

“The Role of East Med Gas in European Energy Supply

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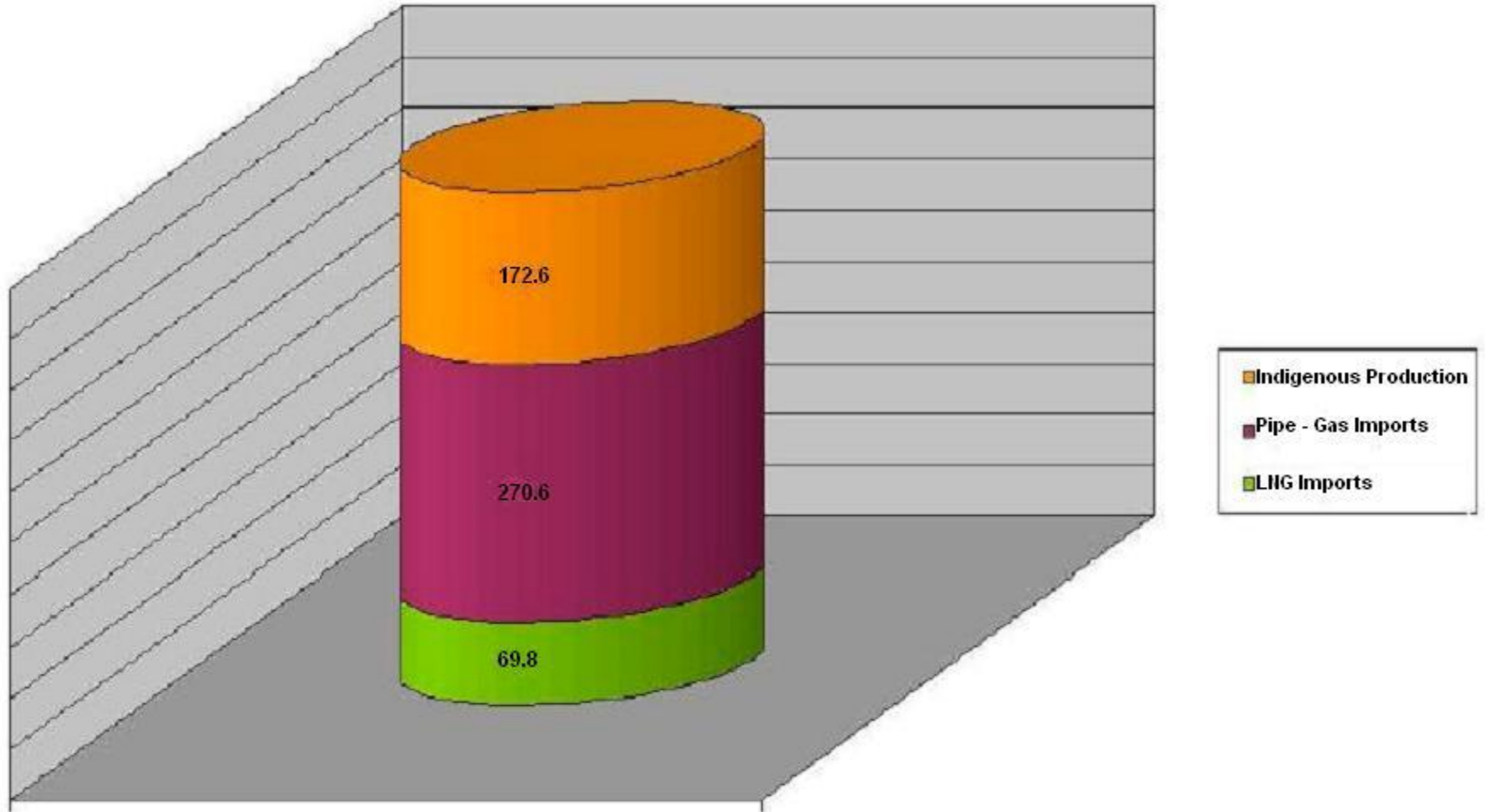
Presentation Outline

- European Gas Supply
- East Med Resources
- Transportation of East Med Gas to Europe and to the Global Markets
- Gas Storage Projects and FSRU
- Energy security considerations

Global and Regional Gas Demand

- ❑ Global and European gas demand is projected to grow marginally between 2012 – 2017, at 2.7% per year
- ❑ Natural gas has emerged as a dynamic energy commodity on which almost all European countries are dependent with demand becoming more robust after 2018.
- ❑ Russia is expected to keep its leading role as the main gas supplier to the European Union with South Stream expected to have a big impact on SE European gas markets when it becomes operational in 2018
- ❑ Russia will continue to control and manipulate as much as possible gas flows, originating from Central Asian countries
- ❑ Asia will be by far the fastest growing region, driven primarily by China, which will emerge as the third-largest gas user by 2013. China and South Asia will try to ensure more gas quantities from the Caspian region
- ❑ Global and regional LNG market will continue to experience strong demand growth
- ❑ The shale gas boom in US could channel some gas export quantities to Europe as early in 2015
- ❑ Azerbaijan has key role to play as supplier and prospective regional hub for European gas supply
- ❑ The TAP - TANAP pipeline system, the East Med corridor, Planned Floating LNG terminals (FSRU), Gas interconnectors (IGB, IGI, ITB), can contribute in strengthening the geopolitical role of both Greece and Turkey

Natural Gas Consumption in Europe in 2012, including E-27 and other European countries (in bcm)

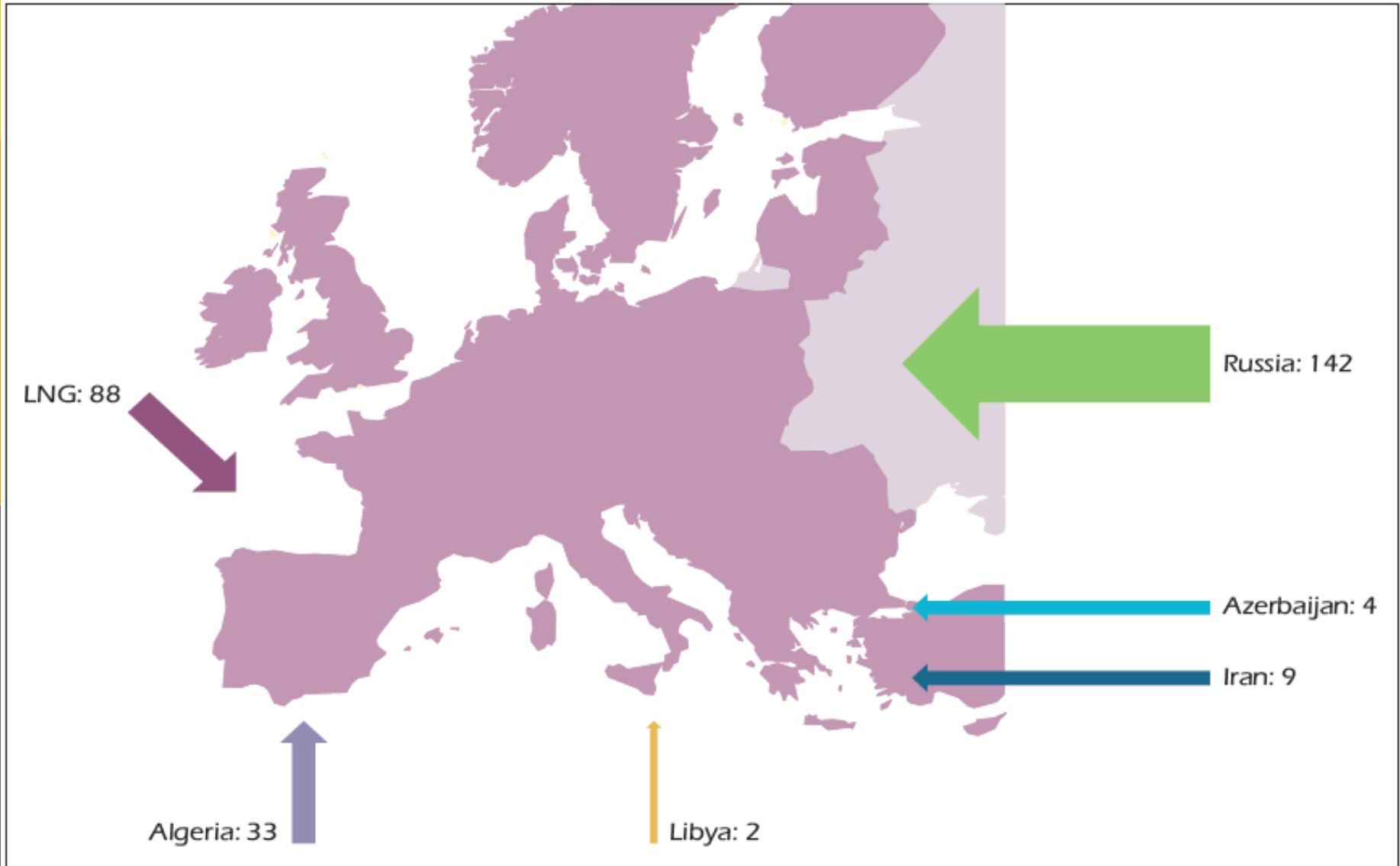


Total European Gas Consumption in 2012: 513 bcm

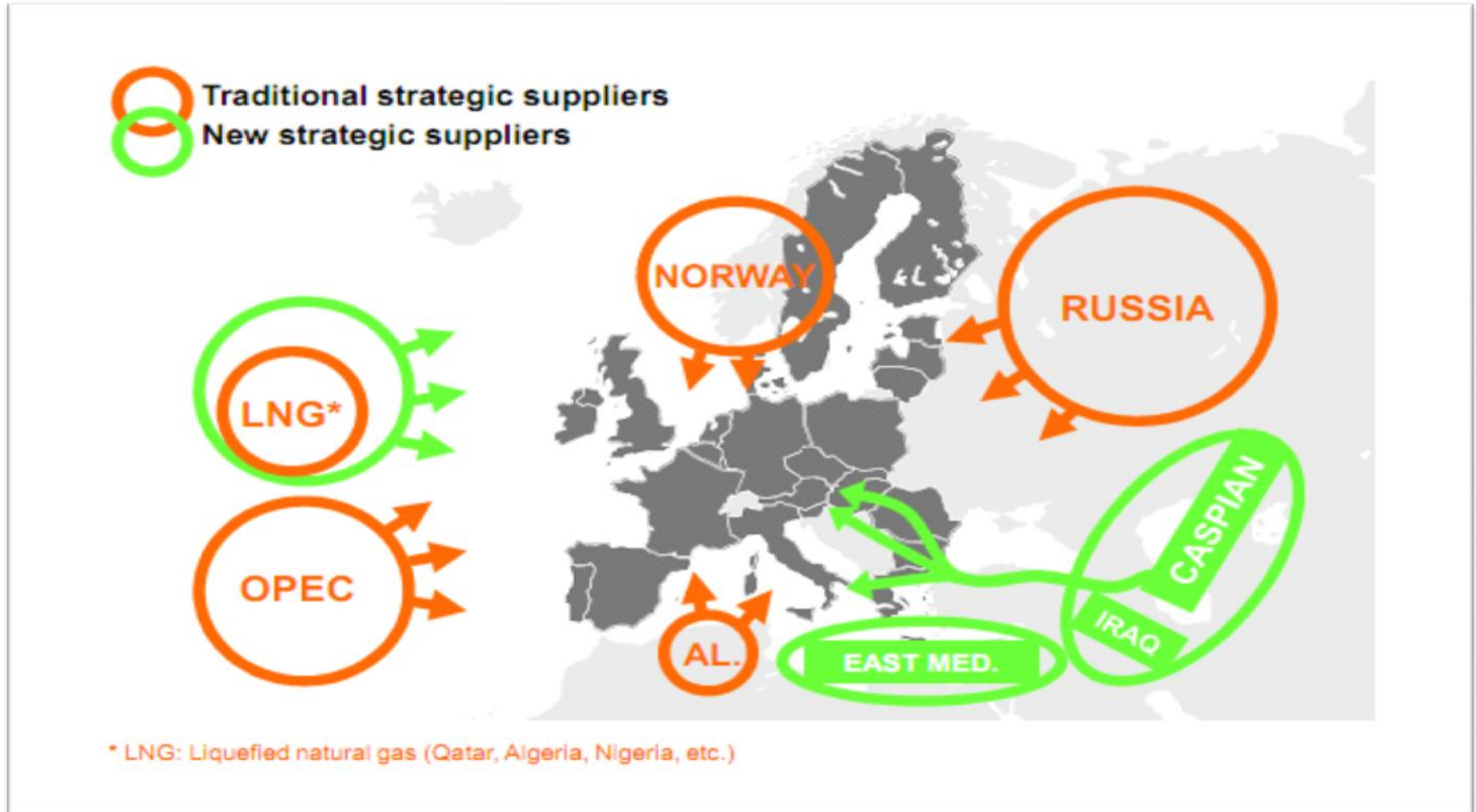
SE Europe Gas Supply



Gas Imports to Europe, 2011 (bcm)



Traditional and New European Gas Suppliers



East Med Gas: One of Several New Energy Supply Options

- Following the annexation of Crimea by Russia and the wider impact of Ukrainian-Russian relations on energy security, the European leadership will come under immense pressure from within and outside the EU to diversify energy supplies and develop a more unified and cohesive energy grid.
- The philosophy of the new European energy grid will be based on the entry into the system of additional supply sources, more interconnectivity, increase of energy storage capability (including more LNG storage and gasification facilities) and increase of energy flows.
- The East Med over the course of the next 6-10 years can indeed provide much needed new oil and gas inputs into the European energy grid in comparable, if not greater, quantities from those originating from Azerbaijan.
- Azerbaijan's proven reserves are 0.9 trillion m³ while those from Israel and Cyprus currently exceed 1.0 trillion m³
- East Med gas to cover supplies from Israeli and Cyprus fields in the first phase and from Lebanon, Syria, Turkey and Greece in a second phase, beyond 2030. Gas deliveries could be at first in the form of LNG supplies and through pipeline (e.g. the East Med pipeline).

Infrastructure Projects in SE Europe and the East Mediterranean Region



Project	Capacity (bcm/y)	Distance (kms)	Estimated Project Cost (in Billion Euro)	Sponsors	Anticipated Start Up Date	Project Status
TAP	10 – 20	791	1.70	EGL, STATOIL, E.ON	2017	Selected by SDC on June 27, 2013
TANAP	16 - 24	2,000	8.0	SOCAR (80%) BOTAS (20%)	2018	Construction to start in 2014
South Stream	63	2,950	26.0	Gazprom, ENI, Wintershall, EDF	2016	Construction commenced December 2012
NPP in Sinope, Turkey	4 – 5 GW	-	17.0	AREVA, Mitsubishi Heavy Industries (MHI)	2023	Intergovernmental agreements signed
NPP in Akkuyu	4.8 GW	-	20.0	ROSATOM, Akkuyu NGS Elektrik Uretim Corp	2023	Engineering and survey work started at the site. Construction of the first unit to begin in 2014
Aphrodite Block (Cyprus)	5 Trillion Cubic Feet	-	2.0	Noble Energy, Delek Group	2018	Second confirmatory drilling Completed
Liquefaction Plant (Cyprus)	8 – 12 Bcm/y	-	7.5	Noble Energy, Avner, Delek Drilling	2020	MoU between Cypriot government and companies
EurAsia Interconnector (Submarine Cable)	2,000 MW	1,000 Km	1.5	PPC-Quantum Energy joint venture	2019	Intergovernmental agreement, feasibility studies completed
Tamar, Leviathan (Israel)	24 Trillion cubic feet	-	11.0	Noble Energy, Delek Group, Ratio, Woodside	2016	Tamar – On stream Leviathan – Under development

Myths, Truths and Half Truths

Some modern day myths about the gas pipelines which will cross the Balkans

- ❑ The South Stream will solve all the energy problems of the SE European region by providing plenty of gas at low prices
- ❑ TAP is a sustainable, viable and effective alternative to European gas supply which will lessen dependence on Russian gas
- ❑ Caspian gas resources will help decisively in diversifying European gas supply
- ❑ East Med gas will supply ½ of European gas demand by 2030
- ❑ Europe will soon be flooded with cheap USA gas to be imported via LNG

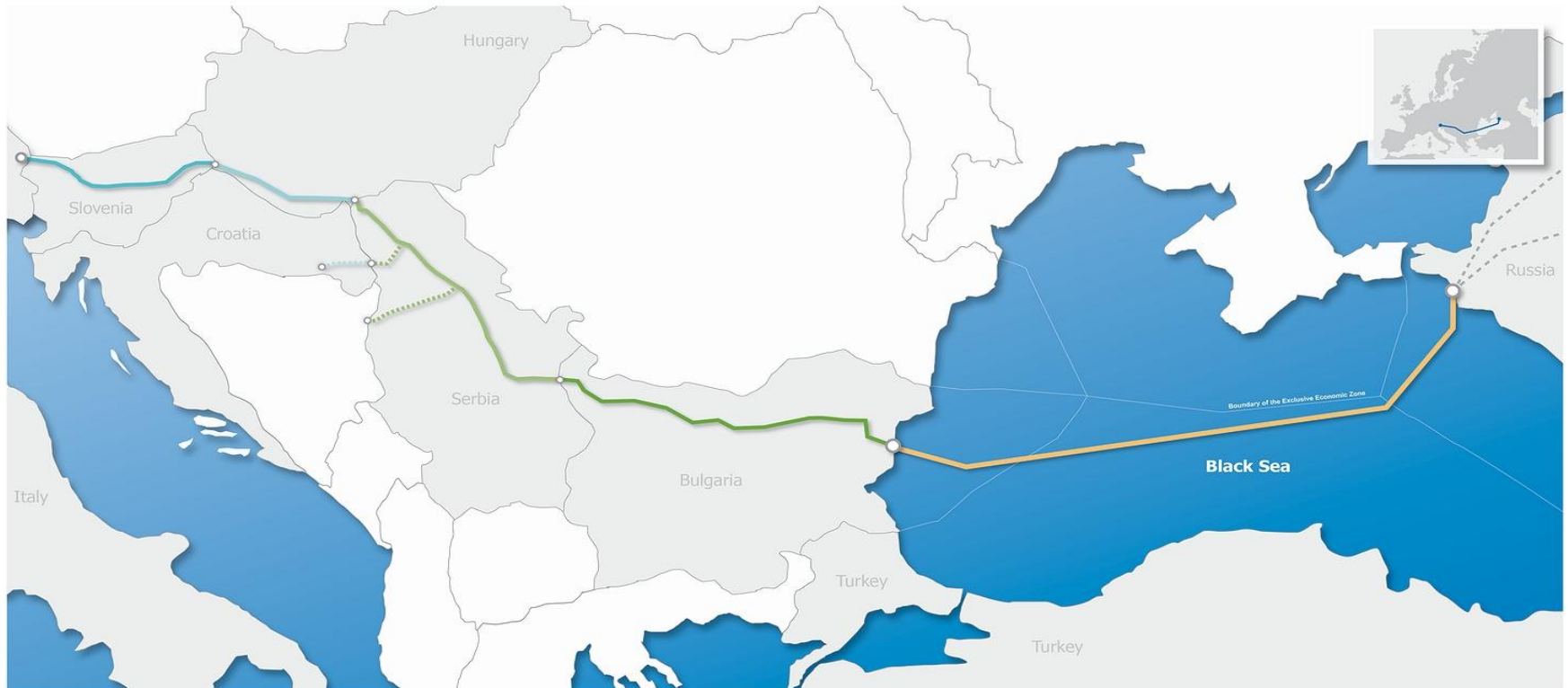
Some Truths.....

- ❑ South Stream is a major gas project which when completed will help increase many fold European energy security
- ❑ South Stream is of equal if not of greater strategic importance as Nord Stream
- ❑ South Stream is a European project with 50% of its shareholders being three of Europe's largest energy companies
- ❑ South Stream will not solve SE Europe's energy problems but like TAP will help secure additional gas supplies which are necessary for its long term economic development

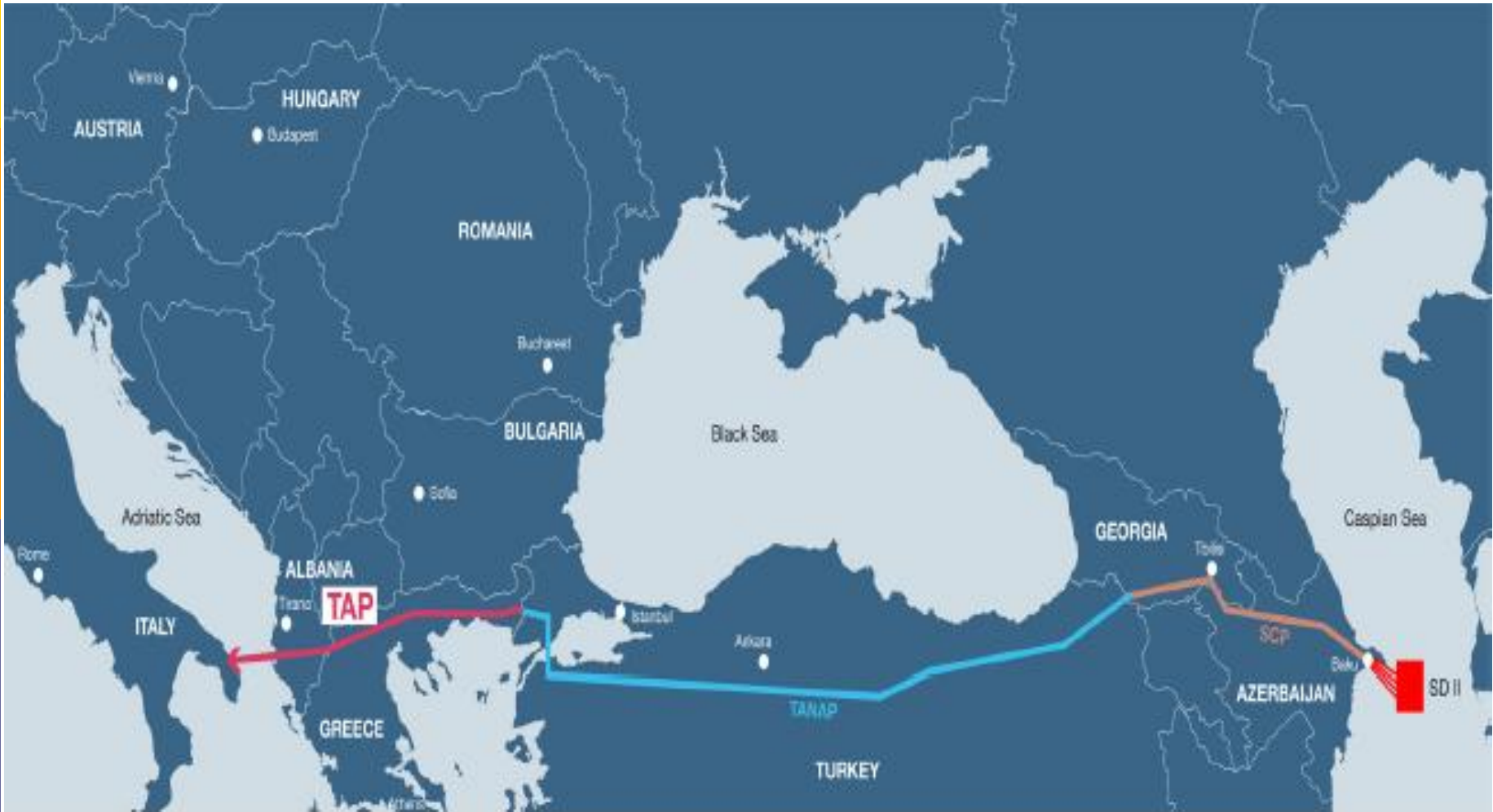
Half Truths.....

- ❑ The geopolitical importance of the Balkans will be strengthened enormously as a result of the new East-West gas pipelines
- ❑as long as Europe will continue to depend on substantial gas imports and Russia is willing to export most of its gas to the West (rather than to the East)
- ❑ Competitively priced LNG will, over the next 5-10 years claim a much larger share of the European gas market (meanwhile LNG imports are in decline)

South Stream Pipeline



TANAP and TAP System

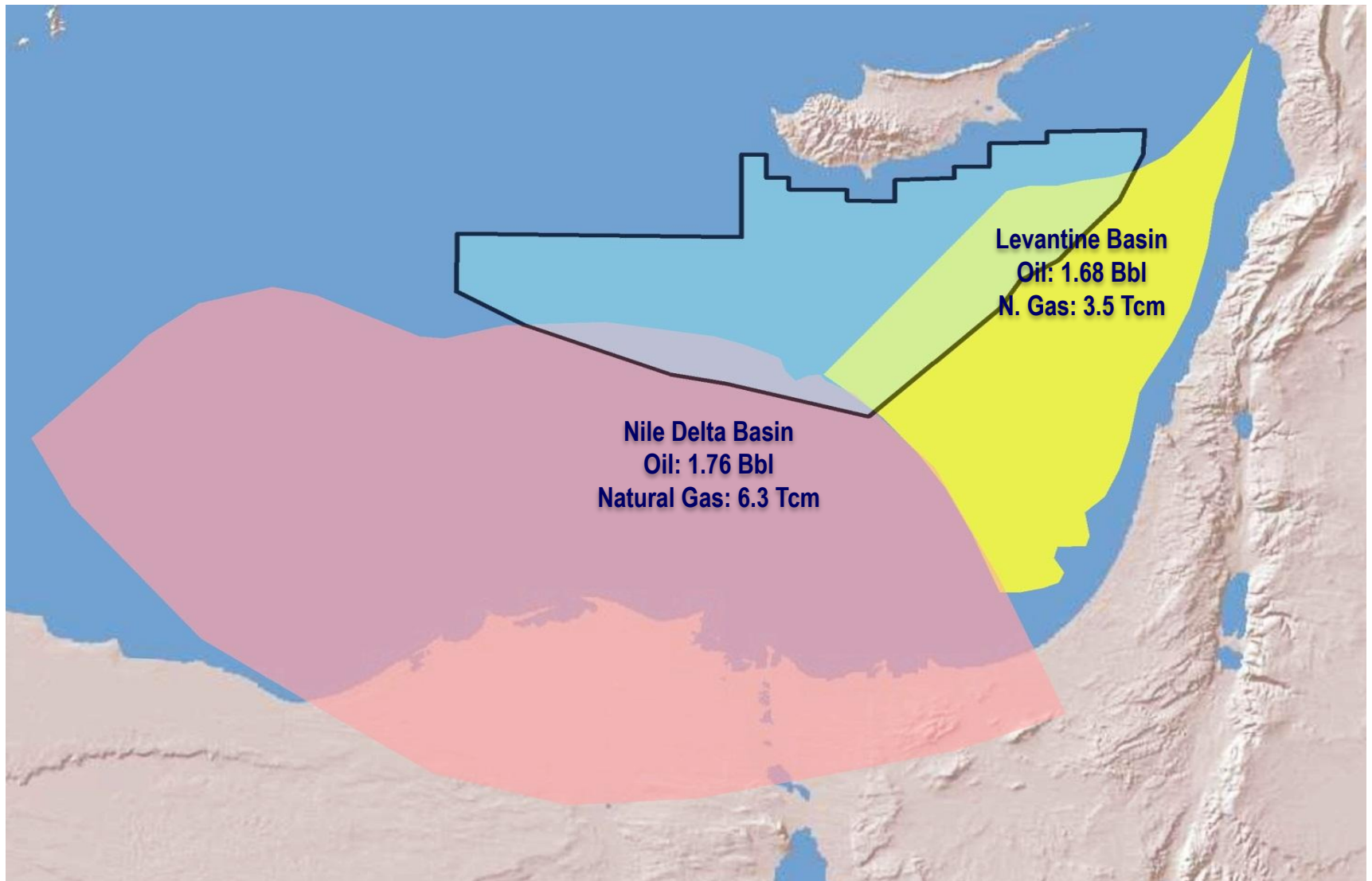


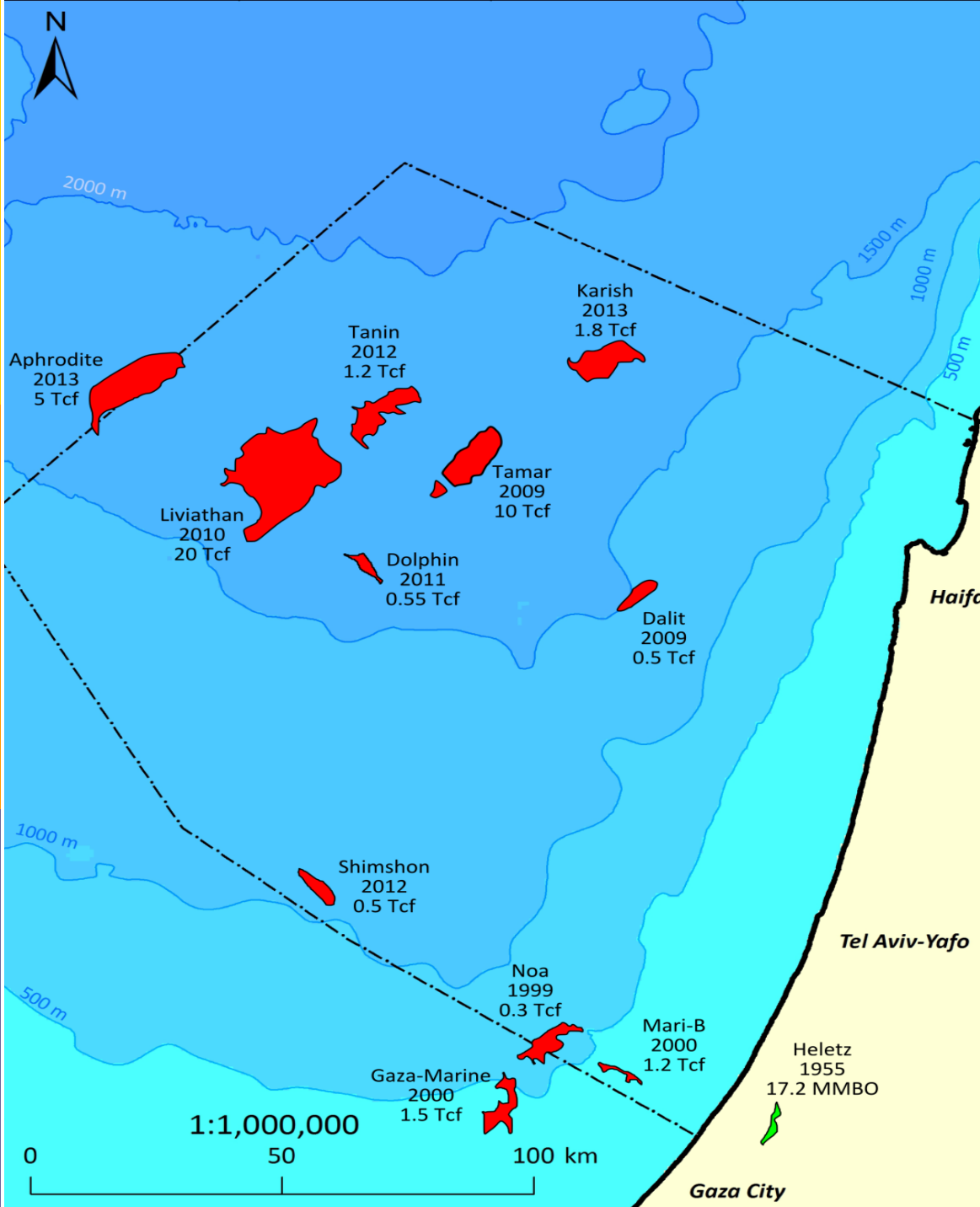
Cyprus – Israel Natural Gas Deposits

- **Major New Natural Gas Discoveries:**
 - Cyprus, Aphrodite, Block 12 – 5.0 TCF,
(gross mean estimated)
 - Israel, Tamar deposit ~ 9.0 TCF
 - Israel, Dalit deposit ~ 3.0 TCF
 - Israel, Leviathan deposit ~ 15.0 TCF
 - Cyprus 2nd Round completed
and exploration to start this year (2014)



South East Mediterranean estimated gas and oil reserves





Proven Natural Gas Reserves in Israel and Cyprus - Total Gas Reserves in Israel (838.0 bcm) and Cyprus (150 – 200 bcm)



Several export options from Leviathan gas field and tomorrow from Cyprus's fields

The East Med Pipeline Project



Eastern Mediterranean gas Reserves

Tamar, Leviathan and Block 12 are three of the top five world's largest discoveries of the decade.

Tamar	2009	Israel	257bcm
Leviathan	2010	Israel	481bcm
Block 12	2011	Cyprus	198bcm

According to the USGS (United States Geological Survey) total reserves at the Levantine basin could be three times more than what has already been discovered.

And there may be even more gas in Greece south of Crete.

Estimates are that more than 16 bcma will be exported, which necessitates exports both in LNG form and through a pipeline.



Connecting to Europe pipeline from East Mediterranean

The ITGI System comprises IGB and IGI, a powerful combination which provides for the needs of SEE.

The ITGI System will connect Greece's grid to Italy, Bulgaria and beyond.

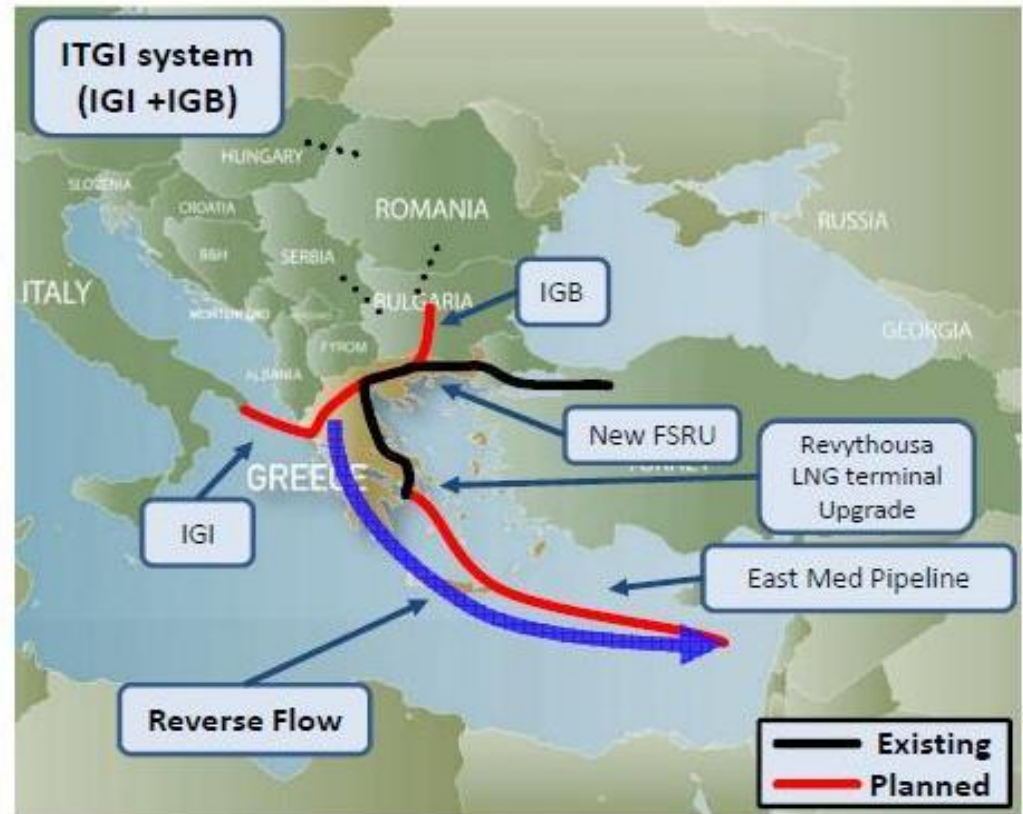
IGI is the most technically mature project of its kind in the region.

Construction of IGB will provide up to 5bcm of either LNG or pipeline gas to SEE by 2014.

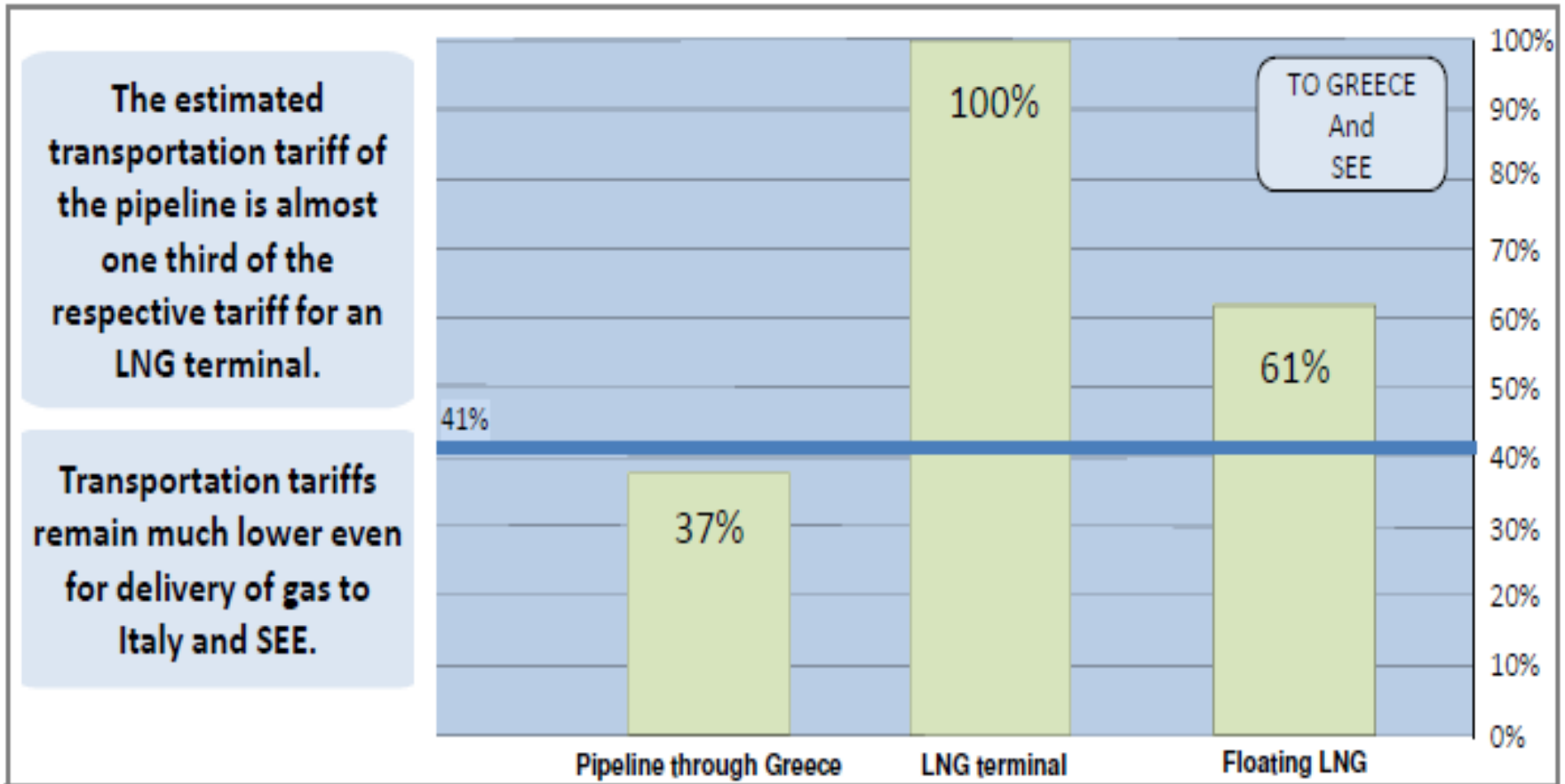
Expansion of existing LNG terminal in Revythousa and new FSRU to feed IGB.

A pipeline from East Med will create strong synergies with the ITGI system and will connect East Med to the European grid.

In case of an emergency, reverse flow would allow gas from Russia, Italy or even N. Africa to reach the East Mediterranean countries.



Tariff Comparison for Greece and SE Europe destinations – Percentage based on onshore LNG facility

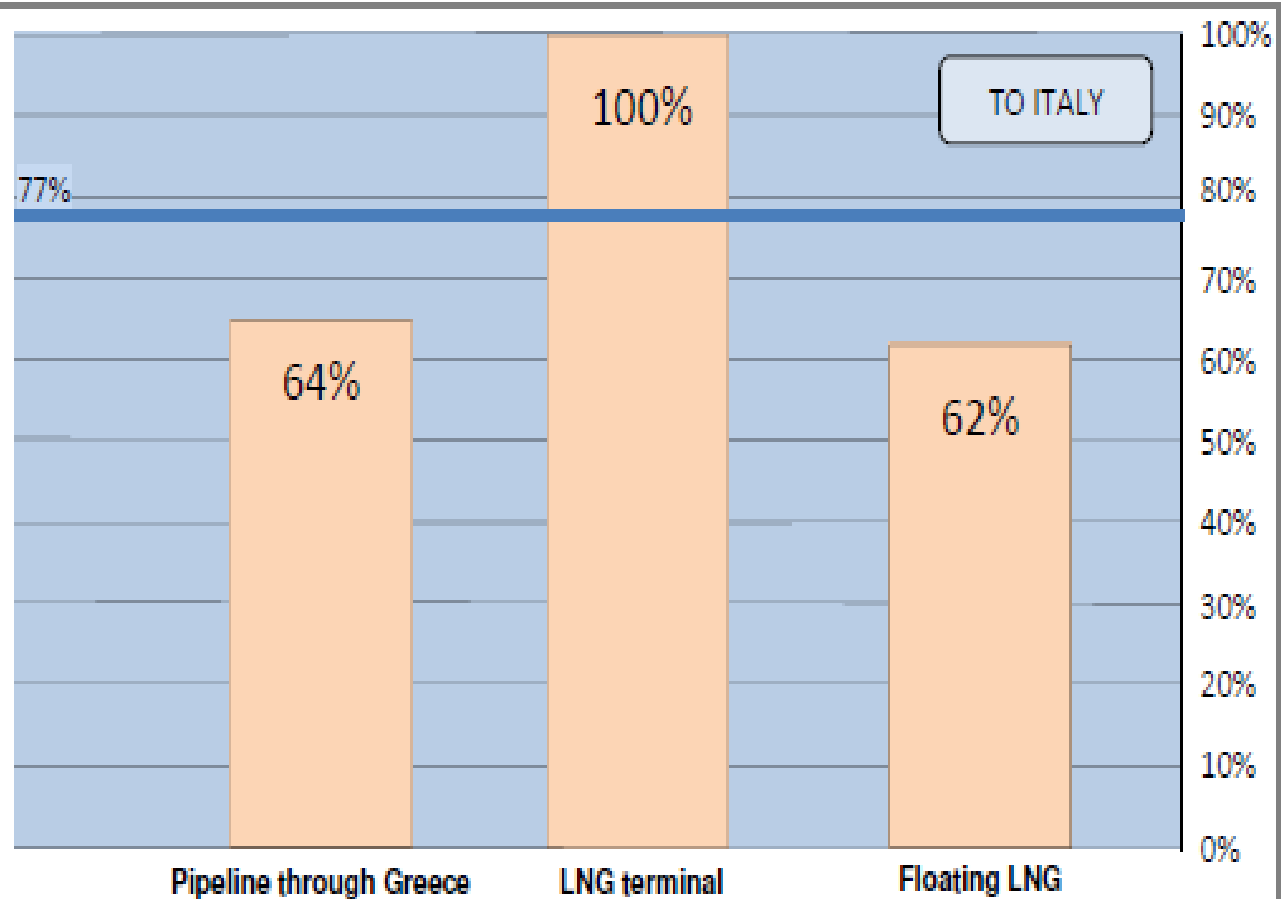


Tariff Comparison for Italy destinations

– Percentage based on onshore LNG facility

The estimated transportation tariff of the pipeline is almost one third of the respective tariff for an LNG terminal.

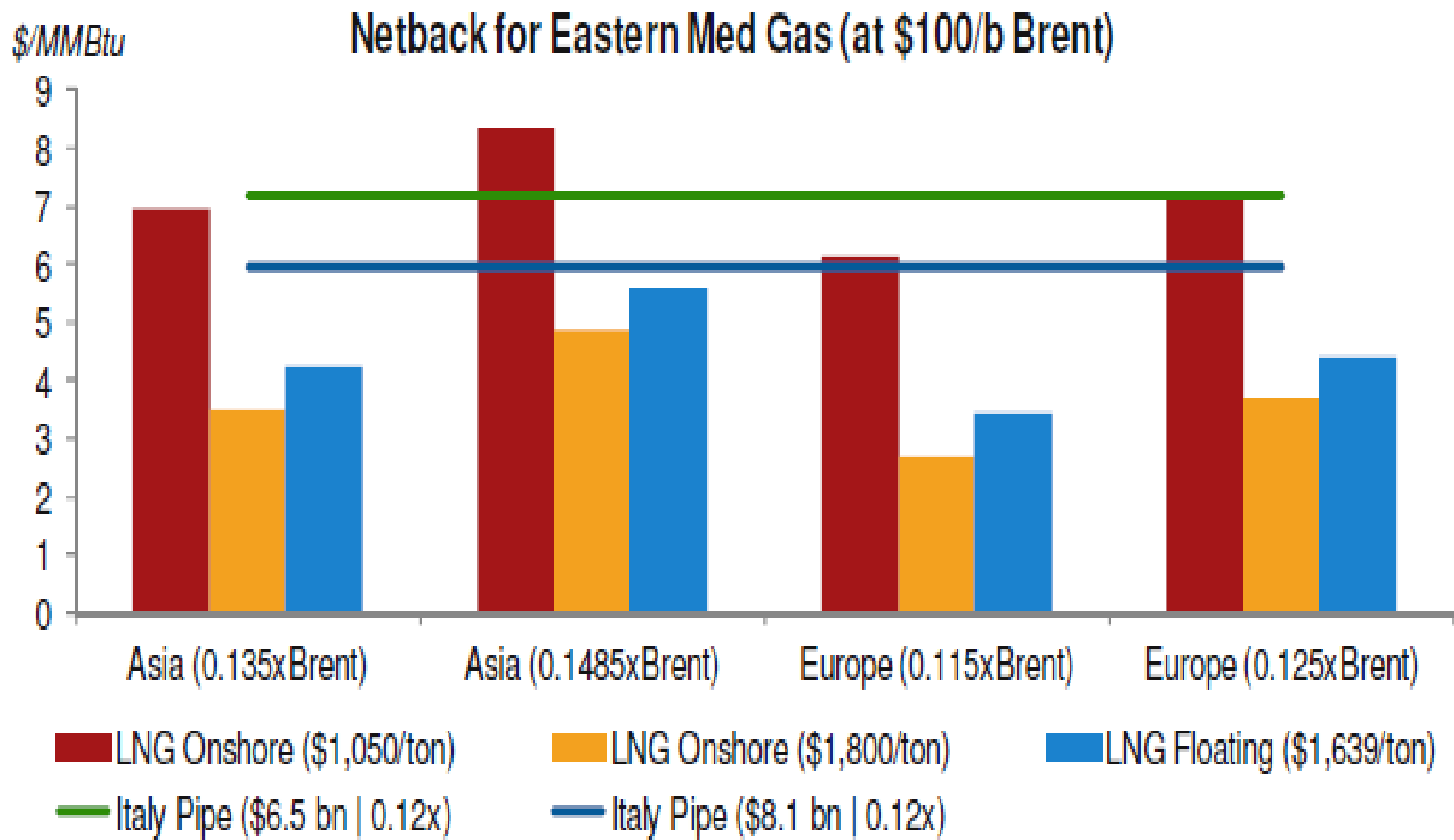
Transportation tariffs remain much lower even for delivery of gas to Italy and SEE.



Preliminary Netback Calculation for East Med gas/LNG deliveries to SE Europe

	Onshore LNG in Cyprus 6 <u>mmtpa/y</u> (8 <u>bcm/y</u>)		East Med Pipeline 8 <u>bcm/year</u>	
	Base	High	Base	High
CAPEX	\$ 6,6 <u>bn</u>	\$ 9 <u>bn</u>	\$ 5,4 <u>bn</u>	\$ 6,9 <u>bn</u>
OPEX	\$ 400 <u>mio/y</u>		\$ 150 <u>mio/y</u>	
Estimated plant/pipeline tariff	\$ 4,8/MMBTU	\$ 6,4/MMBTU	\$ 4,1/MMBTU	\$ 5,2/MMBTU
Assumed LNG Shipping Cost	\$ 0,50/MMBTU		—	
Estimated Fees for Aegean LNG use	\$ 0,90/MMBTU		—	
Estimated fees for NGTS use	\$ 0,20/MMBTU		\$ 1,0/MMBTU	
Estimated Fees for IGB use	\$ 0,1/MMBTU		\$ 0,1/MMBTU	
Assumed border prices in Bulgaria	0,12 X Brent = 12 \$/MMBTU		0,12 X Brent = 12 \$/MMBTU	
Netback margins	\$ 5,5/MMBTU	\$ 4,0/MMBTU	\$ 6,8/MMBTU	\$ 5,7/MMBTU

Preliminary Netback Calculation for East Med gas/LNG deliveries to Italy



ALEXANDROUPOLIS LNG INGS - A NEW ENERGY GATEWAY TO EUROPE

- LNG FSRU Gas Transmission System
- Greek National Gas Transmission System (NGTS)
- Gas Interconnector Greece – Bulgaria (IGB)
- Gas Interconnector Greece – Turkey (ITG)
- Gas Interconnector Greece – Italy (IGI)
- TAP
- South Stream
- Gas Interconnector Bulgaria - Romania



The East Med Energy Corridor to Include also Electricity Interconnector (EuroAsia Interconnector)



The Importance of East Med Gas Supply

- ❑ An important paradigm shift is in progress as major oil and gas reserves are for the first time being developed outside the OPEC – Arab embrace, yet within the Middle East space
- ❑ East Med's proximity to European continent to provide relatively easy access to energy supplies
- ❑ Development of East Med hydrocarbon resources in line with stated EU energy policy of diversifying energy supplies in an effort to lessen dependence on Russian gas
- ❑ East Med oil and gas reserves shall strengthen European hydrocarbon resources as Cyprus and Greece are full EU members and Israel belongs to the European Economic Area
- ❑ Greece is likely to emerge as the next potential oil and gas region in SE Europe, complementing Israel and Cyprus

East Med Gas Supply – Geopolitical Implications (I)

- ❑ Can East Med be seen as a threat to Russian gas dominance?
- ❑ Is Turkey going to claim exclusive rights for East Med gas transmission?
 - (i) Not necessarily since Turkey is primarily interested to cover its own growing gas needs from East Med gas supplies
 - (ii) A brand new gas route will have to be built in addition to TANAP to take the extra gas from the East Med region via the Turkish mainland through TAP and/or through a new East Balkan pipeline to Europe. This requires major investments in gas transit routes but with uncertain quantities at this stage

East Med Gas Supply – Geopolitical Implications (II)

- ❑ Can Greece seize the opportunity to become a vital new gas supply route to Europe? Not likely since Greece, geographically may be in a privileged position but practically the country is bankrupt with a weak government and therefore incapable of long term planning. It is no accident that none of recent major energy projects has been realized despite firm EU support and bilateral agreements, i.e. Burgas – Alexandroupolis oil pipeline, the ITGI, gas pipeline, the Helios Project, Oil and gas Exploration in West Greece, Aegean islands electricity interconnections etc.
- ❑ Exploration and development of East Med gas reserves should be seen as an opportunity for increased regional co-operation and hence contribution to regional political stability
- ❑ In a Middle East which has been in turmoil over the past two years East Med oil and gas exploration offers an opportunity for stability and growth with several countries benefiting from impeding investments (i.e. Greece, Turkey, Syria, Lebanon, Israel, Egypt, Cyprus)

What Next

In Europe

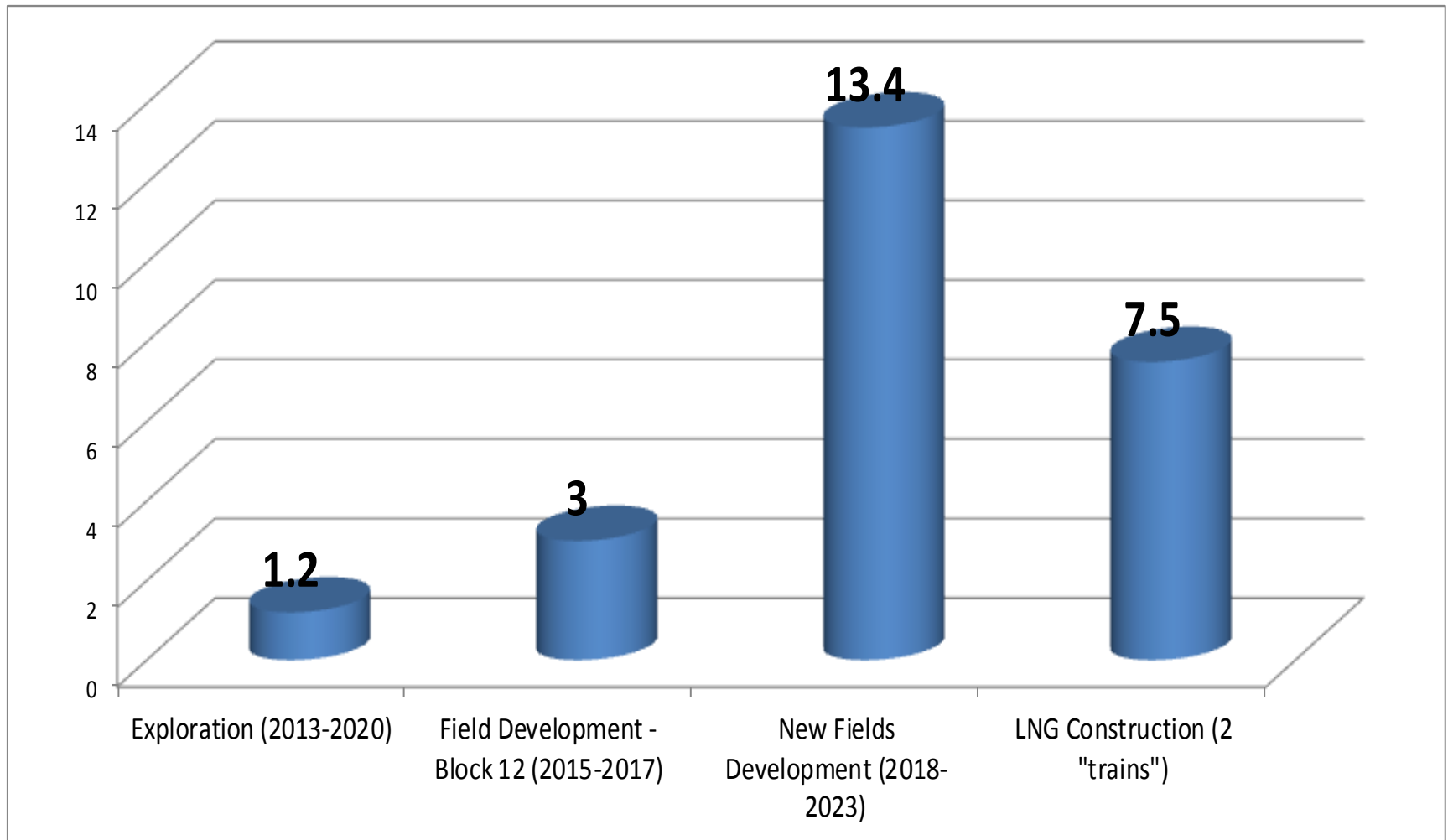
- ❑ The EU and the Brussels bureaucracy will have to accept South Stream as a major European project and hence remove once and for all the various artificial objections which they are raising
- ❑ Russia backed by its European partners should seek to establish a special framework of cooperation with the EU to safeguard South Stream's construction and operation, with specific reference to all agreements signed so far with all the host countries
- ❑ The EU should try over the next few years to develop a cohesive energy policy (which is currently lacking) with energy security as one of its main pillars and hence develop alternative energy supply inputs including Caspian and East Med

What Next

In SE Europe

- ❑ As sizable gas volumes will be entering SE Europe's system by 2020 the case for gas price competition will become much stronger
- ❑ Market liquidity is seen as top priority and can only be realized by completing the various country interconnectors (e.g. IGB, ITB, IBR etc.)
- ❑ The emergence of a Gas Price Hub in SE Europe will help develop gas price competition and hence improve market conditions (IENE is currently preparing a comprehensive study to this end)

Total anticipated investments in Cyprus (upstream and downstream sectors)



East Med Gas: The Next Steps

- ❑ Full development of the Leviathan field in Israel so that gas production may start in 2016/17
- ❑ Full development of the Aphrodite field in offshore Cyprus with production target date of 2018/19
- ❑ Development of further fields in both Israel and Cyprus from existing concession areas (2015-2023)
- ❑ Construction of underwater pipelines linking Leviathan to Israel, Egypt and Turkey (2015-2020)
- ❑ Construction of two (2) LNG trains in Cyprus (2016-2020)
- ❑ Construction of East Med gas pipeline (2018-2020)
- ❑ Total anticipated investments in East Med gas development, for both Israel and Cyprus, likely to reach 60.0 billion euros by 2023.



INSTITUTE OF ENERGY
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**Thank you for
your attention**

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