I. Key uncertainties on gas demand
The strength of environmental policies is the #1 uncertainty on gas demand
The access to emerging countries demand is the #2 uncertainty on gas demand.
The relative price of gas vs. coal is the #3 uncertainty on gas demand.
Gas is a regulatory play

Global gas growth 2015-2035

Source: BP Energy Outlook 2017, p.84
The gas optimum between too soft and too strong environmental policies is also visible in Europe.

CCGT gas consumption, 2030, Europe

- Low CO₂ price
- High CO₂ price
- High renewables

Source: FTI-CL Energy power market model, ENTSOE V3 supply combined with ENTSOE V2 demand
1 Strength of environmental policies

Despite environmental advantages, gas is not well positioned for lobbying in consuming countries

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Some technical advantages over coal

**Electricity Generation pollutants with gas emissions as a % of coal emissions**

![Bar chart showing CO2, NOX, SOX, PM10, HG emissions for coal and gas. Gas emissions are lower than coal emissions for all pollutants.]

**Low political footprint vs. other energies in consuming countries**

**# of jobs in energy production, EU28**

- **Extraction of crude petroleum and natural gas:**
  - Natural gas: 31
  - Crude petroleum: 57

- **Mining of coal and lignite:**
  - 294

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Source: Commission de coopération environnementale - Les émissions atmosphériques des centrales électriques nord-américaines - 2011, p.42

Source: European Commission - EU - 2016 pocketbook energy.

Note: Breakdown between crude petroleum and natural gas taken from a 2010 study of Eurostat (Extraction of crude petroleum and natural gas statistics - NACE Rev. 2)
84% of gas demand increase is expected to come from emerging countries, where political barriers could hinder expected growth.

A large demand growth to capture...

Breakdown of gas demand growth (IEA, 2014-2030)

- Non-OECD, 84%
- China, 28%
- Middle-East, 24%
- India, 9%
- OECD, 16%
- Non-OECD - other, 24%

...with significant political barriers

Security of supply issue
- Main consumers (India, China...) net importers
- Limited appetite for further import dependency

Regulated price issue
- Historic low regulated price a barrier to import
- Hard to reform / High subsidy cost

Note: TPED, New policies scenario
As an example, Ghana’s LNG imports are stuck in political issues

Golar Tundra Case

- **November 2015**: GOLAR LNG signed a 5-year deal with West African Gas Ltd (local company) to charter 170,000 cbm FSRU from Q2 2016 in Tema

- **May 2016**: FSRU arrival, operational set-up

- **Since May 2016**: Delays to start up because of logistical issues and political wrangling

- **October 2016**: Parliamentary delayed approval to gas sales contract but major onshore construction (connecting pipeline, jetty,..) not completed

- **Current situation**: GOLAR is awaiting outstanding charter payments for the vessel, and started legal action against West African Gas Ltd

Source : LNG world news
Coal has recently won over gas where it matters: Asia

Coal and gas-fired power investment in Asian markets (2015)

Coal maintains a cost advantage over natural gas in Asia

Levelised Cost of Electricity in China

However this could be reversed if gas becomes sustainably more competitive than coal (1/2)

Europe OECD gas gross consumption 2010 - 2016

Source: International Energy Agency, monthly gas statistics
However this could be reversed if gas becomes sustainably more competitive than coal (2/2)

Average annual gas demand from power generation in 2017 – 2020 compared to 2016, according to gas price levels [EU28 + NO + CH]

Source: FTI-CL Energy analysis. Forwards as of February 2017

Change in consumption (TWh)

Price €/MWh

2016 gas consumption

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

TTF in
Winter
2006/2007

Current
TTF forwards

Current
Henry Hub forwards + variable transatlantic transport

Top 6 countries:

Netherlands
Italy
UK
France
Spain
Germany
Other Europe

Source: FTI-CL Energy analysis. Forwards as of February 2017
The price of gas will be to a large extent defined by the LNG market

Share of LNG in global long-distance gas trade (IEA)

- **2000**: 525 bcm (LNG 26%, Pipeline 74%)
- **2014**: 685 bcm (LNG 42%, Pipeline 58%)
- **2040**: 1,150 bcm (LNG 53%, Pipeline 47%)

II. Drivers of global LNG prices
The LNG market is reconfiguring

1. **Demand: An increasing volatile world**
   - After decades of Take-Or-Pay contracts…
   - ...An increasingly volatile world

2. **Supply: A bust for now**
   - Oversupply coming to the market
   - Collapse of investments, likely to lead to boom and bust cycle

3. **Industry structure: Taming the explosion of risks**
   - Shorter commitments and more flexible assets
   - New risk bearing intermediaries
1 Demand

The level of LNG demand will be determined by emerging countries’ credit risk and demand uncertainty, and its relative price vs. coal.
New LNG demand from emerging countries carries demand volatility and higher credit risk


Non credit rated companies as % of buyers in new LNG contracts [2]

2. Non-rated companies as % of buyers in LNG contracts starting each year. Source: 2016 GIIGNL Annual Report, page: 8 - 11; and Moody’s.
Europe has a large switching potential supported by import overcapacity – Utilisation dropped from 60% to 40% since 2010

EU import capacity and net imports

**Utilisation factor**

<table>
<thead>
<tr>
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<th></th>
<th></th>
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<tr>
<td>Net imports (bcm)</td>
<td>550</td>
<td>500</td>
<td>450</td>
<td>400</td>
<td>350</td>
<td>300</td>
<td>250</td>
</tr>
<tr>
<td>Total import capacity (bcm)</td>
<td>900</td>
<td>800</td>
<td>700</td>
<td>600</td>
<td>500</td>
<td>400</td>
<td>300</td>
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</table>

European storage overcapacity further supports the region’s global LNG balancing role

Storage capacity and demand for storage products (Base 100% in 2009)

An oversupply is coming to the market

LNG liquefaction capacities

Possible delays in commissioning outside US

Supply investments have collapsed, leading to likely boom and bust cycle

LNG liquefaction terminals investment, according to IEA

The industry is adapting to higher risks

A  Shorter commitments and more flexible assets

• Significant share of short-term deals, Reliance on tendering

• Putting assets on boats to increase flexibility

B  New risk bearing intermediaries

• Trading houses entering the LNG market, offering risk intermediation
Short-term deals have become significant and can be relied upon

**Significant share of short-term volumes**

**Increasing reliance on short-term supplies/sales**

**Development of tenders, 2016-2017:**
- ~500 cargos bought via tender
- ~200 cargos sold via tender

Source: IGU 2016 World LNG Report, p.13
Source: Cheniere Analyst Day 2017, p.61
As an example, Pakistan has secured a significant LNG supply through straight tendering.

**Pakistan gas market forecast**

<table>
<thead>
<tr>
<th>Year</th>
<th>Demand (Bcf/d)</th>
<th>TAPI pipeline imports</th>
<th>LNG supply</th>
<th>Domestic production</th>
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</thead>
<tbody>
<tr>
<td>2016</td>
<td>4.5</td>
<td>1.2</td>
<td>2.0</td>
<td>1.3</td>
</tr>
<tr>
<td>2017</td>
<td>4.9</td>
<td>1.2</td>
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<td>1.3</td>
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<tr>
<td>2018</td>
<td>5.2</td>
<td>1.2</td>
<td>2.0</td>
<td>1.3</td>
</tr>
<tr>
<td>2019</td>
<td>5.5</td>
<td>1.2</td>
<td>2.0</td>
<td>1.3</td>
</tr>
<tr>
<td>2020</td>
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<tr>
<td>2021</td>
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<td>1.2</td>
<td>2.0</td>
<td>1.3</td>
</tr>
<tr>
<td>2022</td>
<td>6.2</td>
<td>1.2</td>
<td>2.0</td>
<td>1.3</td>
</tr>
<tr>
<td>2023</td>
<td>6.4</td>
<td>1.2</td>
<td>2.0</td>
<td>1.3</td>
</tr>
</tbody>
</table>

**Pakistan tender**

- January 2017, 240 LNG cargoes tender secured, totalling 48 Bcf of gas (1.4 Bcm)
- Five-years tender of 60 cargoes
- 15-years tender of 180 cargoes
- Offers submitted on a DES basis
- Bank bond of $100,000 required for each bid
- Pricing: indexation to the 90-day average price of the Brent crude benchmark

Source: PLATTS
The industry is moving its assets on boats

Floating Regasification Capacity by Status and Number of Terminals, 2005-2021

Source: data from IGU 2016 World LNG Report, p.51
Trading houses have entered the LNG market, offering intermediation between producers and risky buyers.

Conclusion
Gas demand growth will remain dependent on coal prices and national fuels policies
Gas demand growth will remain dependent on coal prices and national fuels policies

1. Access to emerging countries demand
   - Helped by oversupply, industry adapting to new demand – but inefficient downstream pricing

2. Strength of environmental policies
   - A narrow path, likely to differ from country to country

3. Price of gas vs. coal
   - More liquidity and transparency to lead to more efficient pricing, based on Henry Hub
   - Cost cutting not yet happening on a large scale

Gas demand growth
Experts with Impact

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