

# Liquefied Natural Gas (LNG)

**Sector Overview**

**March 2017**

# LNG Industry

## ◆ Global Industry

- Life Cycle
- Industry Dynamics
- Trade | Regional Mix
- Exporting & Importing Countries
- Pricing

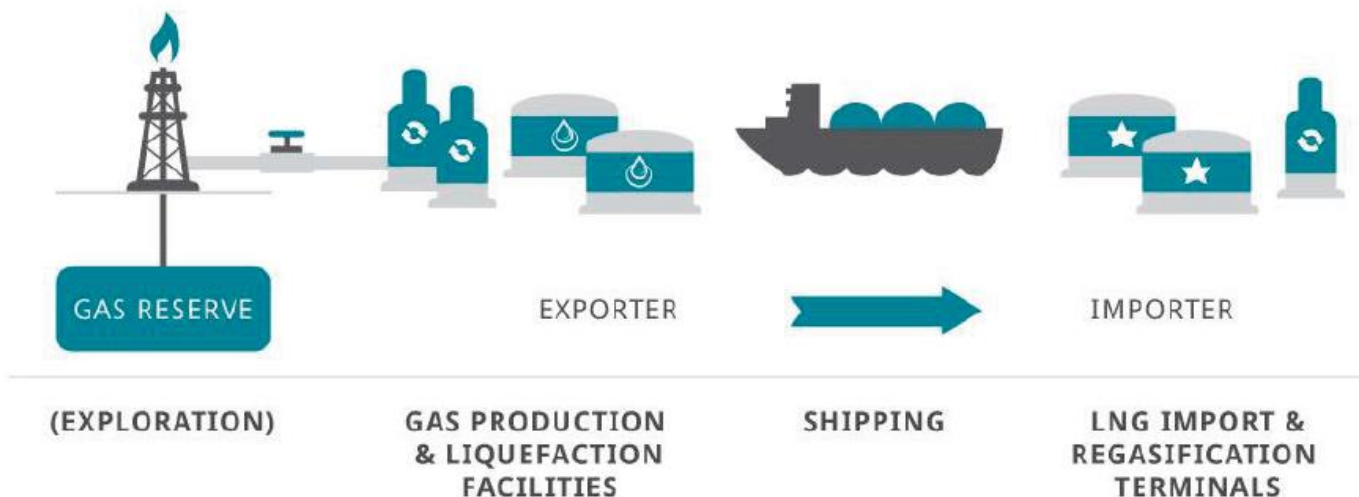
## ◆ Local Industry

- Dynamics | Production & Consumption
- Government Initiatives
- Upcoming Developments

# LNG - Lifecycle

Liquefied Natural Gas (LNG) is a form of natural gas converted to liquid form ease of storage or transport. It is odourless, colourless, non-toxic, and non-corrosive.

*LNG achieves a higher reduction in volume than (CNG) so that the (volumetric) energy density of LNG is 2.4 times greater than that of CNG or 60 percent that of diesel fuel. This makes LNG cost efficient to transport over long distances where pipelines do not exist.*



# Global Gas Industry

## % Share of Global Gas Supplies

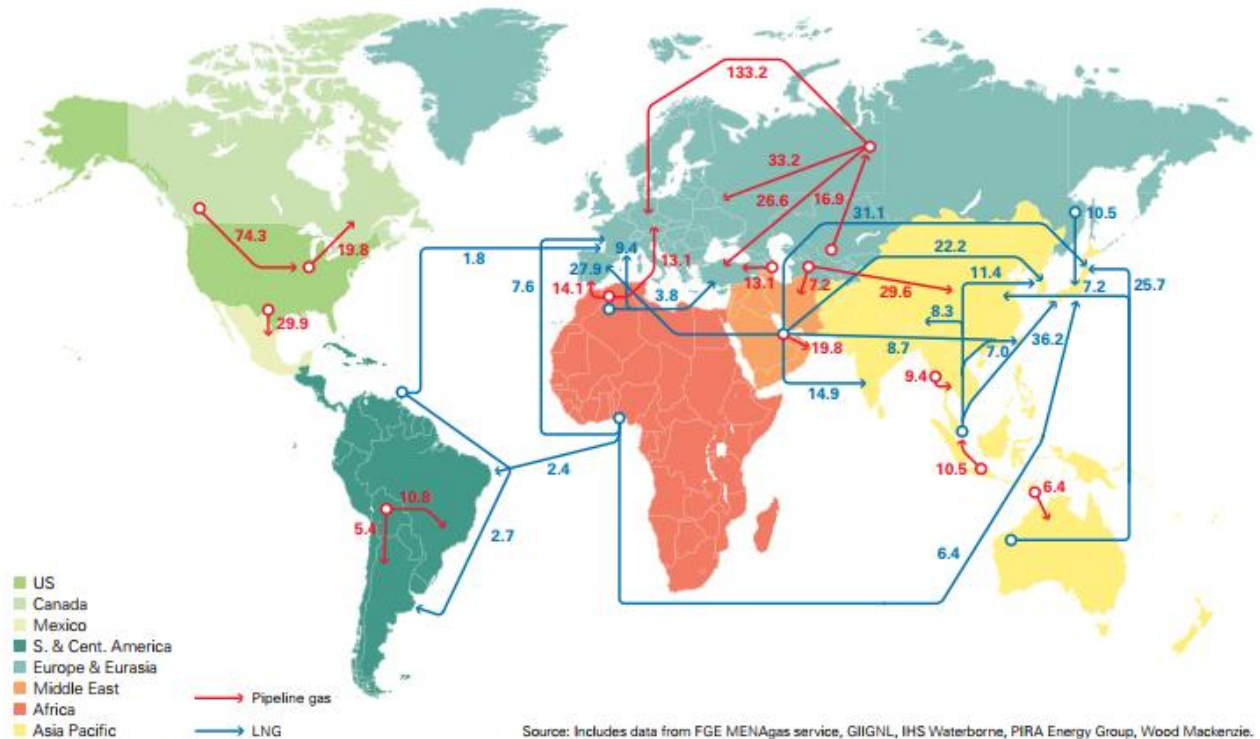
Domestic Consumption  
| 67%

Trade | 33%

Pipeline volumes  
(22%)

LNG Volumes  
(11%)

**Major trade movements 2015**  
Trade flows worldwide (billion cubic metres)



Global LNG supply, 4% in 1990, now accounts for ~10% with a CAGR of 6% since 2000

Low growth rate of LNG trade volume in initial years has picked up pace in recent years

# Global Trade | Regional Mix for CY16

<b>Exporting Region</b>	Africa	Asia-Pacific	Europe	Russia	Latin America	Middle East	North America	<b>Total</b>
<b>Importing Region</b>								
Africa	1.2	0.3	0.2		0.4	4.4		<b>6.5</b>
Asia	5.5	21.5	0.2	0.3	1.1	18.9	0.5	<b>48.0</b>
Asia-Pacific	4.4	76.5	0.1	10.6	0.3	45.7		<b>137.6</b>
Europe	18.2		2.8		2.5	17.4	0.3	<b>41.2</b>
Latin America	1.7	0.1	0.7		5.2	1.0	1.2	<b>9.9</b>
Middle East	3.2	0.7	0.1		0.8	3.6	0.4	<b>8.8</b>
North America	0.7	0.5	0.1		4.3		0.5	<b>6.1</b>
<b>Total</b>	<b>34.9</b>	<b>99.6</b>	<b>4.2</b>	<b>10.9</b>	<b>14.6</b>	<b>91.0</b>	<b>2.9</b>	<b>258.1</b>

Global LNG trade, with a growth of 13.2 MT over CY15, reached a record high 258 MT in CY16

China, India, and Egypt collectively provided 15.7 MT in new import demand.

**Pakistan**, importing 1.1 MT in CY15 (first year), saw an increase of 1.6MT to 2.7 MT (1% share) to meet growing domestic demand

**Leading Exporter:** Asia-Pacific (39% share), surpassing Middle East; additional 15 MT from Australia

**Leading Importer:** Asia Pacific (53% share)

# Global Trade | Countries

Exporting Countries		Importing Countries	
<u>Name</u>	<u>Qty (MTPA)</u>	<u>Name</u>	<u>Qty (MTPA)</u>
1. Qatar	77	1. Japan	83
2. Malaysia	25	2. South Korea	34
3. Australia	44	3. China	27
4. Nigeria	19	4. India	19
5. Indonesia	17	5. Taiwan	15
<b>Top 5 share</b>	<b>70%</b>	<b>Top 5 share</b>	<b>69%</b>

- Total number of exporting countries increased from 17 in CY15 to 18 in CY16 as:
  - i) Angola and Egypt both returned to producing LNG following a halt in CY15 due to repair work,
  - ii) and Yemen, which exported LNG during 1HCY15, did not export a single cargo in CY16 due to ongoing instability in the country.
- Total number of importing countries increased from 33 in 2015 to 35 in CY16, with Jamaica and Columbia entering the industry.

# Global Pricing Mechanism

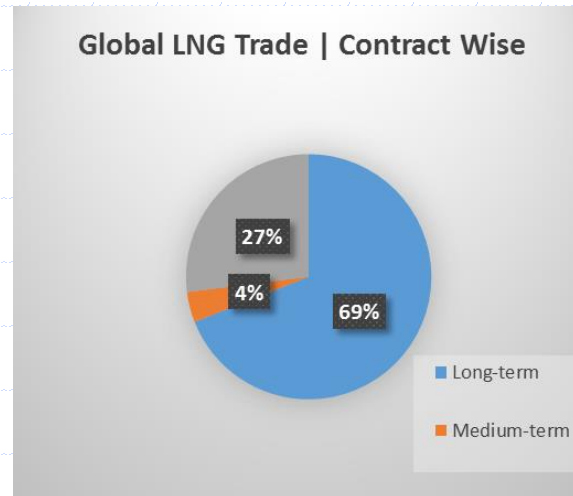
- ◆ Pricing in world gas markets is driven more by local and regional factors. Following are the details pertaining to pricing contracts and mechanism more widely available in the International Market:

## Pricing Contracts:

- Long-term contracts
- Medium-term
- Spot & Short-term contracts

## Pricing Mechanism:

1. Hub-Based: Prices are largely set at liquid trading hubs, the largest and most important of which is **Henry Hub** in Louisiana.
2. Oil-Linked: Without established and liquid gas trading markets, the price of LNG for majority of Asia and emerging markets is set via oil-linkages.



# Global Pricing Dynamics

## US Entry as an Exporter

- ◆ The technological advancements during the last decade in US Shale gas boom led to a 79% increase in reserves and a 50% increase in production of natural gas.
- ◆ Increased shale production reduced natural gas prices in the US in comparison to Europe and Asia, creating a commercial logic to import from US. This led to increase in the projected export facilities from US.
- ◆ Lower prices in US as compared to Europe and Asia since 2009 have increased the appetite for short-term supply contracts and spot trade of LNG. These contracts offer buyers the flexibility to arbitrage prices between alternate LNG markets.

## Declining Oil Prices

- ◆ The decline in oil prices in the last 3 years impacted the economics of LNG import from the US. Due to a large share of long-term contracts and oil-linked pricing, US LNG exports were not able to compete with Russian Pipeline supplies and Qatar's LNG exports. With a sharp decline in prices in 2014-15 resulting in lower spread between the two contracts, US LNG exports slowed down.
- ◆ However, with crude prices increasing from \$29 in Jan16 to \$54 in Dec16, last year saw a return to preference for US LNG contracts.
- ◆ European market: Europe would not have a direct advantage of US LNG exports but would reap indirect benefits due to increased total supply.
- ◆ *Asian market:* The higher shipping cost due to longer distances would make the export commercially unviable in most regions at current oil prices.



# Domestic Industry | Gas Production & Consumption

Demand - ~6000mmcf/d

Production - ~4000mmcf/d

Shortfall - ~2000mmcf/d

## Domestic Production Data\*

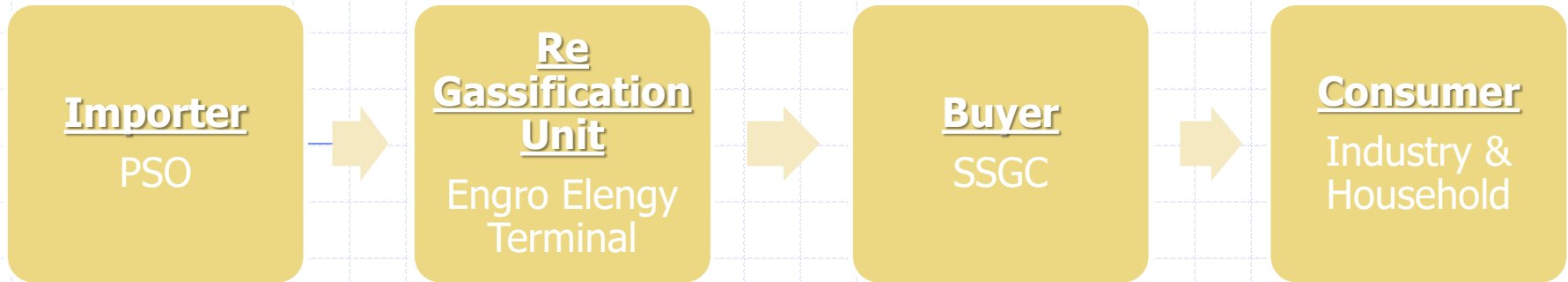
<u>Company Name</u>	<u>% share</u>
OGDCL	29%
PPL	16%
MPCL	15%
Eni Pakistan	13%
OMV Pakistan	7%
<b>Top 5 % Share</b>	<b>81%</b>
Others	19%
<b>Total</b>	<b>100%</b>

## Domestic Consumption Sector Wise

<u>Sector</u>	<u>% share</u>
Power	41%
Commercial & Residential	24%
Fertilizer	21%
General Industry	9%
Transport	5%
<b>Total</b>	<b>100%</b>

\*FY16 data not yet available; FY15 used as proxy

# Pakistan LNG Model



## Performance of LNG in Pakistan

- 1st LNG terminal commissioned in Mar-15 with a storage and Re-gasification capacity of ~600mmcf/d
- Till Dec-15, the terminal was handling ~200mmcf/d of LNG. Post-finalization of remaining contracts during CY16, LNG handling increased to ~400mmcf/d. Room for an additional ~200mmcf/d remains, for which negotiations are underway and are expected to be finalized by Jun-17.
- The terminal is operational and has received 61 cargo ships during CY16.
- Finalization of contracts for importing LNG
  - *Long-term / Qatar / 300mmcf/d / 15 Year contracts (Renewable after 10 years)*
  - *Medium-term / Guvnor / 100mmcf/d 5 Year contract /*

# Industry Developments | Terminals and Pipelines

## **Gwadar-Nawabshah LNG Terminal and Pipeline Project:**

- Pakistan-China G-G arrangement
- Installation of offshore/FSRU-based LNG Terminal – handling capacity of ~600mmcf/d – and related infrastructure at Gwadar Port through Government Holding Private Limited (GHPL).
- Construction of ~700km pipeline – transportation capacity of ~1.95bcfd – from Gwadar to Nawabshah. Estimated cost amounts to USD 2bln

## **North-South Gas Pipeline Project:**

- Pakistan-Russia G-G arrangement
- The pipeline will enable efficient transportation of RLNG (imported from Russia) from terminals in Karachi to users in Lahore. Length of the pipeline is 1,100km – transportation capacity of ~1.2bcfd – with an estimated total cost of USD 2bln.

## **Turkmenistan-Afghanistan-Pakistan-India Pipeline Project:**

- A gas pipeline from Turkmenistan to India via Afghanistan and Pakistan; length: 1,680km
- Turkmenistan will provide ~3.2bcfd of gas (Pakistan's share: ~1.3bcfd). Estimated capital cost of the project is ~USD 7.6bln.

# Industry Developments | Terminals and Pipelines

## 2nd LNG Terminal (Expected CoD: Jun'17):

- Installation of FSRU-based LNG Terminal - handling capacity of ~600mmcf/d – and related infrastructure at Port Qasim
- Constructed by a consortium - Pakistan GasPort Consortium Limited (PGPC) – led by Pakistan GasPort Limited (PGPL), and including Fauji Oil Terminal and Distribution Company (FOTCO)

## 3rd LNG Terminal (Expected CoD: 2H CY18):

- Installation of FSRU-based LNG Terminal - handling capacity of ~750mmcf/d – and related infrastructure at Port Qasim. Expected cost is USD 250-300mln
- Project being constructed by Global Energy Infrastructure Limited (GEIL), a Turkish company former

# Industry Developments | Other

## Short and Long-Term LNG contracts:

- In Jan'17, GoP invited bids for 240 LNG shipments. Post-bidding process, the following are the results as per lowest bids submitted:
  - *Medium-term / 5 years / **Gunvor** / 60 ships / 100mmcf*
  - *Long-term / 15 years / **ENI** / 180 ships / 100mmcf*

Currently only Gunvor has been awarded its contract, whereas ENI's offer has not yet been accepted on grounds of high offer price.

## Pakistan LNG Limited (PLL) and Pakistan LNG Terminal Limited (PLTL):

- PLL & PLTL are state-owned companies and subsidiaries of Government Holdings (Private) Limited (GHPL).
- PLL is mandated by GoP to procure LNG from international markets and enter into onward arrangements for supply of gas to the end user. PLTL has been established to manage and procure LNG storage and regasification service.
- Both companies are currently incorporated and operational.

## Challenges for LNG in Pakistan

- The end consumer for the use of LNG has not yet been finalized.
- Pricing mechanism for commercial and households use of LNG is yet not clear.
- The emergence of circular debt may hamper the continuity of smooth operations.

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