



RESEARCH CENTRE FOR
ENERGY MANAGEMENT
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Gas & LNG market developments & geopolitics in SE Europe

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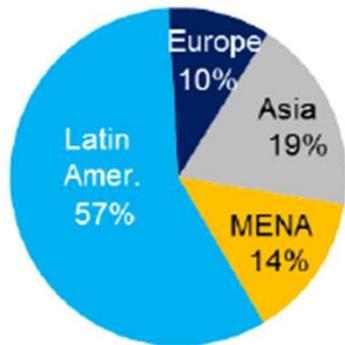


15th European IAEE Conference, Vienna, 3-6 Sept. 2017

Supply flexibility is key..

- ▶ Long-Term risks are coming from Renewables and the uncertainty on the Gas Demand side.
- ▶ Gas supply must be adapted to a market that will be more **complex** and more **demand side driven**.
- ▶ The Globalization of LNG markets in conjunction with the development of FSRUs and Small-Scale LNG can provide such a flexibility of supply needed.

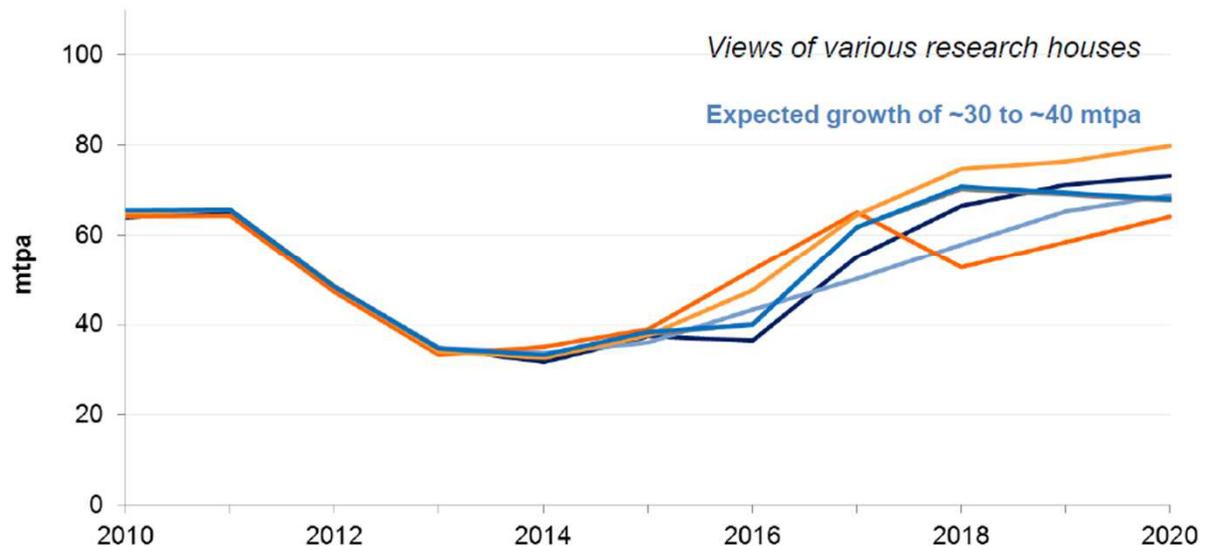
U.S. LNG delivered in 2016



- ▶ ~4 mt exported in total for the year
- ▶ LNG from Sabine Pass Liquefaction project delivered to 14 markets so far

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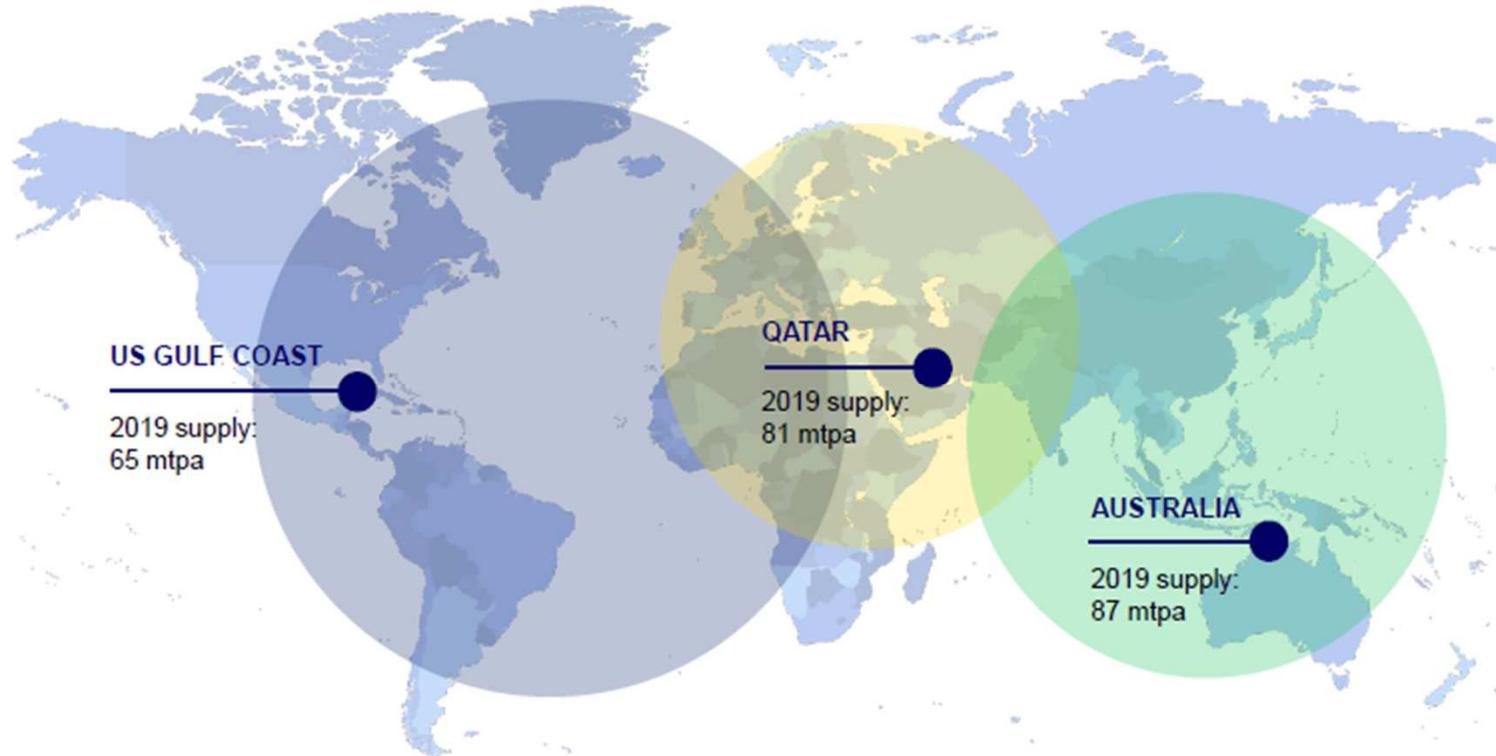
Europe LNG Imports to 2020



Source: Various research house views (2016); Wood Mackenzie, FACTS Global Energy, IHS, PIRA, Gas Strategies, Poten and Partners

Liquidity of LNG supply is increasing

New LNG supply poles emerging in US Gulf Coast, Qatar and Australia



Source: IHS

Note: Does not include all global liquefaction.

- In 2016, 270 mtpa of LNG traded globally.
- **No shortage of market makers**, 30 –40 players in the market.
- **By 2019**, 365 mtpa of planned LNG trade: equivalent to 12-15 cargoes for sale everyday.

The US revolution broke the LNG chain

Old model

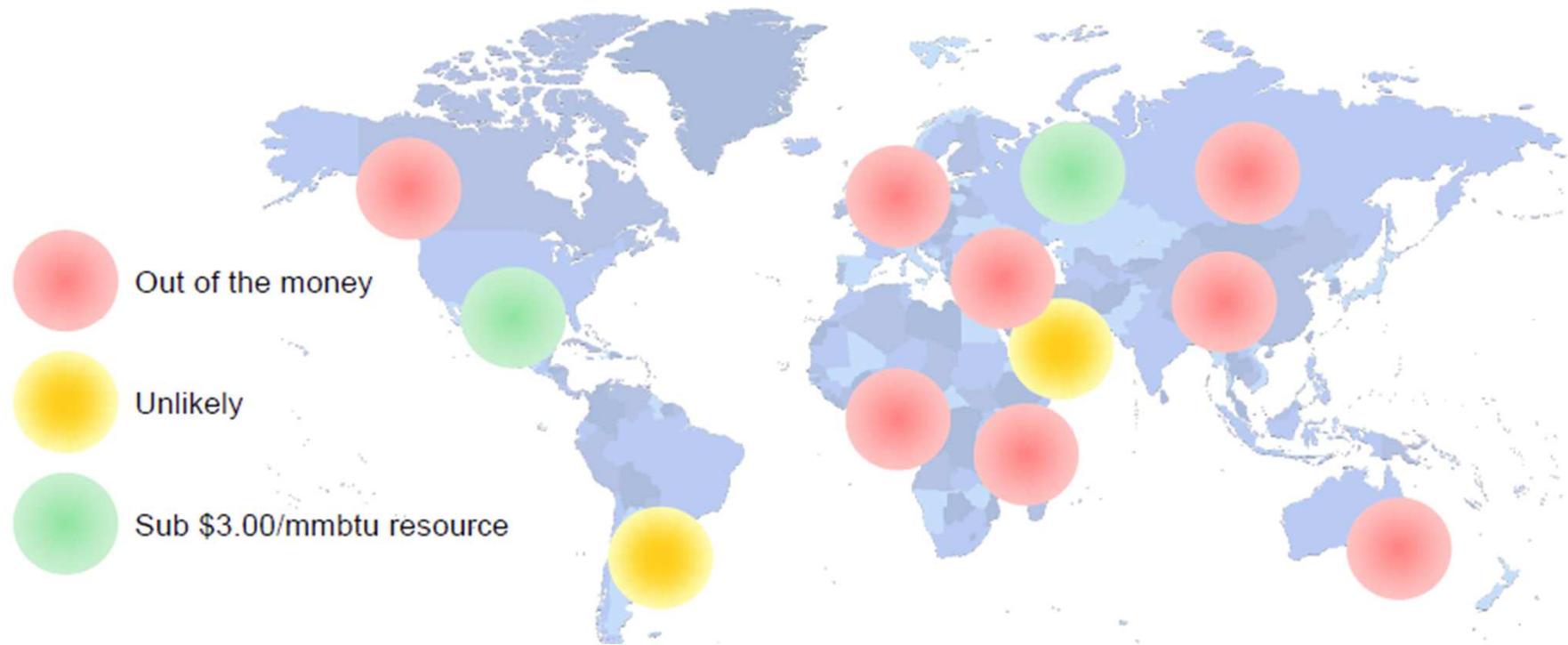
- ▶ LNG - a way to turn stranded gas into oil
- ▶ Integrated chain necessary
- ▶ Scale of investment meant that only the IOCs and NOCs could participate
- ▶ Point-to-point sales
- ▶ LNG project capacity driven by upstream resource

US “Cheniere” model

- ▶ Broke down the chain and separated upstream and downstream for the first time
- ▶ Created simple FOB model with cost plus infrastructure
- ▶ Access to Henry Hub pricing for the world
- ▶ Gave destination flexibility to everyone
- ▶ LNG production driven by how much LNG customers want

After 65 mtpa of LNG, we know the model works in the current environment. Is it enough?

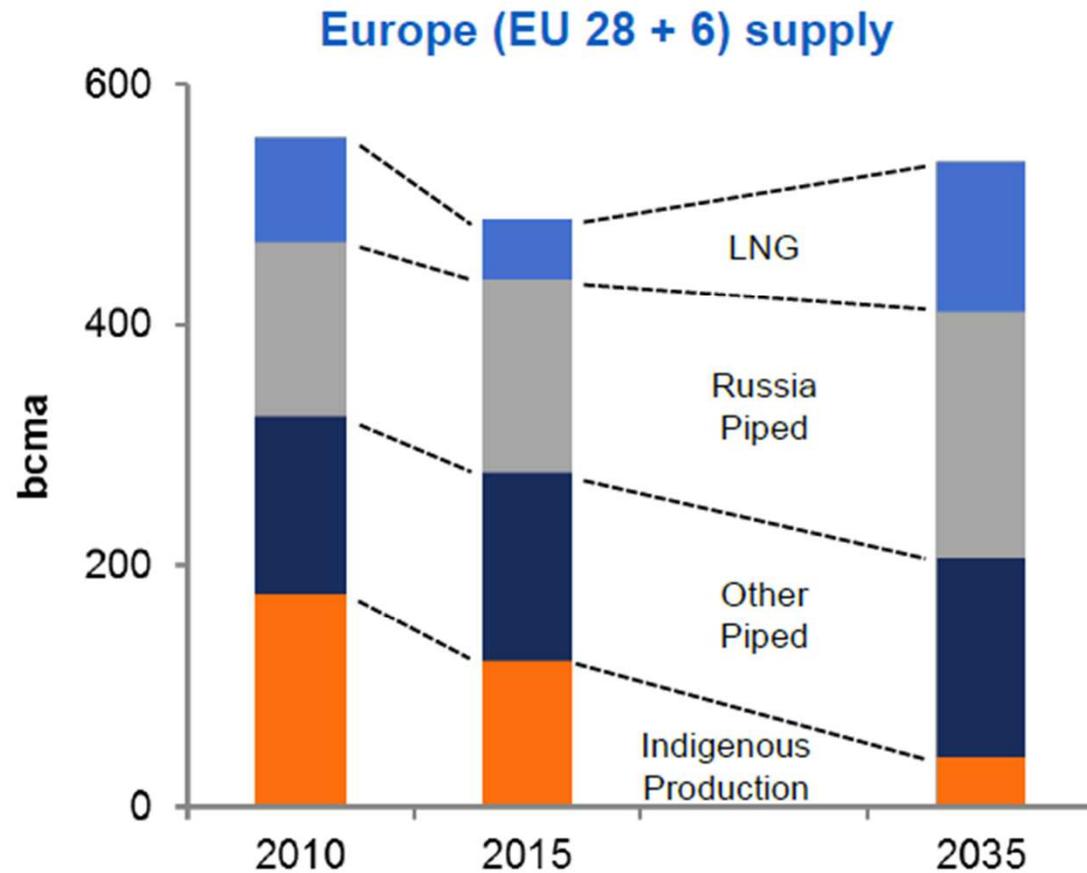
\$3/mmBtu is the new benchmark



Source: IHS, Tellurian Inc. estimates

Russia and the US are the only countries that can deliver \$3/mmBtu gas long-term

European Gas Supply to 2035



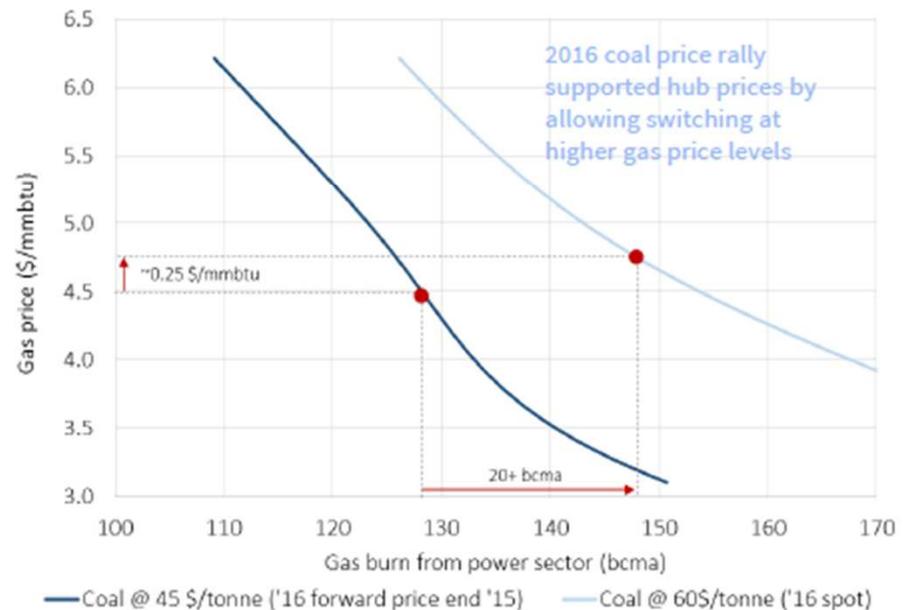
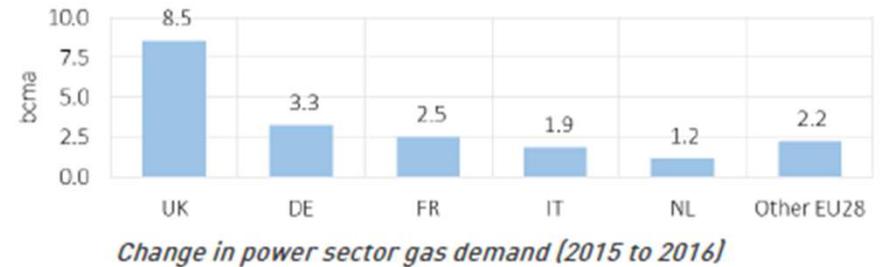
Source: Cheniere interpretation of Wood Mackenzie data (H2 2016)

Determining factors

- Overall Demand
 - Economic Growth
 - Coal / Carbon price
 - Oil price
- LNG
 - Global supply / demand balance
- Russian pipe-gas
 - Near-term: market share vs SMRC
 - Longer-term: LRMC
- Other pipe-gas
 - Norway
 - Algeria
 - Southern Corridor (expansion)
- Indigenous production
 - Groningen Cap
 - North Sea decline rate

European gas/coal switching now a reality

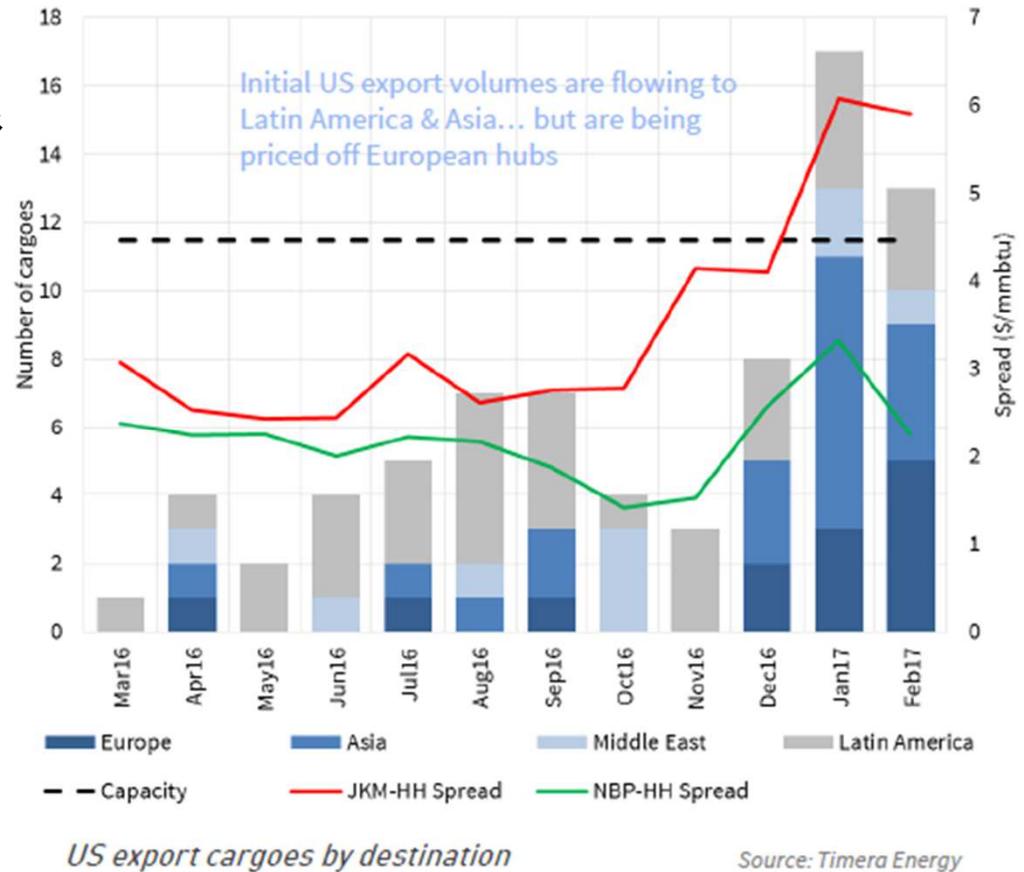
- ▶ European gas demand rose 27 bcma in 2016 (5.4%). 20 bcma of this was driven by higher power sector demand.
- ▶ Gas for coal switching was the key driver behind higher demand. More than 40% of incremental gas demand came from the UK (a consequence of the UK carbon price floor).
- ▶ Coal prices doubled between Q1 and Q4 2016. This increased the gas price levels at which switching took place, providing key support for European hub prices.
- ▶ European switching is currently the primary mechanism for absorbing surplus global LNG.
- ▶ Coal prices and power sector demand will be key drivers in 2017 of (i) European hub prices (ii) spot LNG prices.



2016 European power sector gas demand curves Source: Timera Energy

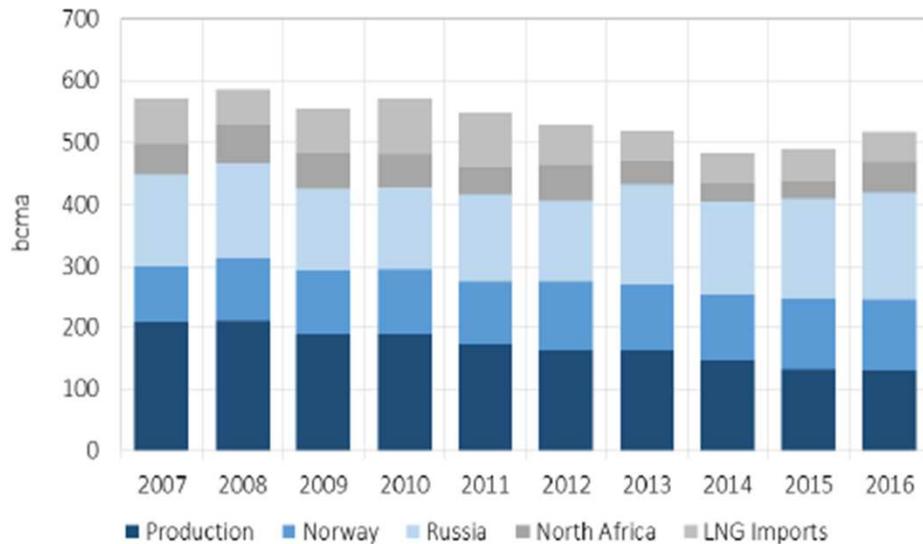
US gas market reconnects

- ▶ US exports commenced in 2016, but are so far limited to Sabine Pass T1 & T2. Only 4.2 bcma [3 mtpa] exported in 2016 due to delays & outages.
- ▶ Europe has received low volumes to date (12% to end Jan 2017), with Latin America the dominant cargo destination (47%).
- ▶ But US export volumes are being priced and hedged based on European hub price signals.
- ▶ A total of 89 bcma [65 mtpa] of committed new US export supply is due online by 2021, most in 2018/19.

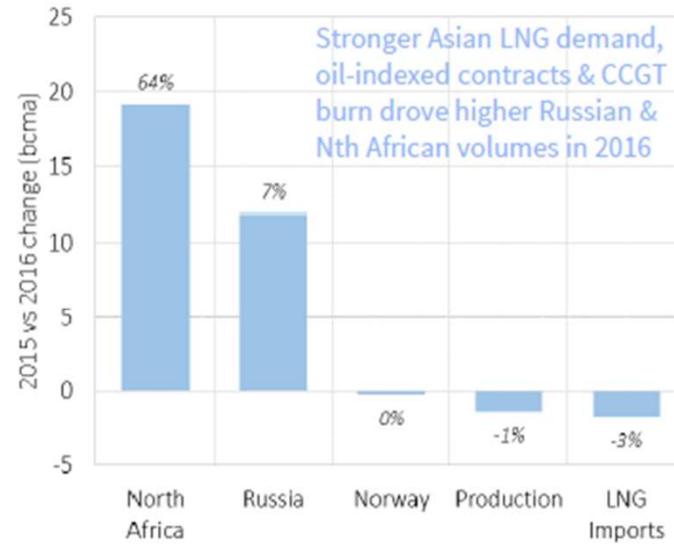


- ▶ As US export volumes grow, significant volumes are likely to land in Europe, or to displace cargoes that flow to Europe from elsewhere.
- ▶ Henry Hub price will have an increasing influence on global gas prices as US exports rise.

European supply sources: LNG vs Russian imports



Evolution of European supply

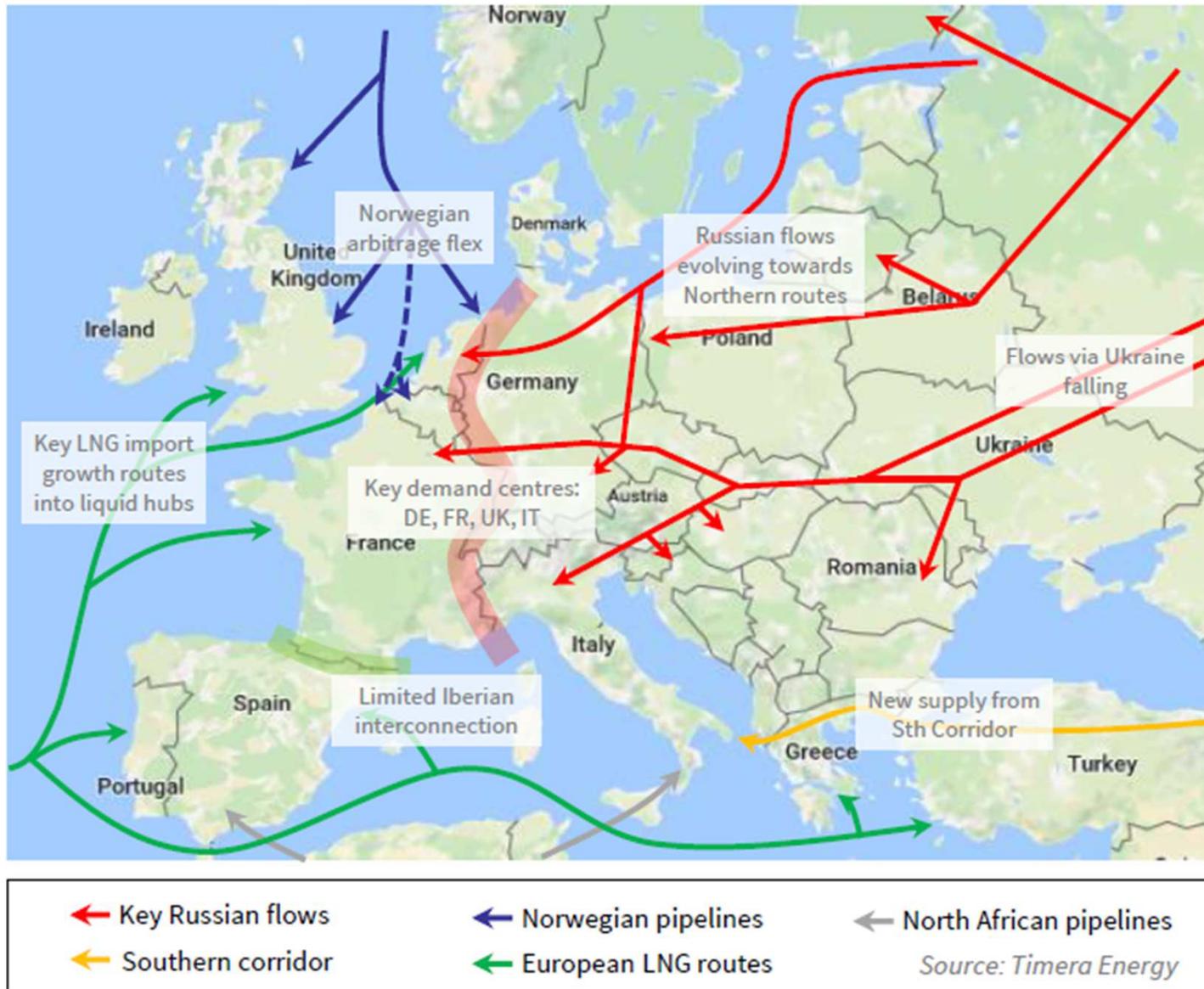


Change in supply (2015 vs 2016)

Source: Timera Energy

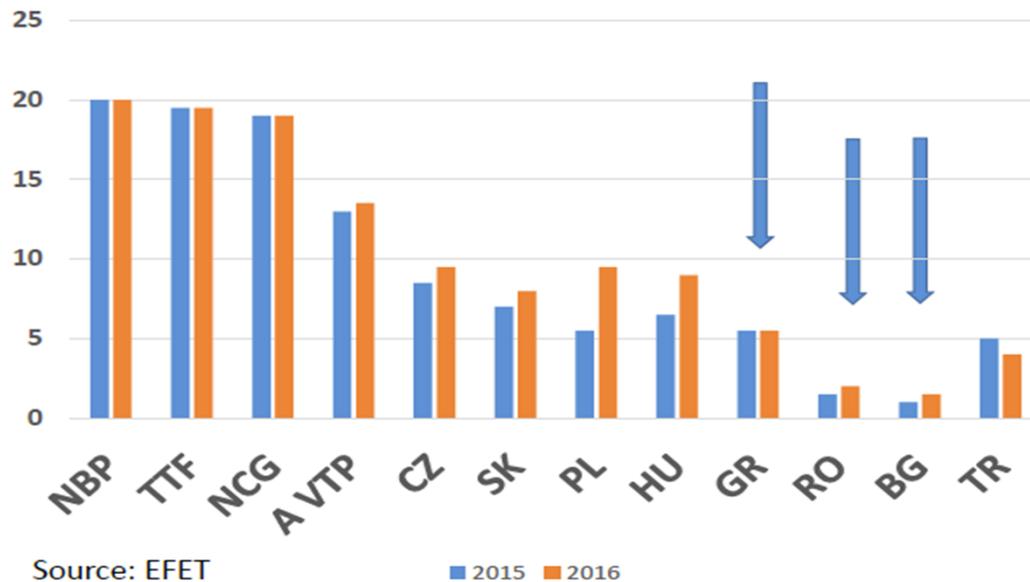
- ▶ 2016 saw lower than expected European LNG imports given (i) strong Asian and Middle East demand & (ii) LNG project delays/outages.
- ▶ Russia and North Africa filled the gap. But increase in Russian volumes was primarily driven by supplier contract nominations not Gazprom flow decisions. Strong Q4 2016 Russian volumes driven by lagged oil indexed contract prices falling below hub prices.
- ▶ Extent of (i) surplus LNG & (ii) oil price recovery, will strongly influence Russia's market share ambitions going forward.

Major European Gas Flows



Situation in the Balkans: Romania, Bulgaria, Serbia and Greece

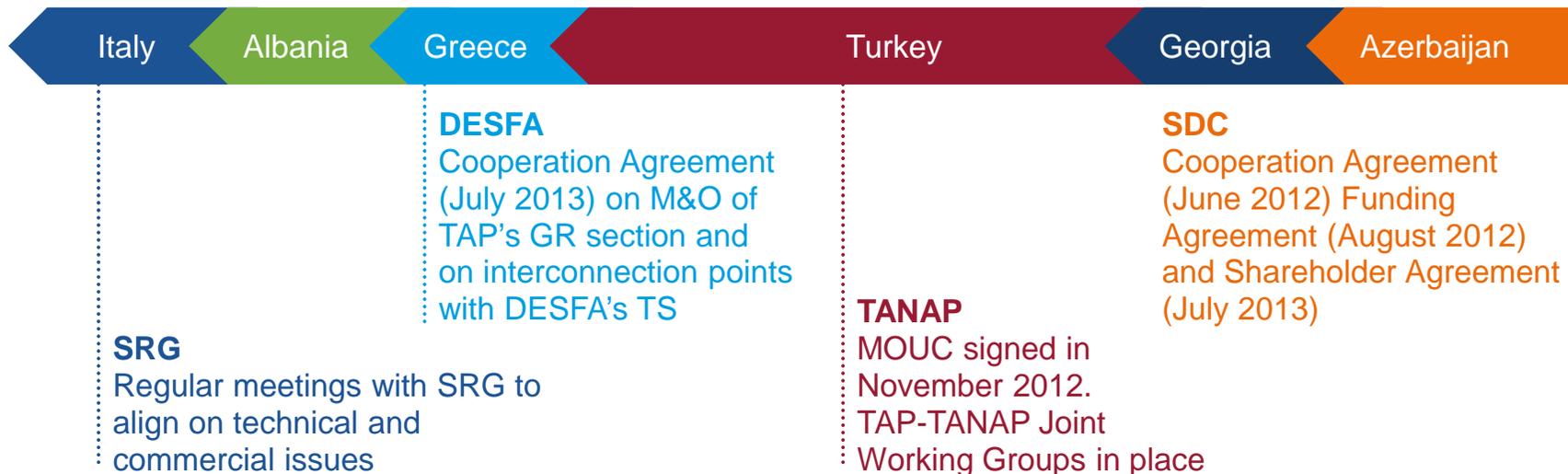
- ▶ Illiquid markets
- ▶ Limited interconnection
- ▶ Poor supply diversity
- ▶ EU 2014 stress test; Central and southeast European gas connectivity initiative (CESEC)



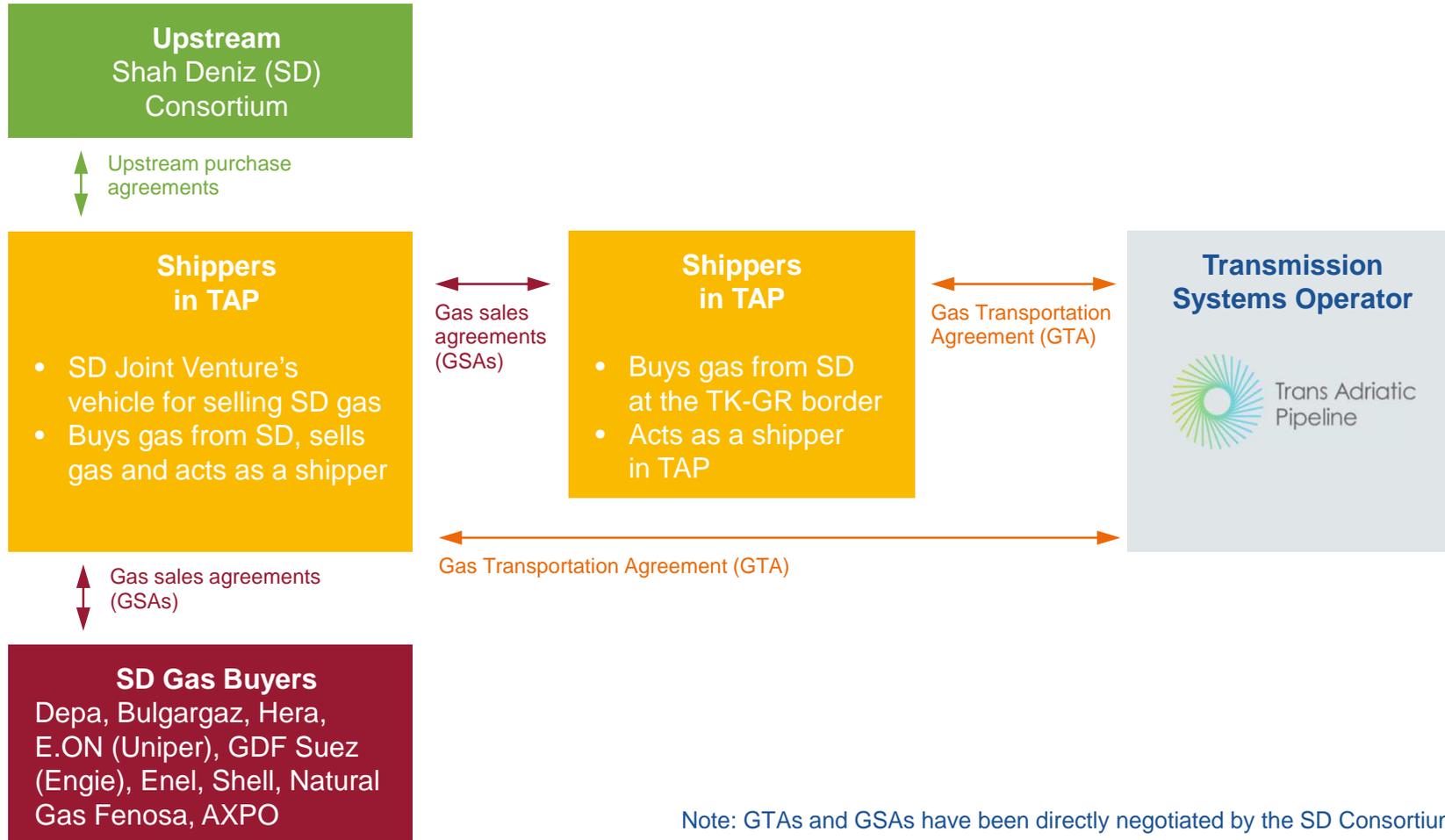
- EFET Gas Hub development study. Score out of 20 (rates the trading environment).
 - Regulation; Grid operators; Market.

Trans Adriatic Pipeline: cooperation along the SGC

TAP is able to expand its capacity from 10 to 20 bcm at **marginal incremental cost** when new supplies become available.

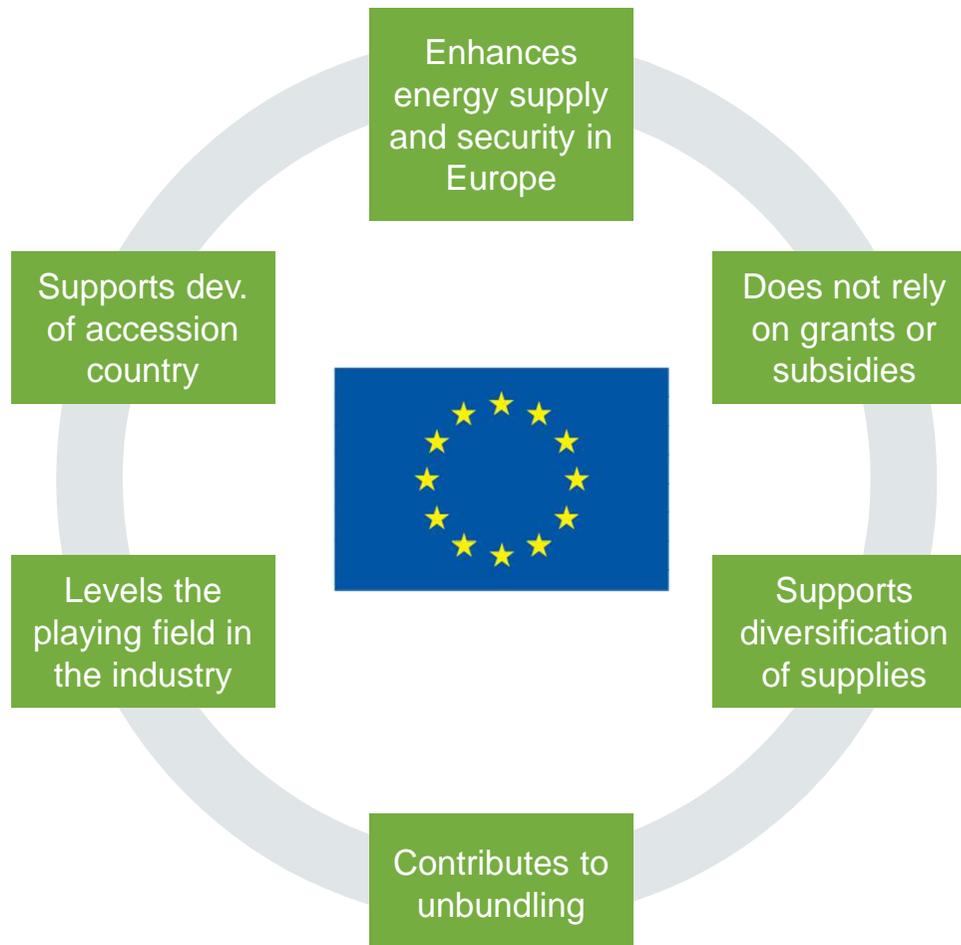


Commercial Framework



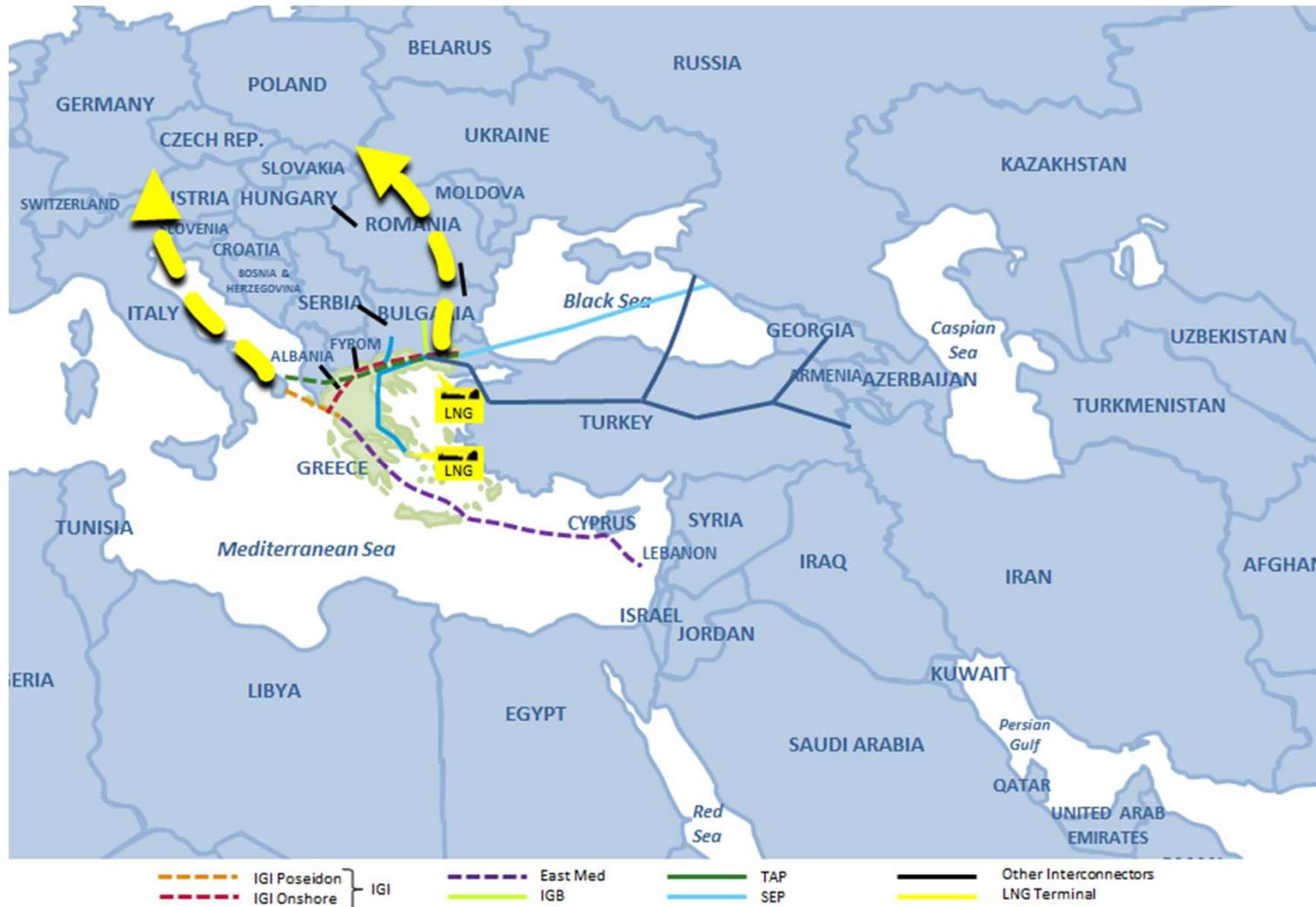
Support from the EU

▶ TAP is a Project of Common Interest (PCI)



- ▶ TAP received PCI status from the EU Commission and EU member states.
- ▶ TAP represents a high priority energy project for the European Union and concerned member states.
 - ▶ TAP can benefit from fast-track procedures for permits
 - ▶ Political support at the highest EU level and formal recognition of TAP as crucial part of Southern Gas Corridor

Greece – The Gateway to Europe



The role of Greece on South-East Europe's Energy Security – Aegean LNG in Alexandroupolis

Project type: A Floating Storage and Re-gasification Unit (FSRU)

Location: Alexandroupolis, Northern Greece

Project status: a specific strategic evaluation study and a technical feasibility study have been completed by DEPA

Proposed size/capacity: a ship with 150,000m³ storage capacity and 5 bcma send out capacity

Estimated start date: 2018

CAPEX: 350m USD

Third-party access: TPA exemption likely

Project structure: Ideally a consortium with 3-4 investors, including an LNG supplier and area's midstream & downstream players

The Aegean LNG:

- ✓ can redefine the regional gas market landscape since it will be the first re-gas facility targeting the broader SEE region, mainly the Balkans
- ✓ will allow SE Europe to diversify its gas supply sources and have easier access to a number of neighboring LNG producers
- ✓ located in northern Greece is at the crossroads of several key infrastructure projects, including cross-border pipelines (ITG, TAP, IGB, ITGI, Turkish-Greek Stream, etc.) and UGS facilities
- ✓ would consist an attractive commercial option, due to its proximity to a number of LNG producers, flexibility, scalability and the ability to meet all relevant environmental, safety, social, legal and regulatory standards

Eastern Mediterranean region: export options

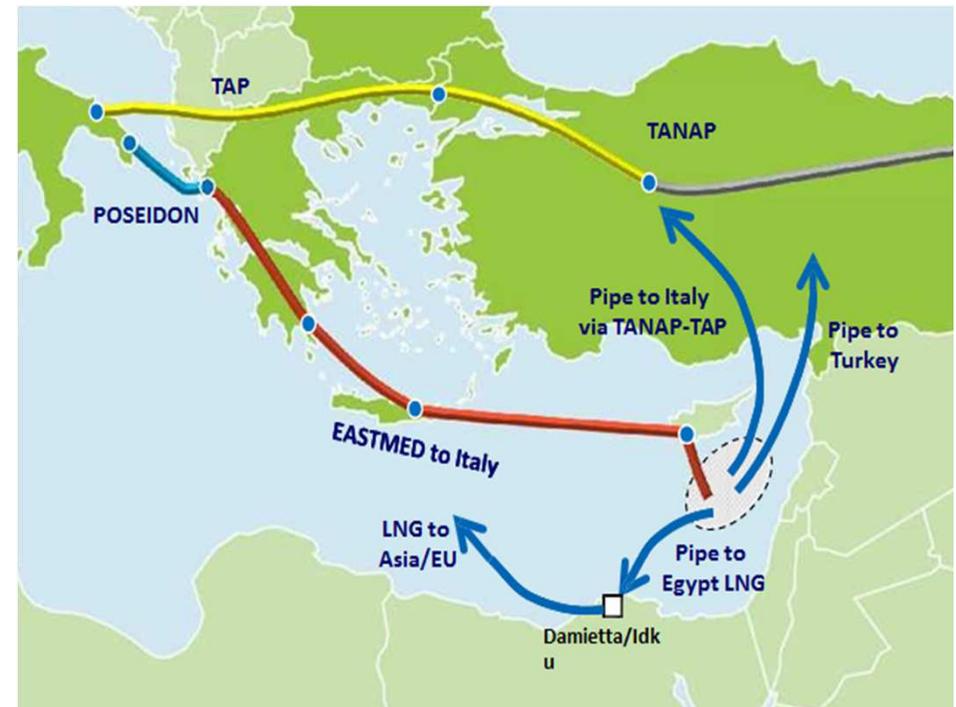
Current reserves of the Eastern Mediterranean region, without accounting future discoveries in a widely underexplored region, could support multiple and complementary export schemes.

3 main destination markets are currently under consideration :

- **Turkey**, large and fast growing market with the demand expected to rise by approx. 25 bcm in 2040
- **Europe**, by far the largest energy importer in the world with the ambition to diversify its supply sources
- **Global LNG**, well supplied market conditioned by the significant increase of global liquefaction capacity (+40% by 2020)

Several export options under assessment:

- pipe to Turkish market
- existing Egypt LNG facilities to Asian and/ or European markets
- pipe to European market, using TANAP /TAP chain
- **EastMed pipeline to European market**
- new liquefaction plant in Cyprus



Northern Greece: Potential for a Gas Hub



-  Trans Adriatic Pipeline (TAP)
-  National NG Transmission System (DESFA)
-  Routing
-  Turk Stream
-  Planned LNG (FSRU)
-  Interconnector Greece - Italy (IGI)
-  Interconnector Greece - Bulgaria (IGB)
-  LNG Distribution





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Thank you for your attention!

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