
The Competitive Advantage of the Forthcoming Mediterranean Energy Hub and its Implementation Alternatives: the EastMed Pipeline or an LNG Terminals Network?

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Abstract:

It has been nearly a decade since the Southeastern Mediterranean region came to the forefront after the discovery of significant gas deposits in offshore fields located within the Exclusive Economic Zones (EEZ's) of Egypt, Cyprus and Israel. Gradually, the region drew the attention of major oil companies (Total, Statoil, ENI, Exxon Mobil, BP, Rosneft Qatargas) who wished to engage by applying –on a theoretical basis - a series of exploitation projects including pipeline and/or LNG terminal networks. At first, the aim of this paper is to investigate the viability and competitiveness of a forthcoming energy hub in South-East Mediterranean, its role and the inevitably fierce competition by other well-established or emerging gas producing areas. In this task, there are a number of direct parameters that need to be taken under deep consideration. On the other hand, European Union is reconsidering its energy policy, seeking to enhance its steady gas supply by implementing a strategy of diversification in counterparts, routes and sources. On second stage the paper examines and evaluates the alternative options of implementing a Mediterranean energy hub, translated into the construction of the EastMed pipeline or the promotion of an LNG terminals network respectively. Additional factors such as close proximity to key maritime routes, the dominance of Greek LNG shipping sector and the existence of the entire appropriate infrastructure (port terminals, refineries, shipyards, human capital) ensure Europe's gradual energy independence.

Key Words: *Cyprus, Greece, Energy Corridors, Pipeline Networks, East-Med Project, LNG Terminal Network*

[This work has been partly supported by the University of Piraeus Research Center](#)

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1. Introduction

Energy has always been a key component of enhancing European sustainability and welfare. Since 2008, global economy has entered into a new era of economic instability, where globalisation faces protectionism and transnational relations are tested while, as it refers to Europe, a new pillar is emerging and it is called Energy Geopolitics.

The region of the South-East Mediterranean holds the lion's share of world's interest as recently potential gas deposits in the Levantine Basin came into light. Under this scope, different Energy Policies come to the forefront as there is a vast necessity to ensure Europe's energy independence in turbulent times. Europe needs to adopt a steady geopolitical direction that would pave the way in this new era by reducing its energy dependence from Russia.

In the forthcoming lines, the most important parts of the existing European pipeline network are being analysed. The promotion of a specific South-East Energy Corridor that connects Greece and Cyprus in terms of economic and geopolitical feasibility is also highlighted, as European Union seeks to enhance its gas security of supply by implementing a strategy of diversification of counterparts, routes and sources.

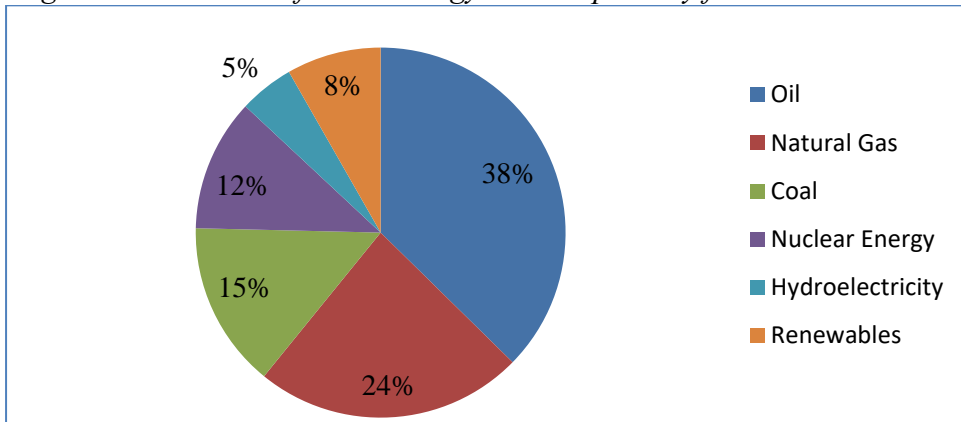
A South-East Energy Corridor may create conflicted interests in the region -that should be seriously taken into account- but, long term benefits for all the stakeholders involved are being accumulated. The South-East Mediterranean could become a major global energy hub supported by a Creek-Cypriot Maritime Cluster in terms of transportation. In order for all the above to become reality, the region must seek ways to attract investments and provide incentives for energy companies under a flexible and friendly business framework.

2. The European Energy Sector

2.1 Facts and Figures

In 2016, European Union held 12.4% of the world's energy consumption, reaching almost 1642 million tons. Moreover, in order to support its heavy industry, EU adopts a diversified energy policy that includes the use of oil, natural gas, coal, nuclear energy, hydroelectricity and renewable energy (biofuels etc.) as it is depicted in Figure 1.

Figure 1. Allocation of EU's Energy Consumption by fuel



Source: BP Statistical Review of World Energy – June 2017

Oil and natural gas account for 62% of energy consumption in Europe¹. It needs to be pointed out though, that EU's energy consumption levels have been declined in the last decade by 10.3%, due to certain reasons, such as the economic recession, supply disruptions of Russian gas but most importantly, due to the increasing share of renewables in power generation and also hydroelectricity. European Union's change of direction towards Green Energy Projects is clearly depicted on Table 1.

Table 1. EU's Energy Consumption Levels 2006 vs 2016 (in mil tonnes)

Type of fuel	2006	2016	% change
Oil	727.3	613.3	-15.2%
Natural Gas	441.1	385,9	-12.5
Coal	327.2	238,4	-27%
Nuclear Energy	224.1	190	-15.2%
Hydroelectricity	71.5	78.7	+10%
Renewables	39.1	135.6	247%
Total	1830.2	1642	-10.3%

Source: BP Statistical Review of World Energy – June 2016

¹ BP Statistical Review of World Energy – June 2017 available at <https://www.bp.com/content/dam/bp/pdf/energy-economics/statistical-review-2016/bp-statistical-review-of-world-energy-2016-full-report.pdf>

Global economy seems to enter in a recovery mode period and so does the European Economy. The global GDP growth for 2016 stood at 2.6% and European GDP growth for the same year was 1.9% respectively². As a result it should be highlighted that in the last couple of years, EU's energy consumption levels are again on the rise, by achieving a 0.9% growth on a year-to-year basis. It should be highlighted though that Natural Gas was the fuel with the highest annual growth in terms of consumption (7.1%), depicting the demand for that source of energy.

Table 2. EU's Energy Consumption Levels 2015 vs 2016 (in mil tonnes)

Type of fuel	2015	2016	% change
Oil	600.6	613.3	1.8%
Natural Gas	359.2	385.9	7.1%
Coal	261.1	238.4	-8.9%
Nuclear Energy	194	190	-2.3%
Hydroelectricity	77.2	78.7	1.7%
Renewables	134.6	135.6	0.5%
Total	1626.7	1642	0.9%

Source: BP Statistical Review of World Energy – June 2017

2.2 European Gas Demand

Dispite the fact that global economy is on a recovery mode, many analysts project that until 2035 gas as a fuel will be the primary source of energy not only as it refers to European Union's energy needs, but on a worldwide level, especially if we take into consideration the new fundamentals of supply and demand in the Global Gas market. The consecutive shutdowns of coal plants, the rise in Asian gas demand (mainly attributed to China's energy shift), the optimization of drilling costs and the new drilling technology (such as fracking) that has led to US shale oil and gas revolution, bring natural gas on the forefront. Moreover, gas might well play an increasing role in the transportation sector, as a fuel for trucks and vessels (LNG-fuelled).

As it refers to EU, gas is an essential component of the region's energy mix by constituting 24% of primary energy consumption and contributes mainly to electricity generation, heating and fuel for industry and

² UNCTAD's Review of Maritime Transport 2017 available at http://unctad.org/en/PublicationsLibrary/rmt2016_en.pdf

transportation³. European gas demand have plunged from a peak of almost 500 bcm in 2010, to 384.5 bcm in 2014. In 2016 though and due to lower energy prices worldwide, European gas demand reached 429 billion cubic meters. In the short term, gas demand in Europe seems to be in a modest process, totally correlated with the economic recovery of the Union.

EU holds only 0.7% of world total proved gas reserves. If the analysis proceeds into a wider region, Eurasia for example, that holds 30.4% of world's proven gas reserves (56.7 trillion cubic meters), it comes as no surprise that Europe targets on specific regions in its eastern borders in order to cover its energy deficit. In 2016, European Union's natural gas trade movements that took place by pipeline stood at 416 bcm (88% market share) while the LNG imports –via LNG vessels- stood at 56 bcm (12% market share). EU's main natural gas importers (via pipelines) are Russia and Norway, which accounted for 166 bcm and 110 bcm respectively, while in terms of LNG imports (via vessels), Qatar supplied 24 bcm and Algeria 15 bcm respectively.

It is obvious that EU relies on a limited number of suppliers, in fact the EU dependency on external suppliers stands at 73%. This high level of dependency on a small number of external suppliers has generated a broad debate over the years in Europe on the issue of gas supply security⁴. Actually, in 2008 the EU launched a strategic plan about the diversification of gas supplies, by taking into deep consideration the new status-quo that emerged after consecutive natural gas crises in 2006 and 2009, caused by Russian-Ukrainian disagreements about pricing, that led to long lasting gas disruptions in many Central and Eastern European countries, something that clearly affected the reputation of Russia as reliable supplier of Europe.

3. Existing and Future Pipeline Networks in Europe's Eastern Territory

Natural gas supply to Europe is currently taking place through four major pipeline networks:

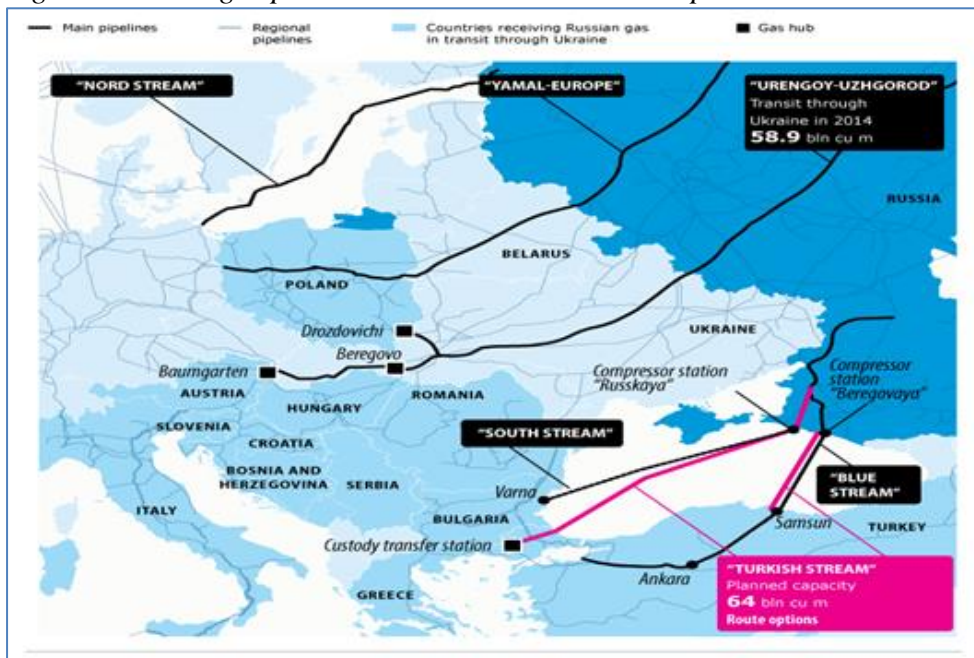
³ M. Hafner, M. and S. Tagliapietra (2013), *"The Globalization of Natural Gas Markets: New Challenges and Opportunities for Europe"*, Deventer, Netherlands: Claeys & Casteels

⁴ G. C. Pelagias (2012), *"Major Gas Finds in Eastern Mediterranean-a source of new supply and conflicts in South East Europe"*, Network for Oil and Gas, Stockholm

- The “Nord Stream Project” (transitted 23,8 bcm in 2013)
- The “Yamal-Europe” through Belarus (transitted 37,4 bcm in 2013)
- The “Blue Stream Project (transitted 14,7 bcm in 2013) and,
- The “Urengoy-Uzhgorod” through Ukraine (transmitted 83,9 bcm in 2013)

Gazprom intends to abandon gas supplies to Europe through Ukraine after 2018 and the “Urengoy-Uzhgorod” Project that now holds 51% of gas supply through pipelines to Europe, must somehow be replaced by other forthcoming projects⁵. For example, as it is depicted on Figure 2, Russia promotes the “Turkish Stream Project” -ex. South Stream-, a pipeline that will transfer gas from Russia to Turkey’s Eastern Thrace with a capacity of 64 bn cbm annually. Then, the EU should construct the rest of the mainland pipeline network by itself.

Figure 2. Existing Pipeline Networks in Eastern Europe

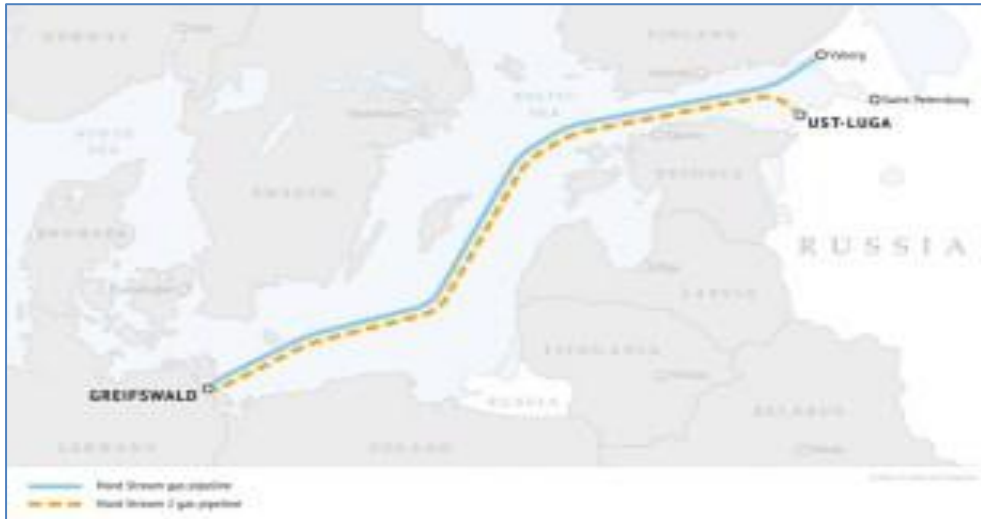


Recently, five european energy companies (Shell, Engie, OMV, Uniper and Wintershall) have signed financing agreements with Gazprom

⁵ tass.com/infographics/7275 Gass pipelinsto Europe by 2018

about the “Nord Stream 2 Project”⁶, a 1.2 km pipeline that would transfer 55 bcm of Russian Gas through Baltic Sea to Germany, as it is depicted in Figure 3. The total cost of the Project is estimated at 9.5 bn \$, with Gazprom being the main shareholder of the Project (50% stake). The new Pipeline will be delivered in late 2019.

Figure 3. The “Nord 2 Project” Pipeline



At this point a question raises and has to do about whether EU trully wishes a change in its energy policy direction towards new potential gas reserves in SouthEast Mediterranean, instead of Russian gas supplies⁷.

3.1 TANAP & TAP Pipeline Projects

Another pipeline network which is proved to be competitive to a South-East Energy Corridor is the over-promoted “Trans-Anatolian Natural Gas Pipeline -TANAP” that would transit gas from Ajerbaijan’s eastern edge of the Caspian Sea (Shah-Deniz field) to Italy’s southeastern shore, connected with Greece’s “Trans Adriatic Pipeline -TAP”⁸. Ongoing

⁶ Nord Stream 2 AG and European Energy Companies Sign Financing Agreements, available at: <https://www.nord-stream2.com/media-info/news-events/nord-stream-2-ag-and-european-energy-companies-sign-financing-agreements-47/>

⁷ Tagliapietra, S. (2016). “Will the European Market need East Mediterranean Gas?”,

⁸ Barden, J. (2014). “Natural gas pipelines under construction will move gas from Azerbaijan to southern Europe”, available at <https://www.eia.gov/todayinenergy/detail.php?id=23332>

operations to build TANAP, are to be completed by 2019 and will cost roughly \$10 billion. The 2.000 km long pipeline will have a carrying capacity of 16 bcm per year, of which 6 bcm will cover Turkish domestic needs and the rest 10 bcm, will be delivered to European countries via TAP. At a second stage, TANAP is planned to increase deliveries up to 24 bcm.

As it refers to Trans Adriatic Pipeline, this project was also selected by the Shah Deniz consortium in order to carry gas to Europe from Turkey's western border- instead of the northern route (Nabucco West). The pipeline is designed with an initial transport capacity of 10 bcm annually, having a combined length of 682 km onshore and 105 km offshore. It is estimated that the construction cost of the pipeline will reach \$ 5.3 billion⁹.

Figure 4. TANAP and TAP Projects
Major natural gas transit pipelines



3.2 Balkan Interconnectors

Bulgaria, Romania and Serbia plan to expand their gas infrastructures, especially, gas interconnectors, in order to avoid future gas disruptions and increase their energy security. The region will be supplied with new natural gas quantities transited from the TAP pipeline or other forthcoming projects such as floating LNG terminals –FSRU- in Northern Greece. The

⁹ <http://www.kathimerini.gr/856113/article/oikonomia/epixeirhseis/o-agwgos-tap-kai-ti-anamenetai-na-shmatodothsei-sthn-perioxh>

Production/Consumption Index of the Region stands at 19%, as the region is major gas importer¹⁰.

The projected Balkan Interconnectors to be constructed are:

- The Interconnector Bulgaria and Romania (IBR)
- The Bulgarian-Turkish Gas Interconnection (ITB) will carry up to 3 bcm annually
- The Bulgarian-Serbian Gas Interconnector (IBS) will carry up to 1,8-4,5 bcm annually
- The Greece-Bulgaria Gas Interconnector (IGB) will carry up to 3-5 bcm annually and,
- Other Gas Interconnectors between Romania, Hungary and Serbia.

Figure 5. Balkan Interconnectors in SE Europe



4. Feasibility of a South-East Energy Corridor in Europe

European Union strongly promotes the enhancement of its Internal Energy Market in order to foster natural gas flows between EU member states, but most specifically it studies the promotion of a South East Gas Corridor, based on potential resources of the Eastern Mediterranean Region. The official document on which the Southern Gas Corridor is based is the “Second Strategic Energy Review-an EU Energy Security and Solidarity

¹⁰ *Background Paper for IENE’s regional conference on “Energy Security and Gas Supply in SE Europe”, Vienna, March 12, 2015*

Action Plan”¹¹. In this document the South-East Gas Corridor is recognized as one of the EU’s highest energy security priorities in order for the EU to enhance its supplies via diversification of counterparts, routes and resources.

In 2009, Noble Energy Inc. discovered the first major gas deposit in the EEZ of Israel and in less than a decade the Southeastern Mediterranean is at the center of the global oil industry's concern by shaping new geopolitical balances. But, in the years followed, the drilling operations that took place in certain fields -Aphrodite, Leviathan and others- did not reveal a sufficient amount of reserves that would ensure a steady gas supply to Europe on a first phase.

In 2017, as global oil prices are on the rise and the drilling technology has been updated in a cost-saving direction, the South-East Mediterranean Region draws again the attention of the major energy players like Total, Statoil, ENI, Exxon Mobil, BP, Rosneft and Qatargas in the light of new potential reserves in the EEZ’s of Cyprus, Israel and Egypt¹².

The promotion of a South-East Energy Corridor could implement two alternative options; the first one has to do with the adoption of a pipeline, the EastMed Project connecting Cyprus and Greece’s potential deposits , which will probably face great competition from the aforementioned pipelines network¹³. The second option has to do with the enhancement of the appropriate Mediterranean LNG Terminals Network with a capability of storing and regasification of liquified natural gas, in order to take advantage of the regional maritime cluster, the geopolitical importance of local ports and the magnitude of Greek Shipping in terms of its fleet of LNG vessels.

4.1 The EastMed Project

The Eastern Mediterranean (EastMed) Pipeline Project refers to the construction of an offshore/onshore natural gas pipeline that connects directly Eastern Mediterranean gas resources of Cyprus and Israel to Western Greece via Cyprus and Crete. The fulfilment of the Project demands the additional construction of “The Poseidon Pipeline” that will connect Epirus Region (North Ionian Sea) with the Italian Region of Otranto. The project is being

¹¹ European Commission (2008) “*Second Strategic Energy Review-an EU Energy Security and Solidarity Action Plan*”, Brussels

¹² <http://news.ihsmarkit.com/press-release/catherine-gifford/totals-offshore-cyprus-block-11-could-rival-egypts-zohr-natural-gas->

¹³ De Micco P. (2014) “*The Prospect of Eastern Mediterranean Gas Production: An Alternative Energy Supplier for the EU?*” Policy Department, European Parliament

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currently designed to transport up to 16 bcm annually, through 1.300 km of offshore pipeline and 600 km of onshore pipeline¹⁴, from the off-shore gas reserves in the Levantine Basin, as well as from potential gas reserves in Western Greece and Southern Crete, as it is depicted in Figure 6.

The EastMed project is comprised of:

- 200 km offshore pipeline stretching from Eastern Mediterranean sources to Cyprus,
- 700 km offshore pipeline connecting Cyprus to Crete island,
- 400 km offshore pipeline from Crete to mainland Greece (Peloponnese) and
- 600 km onshore pipeline through Peloponnese and Western Greece

Figure 6. The “EastMed Pipeline” and its Interconnectors



The EastMed Pipeline Project was initially proposed in August 2010 and then aggressively promoted by Benjamin Netanyahu in 2011, especially after the deterioration of Turkish-Israeli relations that followed the Mavi Marmara incident. The Project was also strongly supported by Greece's PM of that time Antonis Samaras, as it was stated the EastMed pipeline, was the only export project worthy of serious Greek diplomatic support.

In May 2015, the European Commission declared the EastMed Pipeline as a Project of Common Interest –PCI- included in the second PCI list among other Southern Gas Corridor Projects¹⁵. There is an ongoing

¹⁴ <http://www.igi-poseidon.com/en/eastmed>

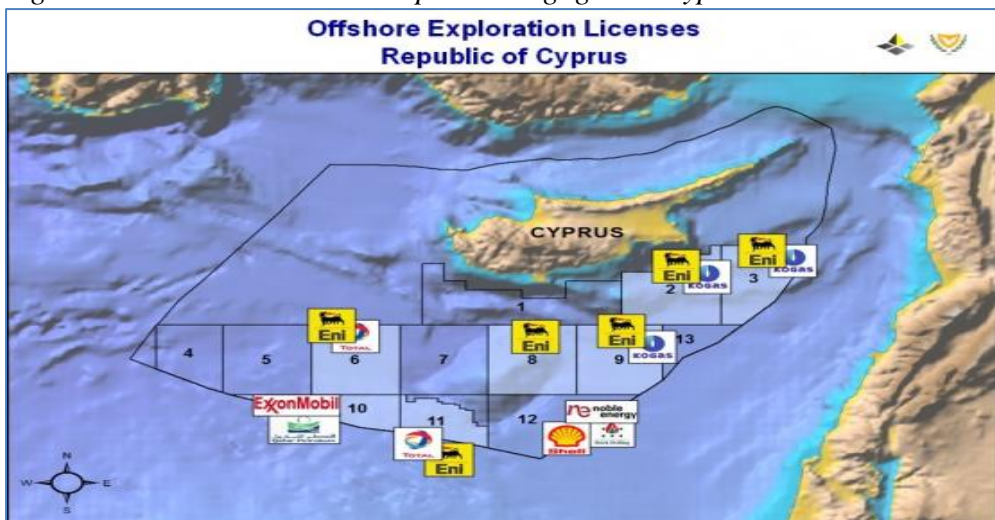
¹⁵ http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:JOL_2016_019_R_0001&from=EN

feasibility study about technical and commercial issues of the Project which is going to be realised at the end of 2017 and was also awarded in 2015 with European grants of 2 million euros¹⁶.

4.1.1 The Framework of Drilling Operations in Cyprus

It should be clearly stated that EastMed’s Project viability exclusively depends on joint exploitation of proven or potential gas reserves of Israel (Leviathan Field with a capacity of 476 bcm), Cyprus (Aphrodite Field/Block 12 with a capacity of 165 bcm) and Greece (potential reserves in the Ionian Sea and Southern Crete). Cyprus had successfully completed an international bidding process about exploration of Blocks 6,8 and 10 to four international energy companies: Eni, Total, Exxon Mobil and Qatar Petroleum¹⁷, as it is depicted on Figure 7.

Figure 7. International Oil Companies Engaged in Cyprus Blocks



Since July 2017, Total/ENI have started drilling activities in Block 11¹⁸, a field that would probably rival the huge Zohr field in Egypt¹⁹. The

¹⁶ <https://ec.europa.eu/inea/en/connecting-europe-facility/cef-energy/projects-by-country/multi-country/7.3.1-0025-elcy-s-m-15>

¹⁷ “Three blocks awarded offshore Cyprus”, Oil & Gas Journal, 23 December 2016, available at <http://www.ogj.com/articles/2016/12/three-blocks-awarded-offshore-cyprus.html>

¹⁸ <http://www.kathimerini.gr/918630/article/epikairothta/politikh/h-gewtrhsh-sto-oikopedo-11>

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Republic of Cyprus issued a NAVTEX²⁰ on 22/6/2017 by prohibiting anyone to approach the platform “WEST CAPELLA” in less than 500 m. The platform will drill in 1.698 meters deep for a period of two months. If the ongoing drilling operations prove new massive deposits until the end of 2017, then a variety of export options could be implemented in order to create a reliable and safe transmission network, capable of meeting part of Europe’s current and future needs.

Moreover, ENI/Total proceeded with drilling operations in Block 6 in early 2017 that proved potential reserves of 6 trillion cubic feet²¹. For the time being, this is a disputable maritime area between Turkey (via Turkish Republic of Northern Cyprus) and the Republic of Cyprus²². The dispute extends to Greece as it refers to Kastelorizo and the continental shelf matters with Turkey (Figure 8).

Figure 8. Turkey’s Claims on Cyprus’ EEZ



¹⁹ <http://www.kathimerini.gr/900445/article/epikairothta/kosmos/kypros-ektimhseis-eidikwn-gia-ypar3h-megaloy-koitasmatos-fysikoy-aerioy-sthn-aoz>

²⁰ <http://www.bankingnews.gr/%CE%B4%CE%B9%CE%B5%CE%B8%CE%BD%CE%AE/item/313735-ekdothke-h-prwth-navtex-gia-thn-protoimasia-twn-gewtrhsewn-sto-oikopedo-11-sthn-kypro.html>

²¹ <http://www.kathimerini.gr/948433/article/oikonomia/die8nhs-oikonomia/eni-toylaxiston-6-tris-kyvika-podia-ta-apo8emata-fysikoy-aerioy-sto-koitasma-kalyvw>

²² <https://maritimecyprus.com/2017/07/25/turkey-false-claims-on-cyprus-exclusive-economic-zone-eez/>

Finally, the US-based Exxon Mobil which has gained the right to proceed in drilling operation in Block 10, will follow a wait-and-see strategy and does not plan to start drilling earlier than 2018²³.

4.1.2 The Framework of Drilling Operations in Western Greece and Southern Crete

The exploration programs in Greece were awkward and speculative so far. In summary the exploration history of Greece spans from 1903 -first well in Zakynthos island by London Oil Development Co. Ltd- to 2001 -last well drilled was Demetra-1, in Ioannina area by Enterprise Oil. As it can be seen on Table 2, there was no drilling operation in Greece during the 1990's.

Table 3. Number of Drilled Wells in Greece 1903-2001

1903-1959	16 wells
1960's	19 wells
1970's	8 wells
1980's	38 wells
1990's	No wells
1998-2001	4 wells

Ionian Zone in Western Greece is a possible hydrocarbon producing area. Oil seeps are abundant and the zone is composed of Triassic evaporites and carbonates that are overlain by Jurassic-Cretaceous carbonates and Cretaceous-Tertiary clastics²⁴. One exploration well was drilled in 2001 at the depth of 3.900 m. but, due to high pressures encountered the well was killed. Experts suggest that drilling in Western Greece should continue, as so far, only one discovery has been made in West Katakolon. The geology of the Western Greece needs a modern technology to be implemented and international companies with experience in drilling in deep sea and in thrust areas.

The last decade there is a revolution in the upstream industry by utilizing the fracking techniques that break very tight rocks and event the source rocks. That is the reason they called unconventional since these

²³ <http://www.kathimerini.gr/919660/article/epikairothta/politikh/den-sxediazeti-gewtrhseis-prin-apo-to-18-h-exxon>

²⁴ A. Mavromatidis (2016), "A review of hydrocarbon exploration in Western Greece Western Greece and its potential"

techniques do not target the reservoir rock which hosts the HCs (conventional) but the source rock and even the cap rock. This revolution made the US to be one of the first producers of oil now and most possible helped the oil price to be at prices below 50\$/barrel since mid 2014. Today all countries with proven resources are trying to maximize if any, of their unconventional resources.

In Greece there is not any reporting of unconventional resources and is obvious the reasoning behind this since the last exploration efforts ended in 2001 where the unconventional industry was at an infant age. There are a lot of arguments about the environmental risk for the unconventional techniques but it is certain that in western Greece the above units are everywhere and hence there are plenty of areas, far away from residential areas that can be targeted and tested as an unconventional play. Possible areas, for targeting are the thickest zones of the units.

In 2012, after ten years of the last drilled well in Western Greece (Demetra-1) the Greek government started looking to revive the forgotten HC exploration activity and organized the legislation, updated fiscal terms and in general tried to attract IOCs. In present times potential reserves in Southern Crete and Western Greece have drawn the attention of major energy companies like Exxon Mobil, Total, ELPE and Energean Oil/Gas by signing offshore licensing rounds about drilling explorations in Western Greece²⁵. ELPE's operation will take place in the regions of Northwest Peloponisos and Arta-Preveza, while Energean (runs projects in Israel's and Egypt's gas reserves) will operate in the region of Aitoloakarnania.

In particular, Total, one of the top-6 energy companies worldwide has entered into an exploration agreement about Block 2, west of the island of Kerkyra in cooperation with the Italian Eni, and other explorations are going to follow in Block 10 in NW Peloponisos (Figure 9). Drilling operations will start at the end of 2018.

It needs to be mentioned that from the twenty potential blocks of Greece's EEZ available for drilling operations, nine of them are included in the southern region of Crete²⁶. According to Spectrum's report in cooperation

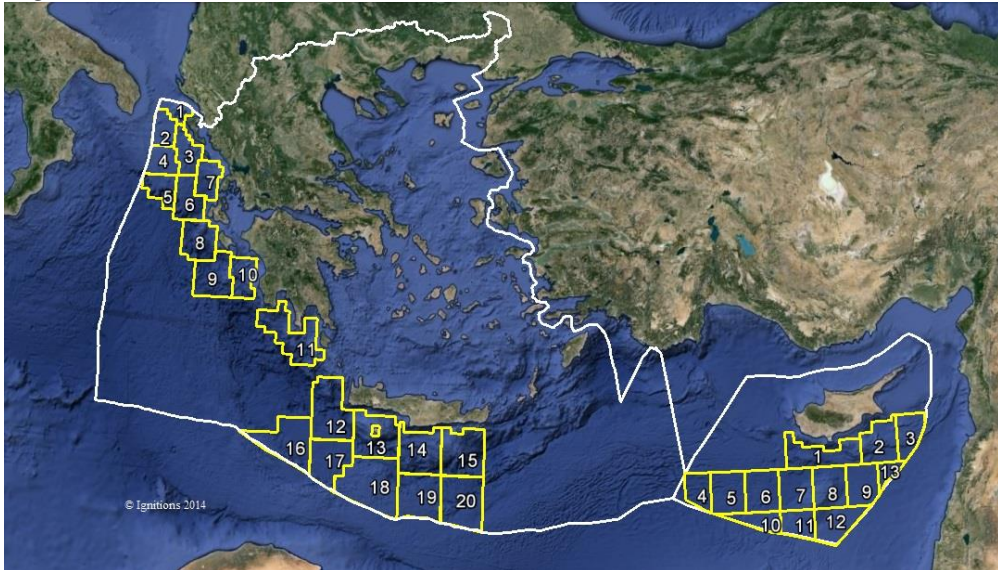
²⁵ <http://www.kathimerini.gr/900115/article/epikairothta/ellada/ti-synepagetai-h-symfwnia-elpe---exxonmobil-gia-thn-ellada>

²⁶ <https://energypress.gr/news/poia-einai-ta-20-blocks-opoy-tha-ginoy-n-ereynes-gia-petrelaio-kai-aerio-ta-9-vriskontai-stin>

with Greek geophysical company ION, the estimated value of the reserves between Libya and Crete, reaches \$ 600 bn²⁷.

On May 31st 2017, the consortium of ELPE-Total-Exxon Mobil filed an application to the Greek Ministry of Energy for acquiring a region of 20.000 sq.km southwest of Crete in order to proceed with drilling operations²⁸, while “Energean Oil and Gas” targets on the region between Kerkyra and Lefkada (6.700 sq. km), as Western Greece is covered by northwest-southeast trending geotectonic units constituting the southern prolongation of Albania, Croatia and Montenegro.

Figure 9. Blocks in Western Greece and Southern Crete



Since 2012, when the Greek state restarted the process of granting areas for exploration and exploitation of hydrocarbons to specific energy companies and after 15 years of stagnation and inactivity in this matter, so far there have been 6 regions granted for operations in Western Greece, namely Ioannina, Katakolo, Patraikos Gulf, Aitoloakarnania, NW Peloponnese and Arta - Preveza, while the contract for drilling operations in Block 2 in the Ionian Sea was recently signed by a consortium of ELPE, Total, Edison.

²⁷ Konofagos, E., and Fokianou T. (2017). “Supergiant "Zohr Type" Reef Reservoir Discoveries South-West of the Island of Crete?”, unpublished paper, Energy Committee of the Academy of Athens.

²⁸ <http://www.kathimerini.gr/910718/article/oikonomia/ellhnikh-oikonomia/symfwnia-elpe-me-exxonmobil-kai-total>

The administration of EDEY (Hellenic Hydrocarbon Resources Management) is in the process of planning both the reprocessing of the seismic data collected by the Norwegian PGS in 2013 and launching new ones in land areas of Central Greece with a high priority. Moreover, the promotion of marine areas that have not shown investment interest during the 2013 licencing rounds is also highlighted²⁹. The aim of the Greek state is to make full use of the favorable conditions that have been established by the identification of large deposits in the South East Mediterranean region, and at least with its attitude it sends positive signals to the world oil industry.

4.1.3 Contribution of EastMed Pipeline

In April 2017 Israel, Greece, Cyprus and Italy signed a preliminary agreement³⁰ to commence preparations for the construction of the pipeline which is hoped to be completed by 2025. Stakeholders believe that EastMed Pipeline is a pipe that unites, as Cyprus and Israel are very reliable suppliers and this is the main reason that it must be supported by all the members of the European Union. The EastMed Pipeline strengthens EU as a reliable buyer and encourages the development of resources that otherwise would remain stranded. EastMed Pipeline is Project with huge political and economic cumulative impact on a regional and global level as well.

a) Greece and Cyprus strengthen their position as Reliable EU Pillars in the Eastern Mediterranean

The construction of an EastMed pipeline enhances European security of gas supply, in terms of developing EU's indigenous resources. Greece and Cyprus are devoted to the principles of EU, consisting important pillars that provide sustainability in a very fragile region -political unrest in Turkey, Syria Civil War etc. It is common sense that the majority of International Oil Companies (IOC) stakeholders and certain political leaderships through Europe, under no occasion want to see Turkey's conversion into a major energy hub and Europe's energy needs to be determined by Mr. Erdogan's will³¹. The most recent example comes from Gazprom and its decision to

²⁹ <http://www.kathimerini.gr/917604/article/oikonomia/ellhnikh-oikonomia/energeiakh-diplwmatia-se-e3eli3h>

³⁰ <http://www.euractiv.com/section/energy/news/italy-greece-cyprus-and-israel-eye-longest-offshore-gas-pipeline/>

³¹ <http://www.kathimerini.gr/901241/article/epikairothta/politikh/o-erntogan-fovizei-tis-etaireies-aerioy>

exit the domestic Turkish Market by selling its Turkish assets³². Gazprom has abandoned its ambition to become one of the biggest players in Turkey's gas imports and trading market as the Turkish Government has taken steps towards nationalization of nearly 900 companies with combined assets of US\$ 11.3 billion.

Moreover, recent plans³³ about promoting exports from Levantine basin through Egyptian LNG terminals instead of EastMed Pipeline is quite a risky business. It is confirmed that core leaders of the Islamic State, after being defeated in Syria and Northern Iraq have moved to the Northern Coasts of Africa, for example in Libya or Algeria. All things considered, Greece and Cyprus remain two reliable and peaceful countries, devoted to the principles of European Union.

b) Returning of the Lost Markets' Trust – Economic Development

The EastMed Pipeline provides confidence about the initial capital investment needed for the Project to become operational. For Greece and Cyprus, the successful operation of EastMed Project means a lot especially for two countries that have been under European financial supervision in recent years. And if Cyprus managed to fulfill successfully its monetary program, Greece seems to be in high need to attract massive investment programs.

According to latest IEA estimates³⁴ the amount of proven reserves in Eastern Mediterranean (Israel, Cyprus and Egypt) reach 2 trillion cbm, “a second Norway” as IEA's head Mr. Fatih Birol stated. The above would have an indisputable impact on strengthening of the local economies in terms of supporting entrepreneurship, reducing high unemployment rates and skilled workforce on the medium term. The development of the domestic gas market in Cyprus and Greece could generate thousands of jobs especially during the construction phase of the import infrastructure and the national and regional distribution network of pipelines³⁵.

³² <http://www.intellinews.com/comment-gazprom-s-exit-from-turkey-is-a-sign-of-the-times-125336/>

³³ Baconi, T. (2017) “Pipelines and Pipedreams; How the EU can Support a Regional Gas Hub in the Eastern Mediterranean”, European Council on Foreign Relations.

³⁴ <http://www.kathimerini.gr/920695/article/proswpa/synentey3eis/ta-koitasmata-ths-anat-mesogeioy-einai-san-ayta-ths-norvhgias>

³⁵ Giamouridis, A., eds. (2013). Natural Gas in Cyprus; Choosing the Right Option. Mediterranean Paper Series. The German Marshall Fund of the United States

As it refers to Cyprus, according to the last IMF Report about the first Post-Program Monitoring³⁶, the country's economy grows steadily by 2.5% but structural reforming and attracting investments must go on in order for Cyprus to get in a steady development phase. The combined profits for Cyprus and Greece from the direct sales of gas to regional markets could generate several billion of euros on a long term basis -10 years- as most of the profits will come from savings and investment on gas infrastructures³⁷.

c) The region attracts serious investments and the need of active European Fianancing

The Eastern Mediterranean has become a hotspot for the oil and gas industry following a series of large-scale natural gas discoveries since 2009 offshore Israel and Cyprus. In developing such projects, the companies involved are seeking third-party financing³⁸. The project that will actually be developed is the one that can secure financing and as a result questions raise about the engagement of European financial institutions or the involvement of funds from USA or China.

Project finance is increasingly popular especially for LNG Projects that require large initial capital outlays and are able to secure long-term commitments from buyers, guaranteeing 10-20 years of cash flow. The European Investment Bank (EIB) is the most important source of financing in the EU by promoting strategic infrastructures. In 2014, the EIB disbursed almost \$77 billion of which \$12.8 billion went towards energy projects, representing 16.6% of EIB's portfolio. The above means that there are huge potential for EIB to raise the share of financing energy projects.

As it is depicted in Figure 10 and Tables 4 and 5 major energy companies under the assistance of reputable financiers (banks, funds etc) are strongly willing to invest in the region, by holding strong balance sheets as they have already invested billion of dollars in projects worldwide. Furthermore it needs to be pointed out that there will be no massive short-term state revenues before 2020, when production is expected to begin. Then, at the initial cost gas phase of the field's production the majority of gross revenues will be given, in terms of Production Sharing Agreement, to the

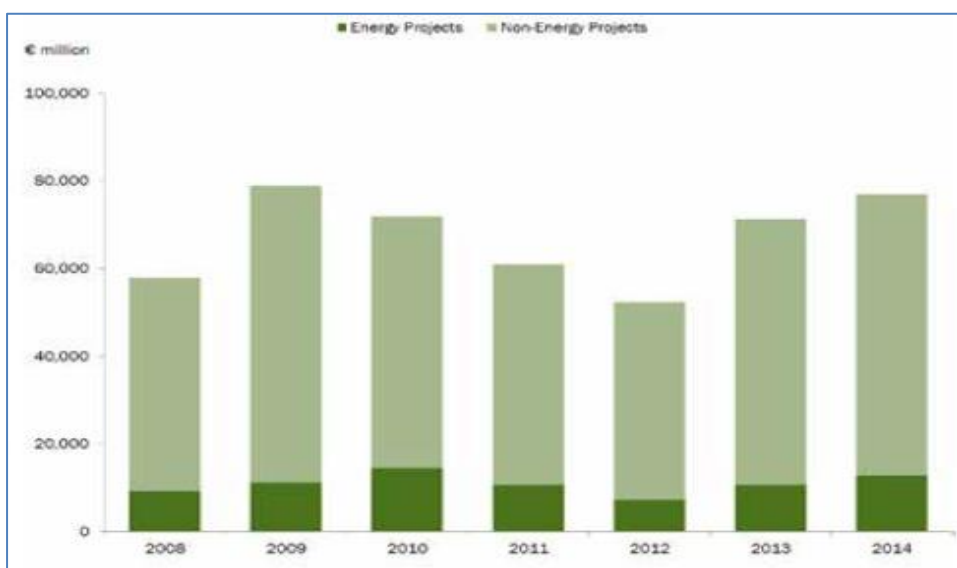
³⁶ <https://www.imf.org/en/News/Articles/2017/04/03/PR17107-Cyprus-IMF-Staff-Completes-Mission-for-First-Post-Program-Monitoring-to-Cyprus>

³⁷ Tsakiris, T. (2016). "The Gifts of Aphrodite: The Need for Competitive Pragmatism in Cypriot Gas Strategy?"

³⁸ A. Giamouridis & N. Tsafos (2015), "Financing Gas Projects in the Eastern Mediterranean", Foreign and Security Policy Papers

developers in order to recapture their initial investments. Revenues flows for the states will follow given strong production levels, To achieve this, it is necessary to attract buyers (Sales and Gas Purchasing Agreements) and lower the exports costs.

Figure 10. Project Finance by the European Investment Bank (2006-2014)



Source: EIB

Table 4. Financial Metrics for main Licencees in the Eastern Mediterranean (2008-2014)

	2008	2009	2010	2011	2012	2013	2014
Cash from Operating Activities (\$ million)							
TOTAL	27,458	17,240	24,516	27,193	28,858	28,513	25,608
ENI	32,067	15,526	19,506	20,025	15,907	14,567	20,058
Noble Energy	2,285	1,508	1,946	2,170	2,933	2,937	3,506
KOGAS	523	658	1,462	181	1,057	1,930	2,582
Delek Group	469	835	279	587	1,016	652	494
ExxonMobil	59,725	28,438	48,413	55,345	56,170	44,914	45,116
BG Group	8,283	5,532	6,386	6,982	7,995	7,817	7,399
Capital Expenditures (\$mm)							
TOTAL	17,445	16,527	18,310	24,986	25,574	29,478	26,320
ENI	19,026	17,032	16,527	16,582	16,408	16,932	16,249
Noble Energy	2,263	1,317	2,143	3,024	3,626	4,311	4,883
KOGAS	719	1,107	1,457	1,887	2,890	3,434	3,049
Delek Group	1,731	1,833	2,001	2,687	2,384	1,389	726
ExxonMobil	26,143	27,092	32,226	36,766	39,799	42,489	38,537
BG Group	5,707	7,599	8,671	10,217	11,291	11,634	8,877

Table 5. Major Players in LNG Project Finance (2008-2014)

Mandated Lead Arrangers	\$ million	Public Sector Entities	\$ million
Sumitomo Mitsui	5,357	JBIC	16,840
Mitsubishi UFJ	4,317	US EXIM	6,570
Mizuho	3,521	China EXIM	4,787
Societe Generale	2,326	Kexim	2,087
BNP Paribas	1,808	SACE	1,750
Other	27,829	Other	1,617
Total	45,158	Total	33,651

d) Greece will become an important hub of Energy Transport to the EU

The East Med Project and its possible connectability with other projects that transfer natural gas through Northern Greece (TAP Pipeline and IGB Interconnector) and the Poseidon Pipeline (Italy's Interconnector), promotes the goals of EU's as it refers to Energy Policy; diversification of routes and diversification of energy sources³⁹.

Greece is becoming an energy hub as it transits gas from Azerbaijan, Cyprus and Israel's reserves, not to mention the aforementioned new country's reserves that came into light recently in Western Greece and Southern Crete. Furthermore, the construction of a FSRU terminal in Alexandroupolis that would receive American LNG (via LNG vessels) would be further connected with the national pipeline network. Moreover, progress has been made in expanding the national gas grid and the further coverage of regions that lacked gas supplies until recently.

³⁹ A. Giannakopoulos (2016), "The Eastern Mediterranean in light of Recent Energy Developments and their Impact"

4.1.4 EastMed's Viability and Barriers

The cost of constructing EastMed Pipeline is the main obstacle that needs to be overcome by the involved stakeholders. The project demands a high capital investment of about \$ 4-6 billion due to certain technical challenges such as the unprecedented depth of 3 km in Southern Crete that the pipeline must reach. High infrastructure costs would jeopardize the final gas prices that will have to rival the cheaper Russian or Qatari gas, creating a very challenging condition⁴⁰.

A positive notion to the above claim is that many of the energy companies that have expressed interests in exploring Levantine gas fields are supermajors of the global and gas industry that operate ultra-deep pipe laying vessels. It should also be mentioned that the global energy market remains unstable with global energy prices growth remain modest (oil hovers between \$65 per barrel), something that clearly affects the energy companies' appetite in terms of investments.

EastMed Project faces competition from many similar existing or planned energy projects. It is of massive importance for the beneficiary countries to proceed in joint efforts promoting the project. In order to proceed as fast as possible, elimination of bureaucracy must take place. As it mainly refers to Greece, bureaucracy must be addressed by creating a friendly and safe investment environment⁴¹, with the minimum requisite state control and short term offshore licensing rounds. For example, a licencing round in Greece may last two and a half to three years while in Cyprus it is completed in nine months. The Cypriot method tends to be profitable, as Cyprus in May received 103.5 mil euros from signature bonuses with major energy companies.

Furthermore, Greece must strengthen its diplomatic stance towards a re-approachement with Israel, in order to convince its interlocutors about the cumulative economic effects stemmed from the operation of East Med, instead of Israel's official preference of building an underwater pipeline that will transfer gas to Turkey⁴². It is of massive importance for Israel to be persuaded to adopt an energy shift towards EastMed Project despite any

⁴⁰ Tsakiris, T., (2014). "Greece and the Energy Geopolitics of the Eastern Mediterranean" LSE IDEAS: Strategic Update 14.1

⁴¹ Mathios, R. (2015). "Energy, Economics and Security in Eastern Mediterranean". Hellenic National Defence College & Dartmouth Centre for Sea Power and Strategy, Piraeus.

⁴²Nasi, S. (2017). Turkish-Israeli Pipeline Deal on the Way?, available at <http://www.hurriyetdailynews.com/turkish-israeli-pipeline-deal-on-the-way.aspx?pageID=449&nID=112537&NewsCatID=570> (accessed at 29 April 2017)

Turkish intervention in order to abandon it. A Leviathan-Cayhan pipeline creates an imbalanced trade relationship⁴³, as 43% of Israel's exports will be transferred to Turkey, while 14% of Turkish natural gas imports would be Israel's gas supply.

Moreover, an aspect that must be addressed by the EU has to do with Turkey's ambitions⁴⁴ in the region southwest of Cyprus, as it was recently addressed to the UN⁴⁵. According to Ioannis Kasoulidis, Cypriot Minister of Foreign Affairs, Turkey should understand the energy interests of oil major companies in the region⁴⁶ (Kasoulidis 2017). Both Cyprus and Greece are seeking for stronger support by co-operators of the project such as Israel, or even Egypt. For example, the EastMed could probably make a detour through Egypt's EEZ in order to avoid the Turkish claims. In any case, Europe must pave the way towards a mutual compromise between the involved countries and Turkey, as it refers to energy interests.

Finally, another important matter that should be seriously taken into deep consideration is that of irrational exuberance, populism and how to be addressed. What FED's Alan Greenspan once stated about the dot.com crisis of the 1990's fits perfectly to the overvalued estimates about Levantine's Basin gas reserves. There were illogical expectations that cultivated in the 2011-2013 period and had to do about the transformation of the region into something equivalent to Qatar. It needs to be pointed out that any gas potential reserve higher than 8 tcf has a statistical possibility close to 10-15% of being verified⁴⁷. There is a high need for pragmatism to be adopted in order for EastMed project to proceed further, no matter how huge the new gas deposits in Cyprus are or the potential ones in Western Greece and Southern Crete will prove to be.

⁴³ Th. Tsakiris (2014), "*Shifting Sands or Burning Bridges?*" *ELIAMEP Policy Papers*

⁴⁴ Richert, J. (2016). "Turkey's Energy Leadership Ambitions and Their Implications for Energy Governance in the Eastern Mediterranean",

⁴⁵ <http://mignatiou.com/2017/05/apili-polemou-apo-erntogan-meso-oie-enantion-ton-petrelaikon-kolosson-eni-ke-total-alla-ke-tis-kiprou/>

⁴⁶ <http://www.kathimerini.gr/901243/article/proswpa/synentey3eis/i-kasoylidhs-den-apokleiw-entash-sto-aigaio-kai-sthn-kypro>

⁴⁷ Th. Tsakiris (2016), "*The Gifts of Aphrodite: The need for Competitive Pragmatism in Cypriot Gas Strategy*"

5. An Alternative SouthEast Energy Corridor; Creation of LNG Terminals Network between Greece and Cyprus

In 2010 Noble Energy and Israel's energy company Delek proposed the construction of underwater pipelines linking Leviathan gas deposits and those in Aphrodite's field with Vasilikos LNG plant, a terminal with a projected annual capacity of 6.8 bcm annually⁴⁸. The above in combination with Revythousa LNG Terminal -5.2 bcm capacity annually- and the construction of a Floating LNG Terminal –FSRU- promoted by Gastrade and Cheniere in Alexandroupolis⁴⁹, having an annual capacity of 6.1 bcm and in close proximity to the national pipeline network⁵⁰, creates a huge potential for establishing a Greek-Cypriot Maritime Cluster.

If the new round of drilling operations during 2017 and 2018 reveals new massive gas reserves in Greek and Cypriot fields, parallel exports of natural gas -via pipelines or LNG vessels- should not be excluded. In such a case, there is strong fundamental as Greece operates the 3rd largest fleet of LNG vessels in terms of capacity and the 2nd most expensive in the world with a value of \$ 9.3 bn⁵¹. The Greek LNG fleet is consisted of 87 vessels - 16% of global fleet- with an average transferring capacity of 130.000 bcm per vessel, while the global fleet accounts for 532 units. On the other hand, Cyprus plays a prominent role as a leading shipping and shipmanagement centre and will continue to strengthen its position in the world economy by providing a sound maritime infrastructure, favourable tax regime and competitive ship registration and annual tonnage tax rates⁵².

Regional gas exports on a steady basis -via LNG vessels- could provide the Greek-Cypriot Maritime Cluster with robust cash flows and the

⁴⁸ Cypriot Ministry of Energy, Industry, Commerce and Tourism (2015). Master Plan of the Vasilikos Area (Update) Executive Summary, available at [http://www.mcit.gov.cy/mcit/mcit.nsf/0/11ffcd876c06b58cc2257c7700255d18/\\$FILE/The%20Vasilikos%20Master%20Plan%20Update%20May%202015%20-%20Executive%20Summary.pdf](http://www.mcit.gov.cy/mcit/mcit.nsf/0/11ffcd876c06b58cc2257c7700255d18/$FILE/The%20Vasilikos%20Master%20Plan%20Update%20May%202015%20-%20Executive%20Summary.pdf)

⁴⁹ *Cheniere Energy Eyes Stake in Greek LNG Project*, available at <http://www.reuters.com/article/cheniere-energy-greece-idUSL8N1452RH20151216>

⁵⁰ Dokos, T. (2016). "Energy Geopolitics in the Eastern Mediterranean; The role of Greece",

⁵¹ The Greek Influence on LNG Trade is Expanding, available at <http://www.kathimerini.gr/889700/article/oikonomia/epixeirhseis/dieyrynetai-h-ellhnikh-epirroh--stis-8alassies-metafores-lng>

⁵² Price Waterhouse Coopers (2013). Cyprus Shipping; a Sea of Opportunities, available at <https://www.pwc.com.cy/en/publications/assets/cyprus-shipping-publication-february-2015.pdf>

national economies with financial stability⁵³. Concerns about competition from other nearby exporting nations in terms of LNG pricing remain unfounded, as the anticipated massive gas deposits -if proven- could produce economies of scale that could lower production costs in the long term.

The imposed IMO policies in order to reduce sulphur emissions and a proposed dimension towards Green Shipping are widely discussed matters so far. In such a case, the region of South-East Mediterranean could provide more LNG bunkering spots (Figure 13) as it refers to vessels and commercial shipping that takes place in the world's most intense maritime routes, as LNG is the marine fuel of the future⁵⁴. As it is depicted in Fig. 13, the majority of LNG Terminals that under circumstances could operate as LNG bunkering spots, is gathered on Western Mediterranean Sea, while only four LNG terminals can be spotted on the SouthEastern region. So, there is a huge potential for this trend. The Poseidon Project which is co-funded by the EU involves three countries, Greece, Italy and Cyprus, six Mediterranean ports (Piraeus, Patras, Limassol, Venice, Heraklion, Igoumenitsa) as well as the Revithoussa LNG terminal. Top experts from the marine, energy and financial sectors are brought together in order to design an integrated LNG value chain and establish a well-functioning and sustainable LNG market.

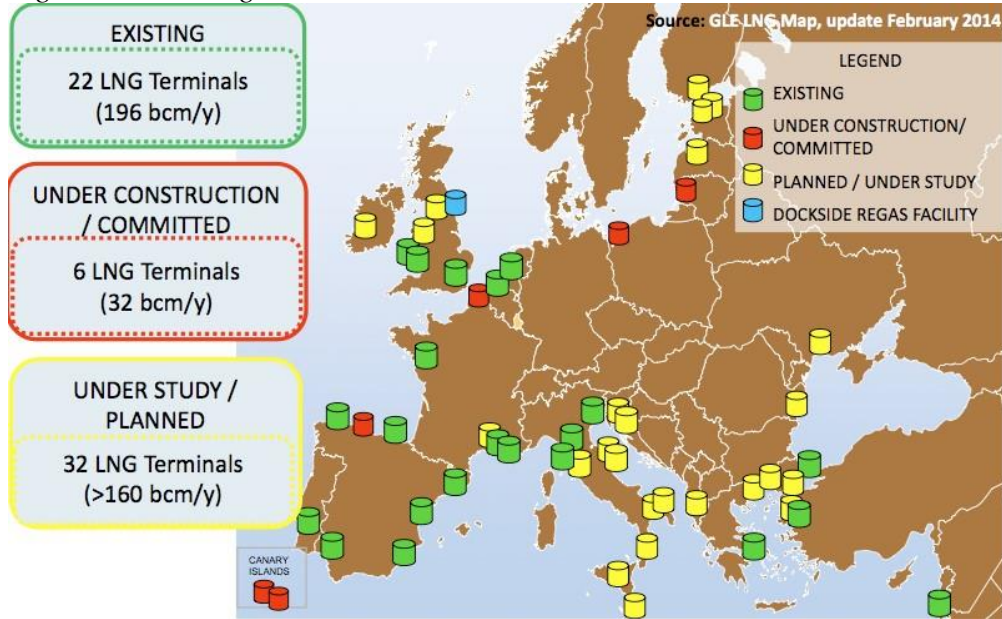
The operation of a LNG Terminals Network across East Mediterranean may attract many new allies, for example Italy. As it refers to local industries, a reliable and affordable gas supply is a crucial challenge for the countries involved as the phasing out of coal and carbon in electricity production is already taking place. Moreover, a new LNG terminal is being promoted in the port of Crotona in SE Italy, the first in the region, that will boost local steel industries⁵⁵. The new LNG terminal will also provide LNG as a fuel to nearby vessels. This latest development is part of a huge European Plan for gas promotion in South Italy and the disengagement from Russia's dependency.

⁵³ Can LNG Save Greece From A Russian Gas Collapse?, available at <https://www.forbes.com/sites/christophercoats/2014/08/26/can-lng-save-greece-from-a-russian-gas-collapse/#50999b9f6531>

⁵⁴ Chiotopoulos, A., (2016). "LNG as a Fuel, the Past, the Present and the Future Developments", 3rd International Seminar on "Energy and Shipping", IENE, Athens

⁵⁵ <http://www.naftikachronika.gr/2017/03/21/neos-termatikos-stathmos-lng-stin-italia/>

Figure 11. Existing and Planned LNG Terminals in Mediterranean Sea



5. Conclusion

Natural Gas is the fastest growing form of primary energy worldwide, a very important element, especially if we take into account the efforts taken to reduce global emissions. A South-East Gas Corridor might not be EU's top priority right now, but sustained engagement at this early stage could yield fruitful results in the future. Such a project changes geopolitical stability and strengthens the status quo among the involved countries as the European market represents the best option for East Mediterranean gas.

In order to achieve this transition into a new era in terms of Energy, irrational exuberance of the past must be replaced by a new pragmatic approach as it refers to the feasibility of any potential resources. This is translated into a solid energy plan for all the countries involved; based on the region's potentials reserves and the promotion of the best possible solution that reassures EU independence in natural gas supplies. On the political level, the proposed EastMed Pipeline project is receiving a continuous and growing support by the Governments of Greece, Italy, Cyprus and Israel as well as the European Commission.

Attracting investors is another important element; as the global energy market remains unstable with modest global energy prices (for both gas and oil), appetite from international energy companies in investing in gas

projects is negatively affected. The feasibility of a South-East Energy Corridor lies in the number of potential buyers that could be found or, the number of long term contracts that could be signed, providing a steady demand flow and ensure certain production levels that would support the return on investment in the medium term, for the energy companies involved.

Finally, certain obstacles that have to do with territorial or maritime disputes between nations, must be addressed wisely on a diplomatic level, as the current need of mutual concessions is more critical than ever. East Mediterranean region is being given the opportunity to exploit and commerce important volumes of gas deposits; any reckless action would jeopardize all the attempts that have already taken place and it will end the chapter of Energy in the East Mediterranean at least for the decades to come.

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