such an energy corridor should not be seen as a competitor to existing energy supply routes, but as complimentary to Europe's overall efforts to diversify, and secure its energy supplies. The economic and political rationale of an Eastern Mediterranean Energy Corridor is manyfold.

The considerable interest shown in the second licensing round of Cyprus by international heavy-weights from European countries, such as France, Italy, the Netherlands and the UK testify to the importance of Cyprus's hydrocarbon deposits and point towards a fast implementation framework for the actual production. "Therefore, any action by Cyprus in the energy field should not be undertaken pro domo sua, but sould be seen in the interests of Europe, which has already recognised the need for active engagement in promoting the energy infrastructure of the East Mediterranean." (47)

The emergence of an East Med energy supply route apart from enhancing European energy security by helping diversify gas imports it, will also help the economies of the three countries involved, i.e. Israel, Cyprus and Greece. The establishment of such an energy corridor will have certain profound economic, social and environmental advantages which can be summarized as follows:

(i) Attract outside investment, in the form of FDI, to the region primarily in the hydrocarbon sector but also in related areas such as construction, logistics, oil and gas and telecommunication infrastructure etc.

(ii) The wide use of natural gas will be promoted by industry, the commercial and domestic sector resulting in improved environmental conditions while providing the opportunity for related investments (e.g. co-generation systems, energy efficiency etc).

(iii) The emergence of an oil and gas industry and the income that will be derived from increased oil and gas exports and gas storage and transiting will strengthen the region's economies. This is particularly important for Greece and Cyprus, which belong to the eurozone, and whose economies have been badly affected as a result of the ensuing crisis. In the case of Israel increased gas production will strength its energy economy.

(iv) For all three countries, the establishment of a diversified East Med energy corridor which will combine LNG liquefaction and LNG storage and gasification plants and an underwater pipeline linking the Leviathan Basin gas fields to Europe but also electricity interconnectors between all three countries, will enhance tremendously the energy security and will ultimately lead to energy independence of the countries concerned.

CHAPTER 7

THE ROLE OF GREECE

As it was already pointed out in the introduction of this Research Note, Greece's position as a regional energy player has suffered considerably as a result of the ongoing fiscal crisis and the general economic downturn. Some major gas transportation gas pipelines projects where Greece was involved, including the ITGI and the south route of the South Stream, have been abandoned while a territorial dispute with Albania is preventing the TAP project from moving ahead. Also, because of the negative economic climate and the high country risk involved a number of other gas related key infrastructure projects have been put on hold.

However, as Greece is widely anticipated to eventually overcome the present economic impasse with economic growth returning from 2014 onwards, it is useful to highlight the gas infrastructure projects which are bound to bring renewed interest from an investment point of view. These are projects of strategic importance for Greece's economy but also crucial in terms of national and regional energy security, and include the following:

- The **Trans Adriatic Pipeline (TAP)**, an 800km pipeline whose entry point shall be the end-point of the existing Interconnector Turkey-Greece (ITG), and which will pass through Greece and Albania to Italy with 480 km of its route crossing northern Greece.

- The extension of the existing **LNG terminal in Revythoussa**, which will involve the construction of a third LNG tank (95.000 m3) and the increase of the send-out rate from 1.000 to 1.450 m3LNG/h. The project is well underway and is expected to be completed by 2014 almost doubling the terminal's overall capacity.

- The **Underground Gas Storage at South Kavala**, through the conversion of a depleted gas field. The underground storage site is owned by the Greek State and the concessionaire has not been defined yet as the government, through the Privatization Agency, TAIPED, is planning to organize an international tender. The gas field is currently managed by the "Energean Oil & Gas" company the operator and current concessionaire of the entire Prinos concession area which clearly includes the Kavala Gas Field. The "Energean Oil & Gas" has already

submitted a detailed proposal for developing the Gas Storage facility in South Kavala.

- The **Alexandroupolis Independent Natural Gas System**, a project comprising of a Floating Storage & Regasification Unit (FSRU) LNG Terminal and a gas transmission pipeline system connecting the FSRU to the NGTS. This privately managed project is already well advanced in its licensing process.

- The **Aegean LNG Import Terminal**, another FSRU with a capacity of 3-5 bm3/year, to be located off Kavala, in northern Greece which will include all the necessary storage regasification and berthing facilities for LNG tankers with a capacity of at least 150.000 m3. This DEPA conceived project is still in its initial conceptual stage.

- The **Interconnector Greece-Bulgaria (IGB)**, a project with a 2014 construction date. This 180km pipeline has a projected capacity of 3 bm3/year and will be expandable up to 5 bm3/year, while it will also have a reverse flow cabability. This project is well advanced with a bilateral agreement between Greece and Bulgaria already signed, front end engineering completed and its financing secured through a combination of EU and state funds and bank lending.

- The **Trans-Mediterranean Gas Pipeline**, which will transport natural gas from the Levantine Basin into Greece's NGTS through Cyprus. The proposed pipeline will have a total length of 1.400km and could allow for reverse flow. It would be accompanied by the relevant project infrastructure facilities, including three onshore compressor stations - in Cyprus, Crete (Greece) and mainland Greece. The project is now beyond feasibility study stage and is currently being developed by DEPA.

- The **East Mediterranean Pipeline**, which will carry approx. 8 bm3/year and will be around 1.100km kilometers. It may also include a landfall in Crete, before its final destination in the mainland of Greece, which could also allow for the offtake of gas in Crete.

- The **Interconnector Greece-Italy (ITGI)**, a 613km pipeline which shall import up to 20 bm3/year of natural gas from the Caspian Sea region, through Greece into Italy. Although the project, as originally conceived, has been temporarily suspended, following the Shah Deniz II consortium's decision in March 2012 to exclude it (in favour of TAP and West Nabucco) the Greece – Italy pipeline known as Poseidon, has been retained by DEPA and Edisson (the J/V shareholders), as it can became a vital gas interconnector between Greece and Italy.

Some of the above projects are likely to be approved for inclusion in the **Connecting Europe Facility**, covering Energy, Transport and Telecommunication infrastructure, which means that they will receive funding from the EU cohesion funds so as to cover part of the required investments. Within the framework of the forthcoming consultation process on the energy infrastructure package, which shall include a proposal for a Regulation on guidelines for trans-European energy infrastructure, and a proposal for a Regulation on the Connecting Europe Facility covering Energy, Transport and Telecommunication infrastructure, twelve priority corridors and areas have been so far identified, and a procedure and criteria for projects, which include the above, to become a PCI have been defined. The European Commission has set out a list of projects, which include the above, to be considered in a forthcoming public consultation, as potential PCIs in energy infrastructure, with the view of passing all necessary regulatory measures and obtaining the necessary financing as early as 2014.

At this stage it is far from certain as to which of the above projects will eventually be eligible for funding and shall be approved for inclusion in the CEF facility. Even then their realization may not be guaranteed as is often the case with large projects of this nature. It is fair to say that some of these projects are more advanced than others and are already on the road to being implemented. These include the **upgrade of the LNG terminal in Revithoussa, the Interconnector Greece – Bulgaria (IGB)** and the **Alexandroupolis Floating LNG Terminal.** There is also a high degree of probability that the underground storage in the old South Kavala field will be realized and a decision by the Greek government's Privatization Fund (TAIPED) which handles the issue from an investment angle, may give the go ahead as early as the 2nd quarter of 2013. This means that the project may be implemented during 2014 – 2016.

The realization of the above three key projects in Northeast Greece in conjunction with the Revithoussa LNG terminal expansion and the existing Greek – Turkish gas interconnector (which has been in operation since 2007) lead to the conclusion that a mini gas hub is in the making in this particular geographic area.

Completion and operation of the IGB and the Floating LNG Terminal will provide important liquidity in terms of gas volume and of physical product delivery in this part of Greece, which is bound to influence the region's market. This liquidity will be further improved should the South Kavala underground storage facility be realized and also by the reverse flow capacity of the existing Greek – Bulgarian pipeline at Sidirokastro, which is already in the implementation stage. Even if TAP is not after all built the above described mini hub will help to upgrade considerably the region's energy input and transiting role.

- ***Greece could become an important gas corridor***

The emergence of the above described mini-hub and the gestation of some of the gas pipeline projects currently being considered, point out to Greece's potential role as a key gas corridor in SE Europe. This corridor will help serve two distinct requirements.

(i) The transiting of gas from the Israel – Cyprus gas fields to Europe, via Greece

(ii) The movement of gas from Greece's inland system, to the north via the IGB Interconnector and also, by means of the reverse flow capacity of the existing main gas Bulgaria – Greece pipeline at Sidirokastro, and potentially (in case of an emergency) from west to east via the existing Greek-Turkish gas interconnector.

Greece's capability in becoming a main regional gas route is further enhanced through the upgrading of the Revithousa LNG terminal and the possible addition of new LNG terminals in the north, as already mentioned. Even if a main gas pipeline is not built between Cyprus and Greece at this stage, the inflow of substantial LNG quantities that will result from the operation of a liquefaction plant on Cyprus, will reinforce Greece's position as a regional LNG storage and transiting hub, thus paving the way for it to become a main gas corridor.

However, the rationale of linking, by means of a pipeline Cyprus to Greece, remains strong both in terms of security of supply but also on the basis of pure commercial logic. The security of supply angle is self explanatory since, through this pipeline, gas supply diversification is achieved at an EU supply level further guaranteed by EU's own country resources. To that we may add Greece's nascent gas potential, from known hydrocarbon plays but hence to be identified fields in offshore areas west of the Peloponnese and south of Crete. The commercial aspect, although weak at present, on account of Cypriot only gas potential, is to be reinforced in view of two latest developments:

(i) Within 2013 further exploratory drilling is expected to take place in the Aphrodite (Block 12) field in offshore Cyprus, which according to government sources would help increase the field's estimated capacity to near 12 tcf.

(ii) Latest energy security concerns and forward planning by the Israeli government, following the armed conflict with Hamas in November 2012 in the Gaza strip, point to the need of securing LNG production in a geographical area beyond reach of enemy rockets, yet in the vicinity of Israel. This means that plans to divert gas production from Israeli fields to a land based liquefaction facility on Cyprus (at Vassiliko) are now being favoured by the Israeli administration and backed by the companies involved.

Hence sufficiently large gas volumes, in excess of 1.0 tcm, will become available for export which can back plans for the construction of parallel export facilities, i.e. gas pipeline and LNG. In the case of a gas pipeline from Cyprus to Greece (see map) a tie up in the Attica region or South Peloponnese will enable the smooth transit of gas through the existing (and planned) gas pipeline system in Greece, with export options north through the (planned) Poseidon interconnector to Italy and though the IGB interconnector, construction of which is planned to start within 2013, to Bulgaria, Romania and beyond.

The additional gas quantities, to be made available either through LNG exports from Cyprus or through the proposed gas pipeline, will provide the Greek system with extra volumes leading to much greater liquidity thus leading to gas to gas competition, a situation which will help the Greek market integrate fully, in terms of operation, to European market practice. Ultimately this will mean lower gas prices for the consumer and bigger margins for the operators and traders. That will be necessary if Greece is to manage and expand its present gas infrastructure, which is a prerequisite for the country's new role as a regional transit route.

Figure 7.1: The planned East Med gas pipeline

CHAPTER 8

KEY MESSAGES

1. There is a growing realization that the newly discovered hydrocarbon deposits in the East Mediterranean can play a significant role in European gas supply.

2. The prospect of an Eastern Mediterranean Energy Corridor (East Med) as an additional East – West energy corridor should therefore be given serious consideration, as it could prove to be of key strategic and economic importance, not only for this region, but to the EU as a whole.

3. Of paramount importance for the realisation of this energy corridor is the development of a strong bilateral relationship, and a close co-operation in the field of energy between Greece, the Republic of Cyprus and Israel.

4. The signing of a three-partite inter government agreement between Greece, Cyprus and Israel is expected to firm up commitments for a joint energy strategy and to speed up the implementation of the necessary infrastructure.

5. The construction of a liquefaction facility on Cyprus that would process and export natural gas from Israel's and Cyprus's gas fields is currently being considered as a strategic energy priority by the Cypriot and Israeli governments.

6. A liquefaction facility in Cyprus would help provide other regional gas producers ready access to the European energy market and thus encourage the further exploitation, and production of Eastern Mediterranean gas fields.

7. The construction of a pipeline from Cyprus to Greece and from there to Italy, via the Poseidon interconnector, which will transit natural gas from the fields in Israel and Cyprus, has until now been considered as an alternative option to an LNG liquefaction plant. Given the magnitude of the discovered gas deposits in the region a gas pipeline may also be developed in parallel to the LNG export option.

8. Given Europe's interest to be fully involved in the development of the natural gas resources in the Eastern Mediterranean, Cyprus together with Greece and Israel should seek EU Commission support.

9. The emergence of an East Med energy supply route apart from enhancing European energy security by helping diversify gas imports, it will also help the economies of the three countries involved, i.e. Israel, Cyprus and Greece.

10. There are several key energy projects currently considred in the natural gas sector which are of strategic importance for Greece's economy but also crucial in terms of national and regional energy security. These include the **Trans Adriatic Pipeline** (TAP), the extension and upgrading of the existing **LNG terminal in Revythoussa**, the **Underground Gas Storage in South Kavala**, the **Alexandroupolis Independent Natural Gas System (FSRU)**, the **Aegean LNG Import Terminal (FSRU)**, the **Interconnector Greece-Bulgaria** (IGB), the **East Mediterranean Pipeline** and the **Interconnector Greece-Italy** (ITGI). Although ITGI has temporarily been suspended following SDII's decision of March 2012, Greece maintains this option on account of the Poseidon interconnector, and its maturity as a major infrastructure project.

11. Some of the above projects are likely to be approved for inclusion in the Connecting Europe Facility, covering Energy, Transport and Telecommunication infrastructure, which means that they will receive funding from the EU cohesion funds so as to cover part of the required investments.

12. The realization of **IGB**, the **Alexandroupolis Independent Natural Gas System** and the **Underground Gas Storage at South Kavala**, in conjunction with the **Revithoussa LNG terminal** expansion and the existing **Greek – Turkish gas interconnector** (which has been in operation since 2007) lead to the emergence of a mini gas hub in this particular geographic area.

13. The above mini-hub and the gestation of some of the regional gas pipeline projects currently being considered, point out to Greece's potential role as a key gas corridor and its emergence as a main regional gas route in SE Europe.

14. The rationale of linking, by means of a pipeline Cyprus to Greece, remains strong both in terms of security of energy supply and also from serving pure commercial interests. A gas pipeline from Cyprus to Greece, which can tie up in Attica or South Peloponnese, will enable the smooth transit of gas through the existing (and planned) gas pipeline system in Greece, with export options north through the (planned) Poseidon interconnector to Italy and though the (planned) IGB interconnector to Bulgaria, Romania and beyond.

15. Even if a main gas pipeline is not built between Cyprus and Greece at this stage, the inflow of substantial LNG quantities that will result from the operation of a liquefaction plant on Cyprus together with an expanded Revithousa LNG terminal, will reinforce Greece's position as a regional LNG storage and transiting hub, thus paving the way for it to become a main gas corridor.

16. Greece's priority is to manage and expand its present gas infrastructure, which is a prerequisite for the country's new role as a regional transit route.

CHAPTER 9

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