

LIQUIFIED NATURAL GAS (LNG)

Sector Overview

March 2016

LNG Industry

◆ Global Industry

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

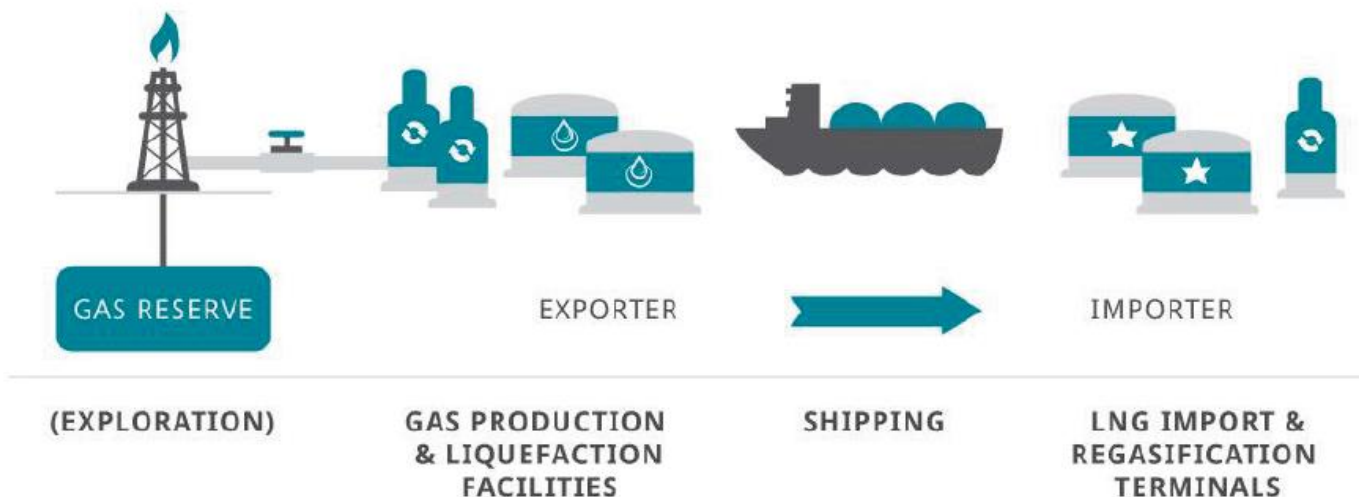
◆ Local Industry

- 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

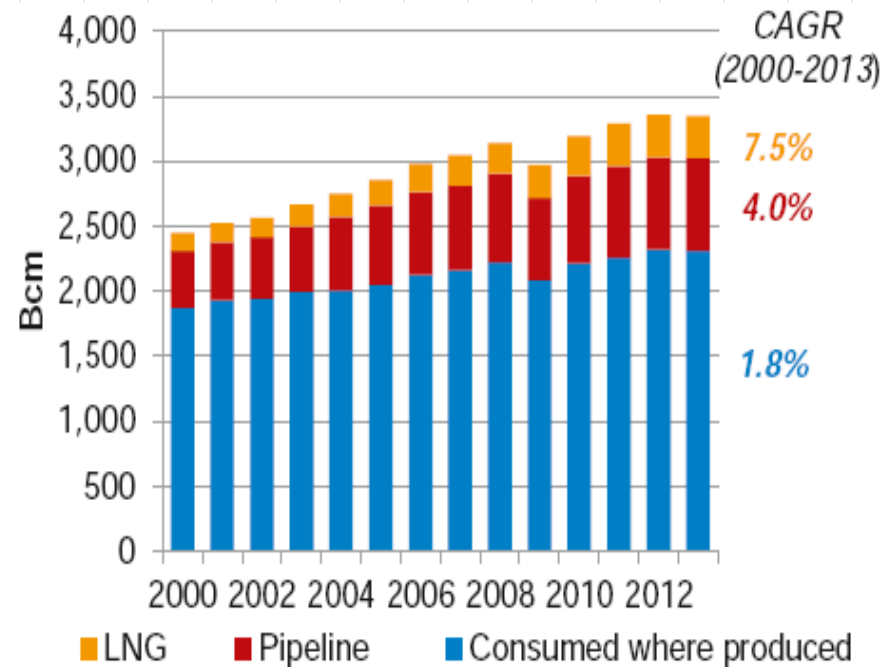
% Share of Global Gas Supplies

Domestic Consumption | 69%

Trade Dynamics | 31%

Pipeline volumes
(21%)

LNG Volumes
(10%)



4% in 1990 Global LNG Supply now accounts for 10% with a CAGR of 7% since 2000

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

Global Trade | Regional Mix

Figures in MT

Exporting Regions	Africa	Asia Pacific	Europe	Russia	Latin America	Middle East	N.America	Total
Importing Regions								
Asia	3.2	9.7	0.2	0.1	0.2	20.5	-	33.9
Asia Pacific	13	63.8	0.4	10.5	0.9	54.4	0.3	143.3
Europe	15.3	-	1.9	-	3.5	17.7	-	38.4
Latin America	2.7	-	0.9	-	8.4	1.2	-	13.2
Middle East	0.5	0.3	0	-	0.9	2.2	-	3.9
N. America	1.8	0.2	0.2	-	4.9	1.2	-	8.3
Total	36.5	74	3.6	10.6	18.8	97.2	0.3	241

Global Trade With a growth of 4.3MT reached 241.1MT in 2014

Highest level of trade was 241.5MT in 2011

Middle Eastern region remained the largest exporter with 41% share

Asia Pacific region remained the largest importer with 61% share

Global Trade | Countries

Exporting Countries		Importing Countries	
<u>Name</u>	<u>Q(M Tons)</u>	<u>Name</u>	<u>Q(M Tons)</u>
1. Qatar	77	1. Japan	89
2. Malaysia	25	2. S. Korea	38
3. Australia	23	3. China	20
4. Nigeria	19	4. India	14
5. Indonesia	16	5. UK	9
Top 5 % age	67%	Top 5 % age	70%

- Total number of exporting countries increased from 17 in 2013 to 19 in 2014
- Total number of importing countries increased from 28 in 2013 to 29 in 2014. The number is set to rise to 33 in 2015 with new terminals expected in Jordan, Egypt, Pakistan and Poland.

Global Pricing Mechanism

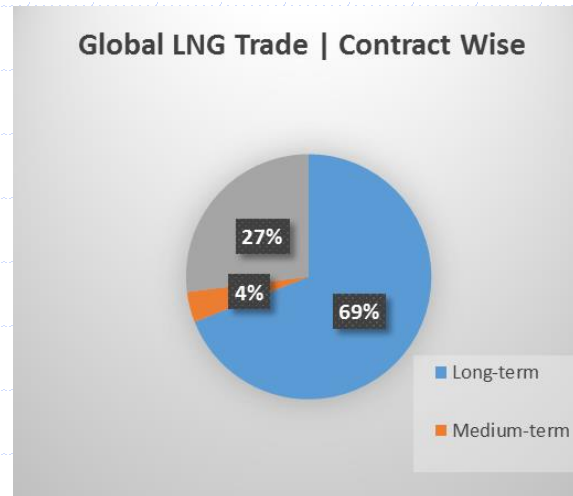
- ◆ Pricing in world gas markets driven more by local and regional factors. Following are the details pertaining to pricing contracts and pricing mechanism more widely available in the International Market.

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 is for the most part 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 50% increase in reserves and 34% increase in production of natural gas.
- ◆ The increased production reduced the prices of natural gas in US in comparison to Europe and Asia, creating a commercial logic to export from US. This led to increase in the projected export facilities from US.
- ◆ The low natural gas prices in US as compared to Europe and Asia since 2009 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 changed the economics of LNG export from US completely. The average annual prices of natural gas have moved from \$16/mmbtu in June 2013 to ~\$7/mmbtu currently at major world terminals.
- ◆ Due to a large share of long-term contracts and oil linked pricing, US LNG exports could not compete with Russian Pipeline supplies and Qatar's LNG exports.
- ◆ **European market:** The 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 | Production & Consumption

Total Demand - 6000mmcf

Total Production - 4000mmcf

Shortfall – 2000mmcf

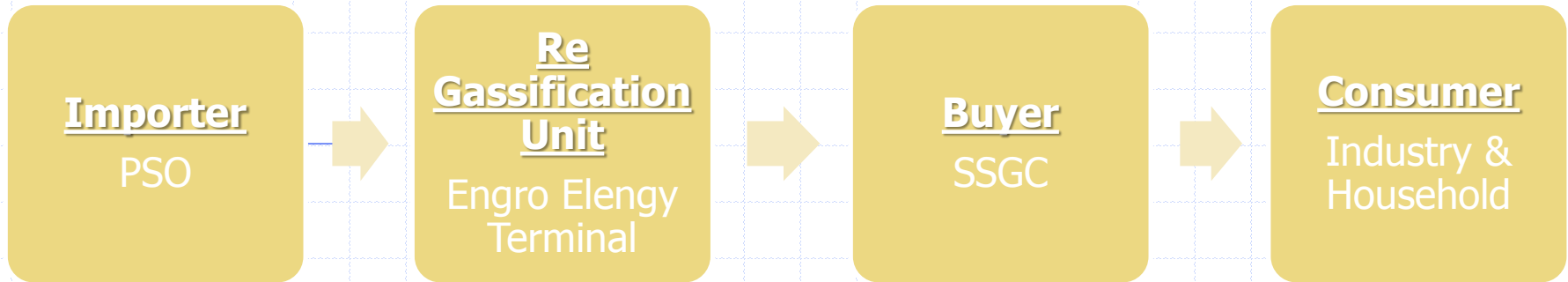
Domestic Production Data

<u>Company Name</u>	<u>% share in Production</u>
OGDCL	29%
PPL	16%
MPCL	14%
Eni Pakistan	12%
OMV Pakistan	8%
Top 5 % Share	78%
Others	22%
Total	100%

Domestic Consumption Sector Wise

<u>Sector</u>	<u>% share in Consumption</u>
Power	40%
Commercial & Household	25%
Fertilizer	19%
General Industry	10%
Transport	6%
Total	100%

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
- Terminal handled ~200mmcf/d of LNG till Dec-15. During CY16, the remaining contracts have been finalized and is currently handling ~400mmcf/d of LNG. Room for handling additional 200mmcf/d is present.
- The terminal is operational and has received 20 cargo ships including 15 STS (Ship-to-Ship) and 5 FSRU till Feb-16.
- 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 /*

Upcoming Developments

Gwadar-Nawabshah LNG Terminal and Pipeline Project:

- Installation of offshore / FSRU based LNG Terminal and associated Utilities & Off-Sites at Gwadar Port. (500MMCFD) through Government Holding Private Limited (GHPL).
- Construction of 42 inch diameter 700 Km (Approx.) Pipeline System from Gwadar to Nawabshah.

North-South Gas Pipeline Project:

- The government is planning to increase the size of power plant in Punjab. The Pipeline will enable to efficiently transport imported RLNG. Length of the pipeline is 1,100 km with a estimated total cost of US\$ 2.6bn.

Turkmenistan-Afghanistan-Iran-India Pipeline Project:

- A gas pipeline project from Turkemanistan to India Via Afghanistan, Iran & Pakistan. Turkemanistan will provide ~3.2 bfcfd of gas (Pakistan Share: 1.3 Bfcfd). Estimated Capital Cost of the project is US\$ 7.6bn.

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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