



Energy Security in SE Europe and the role of LNG The market perspective

Athens, 4-5 July 2017



Gas Supply and Demand



Gas supply and demand trends globally

- The fastest growing fossil fuel by 2030 is expected to be Natural Gas
- 21% to 23% increase in the global primary energy mix from 2016 to 2030
- Demand will continue to increase in the years to come, although with different growth patterns from region to region (high growth rates in emerging economies and moderate ones in OECD countries)
 - ✓ By 2030, China, India and rest Asia will become the main drivers of demand growth (more than 50%)
- Key Drivers of global demand growth
 - ✓ Power generation: 1,5% per year
 - ✓ Industry: 1,2% per year
- Between 2016 and 2030, energy supply is expected to grow by 1,3% p.a
- Gas supply is also set to grow globally (can reach up to 4,200 bcm) mainly due to US shale gas as well as due to conventional gas production in Russia, Middle East and Australia
- LNG is rapidly expanding due to glut in global LNG supplies and unprecedented high rates of FSRUs employment



Gas supply and demand trends in Europe

- Gas demand in Europe is expected to be relatively stable (i.e. low growth rates) at least till 2035, while indigenous gas production will continue to decline
- Import dependence worries/risks will be mitigated by diversified gas supplies and “flexible” LNG
- Gas will continue to play a key role in the European energy mix, as “transition” fuel to a low carbon economy

The Greek Gas Market

- After several consecutive years of decline, there was a remarkable increase of gas demand in Greece in 2016 (+33%), due to low gas prices and strong gas demand for power generation
- In 2017 gas demand is expected to increase further by ca 15% and reach up to 4,6 bcm



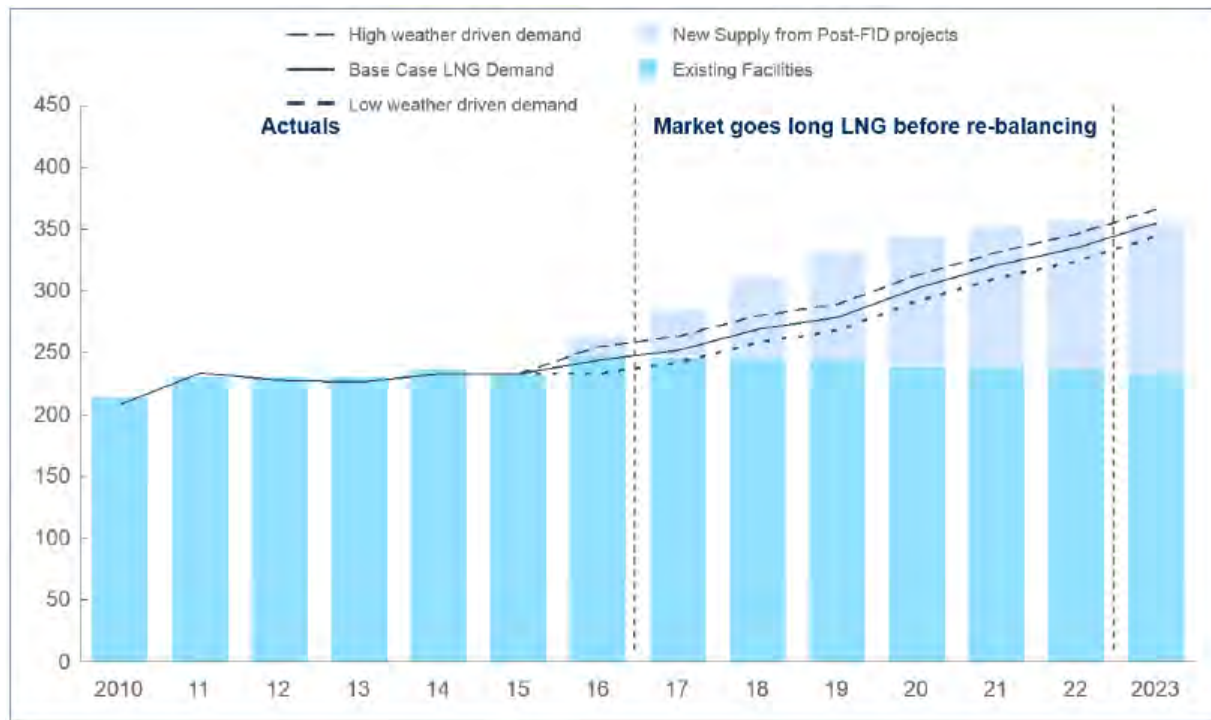
Demand

- European gas demand is expected to be relatively stable through 2030
- Main driver: Declining gas to power demand
 - ✓ Although gas is expected to take market share from coal-fired generation and nuclear in 2020, will face continued decline from 2020 due to renewable generation capacity expansion
- Major European gas markets will face demand stagnation through 2030
 - ✓ France: 0,5% (Slight demand growth mainly driven by residential & transportation sectors)
 - ✓ Italy: -0,5% (Slight decline due to improving energy efficiency and photovoltaics expansion)
 - ✓ Germany: 0,1% (Gas in power generation struggling to compete with lignite and renewables)
 - ✓ United Kingdom: -0,5% (Gas to power demand decrease due to new nuclear power generation and renewables expansion)

Supply

- A slight decline of 2,5% p.a. from 254bcm in 2016 to 178bcm in 2030
 - ✓ United Kingdom:- 2,7% (Steep decline in North Sea fields and high exploration costs)
 - ✓ Norway: -3,1% (Maturing assets and new developments will struggle to balance with legacy assets)
 - ✓ Netherlands: -3,0% (Recent earthquakes forced Dutch Government to reduce Groningen output to 24bcm (from 27bcm)
 - ✓ Rest of Europe: -0,3% (Overall decline in production and exploration)
- 70 bcm increase in European import dependency is expected between 2016-2030
 - ✓ High probability of increased LNG imports as Europe acts as a balancing point, likely to receive extra LNG flows
 - ✓ Pipeline gas supplies mainly from Russia and alternative exporters (Algeria, Libya, Azerbaijan) with superior economics

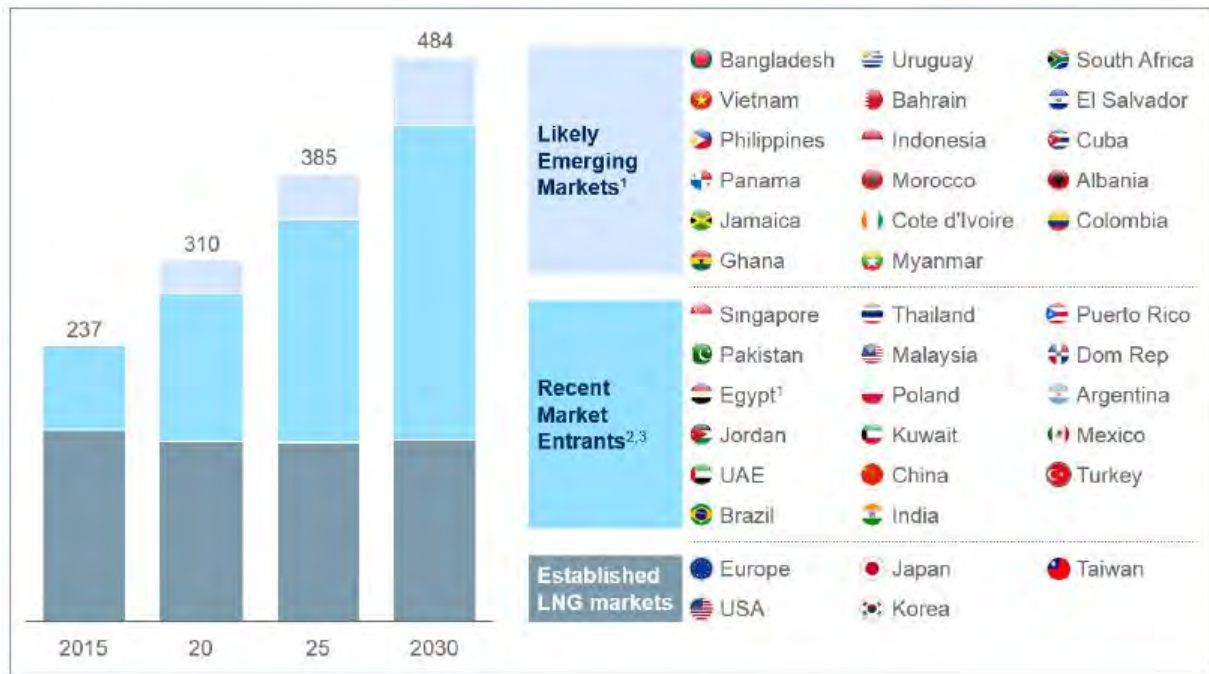
LNG Supply and Demand balance: 2016-2023



Source: McKinsey Energy Insights

- Underlying Demand for LNG will struggle to keep up pace with new capacity
- Relatively small footprint, despite the fact that some trading houses have managed to successfully enter the LNG market even in a constrained environment
- Market expectation to become long in the next 6-9 years
- LNG Demand expectation: 17 recent and more than 15 likely emerging markets

LNG Demand by Market (established-recent & likely market entrants)



Source: McKinsey Energy Insights

- Established LNG markets: Europe, Japan, Taiwan, USA, Korea
- Recent Market Entrants: Singapore, Thailand, Puerto Rico, Pakistan, Malaysia, Egypt, Mexico (amongst others)
- Likely Emerging Markets: Bangladesh, Uruguay, South Africa, Vietnam, Indonesia (amongst others)



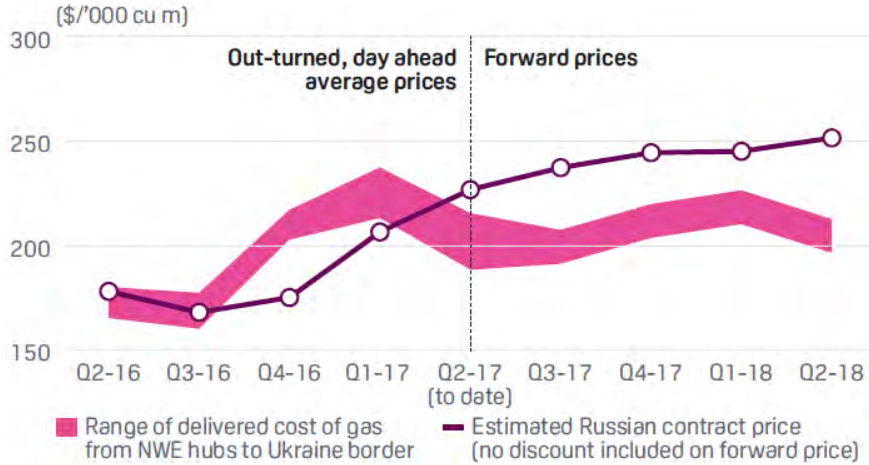
Globalization of Gas Market

- Growing share of LNG in total gas consumption can be an accelerator factor
- Between 2005 - 2016 the share of pipeline gas increased faster than LNG
- LNG Market growth characterized by the addition of 15 new importing markets and 7 more LNG export routs.
- More than 300bcm of export capacity was added during this period (2005 – 2016)
- Share of LNG in global gas trade: 10% - 14% growth is expected , mainly due to increased distance between Sellers and Buyers
- More than 90% of total LNG demand growth will be driven by emerging markets
- Through 2024, LNG Market is expected to be oversupplied
 - ✓ Demand is not expected to keep up with capacity additions
 - ✓ Undersupply avoidance after 2024 with additional investments
- Under development LNG capacity located in US & Australia
- Europe would double import capacity to import needs in case all planned infrastructure were built by 2030
 - ✓ LNG & Pipeline imports can fulfill domestic and gas production decline
 - ✓ Europe's high regasification capacity can accommodate increased demand in LNG Market
 - ✓ New import routs can increase optionality but still there is uncertainty on route-prioritization

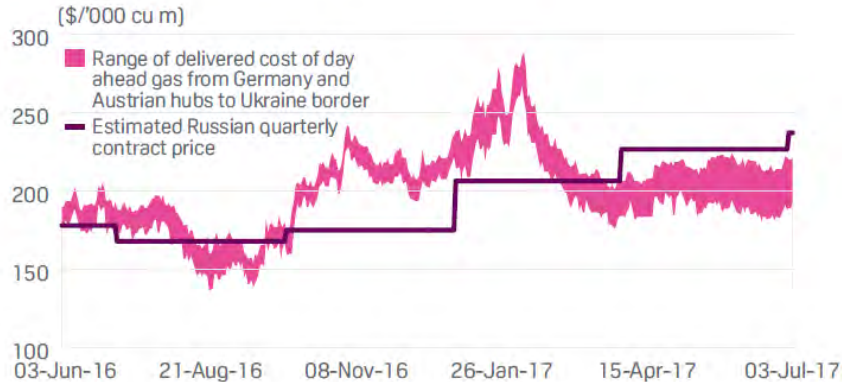
European Hub Prices



Russian Contract seen out of money in SUM-17 as HUB price bottoms in Q3-17



- The Russian oil-indexed price for Q3 expected 7% higher than EU hub prices, estimated at \$237,25/tScm



An evaluation of the Greek gas market



The wholesale gas market/trading

- Despite the positive developments in both the legislative and the regulatory regimes the last years the wholesale market is not yet functioning properly not only at a national but also at a regional level (SE Europe)
- The most important barriers and inefficiencies are:
 - ✓ The existence of long-term take-or-pay supply contracts (mainly at DEPA's portfolio), accompanied with long-term capacity reservations at the entry points
 - ✓ Infrastructure limitations (Revithousa)
 - ✓ Tariff for usage of the LNG terminal essentially hampers or even terminates spot access to the sole available flexible entry to the domestic and regional gas system
 - ✓ Incomplete regulatory regime, particularly concerning transparency and wholesale price formation mechanisms
 - ✓ The Greek Virtual Trading Point (VTP) is still at its infant stage and consequently there is absence of a national or regional gas exchange and forward market, as well as lack of any capacity/balancing platform to support a real secondary gas/capacity market
 - ✓ Lack of market based balancing procedures
 - ✓ High complexity in transactions with TSO and between market participants