2018

Competition Assessment Study of LNG Sector in Pakistan

COMPETITION COMMISSION OF PAKISTAN

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Acronyms

AEDB	Alternative Energy Development Board
ARE	Alternative and Renewable Energy
BOO	Build Own and Operate
BRICE	Brent Price
C & F	Cost and Freight
CCP	Competition Commission of Pakistan
CIF	Costs, Insurance and Freight
CNG	Compressed Natural Gas
DAP	Delievered at Place
DAT	Delievered at Terminal
DES	Delievered Ex Ship
DG (Gas)	Directorate General of Gas
DGPC	Directorate General of Petroleum Concessions
ECC	Economic Coordination Committee
EETL	Engro Elengy Terminal Limited
EIA	Energy Information Administration
FOB	Free On Board
FOTCO	Fauji Oil Terminal and Distribution Company
FSRU	Floating Storage Regasification Unit
G2G	Government to Government
GAIL	Indian Natural Gas Processing and Distribution Company
GDP	Gross Domestic Product
GHPL	Government Holding Private Limited
GSA	Gas Sale Agreement
GTA	Gas Transport Agreement
HDIP	Hydrocarbon Development Institute of Pakistan
HSD	High Speed Diesel
IA	Implementation Agreement
IEE	Initial Environmental Examination
IP	Iran – Pakistan
IPP	Independent Power Producer
JCC	Japanese Crude Cocktail
JKM	Japan Korea Marker

KESC	Karachi Electric Supply Company
KOGAS	Korea Gas Corporation
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
LSA	LNG Service Agreement
MMCFD	Million Cubic Feet per day
MTPA	Million Tonnes Per Annum
NBP	National Balancing Point
NEPRA	National Electric Power Regulatory Authority
NOC	No Objection Certificates
OGRA	Oil and Gas Regulatory Authority
PGPC	Pakistan Gas Port Consortium
PLL	Pakistan LNG Limited
PLTL	Pakistan LNG Terminals Limited
PPRA	Public Procurement Regulatory Authority
PQA	Port Qasim Authority
PSO	Pakistan State Oil
RLNG	Re Gasified Liquefied Natural Gas
SEPA	Sindh Environmental Protection Agency
SNGPL	Sui Northern Gas Pipelines Limited
SPA	Sale Purchase Agreement
SSGCL	Sui Southern Gas Company Limited
T & D	Transmission and Distribution
TAPI	Turkmenistan - Afghanistan - Pakistan – India
TPA	Third Party Access
UFG	Unaccounted for Gas
USAID	US Agency for International Development
WB	World Bank

Executive Summary

The Competition Commission of Pakistan (the Commission) carried out the study 'Competition Assessment of the LNG Sector in Pakistan' under Section 28(1)(b) of the Competition Act (the Act), which mandates the Commission to carry out market studies to promote competition in all spheres of commercial economic activity.

The objective of the study is to examine and evaluate the competitiveness of the Liquefied Natural Gas (LNG) sector in Pakistan from LNG procurement in the international market, to the regasification of LNG at the regasification terminals, to the end consumers of RLNG. Further to evaluate the regulatory framework, pricing mechanism (including LNG long term, medium term contracts and spot purchases), market players, the level of competition in the sector at each level of the LNG value chain, and to assess the likelihood of any anticompetitive practices such as abuse of dominance, cartelization or bid rigging in the sector. It is also pertinent to establish whether there is a level playing field for all players at various levels in the sector, regardless of their status being state owned or privately owned. Moreover based on the competition assessment of the sector give recommendations for a more competitive and efficient sector.

Energy sources in Pakistan include oil, natural gas, liquefied petroleum gas, liquefied natural gas, electricity, coal, nuclear power and alternative energy sources which include wind, geothermal, and solar power. Oil and gas are the two main sources of energy in Pakistan and their respective shares in the energy supplies are 34.4% and 37.9% respectively (2016-17). Both oil and gas had an equal share in energy consumption during 2004-05 however since then the percentage share of gas has increased compared to oil. The primary reason for this conversion from oil to gas is due to gas being a cheaper substitute compared to oil. This increase in natural gas demand has resulted in natural gas shortage in the country. Currently the constrained natural gas demand (shortage) stands at 2000 MMCFD. To overcome the natural gas shortage, Pakistan began the import of LNG in 2015.

In Pakistan the LNG/RLNG market is a regulated market. Whereby the procurement of LNG is made by Pakistan State Oil (PSO) and Pakistan LNG Limited (PLL). The LNG import is for Sui Northern Gas Pipelines Limited (SNGPL), the buyer of LNG/RLNG. Currently there are two regasification terminals operating at Port Qasim, Engro Elengy Terminal (Pvt.) Limited (EETPL) and Pakistan GasPort Consortium Limited (PGPC) terminal. The Re-gasified Liquefied Natural gas (RLNG) is transported to the end consumers of RLNG through the transmission and distribution network of Sui Southern Gas Company (SSGC) and Sui Northern Gas Pipelines Limited (SNGPL).

The Oil & Gas Sector falls under the Ministry of Energy (Petroleum Division). The Petroleum Division is responsible for all matters dealing with petroleum, gas and minerals. The LNG sector is regulated mid-stream and down-stream by Oil and Gas Regulatory Authority (OGRA), under the OGRA Ordinance, 2002 and policies of the Federal Government. Furthermore OGRA has the exclusive power to grant licenses for regulated activities in the natural gas,

Compressed Natural Gas (CNG), Liquefied Petroleum gas (LPG), Liquefied Natural Gas (LNG) and oil sectors.

The *Delivery Ex-Ship (DES)* price of LNG is indexed to the Brent. Since the price of Brent fluctuates therefore weighted average Brent price of last three months is taken. The DES price is subject to the SPA of PSO and PLL with the LNG supplier and are contractually determined, also subject to PPRA rules where applicable. The RLNG price is determined and notified by OGRA on monthly basis. As the LNG vessels enter the Port Qasim limits, under Port Qasim Act 1973, Port Qasim Regulations, 1981 and the Standard Operating Procedures (SOPs) for LNG carriers are applicable regarding the specifications of the vessel, berthing, environmental impact assessment and other safety standards.

The competition assessment of the sector reveals various barriers to effective competition. These barriers arise due to a number of factors which affect competition and competitiveness of the sector. These include, the terms of the LNG contracts upstream-contract price review period, pricing models adopted, volatility in oil market and Brent indexed contracts, regulatory barriers in the form of excessive port charges, the ambiguity in classification of LNG and RLNG by the Federal Government, and application of Sindh Infrastructure Cess on LNG. Other barriers include capacity utilization of regasification terminals, SSGC pipeline losses, infrastructure network capacity, gas swap, and issues of network congestion.

Based on the competition assessment, the study proposes a number of recommendations to improve the competitiveness of LNG sector in Pakistan. These recommendations include a more competitive DES price negotiation through lower contract price review period, alternate pricing arrangement- S curve model, introducing price ceiling and floor, natural gas hubs and spot prices in the long term contracts. To improve the competitiveness of LNG regasification at the terminals, more competitive tolling tariff and maximum capacity utilization is proposed. Regulatory reforms proposed include, amendment in PPRA Procurement Rules for spot purchases, lower port charges by Port Qasim Authority (PQA), amendment in OGRA Ordinance, and exemption of Sindh infrastructure Cess on LNG. Other recommendations include revision of natural gas prices, quota and caps on domestic gas for commercial and industrial consumers, improvement in the transmission and distribution network of SSGC and SNGPL, and a stable investment policy on LNG sector development.

Chapter-1 Introduction

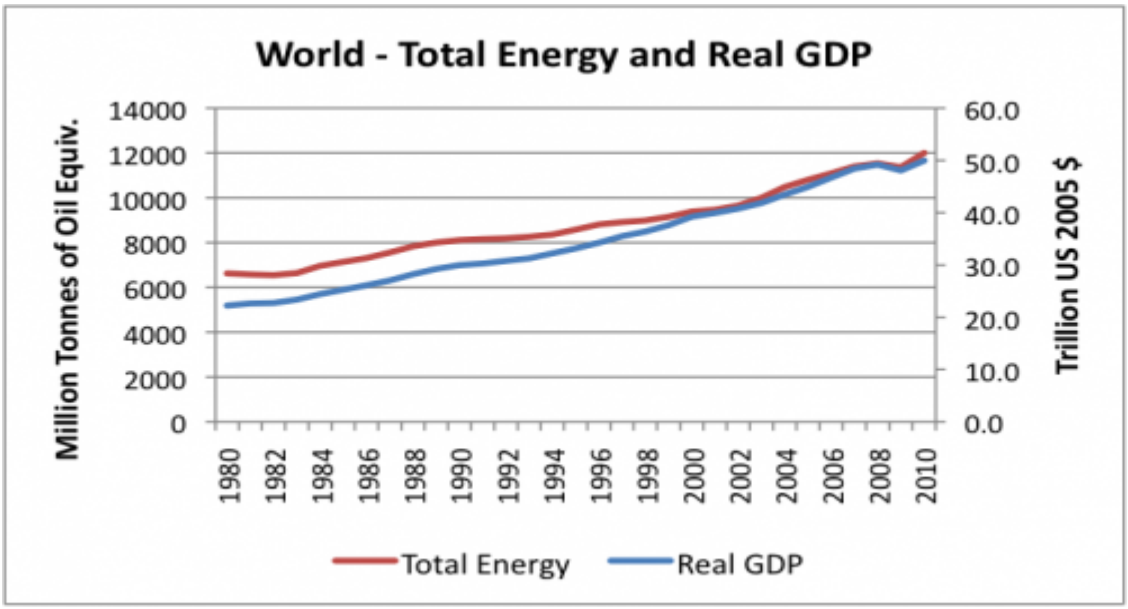
1.1 Background of Energy Sector

1. Energy availability is a critical determinant of a country's economic progress. The global energy demand continues to grow and 60 percent of the world's energy demand is met by oil and gas. Policy makers and businesses continuously seek to adapt energy systems to meet the current demand of energy. The key pillars of any energy system are economic growth and development, sustainability in energy, and access to and security of energy. The Power Policy of Pakistan 2013 focuses on sustainability in the energy sector to achieve long term transformation. This sustainability is based on three pillars which are (i) low cost energy, (ii) fair and level playing field, and (iii) demand management.

2. There is a positive relationship between a country's economic growth and its energy demand.[1] Higher GDP growth accompanied by higher per capita income and higher production activities will raise the energy demand. In a study by Al-Iriani (2005) comprising of the emerging markets including Pakistan, the results indicate that there is unidirectional causality from GDP to energy consumption. Narayan *et al.* (2010) examine the long-run elasticities of the impact of energy consumption on GDP in addition to the impact of GDP growth on energy consumption for Pakistan during the time period 1980- 2006. They concluded a long run relationship between GDP growth and energy consumption. For instance a 1% increase in GDP increases energy consumption by 0.59% across the entire panel. The relationship between real GDP and energy consumption in four south Asian countries (Pakistan, Bangladesh, India and Sri Lanka) was empirically tested by Khan and Qayyum (2008). They found a unidirectional causality both in short run and long run from energy consumption to real GDP in each of the four countries. Mahmood et al. (2014) empirically examine electricity requirements in Pakistan and economic growth and conclude that Pakistan can achieve high economic growth with the expansion in energy consumption and that a shortage of energy availability will impede economic growth.

[1] Competition in India's energy sector

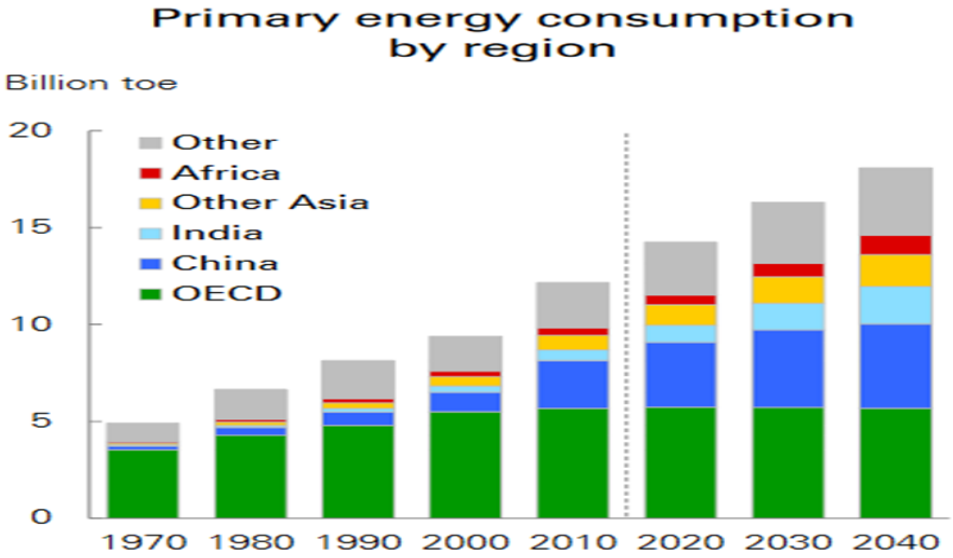
Figure 1: Relationship between Real GDP and Total Energy



Source: https://www.financialsense.com/contributors/gail-tverberg/2011/11/15/the-shared-fate-of-gdp-and-energy-growth

3. Figure 1 shows the world energy consumption growth and the real GDP growth from 1980 to 2010. The world energy consumption is based on British Petroleum (BP) data and the real GDP growth is based on the United States Department of Agriculture (USDA) data. The figure shows that the two variables world energy consumption and real GDP growth, move in same direction, implying there is a strong relationship between energy consumption and real GDP growth.

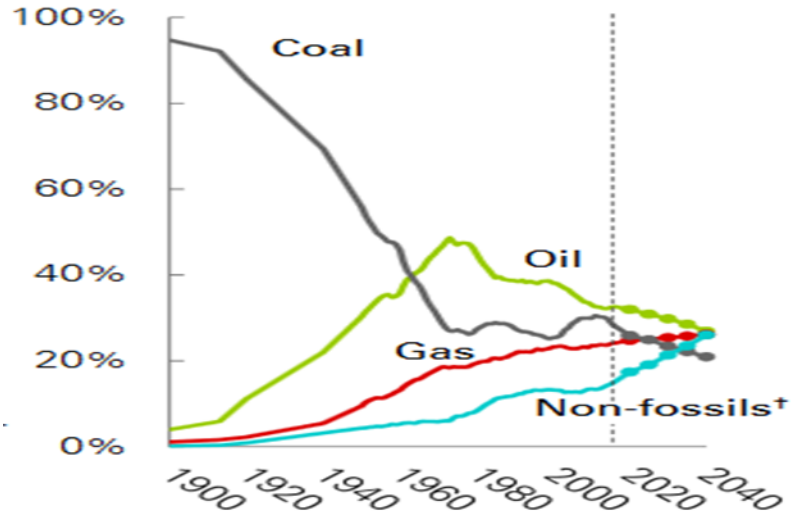
Figure 2: Primary Energy Consumption by Region



Source: BP Energy Outlook, 2018

4. Figure 2 shows world primary energy consumption from the period of 1970 to 2040. the world energy consumption has be steadily growing since 1970. The figure shows that the OECD countries are the largest consumers of energy in the world. China's energy consumption shows increasing demand from year 2000 onwards owing to their high economic growth. India and other Asia region also show a steady growth in energy consumption from year 2010 onwards.

Figure 3: Primary Energy Shares (1900-2040)



Source: BP Energy Outlook, 2018

* Non-fossils include nuclear, hydro and renewables

5. Figure 3 shows the world primary energy shares which include coal, oil, gas and non-fossils from 1900 to 2040. The graph clearly shows that where coal was used as the main energy resource in 1900, the other energy resources share gradually increased and in 1960 the share of coal and oil was equal at 40% each. The share of gas in the primary energy mix remains between 25% - 30% from 2000 and 2018. An interesting fact (figure 3) is the share of non-fossils including nuclear, hydro and renewable energy resources steadily increasing, and the forecast shows that by 2040 the non-fossil fuels will have an equal share to that of oil and gas.

6. Energy sources in Pakistan include oil, natural gas, liquefied petroleum gas, liquefied natural gas, electricity, coal, nuclear power and alternative energy sources which include wind, geothermal, and solar power. The primary energy supplies increased from 28.5 million tonne of oil equivalent (MTOE)[2] in 1991 to 66.8 MTOE in 2014 and showed an annual compound growth rate[3] of 3.6% during the period 1991-2014. In

[2] Tonne of oil equivalent (toe) is a unit of energy defined as the amount of energy released by burning one tonne of crude oil.
[3] Compound growth rate is a measure of growth over multiple time periods. It takes out volatility and smooth out data in order to interpret it easily. Formula to calculate compound annual growth rate is $\{[X_n/X_1]^{1/\text{no. of years}} - 1\}$

2016-17 the total primary commercial energy supplies increased from 74 MTOE to 80 MTOE showing an increase of 7.6%, higher than in 2015-16.[4] The total final energy consumption in 2016-17 is 50 MTOE showing an increase of 10.4%[5] compared 2015-16.[6] Oil and natural gas are the top two energy supply sources in Pakistan and meet 75 % of the energy demand.[7]

7. Table 1 shows the primary energy sources in Pakistan along with their respective shares during 2016-17.

Table 1: Primary Energy Supplies 2016-17 (In Percentage)

Source	Percentage
Oil	**34.4%**
Gas	**37.9%**
LPG	**1.3%**
LNG import	**5.6%**
Coal	**8.1%**
Electricity	**12.7%**

Source: Pakistan Energy Year book 2017, HDIP, Ministry of Energy (Petroleum Division)

7. Table 1 shows that the two main sources of energy in Pakistan are Oil and Gas and their respective shares in the energy supplies are 34.4% and 37.9%. The share of gas in the primary energy supplies is the greatest and it has over taken oil in 2016-17.

Additionally compound annual growth rate (CAGR) is used for forecasting future values

[4] Increase in energy supplies came from LNG, renewable, nuclear, coal and LPG

[5] This was due to increase in energy demand in the industrial and transport sector

[6] Pakistan Energy Year Book, 2017. Hydrocarbon Development Institute of Pakistan, Ministry of Energy (Petroleum Division)

[7] ibid

Table 2: Primary Energy Supplies By Source 2011-12 – 2016-17 (Unit:TOE, Percentage Share)

Source	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	ACGR
Oil[1]	19,958,483	20,968,730	23,006,510	24,970,360	25,280,073	27,366,526	6.5%
	30.8%	32.5%	34.4%	35.5%	34.2%	34.4%	
Gas	32,033,074	31,144,006	30,964,868	29,977,755	30,460,521	30,163,334	-1.2%
	49.5%	48.2%	46.3%	42.7%	41.2%	37.9%	
LNG Import[2]				472,503	2,404,128	4,455,734	
				0.7%	3.3%	5.6%	
LPG[3]	321,214	309,524	363,710	457,197	908,705	1,008,673	25.7%
	0,5%	0.5%	0.5%	0.7%	1.2%	1.3%	
Coal	4,285,400	3,863,081	3,590,386	4,952,556	5,066,935	6,482,401	8.6%
	6.6%	6.0%	5.4%	7.0%	6.9%	8.1%	
Hydro Electricity[4]	6,806,704	7,126,623	7,607,804	7,751,133	8,266,670	7,681,699	2.4%
	10.5%	11.0%	11.4%	11.0%	11.2%	9.7%	
Nuclear Electricity[5]	1,256,791	1,086,846	1,215,042	1,385,283	1,009,261	1,670,560	5.9%
	1.9%	1.7%	1.8%	2.0%	1.5%	2.1%	
Renewable Electricity				191,407	369,731	636,825	
				0.3%	0.5%	0.8%	
Imported Electricity	65,515	89,542	99,907	105,632	110,525	118,480	12.6%
	0.1%	0.1%	0.1%	0.2%	0.1%	0.1%	
Total	64,727,181	64,588,351	66,848,227	70,263,825	73,966,548	79,584,246	4.2%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	
Annual Growth Rate	0.32%	-0.21%	3.50%	5.11%	5.27%	7.59%	

1. Excluding Petroleum products, exports and bunkering

2. LNG imports and Renewable generation reported for the first time in FY 2014-15

3. Includes imports and production from field plants

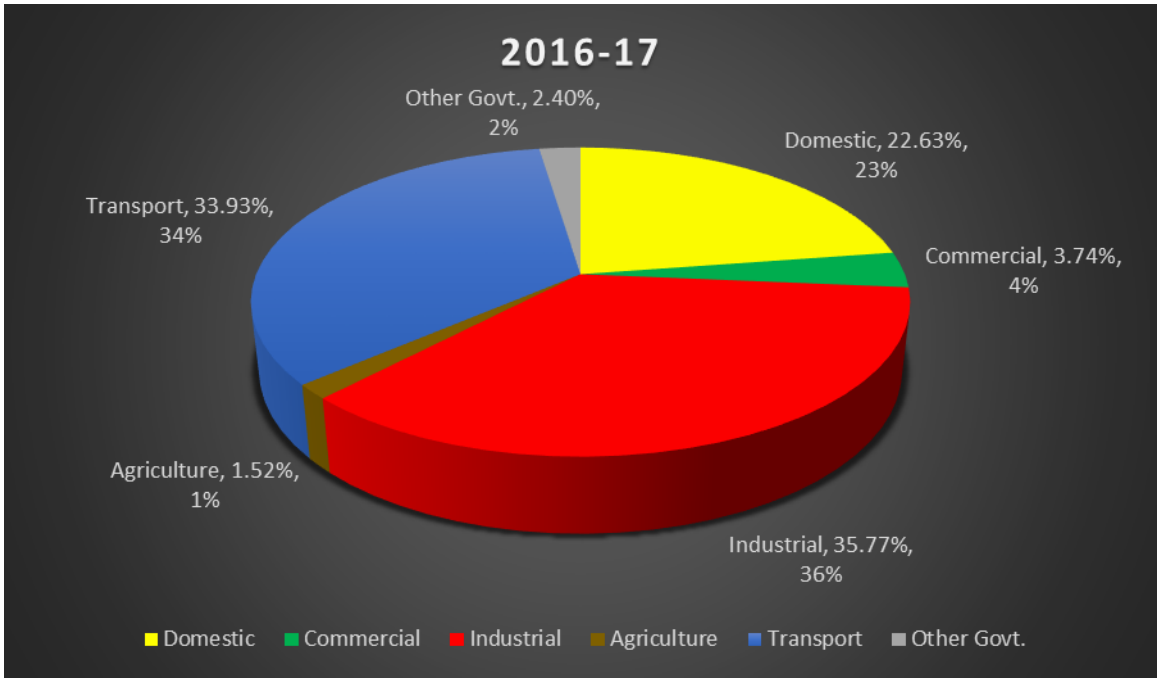
4. Converted @ 10,000 Btu/kWh to represent primary energy equivalent of hydro and nuclear electricity as if this was generated by using fossil fuels

5. Imported electricity from Iran since Oct-2002

Source: Pakistan Energy Year Book 2017, HDIP

8. Table 2 shows the primary energy supply by source from 2011-12 to 2016-17. In 2014-15 two new sources of energy supply, imported LNG and renewable energy to the energy supply mix were included.

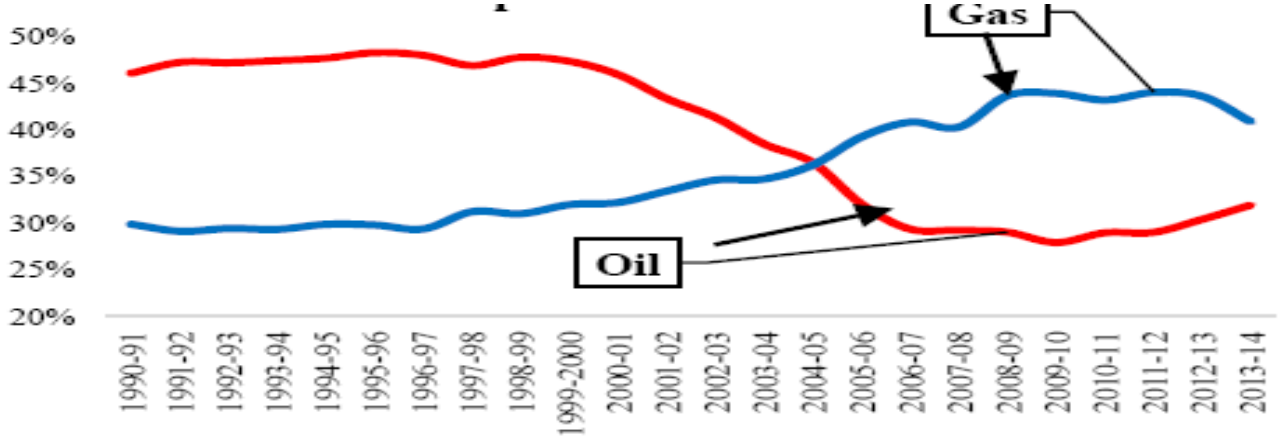
Figure 4: Energy Consumption by Sector, 2016-17 (Percentage)



Source: Pakistan Energy Year Book, 2017

9. The above pie-chart gives a sector wise break down of energy consumption during 2016-17. Industrial sector has the greatest energy demand of 36%, followed by the transport sector showing a demand of 34% and domestic sector 23%. This increase in domestic sector is reflective of economic welfare, population growth, and technical innovations that have led to increased energy consumption by households.

Figure 5: Share of Oil and Gas in Energy Consumption



Source: Economic Survey of Pakistan, 2014-2015

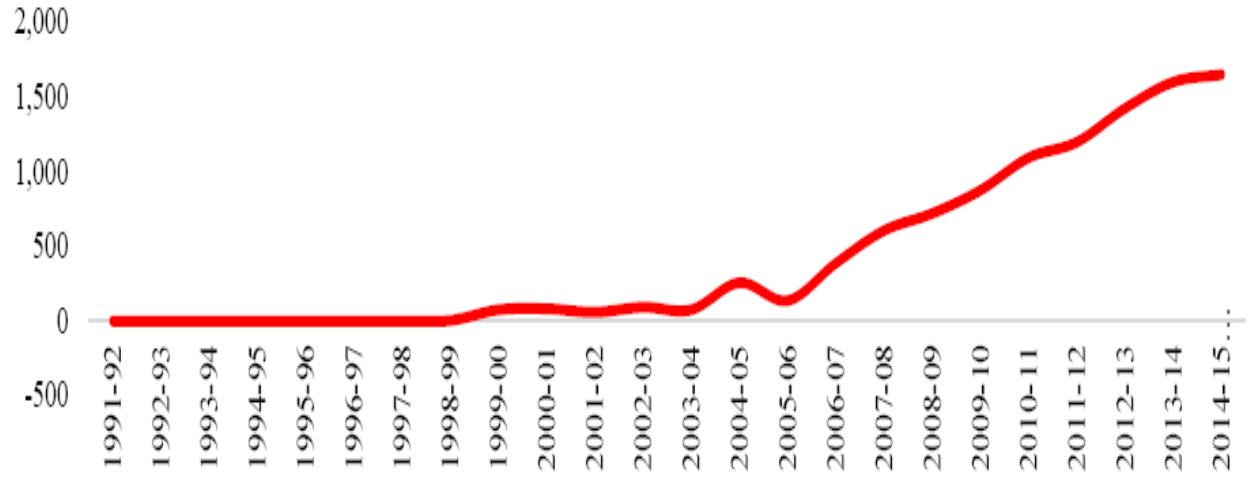
10. Figure 5 shows the long term trend of energy consumption in Pakistan. The share of oil as an energy source in energy consumption has been gradually declining since 2000-01 and the share of gas has been steadily increasing since 1997-98. Both oil and gas had an equal share in energy consumption during 2004-05 however since then the percentage share of gas has increased compared to oil. The primary reason for this conversion from oil to gas is due to gas being a cheaper substitute compared to oil.

1.2 Natural Gas Sector

11. Natural gas is a clean, more efficient, cheaper, and environmentally friendly source of energy.[8] The indigenous gas supplies contribute 38% in the total energy supply mix.[9] Natural gas primarily consists of Methane and is odourless and colourless when it comes out of the ground. After removing the impurities it is injected into the pipelines for supply to consumers.[10]

12. In Pakistan, Sui Northern Gas Pipelines Limited (SNGPL) and Sui Southern Gas Company Limited (SSGCL) are the two public sector gas utility companies, having extensive natural gas transmission and distribution (T&D) network which is annually upgraded owing to the rising natural gas demand in the country. The increase in natural gas consumption has resulted in a growing gap between demand and supply. Figure 5 shows the growing shortfall in natural gas.

Figure 6: Natural Gas Short Fall



Source: Directorate General of Gas, Ministry of Petroleum & Natural Resources

[8] Natural gas after combustion is the cleanest fuel available because if it is burnt properly the only emission it has are carbon dioxide and water vapour.

[9] Pakistan Economic Survey 2017-2018

[10] Sui Northern Gas Pipelines Limited (SNGPL)

13. Figure 6 shows the growing gap between natural gas demand and supply. This short fall has been rising rapidly since 2005-06. The gap between the demand and supply of natural gas has been growing as gas is a cheaper substitute of oil and because of the political imperative to add new consumers on account of development schemes. Thus the increase in domestic, commercial and industrial gas connections.

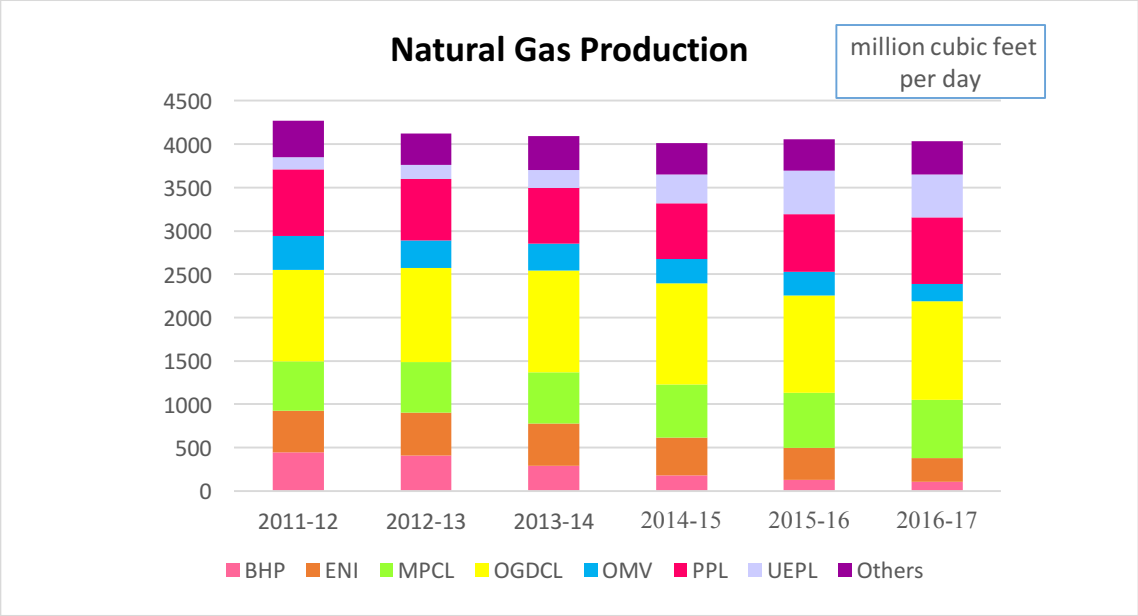
Table 3: Natural Gas Production by Company (Unit: Million CFt TOE)

Company	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	ACGR
BHP	161,899 3,108,461	147,726 2,821,567	104,570 1,997,287	64,657 1,234,959	45,164 862,631	39,039 741,750	- 24.8%
Dewan Petroleum	9,686 231,503	8,462 202,243	6,684 159,754	5,491 131,231	4,517 107,950	3,837 91,701	- 16,9%
ENI	176,315 3,578,131	182,198 3,707,119	178,612 3,640,678	158,405 3,222,705	134,997 2,737,206	97,733 1,979,785	- 11.1%
Hycarbex	2,682 50,958	3,765 71,150	4,063 76,786	1,298 24,527			
MPCL	205,937 3,543,796	211,355 3,709,991	216,448 3,814,049	225,094 3,982,406	233,468 4,152,827	245,706 4,383,421	3.6%
MOL	114,614 2,858,821	99,847 2,485,468	104,838 2,620,000	96,679 2,401,621	102,879 2,579,778	107,713 2,838,572	-1.2%
OGDCL	386,460 7,239,742	397,632 7,783,451	427,579 8,245,996	426,472 7,920,402	408,724 7,690,521	415,403 7,743,511	1.5%
OMV	142,421 3,176,046	116,436 2,600,102	112,980 2,668,640	102,638 2,441,247	99,414 2,220,445	72,954 1,594,225	- 12.5%
OPL	6,249 163,743	4,902 125,672	3,431 89,592	2,734 69,650	5,052 129,673	2,385 63,792	- 17.5%
PEL	8,880 127,507	7,848 112,354	7,133 101,601	6,842 111,013	7,887 130,428	10,116 163,673	2.6%
OMV Maurice	4,609 107,851	3,369 78,844	6,515 162,566	12,481 322,970	5,709 146,720	4,842 124,441	1.0%
POGC			3,726 75,256	3,554 70,726	3,198 63,644	6,105 126,966	
POL	7,116 197,836	5,399 154,546	5,358 153,779	4,408 129,795	4,084 122,135	3,447 102,450	- 13.5%
PPL	281,967 6,417,420	258,307 5,890,998	236,445 5,417,040	232,737 5,121,596	242,057 5,464,660	280,136 6,210,815	-0.1%
UEPL	50,124 1,237,710	58,594 1,408,878	75,126 1,729,153	122,270 2,820,792	184,400 4,036,386	182,438 4,023,633	29.5%
Total: **Million CFt** **TOE** **Million CFt/Day**	**1,558,959** **32,029,523** **4,259**	**1,505,841** **31,152,381** **4,126**	**1,493,508** **30,952,177** **4,092**	**1,465,760** **30,005,637** **4,016**	**1,481,551** **30,445,003** **4,048**	**1,471,855** **30,188,735** **4,032**	**-** **1.14%**

Source: Energy Year Book, 2017

14. Table 3 shows a list of Exploration and Production (E&P) companies including both local and international companies producing natural gas from various fields in Pakistan. SNGPL and SSGCL purchase gas in bulk from these E&P companies for distribution in their respective areas. Oil and Gas Development Company Limited (OGDCL) is the largest E&P Company in Pakistan. It sells natural gas to SNGPL, SSGC, Uch Power limited, Engro Fertilizer and Fauji Kabirwala Power Company Limited. Mari Petroleum Company Limited (MPCL) is an E&P company of Pakistan. It is managing and operating Pakistan's largest gas reserves (current reserves) at Mari Field, district Ghotki, Sindh. MPCL is a major producer of natural gas having 11% share of the total market. It sells natural gas to SSGCL, SNGPL, Fauji Fertilizer, Fatima Fertilizer, Engro Fertilizer, WAPDA, Foundation Power and Western Power.[11] The above table data (table 3) is presented by a bar chart, each bar represents a specific year and the share of companies is shown through various colors in Figure 7 below.

Figure 7: Natural Gas Production by Companies



Source: Pakistan Energy Year Book, 2017

15. The first gas field was discovered at Sui, Baluchistan in 1952 and Pakistan has gas fields in all the four provinces. Major gas fields in Pakistan include Sui, Uch, Qadirpur, Sawan, Zamzama, Badin, Bhit, Kandhkot, Mari and Manzalia. The natural gas transmission and distribution network consists of over 12,829 km transmission, 132,065 km distribution, and 34,631 services gas pipelines network and serving over 8.9 million consumers across Pakistan.[12] The average natural gas consumption during

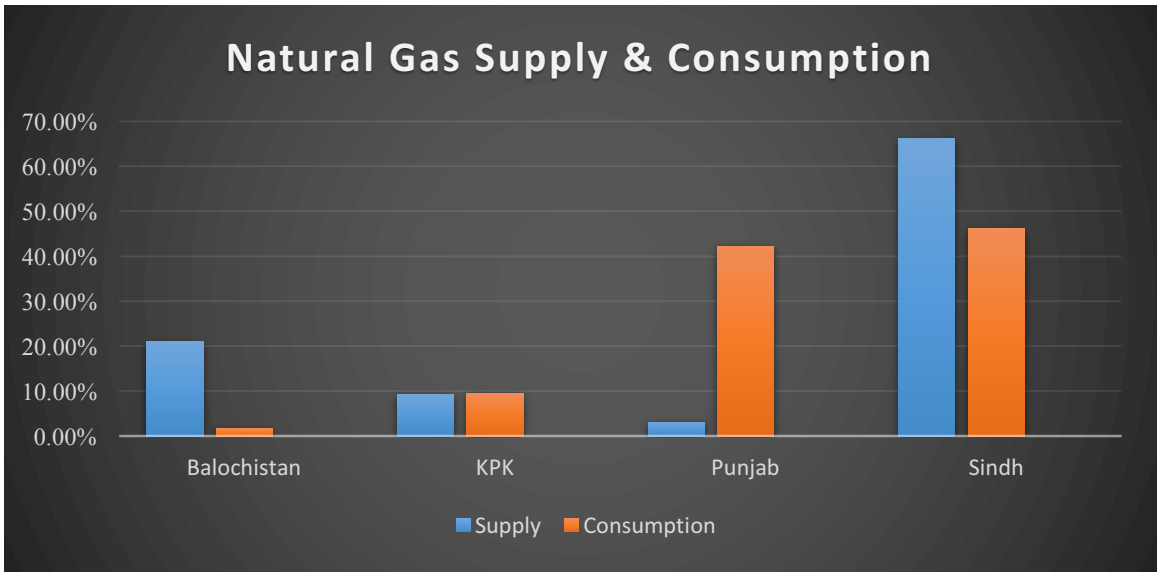
[11] State of Regulated Petroleum Industry, 2016-17, OGRA

[12] See fn 7 (pg 10)

July-Feb 2017-18 was 3,837 million cubic feet per day (MMCFD) including 632 MMCFD of RLNG (re gasified liquefied natural gas) compared to 3,205 MMCFD of gas last year.

16. Pakistan's natural gas production is around 4,000 MMCFD and the demand has reached 6,000 MMCFD.[13] Existing natural gas fields are reaching the limits of production capacity due to depletion and the pace of the new gas discoveries has been slow.

Figure 8: Average Natural Gas Supply and Consumption (percentage) by Province

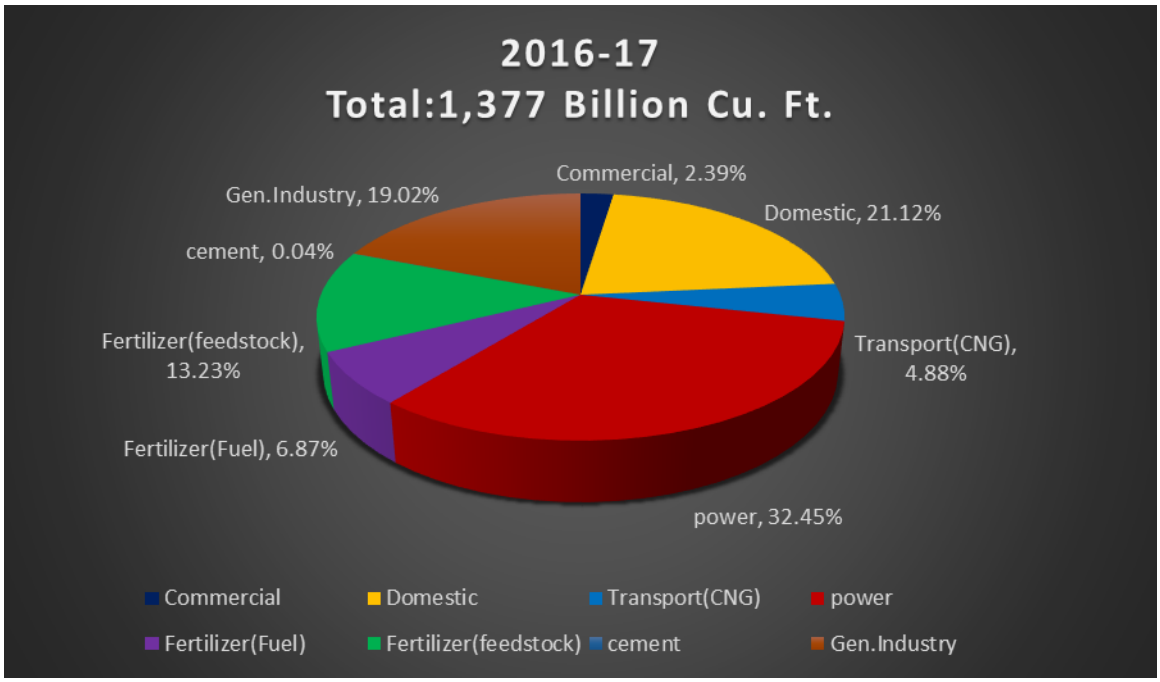


Source: Pakistan Energy Year Book, 2016 & State of Regulated Petroleum Industry 2016-17, OGRA

17. From the above bar chart it is clear that natural gas supply is the highest in the province of Sindh and lowest in Punjab. However in Punjab there is a stark difference between natural gas supply (which is the lowest compared to all four provinces) and demand. The two main consumers of natural gas are Sindh and Punjab.

[13] However the unconstrained demand puts this supply demand gap at 4000 MMCFD.

Figure 9: Sector wise Natural Gas Consumption 2016-17 (Percentage)



Source: Pakistan Energy Year Book, 2017, HDIP

18. The above pie-chart gives a snapshot of the natural gas consumption in Pakistan for the year 2016-17. It is evident from figure 6 that power sector is the largest consumer of natural gas followed by domestic sector, general industry and the fertilizer sector.

19. To manage the shortfall in indigenous natural gas demand and supply, the Federal Government has taken steps to address the gas shortage, and diversify the energy mix, these include (a) containment of gas demand at current level (b) increase indigenous gas supply through exploration (c) promotion of LPG air mix (d) import of LNG, and (e) import of gas from Iran and Turkmenistan under IP (Iran- Pakistan) and TAPI (Turkmenistan-Afghanistan-Pakistan-India) gas projects.[14]

20. Currently the gap between indigenous supply of natural gas and the domestic demand of natural gas stands at 2000 MMCFD. However this supply demand gap is expected to increase and it is estimated that it would rise to 3500-4000 MMCFD by the year 2020. To overcome the supply shortage, Pakistan imports Liquefied Natural Gas (LNG).

21. Natural gas sector in Pakistan is highly regulated where both upstream and downstream sectors including their prices are regulated. The government not only gives direct

[14] Both IP and TAPI gas projects are handled by Inter-State Gas Company (ISGC), a company which has been established by the government to work on gas import projects

subsidies through natural gas pricing to certain sectors of the economy but also cross subsidizes different segments as well.[15]

1.3 Liquefied Natural Gas (LNG)

22. Liquefied Natural Gas (LNG) mainly consists of Methane gas and is cooled to approximately -256 degrees Fahrenheit (-162 ^{0}C) to allow exports. Natural gas in liquefied form only takes 1/600th of space which makes it feasible to ship to other countries where supply of natural gas through pipelines is not possible. It is odourless, colourless, non-toxic, and non-corrosive. The liquefaction process of this natural gas requires removal of certain components such as dust, acid gasses, Helium, water and heavy hydrocarbons.

23. The natural gas is first extracted and transported to a processing plant where it is treated to remove any condensates. The gas is later cooled down in stages until it is liquefied. Later it is stored in storage tanks and can be shipped to other countries. The LNG is transported on special sea vessels and road tankers and after reaching its destination it is re-gasified and distributed as pipeline natural gas.

24. LNG liquefaction and storage is a very capital intensive industry and without having firm uplifting contracts by the buyers, financial close of the projects are not possible. That is why LNG is sold first and produced afterwards, contrary to oil which is traded like a commodity. Like sellers the LNG buyers also have to invest heavily in specialized receiving and storage terminals and other infrastructure.

25. Globally Japan, Europe, South Korea, China and India account for 80% of the world's total LNG import.[16] In the past, LNG came from the Asia Pacific region however a progressive build up by Qatar starting in the late 1990's made the Middle East the largest exporting region from 2010 onwards. Qatar has remained the largest LNG exporter and supplies one third of the global LNG supply. Malaysia and Australia are the second and the third largest LNG producers.[17]

26. There was a 7.5% increase in LNG import globally in 2016. Currently there are 40 LNG importing countries and 19 exporting countries. Asia is the largest LNG importing region accounting for 72.9% of the market share. There has been an increase in global supplies of LNG. 30% of the global LNG is supplied by Qatar and 45% is supplied by the Pacific Basin.[18] Figure 9 below shows the current and projected LNG exporting and

[15] Ministry of Energy (Petroleum Division)

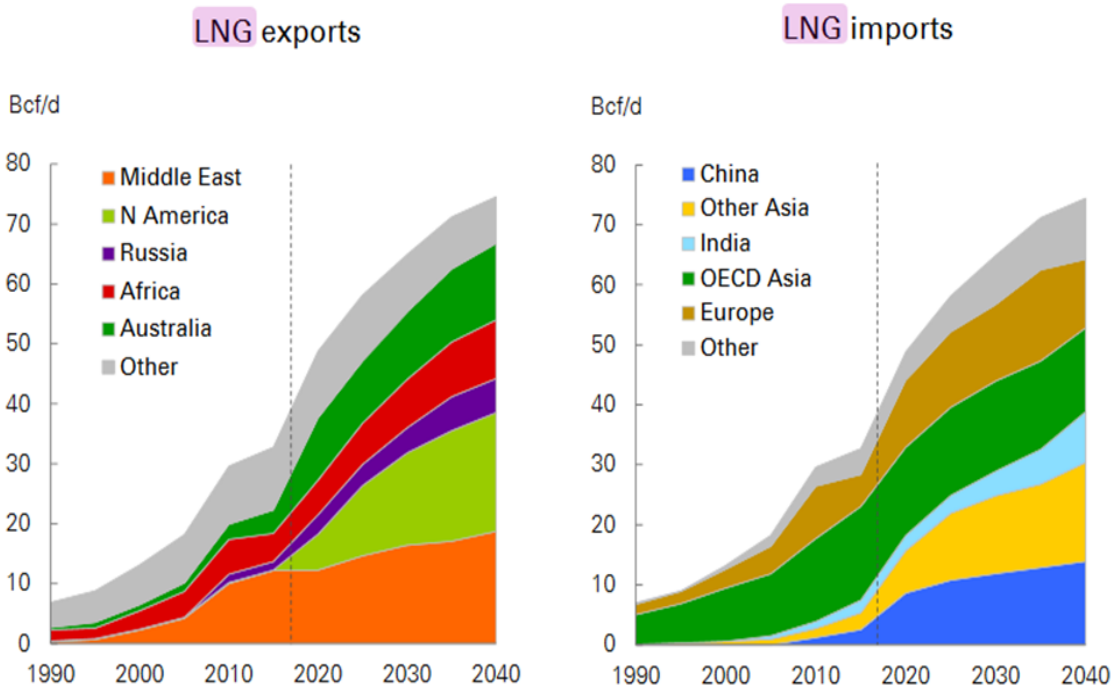
[16] http://www.reuters.com/article/us-lng-japan-investigation-idUSKBN13B180

[17] International Gas Union, World LNG Report-2015

[18] http://www.lngallies.com/news/giignl-2017-03-27/

importing regions in the world from 1990-2040. It shows a gradual increase in LNG demand in Asia and LNG export shows that where the export market has been dominated by Middle East, North America will become a prominent LNG exporter from 2020-2040 period.

Figure 10: LNG Increases the Global Availability of Gas



Source: BP Energy Outlook, 2018

27. Pakistan started the import of LNG in 2015 with Engro Elengy Terminal (Pvt.) Limited (EETPL), the first terminal commissioned at Port Qasim. Pakistan signed a 15 year long term Government to Government agreement with Qatargas for the supply of 3.75 million tonnes per annum (MTPA) and a 5 year medium term LNG import term tender with Gunvor of 0.75 MTPA. Additionally Pakistan LNG Limited (PLL), a public limited company has also signed a 15 year long term LNG supply agreement with Eni for the supply of one cargo per month (i.e 0.75 MTPA) and a 5 year medium term agreement with Gunvor for the supply of one cargo of LNG per month. PLL also meets the additional demand by SNGPL through spot tendering.[19]

[19] Primary data collected through meetings and correspondence with PSO and PLL

28. The development of Engro Elengy Terminal (Pvt.) Limited (EETPL) and Pakistan GasPort Consortium Limited (PGPC) terminal at Port Qasim for LNG handling is major milestone to mitigate the gas shortage faced by the country. EETPL has a regasification capacity of 630 MMCFD with a peaking of 690 MMCFD[20] and PGPC having re-gasification capacity of 650 MMCFD. During the Fiscal Year (FY) 2016-17, the total supply of natural gas in the country, including imported RLNG, reached 4,131 MMcfd.[21]

1.4 Rationale of Study

29. Competition Commission of Pakistan (CCP) '*the Commission*' is mandated under Section 28(1)(b) of the Act to carry out '*market studies to promote competition in all spheres of commercial economic activity'*. The competition assessment of LNG sector is thus undertaken to analyze the state of competition in the sector from LNG import, to its regasification, to the supply of LNG to end consumers.

1.5 Objectives of Study

30. The objective of the study is to examine and evaluate the LNG sector in Pakistan. To evaluate the regulatory framework, pricing mechanism (including LNG long term, medium term contracts and spot purchases), market players, level of competition in the sector at each level of the LNG value chain (from import to end consumer), and to assess the likelihood of any anticompetitive practices such as abuse of dominance, cartelization or bid rigging in the sector. It is also pertinent to establish whether there is a level playing field for all players at various levels in the sector, regardless of their status being state owned or privately owned. Moreover based on the competition assessment of the sector give recommendations for a more competitive and efficient sector.

1.6 Significance of Study

31. LNG has increasingly become an important source of energy since its import began in 2015 to meet the growing gas demand in the country. In this backdrop, *the Commission* through this study, aims to:

    - Assess the level of competition in this sector;

[20] Information provided by EETPL

[21] Petroleum Industry Report, 2016-17, OGRA

- Highlight the areas for enforcement action (in case of anticompetitive practices);
- Visualize the challenges of the sector
- Provide recommendations to improve competition in the sector;
- Issue policy notes in case of presence of any governmental policies that impede competition; and
- For the general public to understand the dynamics of this sector.

1.7 Methodology

32. Both primary and secondary data has been collected from different sources to carry out the LNG sector study. The secondary data has been collected through the official websites of PSO, PLL, OGRA, Ministry of Energy (Petroleum Division), Pakistan Economic Survey 2017-18, Pakistan Energy Year Book 2016, HDIP, NEPRA, internationally published research papers, articles on LNG sector. Primary data has been collected through detailed questionnaires and extensive meetings held with public/private undertakings, the list of which is as under:
    a. Ministry of Energy (Petroleum Division)
    b. Oil and Gas Regulatory Authority (OGRA)
    c. Sui Southern Gas Company Limited (SSGCL)
    d. Sui Northern Gas Company Limited (SNGPL)
    e. Engro Elengy Terminal Pvt. Limited (EETL)
    f. Pakistan State Oil (PSO)
    g. Pakistan LNG Limited (PLL)
    h. Pakistan LNG Terminals Limited (PLTL)
    i. Independent power producer (Saif Power Limited)
    j. Alternate Energy Development Board (AEDB)
    k. Shell Eastern Petroleum (Pte) Limited/ Shell Pakistan Limited
    l. PETRONAS LNG Limited

Chapter-2: LNG Market Structure

2.1 LNG Market Structure

1. The market structure of a good or service is defined by the number of buyers and sellers in the market, nature of product sold in the market, availability of substitutes, the nature of competition faced by the sellers, pricing mechanism, and barriers to enter and exit the market.

2.1.1 Relevant Market

2. In order to assess competition in the LNG sector of Pakistan it is important to define the relevant market. The relevant market consists of (a) the relevant product market and (b) the relevant geographic market. LNG is a product which cannot be consumed by the domestic consumers before it is converted into re-gasified liquefied natural gas RLNG (due to the complexity of the product[22]). Therefore the relevant product market is further split into two sub relevant product markets, LNG and RLNG. Similarly the relevant geographic market consists of two sub relevant geographic markets.
3. The relevant product market A is the upstream imported LNG market. The relevant product market B is the RLNG market, converted into gas at the regasification terminals and injected into pipeline infrastructure. The relevant geographic market A is the upstream LNG supply market where the supply can be arranged from various offshore sources. The relevant geographic market B is the RLNG supply market which is from south of Pakistan at Port Qasim where LNG is received and converted into RLNG, to the north of Pakistan i.e Punjab.

2.2 Supply side (Upstream LNG Market)

4. The supply side of the LNG market consists of the various sources through which LNG in the upstream market is supplied to Pakistan.
   a. Government to Government Agreement: Under the agreement Government of Pakistan is importing LNG from Qatar. It is a long term contract of LNG supply for 15 years. The long term LNG sale purchase agreement (SPA) is between Pakistan State Oil (PSO) designated by Government of Pakistan and Qatar Liquefied Gas

[22] The LNG carrier docks at the port right next to the FSRU unit where the LNG is converted to RLNG before it is finally injected into the pipeline infrastructure and into the distribution and transmission network of SSGC and SNGPL.

Company (2), a joint stock company incorporated under the laws of the State of Qatar, whereby Qatargas (2)[23] is the seller of LNG.

b. Long Term/Medium Term contracts: Under these contracts international energy companies are supplying LNG to Pakistan. Italian energy company ENI is supplying LNG to Pakistan under a 15 year long term agreement. Likewise under a 5 year medium term contract Gunvor is supplying LNG to Pakistan as well. These medium to short term agreements are between Pakistan State Oil (PSO) and LNG suppliers and also between Pakistan LNG Limited (PLL) and the international LNG suppliers such as ENI and Gunvor. PPRA rules are followed when awarding these long term and short term contracts.
c. Spot market: This source is need based, as and when LNG is required a tender is floated and through competitive bidding the spot LNG cargo is arranged. The spot can be arranged from any LNG source throughout the world. Pakistan LNG Limited (PLL) procures LNG from this source as well.

2.3 Demand Side

5. Federal Government/Provincial Government
   On the demand side LNG is imported by government of Pakistan in order to meet the energy shortage. The imported LNG after conversion into RLNG is supplied to all categories of consumers (without any priority) who are willing to consume it at the applicable RLNG price.[24] These consumers include power, fertilizer, industrial, and CNG among others.

6. Pakistan State Oil (PSO) Limited
   The creation of PSO can be traced back to the year 1974, when on January 1st, the government took over and merged Pakistan National Oil (PNO) and Dawood Petroleum Limited (DPL) as Premiere Oil Company Limited (POCL). Soon after that, on 3rd June 1974, Petroleum Storage Development Corporation (PSDC) came into existence. PSDC was then renamed as State Oil Company Limited (SOCL) on 23rd August, 1976. Following that, the ESSO undertakings were purchased on 15th September, 1976 and control was vested in SOCL. The end of that year (30th December, 1976) saw the merger of Premier Oil Company Limited and State Oil Company Limited, giving way to Pakistan State Oil (PSO).[25]

7. PSO is Pakistan's largest state owned energy company under the Ministry of Energy (Petroleum Division). It is engaged in the marketing and distribution, acquisition, product movement and storage of various POL products. PSO became the pioneer

[23] Qatargas is the world's largest LNG producer and it produces 77 million tonnes per annum of LNG. It has four ventures Qatargas1, Qatargas2, Qatargas3 and Qatargas4. Qatargas2 is a joint venture of Qatar Petroleum and ExxonMobil.

[24] Pakistan LNG Limited (PLL)

[25] Information provided by Pakistan State Oil (PSO)

company of LNG import in Pakistan in 2015 and is a prominent importer of LNG in South Asia[26]. PSO manages the long term LNG sale purchase agreement with Qatargas(2). Other than the long term contract PSO has been importing LNG on behalf of government of Pakistan under medium term supply of LNG contracts which it has with Gunvor[27] and also from the spot market.

8. Pakistan LNG Limited (PLL)
   PLL is as a public limited company incorporated in December 2015 under section 32 of Pakistan Companies Ordinance 1984. PLL is a 100 percent subsidiary of Government Holdings Private Limited (GHPL), and GHPL[28] is 100 percent owned by government of Pakistan. PLL operates under the governance of Ministry of Energy (Petroleum Division). PLL is mandated by government of Pakistan to *carry out the business of buying, importing, storing LNG, distributing, transporting, metering and selling of natural gas*. PLL therefore procures LNG from international markets and enter into onward arrangements for supply of gas to the end user. It handles the whole supply chain of LNG from procurement to end user gas sale agreements. PLL is responsible for the procurement and import of LNG for Pakistan's second LNG Terminal-Pakistan Gas Port Consortium (PGPC) Limited.

9. PLL has made long term, medium term contracts with international LNG suppliers and it also purchases LNG from the LNG spot market. These agreements and the spot cargoes are subject to PPRA rules, where by competitive bidding process is followed. PLL has made a 5 year contract with international energy company Gunvor where by the company will supply LNG at a rate (slope) of 11.6247 percent of Brent price. PLL has made a 15 year long term Sale Purchase Agreement (SPA) of LNG supply with Eni, another international company at the rate (slope) of 11.6247 percent (for year 1&2), 11.95 percent (for year 3 &4), 12.14 percent (for year 5-15), of Brent. For the 15 year SPA with Eni the weighted average for 10 years (before the option of walkaway clause) is 11.99% of Brent.[29] Furthermore one cargo of LNG from both the suppliers is received every month at Port Qasim.

10. PLL also procures LNG from the international spot market on need basis. PPRA rules are followed and through the competitive bidding the spot cargo is arranged. The spot price of LNG is also indexed to Brent price.

11. Three new power plants constructed in Punjab[30] will be supplied LNG directly by PLL. It is expected that these newly constructed power plants will generate 3600 MW of electricity.

[26] http://psopk.com/en/media-center/email-newsletter/2017/june-july/the-100th-lng-cargo

[27] Gunvor is an international crude oil and oil products trading company and operates across the globe. It has its main trading office in Geneva, Switzerland.

[28] GHPL operates under the Ministry of Energy (Petroleum Division)

[29] Pakistan LNG Limited (PLL)

[30] At Bhikki, Baloki and Haveli Bahadur Shah.

12. Pakistan LNG Terminals Limited (PLTL)
    PLTL is a public sector organization incorporated under the Companies Ordinance 1984 and operates under the Ministry of Energy (Petroleum Division). It is a wholly owned subsidiary of Government Holding Private Limited (GHPL)[31] and is a sister organization of Pakistan LNG Limited (PLL). PLTL is mandated by the Government of Pakistan to manage the implementation of storage and regasification of LNG for the country. It is therefore mandated to implement and procure LNG regasification capacities from the existing as well as the new LNG terminals at Port Qasim, Gwadar and Sonmiani, etc.

13. The objective of forming PLTL is to manage the terminals and to reduce the complexities in the RLNG supply chain. To provide guidance and develop regasification models such that to reduce cost through BOOT (build, own, operate and transfer), BOO (build, Own and operate) and EPC (engineer, procure, construct) projects.

2.3 Regasification of LNG

14. Engro Elengy Terminal Pvt. Limited (EETPL)
    EETPL was initially a joint venture between Engro Corporation and IFC, recently Royal Vopak of Netherlands has acquired 44% equity stakes in the company making Engro Corporation and Royal Vopak as JV partners in the company. It is the first terminal in Pakistan, commissioned on 28th March, 2015. The LNG Service Agreement (LSA) for 15 years was signed between EETPL and Sui Southern Gas Company (SSGC) limited in April 2014. The terminal has a capacity to re-gasify 630 mmcfd with an annual terminal handling capacity of 4.5 million tons of LNG[32]. Initially the regasification capacity of EETPL was 400 mmcfd which was enhanced to 630 mmcfd after an addendum was signed between SSGC and EETPL in 2017. Additionally whilst EETPL has guaranteed 630 mmcfd of regasification to SSGC, the terminal capacity is 690 mmcfd.[33] As a result of this enhancement in capacity the regasification tolling tariff charged by EETPL was reduced from $0.66/mmbtu to $0.479/mmbtu[34]. Under the LNG Policy 2011, the tolling tariff negotiated between the gas utility companies and the LNG Terminal Operator is based on (i) fixed charges, (ii) variable charges including operation and maintenance of terminal, and (iii) capacity utilization. Additionally where the sale is to a public sector gas utility, the tolling tariff negotiated between the gas utility and the terminal operator requires approval by OGRA.

15. Engro has executed an Implementation Agreement with Port Qasim Authority (PQA) to develop and operate an LNG terminal at Port Qasim. EETL pays a royalty on the

[31] https://www.paklngterm.com/company-profile/

[32] Engro Elengy Terminal presentation.

[33] Pakistan State Oil (PSO)

[34] Primary data collected from the meeting with EETPL.

volume rate of $1.99/ton for the LNG volume handling at Port Qasim for year 1-5. The amount of royalty is subject to increase with time. The royalty schedule is as follows

- Y 1-5 – USD 1.9/ ton
- Y 6-10 – USD 2.375/ ton
- Y 11-15 – USD 3.325/ ton
- Y 16-20 – USD 4.090/ ton
- Y 21-25 – USD 4.855/ ton
- Y 26-30 – USD 5.624/ ton[35]

16. The Floating Storage Regasification Unit (FSRU) of EETPL is docked at the EETPL berth at Port Qasim. Under the Time Charter Party Agreement between EETPL and Excelerate Energy[36], the FSRU of Excelerate Energy, *Exquisite* its FSRU has the regasification capacity of 690 mmcfd of natural gas directly to the system of Sui Southern Gas Company's (SSGC) pipeline network[37].

17. From the start of operations till 30th November, 2018, total 198 cargoes of LNG[38] have been received by EETPL, and the total LNG handled is equal to 12.182 million tons. Total RLNG re-gasified by EETPL and injected is 591.48 bcf (billion cubic feet). Likewise an approximately cumulative of 1089 bcf (from both terminals) of indigenous gas has been swapped to Sui Northern Gas Pipelines Limited (SNGPL) in lieu of RLNG.

18. As part of the tender and bidding requirements, EETPL laid an additional 17 km 42 inch high pressure gas pipeline which was transferred to SSGC post commissioning. This additional pipeline facilitates all future LNG terminals as well and its cost is recovered through the LSA tariff. This pipeline was an additional scope for EETPL which was not required by the second LNG terminal PGPL by virtue of EETPL laying it during their construction period.[39]

19. Pakistan GasPort Consortium Limited (PGPC)
    PGPC is a wholly owned subsidiary of Pakistan GasPort Limited (PGPL). PGPC owns and operates the 2nd LNG regasification terminal at Mazhar point, Port Qasim, Karachi. PGPC has a regasification capacity of 750 mmcfd. For the terminal construction PGPC made investment in the jetty and marine works at Port Qasim.

20. The FSRU of PGPC docked at Port Qasim is owned by BW group of Norway. The LNG received by the PGPC terminal at the FSRU is handled by the 32 member crew of BW. Pakistan Gas Port Consortium Limited (PGPC) have a Time Charter Party Agreement with BW *Integrity* for 15 years under which BW will provide the LNG

[35] Information provided by EETPL

[36] Excelerate Energy is a U.S.A Based company

[37] https://www.marinelink.com/news/maritime/excelerate-energy

[38] Data provided by EETPL

[39] ibid

regasification services to PGPC[40]. BW *Integrity* is a joint venture of BW Group and Mitsui & Co[41].

21. PGPC has signed an Operation and Service Agreement (OSA) with PLTL. Under the LSA, PGPC will be providing LNG storage and regasification service to PLTL of 600 mmcfd for 15 years at a levelized tariff of $ 0.4177/mmbtu. This contract was awarded to PGPC as a result of competitive bidding following the PPRA rules. PGPC has also signed an Implementation Agreement with Port Qasim for the construction and operation of LNG terminal at Port Qasim.

22. Fauji Oil Terminal and Distribution Company (FOTCO)
FOTCO was established in 1995 and has been handling major diesel and furnace oil imports of the country. The company has 52% shareholding of Fauji Foundation and is a joint venture of Fauji Foundation and Infraavest Ltd. of Hong Kong. The terminal at Port Qasim is designed and equipped to handle all POL products. FOTCO has constructed and is operating the high pressure RLNG pipeline from the PGPC jetty to carry the re-gasified gas to the SSGC tie-in point where the RLNG is injected into the system of SSGC. The pipeline has a capacity of 1.2 bcfd which has the capacity to handle additional RLNG (as compared to being injected currently)[42].

23. Both the regasification terminals EETPL and PGPC are constructed on Build Own and Transfer (BOT) model[43]. However their regasification capacity has been bought by SSGC in case of EETPL and PLTL in case of PGPC on behalf of Government of Pakistan.

2.4 Transporters of RLNG (Transmission and Distribution of Natural Gas Networks)

24. Sui Southern Gas Company Limited (SSGC)
SSGC is a public listed large scale company operating under Ministry of Energy (Petroleum division). It is Pakistan's leading integrated gas company and Government of Pakistan (GOP) has majority share-holding in the company. SSGC has a transmission, distribution and sale of natural gas license (in the provinces of Balochistan and Sindh) issued by Oil and Gas Regulatory Authority (OGRA) on 3rd September, 2003.[44] SSGC has the installation of high pressure transmission and low pressure distribution system, the transmission system extends in the provinces of Sindh

[40] BW is an international gas shipping company with a history of maritime energy transportation services. It has a fleet of 21 LNG carriers and FSRUs.

[41] http://www.bw-group.com/news/press-releases/formation-of-joint-venture-and-purchase-of-49-stake-in-lng-fsru-bw-integrity-by-mitsui-co

[42] http://www.ag.com.pk/pakistan-gasport/

[43] Information provided by EETPL

[44] Petroleum Industry Report 2016-17, OGRA

and Balochistan and distribution of natural gas extends to 1200 towns. SSGC also owns the only gas meter manufacturing plant in the country[45].

25. In case of indigenous natural gas, SSGCL purchases gas in bulk from 24 gas fields of International and Local E&P companies for distribution in its franchise area.

26. SSGC has a Gas Transport Agreement (GTA) with Sui Northern Gas Pipelines Limited (SNGPL). The GTA was signed on 30th June, 2016 under which 600 mmcfd of RLNG is the contractual quantity[46] to be transported to the pipeline network of SNGPL at Sawan, district Khairpur in Sindh.

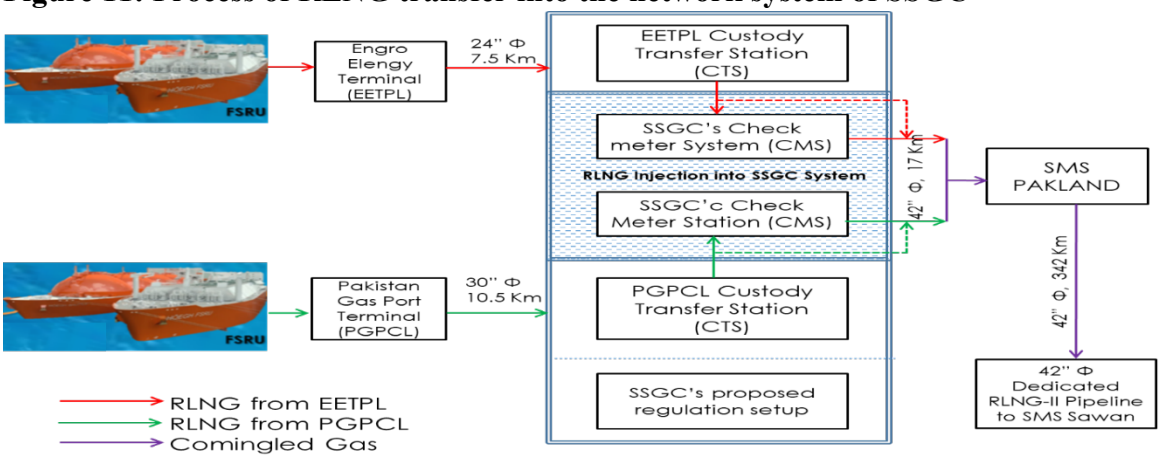
27. Under the GTA in phase I, a swap of 400 mmcfd of indigenous/comingled gas, which translates into 3 mpta was transported and pumped into the network of SNGPL. In phase II, a swap of 600 mmcfd of indigenous/comingled gas, which translates into 4.5 mtpa is to be transported up to the network of SNGPL at Sawan.

28. SSGC and EETL have an LNG Service Agreement (LSA), signed on 30th April, 2014 for a period of 15 years. For the terminal construction and regasification operations competitive bidding was done by Inter State Gas Systems (Pvt.) Limited (ISGS) and the contract was awarded to EETL.[47]

29. There are two service charges received by SSGC, one under the GTA known as the *transportation charges* and the other is the *SSGC margin for the LNG Service Agreement (LSA) with EETL.* The transportation charges are provisionally notified by Oil and Gas Regulatory Authority (OGRA) under 'cost of supply' on monthly basis. SSGC margin for LSA management is also notified by OGRA at $0.025/mmbtu.

30. The process of RLNG transfer into the network system of SSGC is explained in the diagram below.

Figure 11: Process of RLNG transfer into the network system of SSGC



[45] http://www.ssgc.com.pk/web/?page_id=68

[46] Presentation/meeting with SSGC experts.

[47] Sui Southern Gas Company Limited (SSGC)

Source: Sui Southern Gas Company (SSGC)

31. Subsequent to the addendum between SSGC and EETPL the guaranteed capacity of RLNG to be transferred to the SSGC network by EETPL is 630 MMCFD with a peaking of 690 MMCFD.

32. In order to the check the volume and quality of LNG received by the EETL at Port Qasim and later for the RLNG quality and volume measurements at the SSGC pipeline network, a third party, SGS provides the services. SGS is a Swiss based company which provides inspection, testing, certification, and verification services.

33. SSGC has laid a dedicated 340 km long 42″ dia pipeline for RLNG from Pakland, Karachi to Sawan. The pipeline capacity is 1200 mmcfd and can carry 600 mmcfd of RLNG from each of the two terminals. However in case of greater volume of RLNG the SSGC pipeline infrastructure is not equipped to handle.

34. Sui Northern Gas Pipelines Limited (SNGPL)
    SNGPL was converted into a public limited company in 1964 under the Companies Act, 1913. It is the largest integrated gas company serving 5.3 million consumers through its network in Punjab, Khyber PakhtunKhwa (KPK) and Azad Jammu and Kashmir (AJK). SNGPL's high pressure transmission network extends from Sui in Baluchistan to Peshawar in KPK. The distribution network extends to the domestic, industrial and commercial consumers. SNGPL has the transmission, distribution and sale of natural gas license issued by OGRA (in the provinces of Punjab, KP, Federally Administered Tribal Areas (FATA), AJK and some parts of Sindh) on 3rd September, 2003. Additionally SNGPL also has Gas Storage Facility license (at Lilla, Punjab) issued by OGRA on 30 April, 2008.[48]

35. SSGC and SNGPL have a Gas Transport Agreement (GTA) of 600 mmcfd of RLNG. The combined RLNG from both the regasification terminals is 1200 mmcfd and the GTA of another 600 mmcfd of RLNG between SSGC and SNGPL is in the final stages[49]. Where SSGC has undertaken system augmentation plan to cater for the increased amount of RLNG upto 1.2 bcfd/1200 mmcfd from Karachi to Sawan, SNGPL has undertaken system augmentation plan form Sawan to Lahore. Some portion of this pipeline enhancement before Sawan by SSGC has still to be completed.

36. The LNG import began in 2015 in Pakistan and since the gas issue pertained mainly to Punjab at that time therefore the LNG import was initiated to cater the gas demand of consumers on the transmission and distribution network of SNGPL. However with the passage of time the RLNG demand by consumers in Sindh has also increased who are on the network of SSGC.

37. In 2011 the Federal Government placed a moratorium on new gas connections due to the shortage of natural gas in the country created by rising demand and depleting

[48] ibid

[49] Primary data, meeting with SNGPL

domestic gas wells production. This moratorium was relaxed in 2017 by the government for all the provinces on new gas connections to industrial, commercial, captive consumers and new housing societies and also for existing load enhancement by the existing users of the network.

2.5 End Consumers (RLNG)

38. The allocation of RLNG to the various sectors at the transmission and distribution network of SNGPL has been decided by the Federal Government as per the decision taken by the Economic Coordination Committee (ECC) of the Cabinet. These sectors are as follows
    1. Power producers
    2. Industrial consumers (including fertilizer, textile sector)
    3. Commercial consumers (including CNG, housing societies)

Table 4: LNG Consumption by Sector

(Unit: Million CFt
TOE)

Sector	2015-16	2016-17
Fertilizer(as Feedstock)	4,397 102,884	18,080 423,077
Fertilizer(as Fuel use)	1,198 28,036	3,817 89,313
Power	58,934 1,379,048	71,930 1,683,159
Cement		138 3,228
Transport(CNG)	8,319 194,654	16,028 375,056
Gen. Industries	25,004 585,101	61,360 1,435,833
Total	**97,851** **2,289,724**	**171,353** **4,009,666**

Source: SNGPL

39. Table 4 above shows the LNG consumption by various sectors. As compared to 2015-16 the amount of LNG import increased in 2016-17. The total amount of LNG import in 2016-17 was 186,672,977 MMBTU.

40. According to Ministry of Energy (Petroleum Division), LNG is ring fenced since beginning as it was not to replace natural gas, but was mainly to replace expensive fuel oil being used for power generation and to some extent for meeting shortages in industry and CNG sectors, where the choice was either to close these sectors for non-

availability of natural gas or provide them an opportunity to continue running their businesses on LNG.

41. In Pakistan the LNG/RLNG market is a regulated market. Whereby the procurement of LNG from the international market is done by the state owned entities, PSO and PLL. The LNG import is for SNGPL which is the buyer of LNG/RLNG. SNGPL is also a transporter of RLNG having various Gas Sale Agreements (GSA) with power producers, industrial and commercial users of RLNG. It is pertinent to mention that power sector is the prime sector where by RLNG is supplied to both Independent Power Producers (IPPs) and government owned power generation plants including the power plants at Bhiki, Balloki and Haveli Bahadur Shah (having a power generation capacity of 3600 MW).

42. There is an Annual Delivery Plan (ADP), a scheduling tool to efficiently manage the logistics of the incoming LNG cargoes (including the SSGC system capacity to handle RLNG volumes) under the various SPA's as well as the spot cargoes. The program has representation of PSO, EETPL, SSGC, SNGPL and PQA.

43. Table 4 below shows the quantity of LNG import in Pakistan from 2015 to 2017.

Table 5: LNG Import (2014-15 – 2016-17)

UNIT	2014-15	2015-16	2016-17
MMBTu	19,795,505	100,720,923	186,672,977
TOE	472,503	2,404,128	4,455,734
IMPORT value(Million US$)	**(151)**	**(642)**	**(1278)**
Annual Growth Rate of Imports		408.1%	85.34%

Source: Directorate General of Liquefied Gases, MP&NR

44. Listed below are the various agreements in the LNG/RLNG value chain

    a. **Sale Purchase Agreement (SPA)**
    PSO has executed an SPA with Qatargas(2)[50], the agreement is for 15 years (long term contract) under which Qatargas(2) will supply 3.75 MTPA of LNG to Pakistan at 13.37% of Brent.[51] PSO has also executed an SPA with Gunvor (medium term contract) to supply 0.75 MTPA of LNG for 5 years. PLL has an SPA with Gunvor

[50] The Ministry of Petroleum and Natural Resources (MPNR) was authorized by ECC to engage in negotiations with Qatargas on G2G basis for import of LNG. The Price Negotiation Committee (PNC) was constituted by ECC of the Cabinet. The PNC convened rounds of meetings to finalize the key commercial terms including price, term, quantity, payment terms etc. On the basis of the recommendation of consultants and internal discussions, the final set of recommendation was placed by the PNC before ECC for approval. MPNR further negotiated on the slope percentage by matching the offered QG price to the lowest bid received in the term tender of 5 years awarded to M/s Gunvor

[51] The Brent price for a given month is the arithmetic mean of the 3 values of BRICE (US$/bbl) for the three months immediately preceding (and not including) the month in which the commencement of unloading of the relevant LNG cargo falls and is rounded to 4 decimal places.

for 5 years (medium term contract) for the supply of one cargo of LNG per month at a slope of 11.6247% of Brent.[52]

b. Operation and Service Agreement (OSA)
PLL has executed an OSA with Eni for supply of LNG for 15 years (long term contract) to supply one cargo per month (0.75 MTPA) to Pakistan at 11.6247% (slope for yr 1 &2) of Brent.[53]

c. Tri Partite Agreement (TPA)
This agreement is between PSO, SSGC and SNGPL. Under this agreement PSO is the importer and seller of LNG. SSGC is responsible for the regasification of LNG and SNGPL is the buyer of LNG.

d. LNG Service Agreement (LSA)
Currently there are two LSA in Pakistan. (a) LSA between EETL and SSGC and (b) LSA between PGPC and PLTL. Under the LSA between EETL and SSGC the tolling tariff[54] is $0.479/mmbtu[55]to regasify 600 mmcfd of LNG. Under the LSA between PGPC and PLTL the tolling tariff is $0.417/mmbtu to regasify 600 mmcfd of LNG.

e. Gas Transport Agreement (GTA)
The GTA is between the two state owned Sui companies, SSGC and SNGPL. Under the GTA 600 mmcfd of RLNG will be transported by SSGC to the SNGPL network at Sawan. The remaining 600 mmcfd of RLNG is from the 2nd LNG Terminal, PGPC through the dedicated pipeline infrastructure to carry 1200 mmcfd/1.2 bcfd of RLNG, completed in September 2018.[56] SSGC can swap on as and when basis when required (On the swap arrangement the RLNG is consumed by SSGC consumers and the same amount/value of indigenous gas is injected into the system of SNGPL[57]).

f. Gas Sale Agreement (GSA)
The GSA is between SNGPL and the end consumers/buyers of RLNG. These agreements are in the power, industrial and commercial sectors.

45. The LNG market structure is represented below through model (A) and model (B). Model A shows the basic market structure of LNG where the sellers interact with the consumers through various contracts. Model B gives a detail snapshot of the value chain from LNG procurement to end consumer along with various contracts between the

[52] In case of spot cargoes, these are arranged both by PSO and PLL on need basis. For spot cargo a tender is floated by PSO/PLL for the procurement of spot cargo and the contract is awarded through competitive bidding process.

[53] The PLL, Eni OSA slope changes, refer para 9 page 23.

[54] Tolling tariff is the service charges/regasification charges of the terminal.

[55] In 2017 an addendum was signed between EETL and SSGC to increase the regasification capacity of the terminal from 400 mmcfd to 630 mmcfd as a result the tolling tariff decreased from $0.66/mmbtu to $0.479/mmbtu.

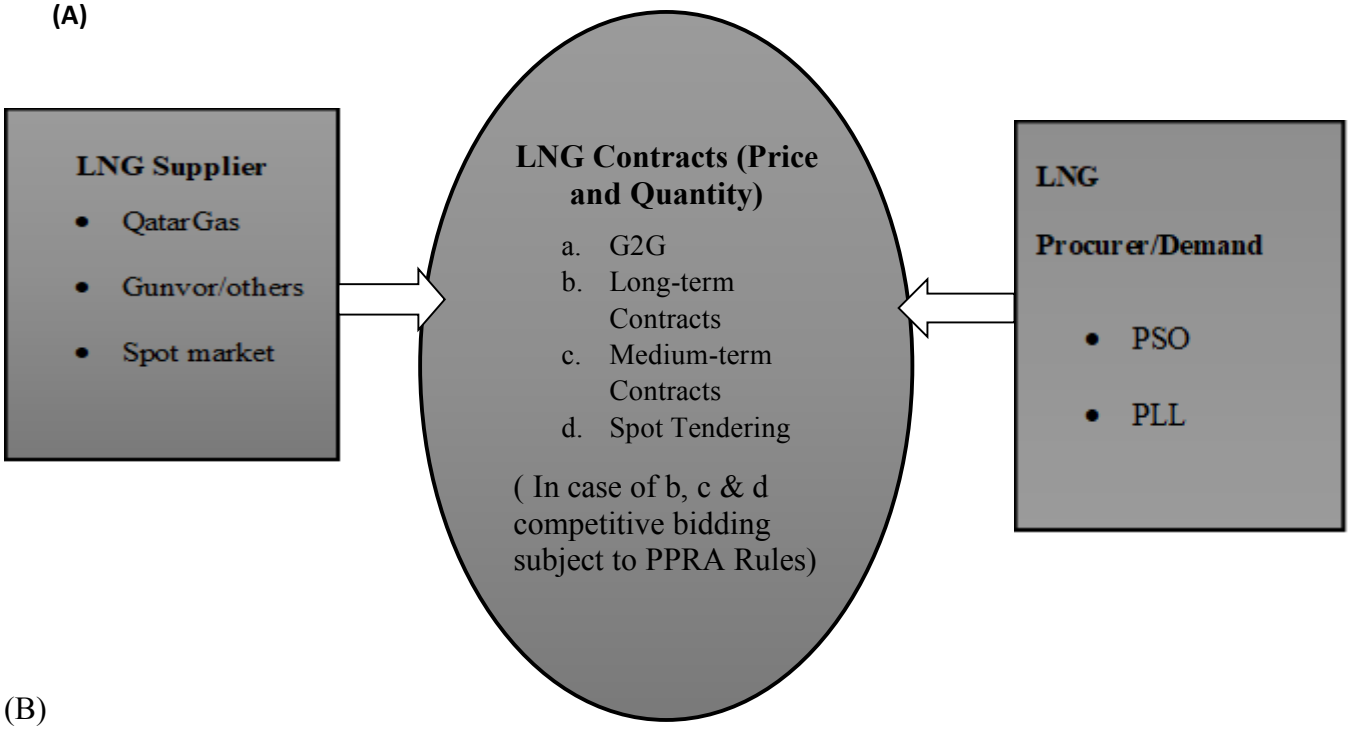
[56] Sui Southern Gas Company Limited (SSGC)

[57] Primary data collected through meetings with SSGC, SNGPL and PLL.

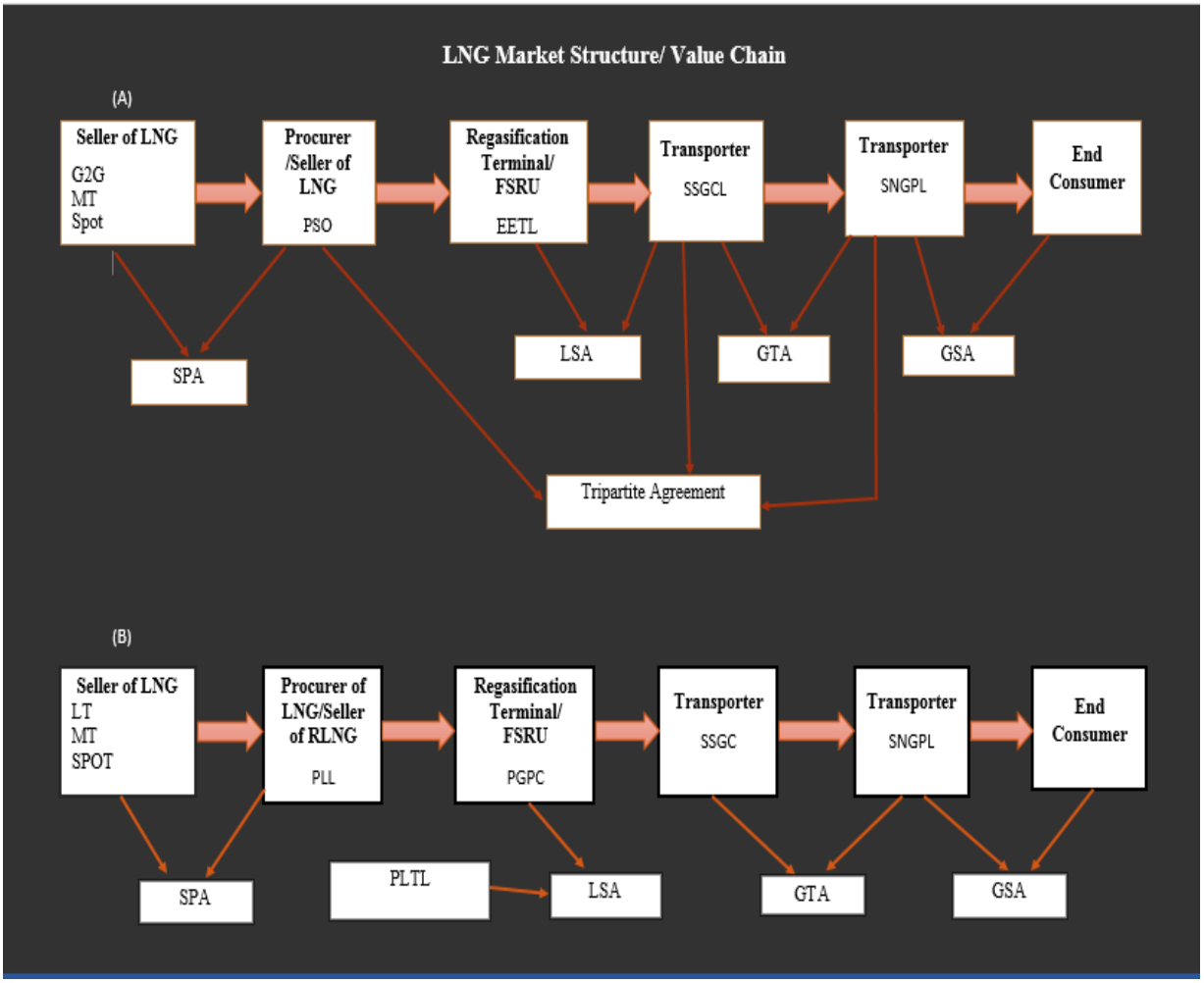
stakeholders. In model B, there are two parallel value chains within the LNG market structure as there are two LNG procurers, PSO and PLL.

Figure 12: LNG Market Structure

(A)



(B)


LNG Market Structure/ Value Chain
(A)
Seller of LNG
G2G
MT
Spot
Procurer /Seller of LNG
PSO
Regasification Terminal/ FSRU
EETL
Transporter
SSGCL
Transporter
SNGPL
End Consumer
SPA
LSA
GTA
GSA
Tripartite Agreement
(B)
Seller of LNG
LT
MT
SPOT
Procurer of LNG/Seller of RLNG
PLL
Regasification Terminal/ FSRU
PGPC
Transporter
SSGC
Transporter
SNGPL
End Consumer
SPA
PLTL
LSA
GTA
GSA

Chapter 3: LNG Pricing

3.1 LNG Pricing

Box 1: International LNG Pricing Mechanisms

At the outset before discussing the LNG pricing models adopted in Pakistan, it is pertinent to elaborate the global LNG market types based on different pricing methodologies adopted.

1. Oil indexed LNG pricing (mainly Asia-Pacific)
2. Gas on Gas Hub pricing (based on demand & supply, mainly US, UK and Canada markets)
3. Mixed Pricing: linked to Brent/Oil products and also a part to Hub pricing (Continental Europe market)

Oil indexed LNG pricing: In the absence of an established reference point, it is a pricing mechanism where the price of LNG is indexed to Brent/crude oil adopted in countries of Asia pacific region mainly Japan, Korea, and Taiwan. During the 90's LNG prices were linked to Japanese Crude Cocktail (JCC) prices. Additionally to absorb international fluctuations in the crude oil prices in the world market, an S-curve model is also adopted with lower slopes at both ends, where the slope at both ends and the middle of the S-curve model is contracted between the buyer and the seller.

Hub Pricing (Gas on Gas): this is an LNG market which well established with many buyers and sellers and the gas price is determined on the basis of local and regional demand and supply of gas. In this market gas trading is conducted in an open and transparent manner. US, UK and most of Europe have hub pricing such as Henry Hub (US), National Balancing Point (NBP, UK) etc. The long term contracts can be undertaken under hub pricing mechanism through gas futures contract which gives coverage against the short term price volatility in gas prices.

Mixed Pricing: this LNG pricing mechanism is a mix of Brent/crude oil/other oil product and hub pricing. It is prevalent in most of Central and Southern Europe.

*It is argued that US gas market based on hub pricing is the most deregulated and transparent gas pricing market.

*Oil indexed LNG pricing (including JCC) and Henry Hub (based on free market) are considered two extremes in LNG pricing.

Source: 'Study of oil linked LNG pricing model in Japan', International Journal of Academic Research, volume 5, issue 6, 2017.

1. The LNG Market pricing involves different pricing mechanisms according to different geographical locations and contract types. A "unique" price does not exist. In standard Asian long term contracts, the LNG Price has been linked with the price of crude oil. In the Asian market (predominantly Japan, Korea, Taiwan &China), LNG long term contract prices have historically been indexed with the JCC (Japanese Crude Cocktail). The "JCC" is the average price of the custom cleared crude oil imports into Japan. The

"generic" expression for the LNG price in Asian oil indexed contracts could be represented by the following formula:

$$\text{LNG Price} = \beta + \alpha(\text{JCC})$$

$$\alpha = \text{slope coefficient}$$

$$\beta = \text{price component independent of JCC}$$

2. The LNG price is linked to the JCC through the slope coefficient (α). Crude oil is a close substitute of LNG and therefore is used in the formula. In Europe, Brent has been used as the preferred variety of crude oil in indexed LNG contracts. Brent is a major trading classification of sweet light crude oil as well as being a benchmark for global oil purchases. The long term LNG contracts in Pakistan are also indexed with the price of Brent.

Box 2: Buyer and Seller Responsibilities for Delivery of Goods

The price of LNG depends on the type of contract and the rights and obligations allocated therein. The set of rules which define the responsibilities of sellers and buyers for the delivery of goods under sales contract are explained as follows:

a. **Free On Board (FOB) Pricing**: Contemplates that the buyer takes title and risk of the LNG at the liquefaction facility and the buyer pays for LNG transportation from the liquefaction facility to the destination market.

b. **Delivered at Terminal (DAT), Delivered at Place (DAP) and Delivered Ex Ship (DES) Pricing:** Contemplates that the seller retains title and risk of the LNG until the receiving terminal in the destination market and the seller pays for LNG transportation from the liquefaction facility to the destination market.

c. **Costs, Insurance and Freight (CIF) Pricing:** A hybrid which contemplates that the buyer takes title and risk of the LNG at the liquefaction facility but the seller pays for transportation from the liquefaction facility to the destination market. The significance of the delivery point is that costs are shifted between the seller and buyer.

3. The LNG DES price for cargoes in Long Term Pakistani Contracts is calculated according to the following formula:

$$LNG\ DES\ Price = \beta + \alpha(Brent\ Price) \qquad \text{(Equation 1)}$$

$$\beta = Port\ Charges\ in\ excess\ of\ the\ limit\ borne\ by\ LNG\ supplier\ specific\ to\ PSO\&\ PLL$$

$$\alpha = Slope\ coefficient\ (As\ contracted\ by\ PSO\ \&\ PLL)$$

4. Brent Price for a given month is the arithmetic mean of BRICE(US$/bbl) values for 3 months immediately preceding but not including the month in which the commencement of the unloading of the cargo falls. BRICE for a given month is the arithmetic mean of all settlement prices (US$/bbl)for each quoted day of that month as published by the Intercontinental Exchange of the first line ICE Brent futures contract.[58]

5. The LNG DES price for April 2018 can be calculated by plugging in the values for α, β and Brent Price according to (Equation 1).[59]

Table 6: LNG DES Price

Apr-18	**PSO**	**PLL**
A	0.1337 (13.37%)	0.116247 (11.6247%)
B	0.0933	0.04
Brent Price	67.0971	67.0971
LNG DES Price ($/mmbtu)	**9.06418227**	**7.839836584**

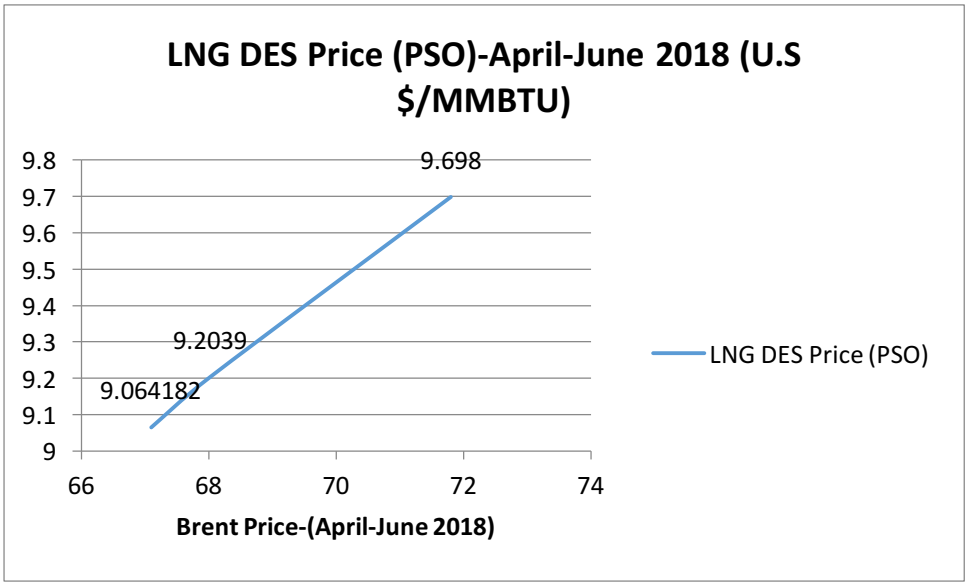
Furthermore, the graph of LNG DES Price (PSO) against the price of Brent is depicted below from April 2018 to June 2018. The line shows an increasing trend for the months April-June 2018.[60]

Figure 13: LNG DES Price (PSO)

[58] Source : http://www.paklng.com/LNG/T05/Bid.pdf

[59] Source : Determination of Re-gasified Liquefied Natural Gas (RLNG) Weighted Average Sale Price for the Month of April 2018 by OGRA.

[60] Source: www.ogra.org.pk



6. It is pertinent to analyze the components (α and β). The slope component (α) is of particular interest as it shows the change in LNG price for a given change in the price of Brent. In line with this we define the concept of heat equivalence between oil and natural gas. On average, 1 mmbtu of gas has approx. 16.67% of the energy content of a barrel of oil (i.e. the 6-to-1 heat equivalent parity). Contract slope is typically expressed in percentage terms, hence if the heat equivalent parity were used, the slope would be 16.67%.[61] If the slope is 16.7%, LNG prices are equal, on an energy equivalent basis, to crude oil. Slopes less than 16.7% imply that LNG is sold at a discount to oil, and slopes greater than 16.7% imply that LNG will sell at a premium price to oil.[62] The "current" slope in the long term PSO-Qatar Gas Agreement is 13.37% and 11.6247% (for year 1 &2), 11.95% (for year 3 &4), 12.14% (for year 5-15) in the case of PLL-ENI. These slope values assume particular importance whenever Brent Price fluctuations are analyzed along with natural gas price movements.

3.2 LNG Pricing and Spot Cargoes

7. Another mechanism for LNG trade is the spot market. Spot LNG refers to LNG that is traded on a cargo to cargo basis. Like the long term contract pricing of LNG, which can be decided following any of the above pricing mechanism presented in box 1, similarly the spot purchases of LNG can be made on any of the above pricing mechanism as well. Over the years, the spot market as well as short term LNG trading (typical duration of less than four years) has increased. The short term contracts are usually for a string of

[61] Source : http://www.hebrewenergy.com/lng-prices-lng-pricing-lng-contracts/

[62] Source : http://www.natgas.info/gas-information/what-is-natural-gas/gas-pricing-contracts

cargoes for a period of one to two years.[63] Not all but some of the cargo by cargo deals are linked with benchmarks. These benchmarks represent spot prices in different geographic locations, namely: The Henry Hub in North America, Japan Korea Marker (JKM) in Asia and National Balancing Point (NBP) in the UK.

8. Henry Hub is a central location for the pricing of natural gas futures contracts. Similarly, the NBP in UK is an established European spot traded natural gas market. Lastly, JKM is a widely quoted measure of the prices of spot LNG trades in Asia published by Platts.

9. In case of Pakistan, the spot LNG cargoes contract price is based on a fixed percentage of Brent.

$$\text{Contract Price} = [xxx.xxx]\ \% \times \text{Brent Price}$$

[xxx.xxx]% refers to the slope/percentage which each of the bidder's quotes.

Where according to PPRA rules, there is open bidding and the undertaking that submits the lowest percentage/slope wins the bid

3.3 Re-gasified Liquefied Natural Gas (RLNG) Pricing Components[64]

10. The cost of RLNG includes the following components added in the LNG (DES) price:

    a. PSO/PLL import related actual costs (including port charges and other costs of handling LNG)

    b. PSO and PLL margin

    c. Terminal charges (in case of EETPL the Terminal Charges are $0.479/ mmbtu and for PGPC the terminal charges are $0.4177/mmbtu)

11. Further to the above cost of RLNG, the following components are added to arrive at the total RLNG price without GST:

[63] Pakistan LNG Limited (PLL)

[64] RLNG pricing components comprise of 7 components out of which 5 components have been determined by the Federal Government. These 5 components include *(i) LNG DES price (ii) import related actual cost (iii) terminal charges (iv) LNG importer margin @ 2.5% (v) LSA margin @ $ 0.025 per MMBTU.* The remaining 2 components are *(i) Cost of service/transportation cost and (ii) Transmission and Distribution losses*. These are determined through the revenue determination process of the Sui companies and the same amount is included in the RLNG price under the *ring-fenced* mechanism and in accordance with the Federal Government. OGRA computes all the components and the price of RLNG in accordance with the policy guidelines provided by the Federal Government to OGRA under section 21 of OGRA Ordinance, 2002.

a. Retainage volume adjustment[65]
b. T & D (transmission and distribution) volume adjustment
c. LNG Service Agreement (LSA) management fee (SSGC/PLTL)
d. Cost of supply[66]

3.4 Computation of RLNG Price

12. RLNG price is determined under Petroleum Product (Petroleum Levy) Ordinance 1961 (PL Ordinance), Petroleum Product (Petroleum Levy) Rules 1967, and in accordance with the policy guidelines of the Federal Government. Under SRO 405(I)/2015 issued by the Federal Government on May 07, 2015, RLNG has been included in the first schedule as petroleum product and the name of the SSGCL and SNGPL have been inserted as petroleum companies.[67]

13. As per the framework provided by the Federal Government, OGRA determines the consumer price of RLNG where the LNG is procured by PSO/PLL for public sector gas utility companies. However in case of sale of RLNG to third parties the price will be based on their mutual agreements.

14. OGRA determines the RLNG price on provisional and actual basis. Prior to the second terminal PGPC and the LNG procurer PLL[68], OGRA determined the price of RLNG where the LNG procurer was only PSO. Later with the development of second terminal and PLL procuring LNG separately from international market, OGRA determined the provisional price for both PSO and PLL independently for the month of January'18.[69]

15. In pursuance of the Federal Government decision on "RLNG Allocation, Pricing and Associated Matters" and on the advice of Ministry of Energy dated 22nd January'2018, OGRA has been further directed to determine the weighted average sale price of RLNG on monthly basis.[70]

The international LNG prices keep on varying depending on the market dynamics (supply and demand situation), buyer's credit rating, and other relevant factors. A natural disaster in an LNG producing country or a large producing country or a large importing country can turn the spot market and make the access to molecules expensive.

It is pertinent to mention that LNG buyers maintain a portfolio of supplies, where reliable and firm supplies are sourced for the base load on firm basis and the flexibility required in supplies is covered through spot purchases. Spot selling market is evolving, it is more actively pursued by LNG traders who usually manage their risk by maintaining various portfolios including term contracts and spot purchases of distressed cargoes.

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streamline/update the pricing mechanism it was decided to determine a single 'weighted average price' of RLNG.

Chapter 4: Regulatory Framework

4.1 Ministry of Energy (Petroleum Division)

1. In Pakistan the LNG sector is a regulated sector, regulated under the OGRA Ordinance, 2002 and policies of the Federal Government. The Oil & Gas Sector falls under the Ministry of Energy (Petroleum Division). The Petroleum Division is responsible for all matters dealing with petroleum, gas and minerals. Its functions include policy making, legislation, planning regarding exploration, development and production policy guidelines to the sector regulators of oil and gas sector. It is also responsible for policy guidelines and facilitation of imports, exports, refining, distribution, marketing, transportation, and pricing of all kinds of petroleum and petroleum products. It is also responsible for the development of petroleum and mineral sectors[71].

2. Following directorates are working under the Ministry: Directorate General of Gas, Directorate General of LNG & LPG, Directorate General of Oil, and Directorate General of Petroleum Concessions (DGPC). Policy formulation regarding natural gas, liquefied petroleum gas (LPG), liquefied natural gas (LNG) and compressed natural gas (CNG) is done by Directorate General of Gas. The directorate is also responsible for the assessment and management of gas demand and supply, allocation of gas from new fields to SSGC and SNGPL and also the allocation of natural gas from different sources to various sectors of the economy. DG(Gas) also processes and implements the ECC decisions.

3. Additionally Article 158 of The Constitution of Pakistan says:

   Priority of Requirements of Natural Gas
   The Province in which a well-head of natural gas is situated shall have precedence over other parts of Pakistan in meeting the requirements from that well-head, subject to commitments and obligations as on the commencing day.

4. The LNG Policy, 2006 was modified to (expedite and facilitate the LNG projects) LNG Policy, 2011. Under the *LNG Policy, 2011* the LNG import project structure can be (i) Integrated Project Structure- where the LNG Developer (private/public) procures LNG from the supplier, transports it to the LNG regasification terminal and supplies RLNG to the domestic market or for its own use. (ii) Unbundled Project Structure- where a government designated buyer, gas utility company, consumer or LNG supplier (LNG Buyer) can import LNG from international market by entering into an LNG Sale Purchase Agreement (SPA). The LNG buyer can then get into a regasification agreement with the terminal owner and or operator. Whereby the terminal owner/operator and the LNG buyer can get into a tolling agreement for receiving, storage, regasification of LNG.

[71] Ministry of Energy (Petroleum Division), Government of Pakistan. http://www.mpnr.gov.pk/frmDetails.aspx

5. Under the unbundled project structure the LNG buyer can enter into an SPA on either Delivery ex-ship (DES) basis, free-on-board basis (FOB) or C&F (Cost and Freight) basis

6. Under the LNG Policy, 2011 an LNG Buyer can procure LNG through one of the three approaches:
   a. Direct negotiations with one or more LNG suppliers for the supply of LNG for a reasonable time
   b. International competitive bidding
   c. Direct purchase from the LNG spot market based on market and commercial considerations on a competitive basis[72].

4.2 Oil and Gas Regulatory Authority (OGRA)

7. LNG/RLNG is a regulated sector and a regulated activity mid-stream and down-stream regulated by Oil and Gas Regulatory Authority (OGRA). OGRA has been set up under the Oil and Gas Regulatory Authority Ordinance, 2002. Under Section 6 of OGRA Ordinance, *Powers and functions of the Authority*, OGRA has the exclusive responsibility to grant licenses in carrying out regulated activity and also to regulate such activity. The Authority has the exclusive power to grant licenses for regulated activities in the natural gas, Compressed Natural Gas (CNG), Liquefied Petroleum gas (LPG), Liquefied Natural Gas (LNG) and oil sectors[73].

8. Under Section 2-definitions of OGRA Ordinance, 2002, (xiv) *"LNG" means liquefied natural gas*, (xxiii) *"petroleum" means crude oil, refined oil products and natural gas;* and (xxxii) "*regulated activity" means an activity requiring a licence*. Under Section 7, tariff is determined and approved by OGRA in regulated activity and under Section 8, pricing of natural gas for retail consumers is determined by OGRA.

9. *Oil and Gas Regulatory Authority (Liquefied Natural Gas) Rules, 2007*
   These rules are made pursuant to Section 41 of the OGRA Ordinance, 2002. Under Rule 3, the regulated activity License is granted for 20 years. Rule 19 specifies the obligations of the licensees, who must follow safety procedures, maintain standards specified by OGRA, provide *non-discriminatory open access to its facilities for a fee* and to *provide interconnection to its facilities on mutually agreed terms*. To facilitate LNG import, under Rule 33 OGRA grants a provisional license for a maximum period of 12 months to a company incorporated in Pakistan or outside to complete all formalities of LNG rules[74].

[72] LNG Policy, 2011, Ministry of Energy (Petroleum Division)

[73] http://www.ogra.org.pk/introduction

[74] OGRA Liquefied Natural Gas Rules, 2007

10. Rule 4, Application for a license- *Any company incorporated inside or outside Pakistan may submit an application to the Authority for obtaining or renewing a license to undertake a regulated activity, by filing it with the Registrar along with such fees based on the estimated cost of the project as the Authority, may, from time to time, determine*[75].

11. In the LNG/RLNG sector, the regulated activity for which a license is issued by OGRA is enlisted below:

    (a) LNG Production Facility (Construction)
    (b) LNG Production Facility (Operation)
    (c) LNG Processing Facility (Construction)
    (d) LNG Processing Facility (Operation)
    (e) LNG Testing Facility (Construction)
    (f) LNG Testing Facility (Operation)
    (g) LNG Storage Facility (Construction)
    (h) LNG Storage Facility (Operation)
    (i) LNG Terminal (Construction)
    (j) LNG Terminal (Operation)
    (k) Transportation of LNG
    (l) Filling of LNG
    (m) Marketing of LNG
    (n) Distributing of LNG

12. OGRA issues licenses for the design, construction, operation and ownership of LNG terminals, construction of pipelines and development of transmission and distribution network subject to technical, environmental, financial, safety standards and other No Objection Certificates (NOCs). OGRA also hires services of consultants to watch over the terminal development, construction and operations.

13. In the upstream LNG market, PSO and PLL are the procurers. The *Delivery Ex-Ship (DES)* price is indexed to the Brent. Since the price of Brent fluctuates therefore weighted average of last three months Brent is taken to determine the DES price. The DES price is subject to the SPA of PSO and PLL with the LNG supplier and are contractually determined, also subject to PPRA rules where applicable. The RLNG price is determined and notified by OGRA on monthly basis.

14. OGRA under *section 41* of the Oil and Gas Regulatory Authority Ordinance, 2002 enacted the *Third Party Access (TPA) Rules, 2012.* These rules were made to enhance competition through private sector participation in the natural gas sector, through

[75] Notification by Government of Pakistan, Cabinet Division, Published 26th May 2007

shipper and *transporter access arrangement.* However due to impracticalities and some technical issues[76] the TPA rules were suspended in 2015.

15. OGRA Gas (Third Party Access) Rules, 2018
    These rules adhere to transparency, competition, fairness and a level playing field in the gas sector. These rules define the transporters and shippers key responsibilities. Under Rule 2(I)(x) *"shipper" means a person holding a valid license issued by the Authority for transmission, distribution or sale of gas through an Access Arrangement for transportation of gas by utilizing capacity of gas pipeline transportation system above such thresholds as may be specified in the Network Code;*

16. Transporter is defined in Rule 2(I)(dd) as *"transporter" means a person holding a valid license issued by the Authority for construction and operation of pipeline for transmission, distribution or sale of gas through a gas pipeline transportation system.* Rule 2(I)(m) defines "*gas" means natural gas and includes RLNG;* and under Rule 2(I)(w) *"RLNG" means natural gas obtained after gasification of liquefied natural gas;*

17. The shipper and transporter of natural gas can get into an agreement for the supply of gas under "access arrangement". The gas allocated to a shipper by the transporter shall be received at a certain entry point and likewise delivered at a certain exit point. The transporter under the *access arrangement* will allocate the available capacity *on first come first served basis* to a shipper of gas.

4.3 Public Procurement Regulatory Authority (PPRA)

18. PPRA under Public Procurement Regulatory Authority Ordinance, 2002 is an autonomous body which prescribes regulations and procedures to be followed by the organizations of the Federal Government in public procurement. Under the PPRA Ordinance, *Public Procurement Rules 2004* are applicable in the LNG sector at various levels. For procuring LNG supplies from the international markets and also for the LNG regasification terminal development PPRA rules are applicable. Additionally any other infrastructure development in the LNG sector is subject to PPRA rules as well.

19. Under Rule 3, the PPRA rules are applicable to *all procurements made by all procuring agencies of the Federal Government whether within or outside of Pakistan*. Under Rule 5, international and inter-governmental agreements are exempt from PPRA rules (in case there is any conflict between the Rules and the international agreement).Under PPRA rules, open competitive bidding is the preferred mode of awarding contracts

[76] Stakeholders/companies approached OGRA and asserted many issues which were not properly addressed in the said Rules and therefore rules required a review. World Bank and IMF also pointed out that the Rules were more LNG specific and needed to be generic, particularly with respect to indigenous gas. Some issues were also raised regarding to impracticalities in timelines.

subject to rules 22 to 37. Exceptions are allowed under Rule 42(c) & (d) in case of extreme urgency and technical reasons[77].

4.4 Port Qasim Authority (PQA)

20. Port Qasim Authority (PQA) operates under the administrative control of Ministry of Ports & Shipping. It provides shore based facilities and services to international shipping lines and other concerned agencies in the form of adequate depth of water in channels, services and facilities to berths and terminals, day and night movement of cargoes and vessels, and storage facilities.

21. As the LNG vessels enter the Port Qasim limits, *Port Qasim Act 1973, Port Qasim Regulations 1981*, and Standard Operating Procedures (SOPs) for LNG carriers are applicable regarding the specifications of the vessel, berthing, environmental impact assessment and other safety standards.

22. Both ETPL and PGPC have implementation agreement with PQA. The Implementation Agreement (IA) is to develop and operate the LNG terminal at Port Qasim. Under the IA, PQA charges the terminal developers for the berthing, royalty, tug charges, mooring fees and other utility/service charges[78].

4.5 Sindh Environmental Protection Agency (SEPA)

23. SEPA is a provincial environmental protection agency to implement the Sindh Environmental Protection Act, 2014. SEPA functions under the Environment Climate Change & Coastal Development Department, Government of Sindh for the protection, rehabilitation and conservation of the environment. As the LNG cargoes enter into the Pakistani territory at Port Qasim and the LNG regasification terminals are constructed at Port Qasim as well, SEPA rules and regulations are applicable[79].

24. SEPA under the Sindh Environmental Protection Act, 2014 made the Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) Regulations, 2014. The regulations subdivides projects into three schedules, I which require an IEE, II which require an EIA and III which is exempt from either IEE or EIA. The projects have to submit the IEE or EIA to SEPA for approval subject to the SEPA guidelines provided. SEPA under Section 12 of the regulations reviews the IEE and EIA submitted.

[77] http://www.ppra.org.pk/

[78] http://www.pqa.gov.pk/, http://www.pqa.gov.pk/forms_downloads.php, http://www.pqa.gov.pk/function_departments.php

[79] http://epasindh.gov.pk/index.htm

25. The LNG projects including terminal development, operations and regasification falls under schedule II where an EIA study has to be carried for the project proponent by and submitted for approval to SEPA[80].

[80] http://epasindh.gov.pk/Rules/EIA%20IEE%20Regulations%202014.pdf

CHAPTER 5: Competition Assessment of Liquefied Natural Gas (LNG) Sector

1. To ensure availability of sustainable energy and energy security LNG is imported. The development and growth of LNG sector in Pakistan both upstream when it is imported and downstream when it is re-gasified and injected into the system of SSGC and SNGPL to the end consumer must be competitive such that the consumers pay a competitive price and receive improved quality of LNG. The LNG sector in Pakistan is new and it is developing. However it is pertinent to access the competition in this sector and highlight the issues that are anti-competitive and as a result impede the growth of this sector.

5.1 Barriers to Entry/Effective Competition

2. Barriers to entry can be broadly categorized as (i) Structural (ii) Regulatory, and (iii) Strategic. The LNG market in Pakistan is a regulated market, it is unlike a traditional market, where demand and supply determine the price. In order to do competition assessment of the LNG sector in Pakistan, competition at each stage of the value chain is under taken and assessed in detail. For this, assessment of the upstream market where LNG is procured, the terms and conditions of contract pricing, LNG handling at the port, regasification at the terminals, injection of RLNG into the pipeline network, to the end consumers is done. Additionally the regulatory framework, policies and rules are also analysed for any anti-competitive barriers in the sector.

5.2 Structural Barriers

3. Structural barriers also called the natural barriers are barriers which limit entry into a particular industry due to the nature of the good or service. These barriers can be in the form of high capital investment requirement, high sunk costs, trained human resource, economies of scale and control of essential raw material.

4. The LNG sector is a sector that requires high capital investment. In the upstream market to procure LNG no license is required for the import of LNG from an international seller. However for the SPA between a seller and a procurer/buyer/importer strong financial international standing, financial security, multiple guarantees are required of the importer to furnish. It may be noted that the provision of financial security is negotiated between buyer and the seller and it varies from case to case. The LNG cargo amounts to approximately 28 to 30 million USD and the seller requires a financial security to cover the invoicing cycle. These as a consequence creates a strong natural entry barrier in the upstream LNG market of procurement[81].

[81] The government of Pakistan in the LNG Policy, 2011 thus has two models- unbundled and bundled, so to encourage investment in the sector.

5. In the midstream LNG market, the terminal construction and operations require licensing by OGRA. The terminal construction/operation requires heavy capital investment in machinery, equipment, and requires financial capital. This creates a structural barrier for new entrants at the terminal stage. Skilled human resource is also required for the terminal construction and operations, creating a natural barrier for prospective firms in the industry.

5.3 Regulatory Barriers

6. **Moratorium on Gas**: In 2011 the federal government imposed a moratorium on new gas connections in all provinces, for the commercial and industrial users including new housing societies and high rise apartment buildings. This was decided in the wake of the energy shortage in the country as the natural gas demand was continuously increasing compared to the depleting natural gas supply through the indigenous sources[82]. The moratorium was relaxed in 2017 on the grounds that the new gas connections, including industrial users, commercial including new housing societies and high rise buildings, and captive power will be on RLNG.

7. RLNG is imported gas and before the recent increase in the consumer gas prices[83], it was $1-$1.5/mmbtu higher than the indigenous gas price. For the domestic consumer, textile and the fertilizer sector, the government is giving a subsidy on the gas price. The cost of natural gas is Rs. 490/mmbtu and the domestic consumer was paying Rs. 110/mmbtu which recently has been increased to Rs.127/mmbtu. A comparison of natural gas price and the RLNG price reveals that the natural gas commercial and industrial consumers pay between Rs. 600/mmbtu to Rs. 980/mmbtu whereas the RLNG price is Rs. 1500/mmbtu for consumers on the transmission network of SNGPL[84].

8. A comparison between the recently notified natural gas consumer prices (September, 2018) with the earlier prices reveal that the Federal Government approved the increase in consumer gas prices of various percentages. These percentages show an increase of 10%, 15%, 25% and 30% for the domestic gas consumers. For the commercial consumers these percentages range from 10% to 40%, depending on the gas usage. Similarly for the general industry the natural gas prices show an increase of 30% to 40% except for the textile sector, carpets, leather, sports and surgical goods[85]. In case of the fertilizer companies and the power plants including IPPs and captive power plants there is a minimum increase of 30% and a maximum increase of 127%.

[82] Primary data collected, meeting with SNGPL

[83] Gas notified prices/ consumer prices 27th September, 2018, OGRA

[84] A point raised at multiple meetings with various stakeholders in the sector

[85] To boost the exports the government has cross subsidized the textile sector, carpets, leather, sports and surgical goods and their captive power. The gas tariff therefore remains the same as before the recently notified gas prices of September, 2018. The tariff is set at Rs. 600/mmbtu.

9. Consumers on the natural gas connections of SNGPL and SSGC pay the natural gas tariff however after the relaxation of the moratorium in 2017 all new connections (industrial, commercial, captive, and also including housing societies) are on RLNG. Consumers as a consequence do not have a choice but to pay for the higher priced RLNG. The gas received by gas consumers is comingled gas since the two molecule of gas (either indigenous or imported LNG) cannot be differentiated. Therefore there is no difference in the gas received by the consumers of natural gas or the RLNG however the RLNG consumers pay the higher price. This results in discrimination between the consumers as the new consumers having RLNG gas connection have to pay higher price than the consumers on the SSGC and SNGPL network of natural gas. Competitors in the same market can therefore have different sources of gas. The price differential however gives a competitive disadvantage to consumers on the RLNG network.

10. **Difference in Consumer Pricing:** OGRA under the OGRA Ordinance, 2002 notifies the sale prices of both the natural gas and the RLNG. The retail consumers of natural gas on the network of both SNGPL and SSGC are segregated into domestic, commercial, special commercial (roti tandoors), ice factories, industrial, compressed natural gas (CNG), cement, fertilizer companies, power stations (WAPDA and KESC power stations), independent power producers (IPPs), and captive power plants. These consumers are charged different price of gas with fixed minimum charges, recently revised September 2018.[86] Additionally it is pertinent to mention that the notified natural gas consumer prices had remained unchanged for last 5 years till the revision in 2018.[87]

11. In comparison to the natural gas the RLNG price is determined by OGRA on a monthly basis. To calculate the monthly price of RLNG, weighted average price of Brent of last three months is taken. The price of RLNG is determined for the transmission and distribution network of SSGC and SNGPL. The price of RLNG is ring fenced, meaning that there is no segregation of consumers. All RLNG consumers on the transmission network of SSGC have to pay the same price. Likewise for consumers on the SNGPL transmission network. For the distribution network of SNGPL all consumers regardless of commercial or industrial or any other have to pay the same price of RLNG. Similarly for SSGC consumers.

12. The pricing comparison of gas from indigenous sources and the RLNG reveals that where the consumers on the indigenous gas pay a fixed rate depending on the sector which they are in, the RLNG consumers pay a price of RLNG which is determined by OGRA on a monthly basis for the consumers on transmission and distribution network of Sui companies, regardless of the sector the consumers belong to. This additionally places the RLNG consumers at a disadvantage[88].

[86] http://www.ogra.org.pk/consumer-gas-prices

[87] Natural gas prices were last revised in 2013 till the recent revision in September, 2018

[88] For instance a commercial connection on indigenous gas pays Rs. 600/mmbtu where as one on RLNG pays Rs. 1100-1200/mmbtu.

13. **OGRA Ordinance, 2002:** the Ordinance extends to the whole of Pakistan including the offshore area. Under *Section 2 (iii) "CNG" means natural gas compressed for vehicular or other mobile use; (xiv) "LNG" means liquefied natural gas; (xvii) "natural gas" means hydrocarbons or mixture of hydrocarbons and other gases which at sixty degrees Fahrenheit and atmospheric pressure are in the gaseous state (including gas from gas well, gas produced with crude oil and residue gas and products resulting from the processing of gas) consisting primarily of methane, together with any other substance produced with such hydrocarbons;* and *(xxiii) "petroleum" means crude oil, refined oil products and natural gas;*

14. Where the OGRA Ordinance clearly defines "CNG", "LNG" is not defined explicitly. Additionally RLNG is not defined in the Ordinance. Similarly in *Section 2 (xxiii) "petroleum" includes crude oil, refined oil products and natural gas*. The Ordinance defines crude oil in *Section 2 (v) "crude oil" means all petroleum other than refined oil products and natural gas, and which at standard atmospheric conditions of pressure and temperature is in a fluid phase, including condensate;* and refined oil products in *Section 2 (xxx) "refined oil products" means products that result from the refining of crude oil and includes, inter alia, furnace oil, motor gasoline, diesel, lubricating oils and other blended products, kerosene, jet fuel and LPG;*

15. Where in Section 2 (xvii) of the OGRA Ordinance, natural gas is defined, it is imprecise whether LNG and RLNG are included in it. LNG and RLNG are defined in Oil and Gas Regulatory Authority (Liquefied Natural Gas) Rules, 2007 however since the definition of natural gas does not include LNG and RLNG, therefore their statues remains unsettled. Furthermore on the directives of the Federal Government RLNG is included in the list of petroleum products whereas the status of LNG is unclear. Consequently Sindh Infrastructure Cess is applicable on LNG, thus leading to increase in the RLNG price paid by end consumer.

16. **Sindh Infrastructure Cess:** The Sindh provincial government under the Sindh Development and Maintenance of Infrastructure Cess Act, 2017 levy "cess" on the *goods entering or leaving the province from or outside the country by air or sea under section 3* of the said Act. Cess is collected *for maintenance and development of infrastructure on goods at the rate determined on the basis of their value, net weight and distance in accordance with the Schedule.* The Sindh provincial government levies the cess for the use of infrastructure and under section 12 *the proceeds of the cess shall be utilized for the maintenance and development of infrastructure and other activities ancillary thereto in such a manner as may be prescribed.*

17. Exemption from Cess is also granted by the provincial government under section 6- *the government through a notification in the official Gazette, for reasons to be recorded, may exempt any goods or category or class of goods from payment of whole or any part of the cess, in accordance with the prescribed rules.*

18. Sindh Infrastructure Cess is levied on imported LNG and is paid by both PLL and PSO who procure LNG. According to the schedule of net weight of goods cess amount is 1.15% on LNG received (exceeding 16000 kg). This cess amount paid by the procuring agencies is passed on to the end consumers in the final price of RLNG. The Cess amount paid to Sindh government is over and above the sales tax, excise duty and income tax paid on the imported LNG.

19. Sindh infrastructure cess is exempted on "petroleum products" however it is not exempted on LNG. LNG is not defined as a petroleum product however in pursuance of SRO 405(I)/2015 on May 07, 2015 issued by the Federal Government *RLNG is included in the schedule of petroleum product* and the names of both SNGPL and SSGCL have been inserted as petroleum companies. Accordingly OGRA determines the price of RLNG under Petroleum Product (Petroleum Levy) Ordinance 1961 and Petroleum Product (Petroleum Levy) Rules, 1967.

20. Sindh Infrastructure Cess is exempted on petroleum products however since LNG is not defined as petroleum product it is not exempted from cess. This exemption given to petroleum products but not to LNG is discriminatory and therefore creates a barrier to effective competition. Both petroleum products and LNG are used as a source of energy and power sector is the key sector for which LNG is imported as a substitute of furnace oil.

21. **Port Qasim Charges:** The Port Qasim Authority (PQA) charges LNG cargoes which are handled at the port for using port infrastructure. The Port Qasim charges $600,000 per LNG vessel that is received at the port. These port charges are shared by both the supplier and procurer of LNG. In case of the G2G LNG deal, $320,000 are paid by Qatargas (the exporter) and $280,000 are paid by PSO. Similarly in case of the 5 year Term Tender with Gunvor, $500,000 are borne by Gunvor (supplier) and $100,000 by PSO. Likewise in the LNG agreement between PLL and Eni, the exporter pays $500,000. PSO pays different port charges in the two agreements to LNG supply however the contract price is the same i.e 13.37% of Brent.

22. Additionally port charges are built in the DES price (which is to be paid by the seller) and the remaining is added in the RLNG price. Comparing the port charges paid by both PSO and PLL it is evident that PSO pays a higher amount as compared to PLL as port charges. Furthermore competitive port charges would reflect in a competitive price of RLNG to be paid by end consumers. The table below gives a list of port charges in the region during start of LNG imports in Pakistan.

Table 7: Port Qasim Charges Comparison with Other Regional Ports

Name of Port	Country	Charges in US$ per LNG vessel
Hazira	India	122,000/-
Mina Al Ahmadi	Kuwait	14,000/-

Ras Laffan	Qatar	115,000/-
Jabel Ali	UAE	70,000/-
Port Qasim Authority	Pakistan	600,000/-

23. From the data given in Table 7 above, the port charges being charged by PQA for LNG are amongst the highest in the world. This raises a serious competition concern in the domestic LNG market since higher port charges will be reflected in inflated LNG/RLNG price.

5.4 Issues in Contract Pricing

Given the discussion presented earlier in chapter 3- LNG pricing, following are the competition issues with respect to the LNG pricing.

24. **Oil indexed contracts (long term and spot) of LNG:** Asian LNG markets have historically used oil indexation for long term contracts, which was necessary in a formerly "illiquid/constrained" market but now the dynamics are different. In the current state of affairs, (40 importing countries and 19 exporting countries)[89] buyers and sellers should not necessarily be "locked in" to long term agreements indexed to Brent/crude oil. The original premise behind long term agreements regarding supply guarantees as well as financing is not as watertight given that there are a larger number of buyers and sellers. Now, the market has a greater number of players and hence the set of possibilities is greater. Long term contract prices indexed to Brent/crude oil do not reflect this enhanced set of possibilities and are a deviation from competitive pricing. Additionally the market trends also change every 3-5 years, suggesting that long term contracts will be a move away from a competitive LNG market.

25. Crude oil and natural gas represent two different products fundamentally. The crude oil market has different demand and supply characteristics as compared to LNG, therefore arriving at a "fair/competitive" (as determined by demand and supply) price is not possible. Moreover recent price trends of both commodities (crude oil and gas hub prices) suggest that they are not moving in sync. Also evident from literature on oil linked LNG pricing models adopted, buyers strongly feel that there is need to move away from the oil linked LNG contracts. This is due to the volatility in the global oil pricing and thus the impact on the LNG contract prices, because of strong correlation between crude oil and LNG price that are indexed to Brent.[90]

26. Most Asian gas prices are pegged to crude oil either Japanese Crude Cocktail (JCC) or Brent-linked, whereas US and Europe gas prices are based on openly traded gas

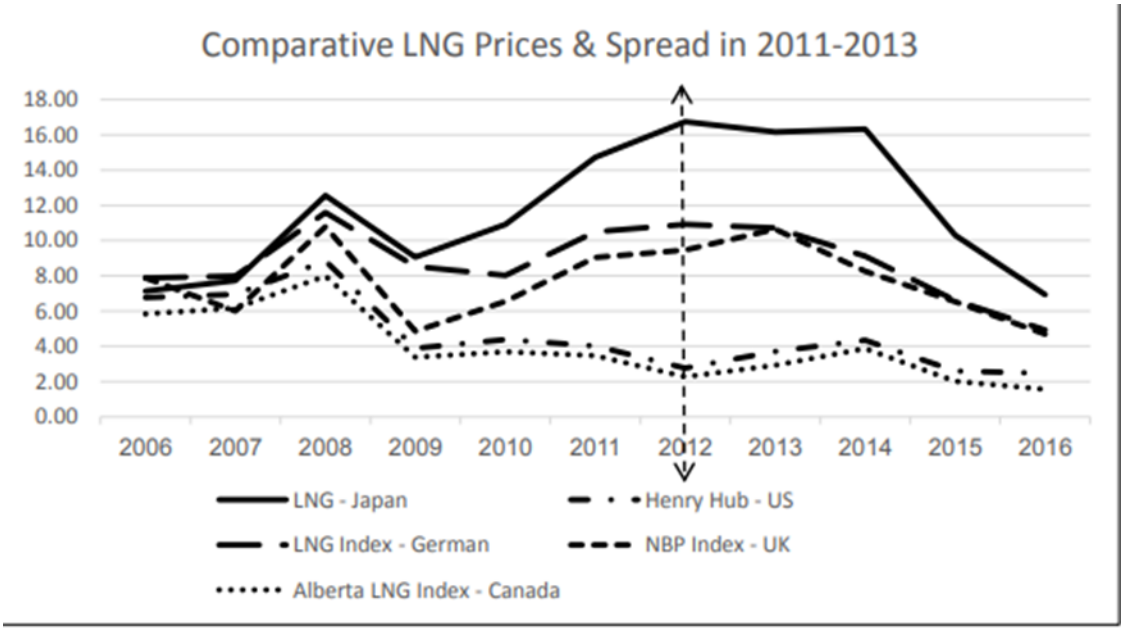
[89] The LNG Industry GIIGNL ANNUAL REPORT 2018

[90] Study of Oil Linked LNG Pricing Model in Japan, International Journal of Academic Research, 2017.

pipeline market-based system; or known as gas to gas competition. In US, gas is priced based on New York Mercantile Exchange's (NYMEX) Henry Hub whilst Europe gas prices are priced at different hubs including UK's National Balancing Point (NBP), Dutch's Title Transfer Facility (TTF) etc. Over 60% of gas sold in Europe is now based on hub prices.[91]

27. Buyers and sellers of LNG must strike a balance in pegging the LNG price between fixed and fluctuate tied to an index to manage price volatility. Therefore concluding all deals on either fixed or index price would expose one greatly and losing its competitive advantage. Possibly to avoid oil index, JKM which is the LNG benchmark price assessment for spot physical cargoes delivered ex-ship into Japan, South Korea, China and Taiwan is an option.[92]JKM has gained popularity as LNG buyers in the Far East market, world's most liquid LNG market refers to JKM (USD/mmbtu) pricing level to price their spot cargoes.

Figure 14: Oil Indexed LNG Price (Japan) Comparison with Market based Hub/index Prices (USD/mmbtu)



Source: http://www.ijarsite.com/wp-content/uploads/2017/11/IJAR-2.11.pdf

28. Figure 14 above gives a comparison of Oil indexed LNG price with hub based LNG prices during the period 2011-2013. The vertical dotted line in the graph depicts the

[91] PETRONAS LNG Ltd.

[92] JKM was launched by Platts on 2nd February 2009.

period (2012-13) when crude oil prices soared above $100/bbl and as a result of which the indexed LNG prices skyrocketed too, followed up by Fukushima Nuclear Power Plant disaster and its shutdown in 2011. As a result LNG demand went up by 20 billion cubic meters (bcm). Furthermore the additional Japanese requirement of LNG was compensated by purchases through spot and other Index based LNG supplies which were relatively cheaper. The LNG price data (USD/mmbtu) from year 2011 to 2013 gives a glimpse of the wide price spread but at the same time inability of (Japanese) buyers to buy freely from other cheaper options due to the long term oil linked contracts.

29. **The Take or Pay clause:** is a standard feature of long term LNG Sale and Purchase Agreements (SPAs). The SPA contains a clause that specifies the 'contract volume' or annual contract quantity (ACQ), which is the total quantity of LNG that the LNG seller maybe required to sell and deliver, and that the LNG buyer maybe required to take and receive, over the course of each contract. The ACQ is subject to adjustment by certain quantities, where the buyer exercises upward or downward flexibility rights including make-up LNG quantities requested by the buyer to restore earlier quantity reductions and other permitted operational adjustments. Thus arrive at the adjusted annual contract quantity (AACQ). The take or pay clause in SPA binds the buyer to take or pay for, or pay for if not taken, the AACQ at the applicable contract price. Such payments made by the LNG buyer is often termed as the 'Take of Pay Payment'.

30. Within the take or pay clause, where the LNG buyer has paid the take or pay payment, is designated as 'Make-up Quantities' for the LNG buyer. If the value of the applicable LNG cargo at the time of delivery of such make up quantity exceeds the take or pay payment then the LNG buyer is obligated to pay the difference to the LNG seller. Conversely if the value of the LNG cargo applicable at the time of delivery of such makeup quantity is less than the take or pay payment, then the LNG seller becomes obligated to pay the difference to the LNG buyer.

31. In each Contract Year, the Seller shall deliver in accordance with Clause 6.2.3 and the Buyer shall, subject to Clauses 8.2.2 (i) to (iii) (inclusive), purchase, receive and pay for, or pay if not taken, the Annually Adjusted Contract Quantity (AACQ)[93].The take-or-pay obligation is an obligation of the buyer to either take-or-pay for a certain contractual quantity, with such obligation typically being measured over the course of the given contract year. The LNG SPA typically obliges the buyer to take-or-pay for, *or pay for if not taken*, the Annually Adjusted Contract Quantity at the agreed contract price. In case the buyer fails to take LNG "at least" equal to the AACQ, then the buyer would be liable to pay the relevant contract price for the difference between the AACQ and the quantity received/taken by the buyer.[94]

[93] Source : Qatar Gas – PSO SPA

[94] Source : https://www.lexology.com/library/detail.aspx?g=a55fc12f-9eef-4353-8d59-b9016aa3f5f3

32. It is argued that as LNG market is a highly planned market (upstream) where the take or pay clause provides LNG seller the necessary guarantee required to ensure the development and commercialization of LNG projects and the feasibility of the total LNG value chain to run without unnecessary disruption. The certainty of sales ensures the sustainability of LNG plant life as well as the LNG fleet system in order to continuously deliver LNG safely and reliably to LNG buyers at the LNG buyers preferred price point. Since the LNG sellers are involved in the entire value chain from the production field of the feed gas, liquefaction at LNG plants and the transportation of using LNG ships, LNG seller's risk exposure is doubled in the event the LNG is not taken.[95] Further the potential volatile behavior of the LNG buyer may also lead to a spike in LNG prices for long-term / medium-term SPAs as the LNG sellers may have to recalculate and price in the risk of the LNG buyers potential unilateral non-acceptance of any particular LNG cargo.[96]

33. However from LNG buyers prospective this clause is potentially "restrictive" as the Take or Pay Clause limits the buyer side "flexibility" as the buyer has to either take/receive the agreed upon contractual quantity or pay an annual amount if not taken regardless of demand. If the buyer has already met its LNG demand, then its "inefficient" to make this payment. It is pertinent to mention that the "Take or Pay" payment is a substantial sum of money. Hence, rather than fostering the development of new markets, such provisions may lead to the collapse of markets/ contractual buyer-seller agreements.

34. **Contract price review:** This clause is yet another standard clause in LNG SPAs. It allows a contract price review after a stipulated period. In the case of PSO-Qatargas SPA, the contract price review term is 10 years.[97] Whereas in PLL's long term contract, there is a walk-away clause after 10 years which can be exercised by either of the parties. However, market conditions change significantly over time. As the market dynamics change, simultaneously the wedge between the "contract price" and the "competitive price" may widen and this leads to inefficient pricing. For instance, South Korea's KOGAS has entered into arbitration with Australia's joint venture North West Shelf Gas over an LNG dispute. KOGAS is the world's second largest buyer of LNG and Australia is one of the largest exporters in the world. Specifically, the KOGAS – North West Shelf case arbitration case revolves around the "price" of a mid term supply contract.[98]

35. **Volatility in oil markets:** Due to oil linkage, LNG prices are also vulnerable to the volatility in oil markets. Historically, oil prices have exhibited large swings and this has significantly impacted the global economy. But in the case of LNG pricing, the link is even closer and exposes the agents to a great deal of uncertainty. This is another

[95] Information provided by PETRONAS LNG Ltd.

[96] ibid

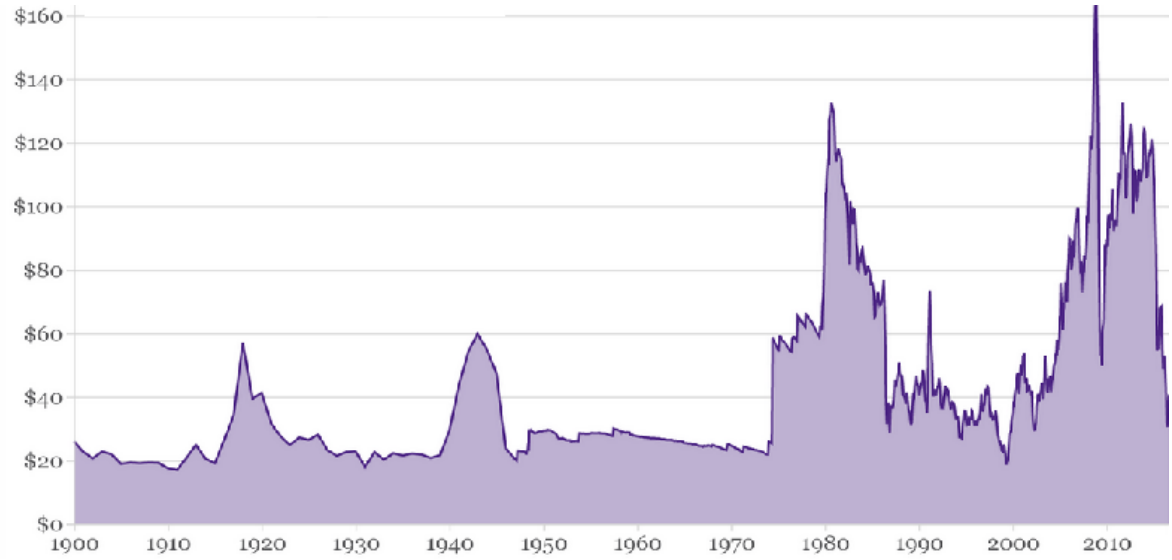
[97] Source: PSO

[98] https://www.reuters.com/article/southkorea-kogas-north-west-shelf/update-2-s-koreas-kogas-says-in-lng-arbitration-with-australias-north-west-shelf-gas-idUSL4N1Q22B6

possible source of inefficiency, as the uncertainty does not arise from organic sources like demand and supply of LNG, but rather from a "different" market like oil.

36. The time series data of the oil price volatility given below from 1900 to 2010 shows the oil market volatility.

Figure 15: Historic Oil Price Volatility (Real Oil Price per Barrel)



Source: Frank Elavsky, Northwestern IT. Extracted from https://insight.kellogg.northwestern.edu/article/what-makes-oil-prices-so-volatile

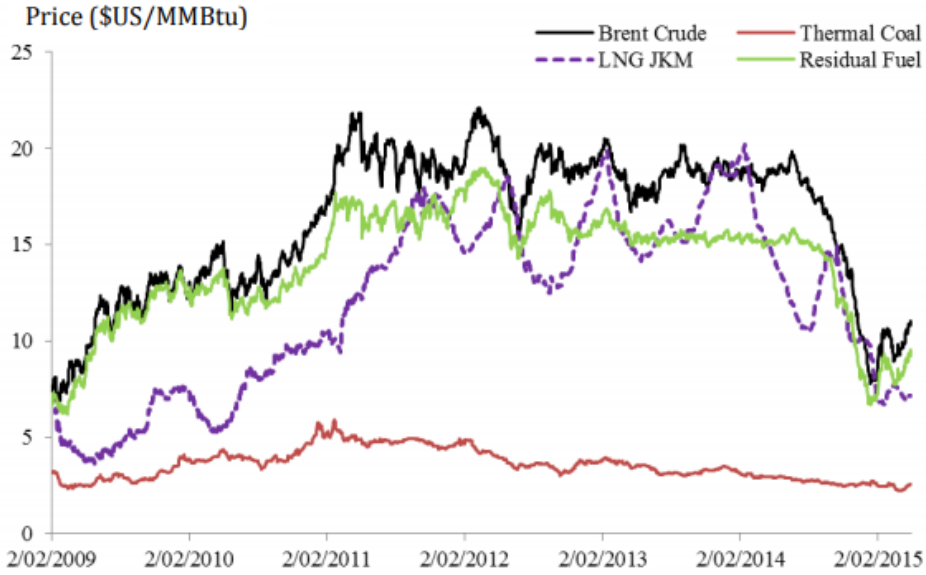
37. Currently, our LNG pricing model is based on slope calculations as discussed above. Therefore the LNG contracts indexed to Brent will reflect the oil price volatility.[99]

Figure 16: Brent Crude (ICE) price trend (Jun2017-May 2018) in USD/bbl

[99] The Brent price on 1st November, 2018 was $72.89/barrel fell to $58.76/barrel on 28th November, 2018.

Source: Bloomberg (15/5/18)

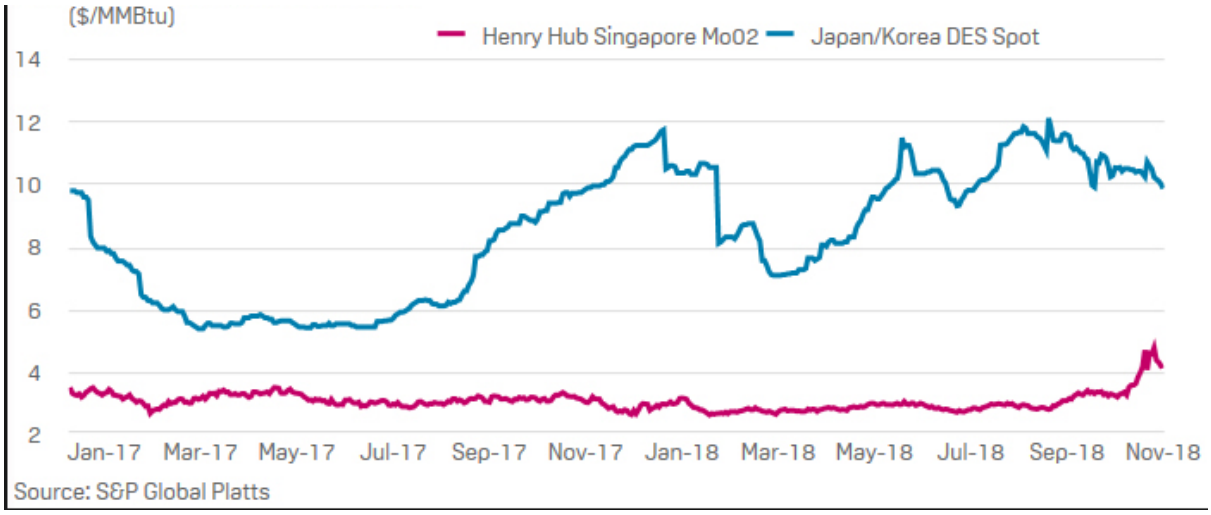
Figure 17: Price Fluctuation of 4 Energy Sources



Source:www.bakerinstitute.org/media/files/files/e3564e5f/CES-AsianSpotPricesLNG-110315.pdf

38. Figure 17 above gives a comparison of prices in USD/mmbtu of 4 fuels, Brent crude, LNG-JKM, thermal coal and residual fuel. Where the three fuels Brent crude, LNG-JKM and residual fuel prices have some similarity, however a closer look suggest that the peaks (high price) in the Brent crude are met with trough (low price) in LNG-JKM. Additionally the data on natural gas hub pricing in Figure 18 shows no correlation with Brent crude, suggesting the fuels as different commodities.

Figure 18: Platts JKM Vs Henry Hub Pricing Comparison



5.4. Other Competition Issues

39. **Cost Structure Difference:** Consequent to the pricing difference between the indigenous gas and the RLNG, consumers in the same sector have a difference in their cost of doing business. For the same energy utilization the businesses using indigenous gas have a lower cost of production than firms using RLNG. Competition as a result is affected since the later firms find it difficult to compete under the gas price difference.

40. **Gas Swap:** For the RLNG transport to end consumers the pipeline infrastructure (transmission and distribution network) of SSGC and SNGPL is used. To date 1.2 bcfd/1200 mmcfd of RLNG can be transported through their network to end consumer. Out of 1200 mmcfd, 600 mmcfd is from the first terminal, EETPL and the remaining 600 mmcfd of RLNG is from the second terminal, PGPC. 600 mmcfd of RLNG is physically transported by SSGC to the network of SNGPL under GTA between SSGC and SNGPL. The remaining 600 mmcfd of RLNG is transferred to SNGPL through swap arrangement, through which the RLNG is consumed in Sindh and equal amount of indigenous gas produced in Sindh is injected into the network of SNGPL. This is because the pipeline infrastructure to carry the gas to the network of SNGPL is incomplete. Under the swap arrangement the end consumers who pay the price of RLNG are in actual consumers of indigenous gas.

41. **SSGC pipeline losses:** Both the Sui companies are handling RLNG however since the regasification terminals are at Port Qasim, the RLNG is initially handled by SSGC. It is pertinent to mention that the imported LNG is better quality natural gas with higher btu in comparison to the indigenous gas produced. The pipeline infrastructure to handle the LNG is the same (where there is swap) for the indigenous gas as a result of which the pipeline losses of SSGC have increased. In comparison to SNGPL, SSGC have high transmission and distribution losses due to the handling of RLNG. The price of RLNG

for consumers on the transmission network incorporates the transmission losses as a percentage of the final RLNG price similarly for the consumers on the distribution network, the price incorporates the distribution losses.

42. Since the SSGC network is not equipped to handle the high btu RLNG, injected into its system the SSGC network efficiency is reduced due to higher losses. Additionally the price of RLNG is affected due to the higher pipeline losses of SSGC.

43. **Infrastructure capacity:** Pakistan has a vast transmission and distribution network of natural gas. The federal government allocates the indigenous gas fields to SSGC and SNGPL. The network of Sui companies continues to expand however at of now both SSGC and SNGPL network is equipped to handle only 1.2 bcfd of gas. If more LNG is imported to live up to the demand and a 3rd terminal to start operations in 2019[100] the pipeline network of the two Sui companies would not be able to handle the increased amount of gas.

44. **Network Congestion:** Additionally if under the third party access rules a private firm wants to import LNG it would have to get into transportation agreements with the Sui companies. However due to network congestion and non-availability of space in the pipelines the Sui companies would not be able to have agreements without further enhancement of pipeline infrastructure. Resultantly even when the private sector is encouraged to import LNG, network congestion acts as a strong barrier to enter the LNG market.

45. **LNG Supply and Sui Companies:** Both SSGC and SNGPL are state owned companies operating under Ministry of Energy (Petroleum Division). SSGC and SNGPL own and operate the pipeline infrastructure for the transport of natural gas from the gas fields to the end consumers through their extensive transmission and distribution network. To import LNG no license is required as the importer can get into a contract with the exporter however to transport the natural gas after regasification at the terminal the importer has to get into a contract with the Sui companies for RLNG transportation[101] whereby he would pay wheeling charges and buy the capacity. Under the existing pipeline infrastructure where the federal government has bought the (1.2 bcfd of RLNG to be transported to consumers in Punjab) pipeline capacity of the Sui companies, the market to transport RLNG by a private firm to end consumer is foreclosed.

46. **Issues in power sector:** Power sector was the key sector for which the decision to import LNG was made in 2015. Power plants in Punjab were to be given uninterrupted gas supply. The price of RLNG is lower than the price of furnace oil and high speed diesel (HSD). Therefore the power plants that were running on furnace oil or HSD were

[100] A conglomerate of Engro Corp, Fatima Group, Shell and the gas trading company Gunvor, https://www.reuters.com/article/pakistan-lng/pakistans-engro-eyes-2019-start-for-new-lng-terminal-in-karachi-idUSL8N1N92GZ

[101] Both the shipper and transporter of natural gas including RLNG also have to get a license from OGRA.

converted to RLNG for power generation and new RLNG based power plants have also been set up in Punjab (government owned) including Haveli Bahadur Shah, Bhikki and Baloki with a combined capacity of 3600 MW (megawatts). Currently there are 11 power plants in Punjab that are being supplied RLNG. Higher efficiency power plants on RLNG are given priority to provide uninterrupted RLNG supply. Later if RLNG is available it is supplied to the smaller IPPs having lower power generation capacity.

47. Under the gas sale agreements (GSA) between SNGPL and the IPPs, the gas is supplied on 'as and when basis'. The supply security of gas as a consequence is not ensured. On HSD these power plants are operational only for 5-6 days except for Ramadan and summers under the federal government directive, to ensure uninterrupted supply of electricity.

48. The IPPs have lower per unit cost of generating power on RLNG compared to furnace oil and high speed diesel (HSD) and consequently the IPPs are operational on full capacity[102]when RLNG is available. However there is no supply security of RLNG supply to IPPs.

49. The table below shows the percentage of power generation in Pakistan through various sources.

Source	**Percentage**
Hydel	28.3%
Coal	12.5%
Indigenous gas	15%
RLNG	24.5%
Nuclear	5%
Solar/Wind	4-5%

50. **Potential competition concerns consequent to new terminal development:** Under Structural Unbundling approach of the federal government in order to develop the LNG sector, the LNG importer is different from the LNG regasification services provider to the pipeline/infrastructure operators and the end consumers. Structural unbundling is procompetitive and consumer welfare enhancing as there are less chances of anti-competitive practices and collusive behavior since firms are not direct competitors of each other.

51. The Economic Coordination Committee (ECC) has given approval of the construction of third LNG terminal for which the private firms are actively seeking various possibilities in the sector. It is learnt that where the third terminal will be in the private

[102] Primary data, meeting with Saif Power

sector, the LNG import will be arranged by the JV independently, regasified at the terminal and will be later sold to RLNG consumers. To transport the RLNG the private consortium would have to get into Gas Transport Agreement (GTA) with SSGC and SNGPL to use their pipeline network. These potential JVs may also have high energy demands for their various other businesses and there might be a potential vertical foreclosure in the domestic RLNG (consumption) market and other potential consumers of RLNG might not have access to the imported LNG.

Chapter 6: Conclusion & Recommendations

Market Liberalisation is the driving force behind economic success and improvement in quality and competitive pricing. In the light of the discussion presented above and the Competition Assessment of the LNG sector following recommendations are given such that to improve the competitiveness of the sector, to create a level playing field, and to further develop the LNG sector in Pakistan. In the wake of the growing energy challenges recommendations are also made to improve the energy situation of the state.

1. **'Contract Price Review' in Long term SPA:** PSO and Qatargas (2) have a 15 year long term SPA under the G2G agreement between Pakistan and Qatar. PLL and ENI also have a long term SPA for 15 years. In PSO and Qatargas SPAs, the contract price review is after 10 years. While in case of PLL and ENI SPA, there is a walk-away clause after 10 years. However where the long term LNG agreements ensure supply security at the same time the global LNG market (natural gas trade) has seen a supply glut. Pakistan's LNG SPA's are indexed to Brent price. In the face of global oil market volatility some of the features of the standard SPA like "Contract Price Review" needs to be revisited. If the price review period could be negotiated to a lower term from 10 years to 5 year period, then this disparity between contract and competitive prices could be lessened as it would be closer to prevalent market prices. In case of G2G arrangement, the PSO and Qatargas SPA, the Government of Pakistan may take it up with the Government of Qatar for a revision on contract price review period. It is additionally proposed that where contract price review to a shorter term may not be possible for the existing SPAs, the LNG buyers may adopt this practice for any future LNG SPAs. This way the contract price will be close to the prevalent price trend in the market, keeping in view that the price trend change is normally 3-5 years.

2. **Competitive DES Price:** According to the Brent price trends, whereby the Brent price has been on the rebound, the slopes may be re-negotiated if possible (in the event of rising Brent prices) in order to obtain a relatively competitive price for Pakistan. If the slope in the DES price is set at 16.7%, LNG price is equal to that of crude oil (on an energy equivalent basis). A slope less than 16.7% imply that LNG is sold at a discount to oil, and slopes greater than 16.7% imply that LNG will sell at a premium price to oil. Pakistan's two long term contracts have slopes set at 13.37% (PSO and Qatargas) and at 11.6247% (PLL and ENI for year 1 and 2). However due to the global Brent price trend many LNG importing countries are renegotiating the DES price to a lower slope. For instance GAIL (Indian Natural Gas Processing and Distribution Company) has renegotiated some prices with Russia's Gazprom under its long term agreement.[103] With regard to GAIL, the

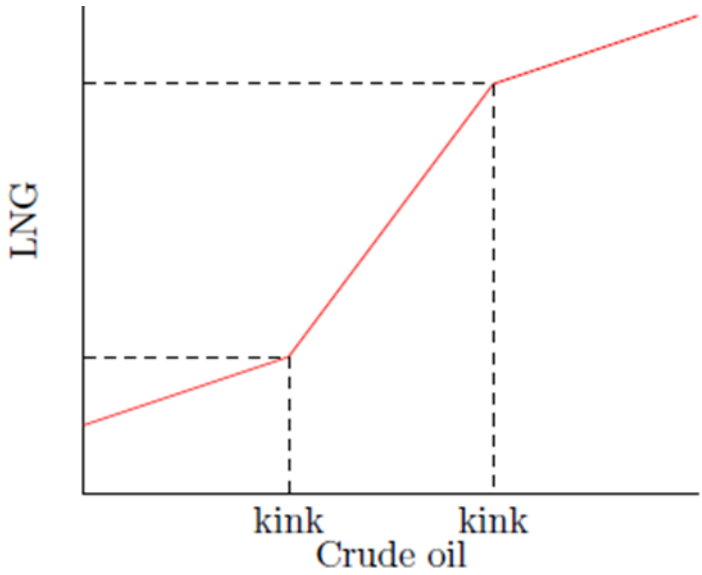
[103] https://www.reuters.com/article/southkorea-kogas-north-west-shelf/update-2-s-koreas-kogas-says-in-lng-arbitration-with-australias-north-west-shelf-gas-idUSL4N1Q22B6

pricing of LNG has been changed from 9-month linkage to Japanese Customs cleared crude to 3-month average of Brent. Further, during the initial three-year period, GAIL will be buying lower volumes- 0.5 million tonnes in the first year, 0.75 million tonnes in the second year and 1.5 million tonnes in the third year, and the remaining volumes of the first three years will be picked up in the subsequent years. In another deal India's Petronet renegotiated its 25 year LNG contract with Qatar's Rasgas, whereby Petronet renegotiated a price at 12.66% of Brent plus a constant of US$ 0.6/mmbtu. The data analysis further suggests that where Pakistani SPA (PSO-Qatargas) will get a lower LNG price if the price of Brent remains below US$ 80/barrel, on the contrary if the Brent price rises above $80/barrel the Pakistani LNG contract price (PSO-Qatargas) will be higher. It is therefore recommended that in order to have a more competitive DES price these slopes maybe renegotiated by the LNG procuring agencies in the event of rising international Brent prices.

3. **Alternate Pricing Arrangements- The *S-Curve Model*:** Pakistan's long term SPA and the medium term contracts (term tender) have a constant slope and a linear pricing model. However due to rising crude oil prices, LNG price will also rise therefore alternate pricing arrangements need to be considered. One of them is known as the "traditional" S Curve model. One of the variations of the "S-Curve" model basically consists of three sections. Moving along the X-axis, (Lower to Higher Brent/crude Prices) the first section consists of a line with a given gradient which protects the seller against very low Brent prices. This line is connected to a linear section with a steeper gradient, at a "kink" point. Finally this linear section is connected at another "kink" point to a line with a relatively flatter slope /gradient. This final line segment protects the buyer against extremely high Brent prices. The S-curve is introduced to absorb the fluctuations in the crude oil prices, with lower slopes at both ends. The S-Curve[104] is illustrated in the figure below.

Figure 18: The S-Curve

[104] Working paper: Global LNG pricing terms and revisions : an empirical analysis by Mark Agerton- Graduate Fellow Center for Energy Studies James A. Baker III Institute for Public Policy, Rice University



4. **Introduce Price Ceiling and Floor in DES Price:** Addition to the constant slope model adopted in Pakistan's LNG contracts, there are no caps/ceiling or floors in the DES/contract price. Where introducing the "price floor" (in the figure above the lower kink point) protects the seller against extremely low Brent Prices. Similarly, "price ceiling" protect the buyers against extremely high Brent prices (in the figure above the higher kink point). With the currently rising Brent prices such a "price ceiling" may help lower prices for LNG buyers like Pakistan and in turn lead to greater consumer(refers to buyer/importers) welfare as compared to a "constant" slope model currently employed.

5. **Competitive pricing through the introduction of LNG spot market and natural gas hubs in long term contract pricing:** Over time, the LNG market has started to evolve towards competitive regimes. The emergence of spots as well as established hubs like the Henry Hub has thrown the spanner in the works. The JKM, although not a hub, does represent a potential option as far as pricing is concerned vis a vis Asian LNG spot market contracts. Falling Asian spot market prices strengthen the case for indices like the JKM. Therefore, within long term contracts there can be greater "flexibility" even if a move to alternative pricing is not possible. One facet of the KOGAS-Northwest Shelf arbitration centers around the buyer demanding greater "flexibility" in the contract. Through greater flexibility we could move to more competitive outcomes. Given the greater market fluidity, flexibility is the need of the hour. A mixed or hybrid type of pricing arrangement/contract is therefore recommended which has a portion of Brent/crude oil or oil basket and a part of hub pricing. This will bring in the necessary flexibility in the SPA's required. The recent agreement between Jera and Total is also an example of this shift. The Japanese Company Jera, agreed to buy six LNG cargoes. Four of them were priced according to a traditional oil indexed pricing formula, whereas two were based on spot prices.

6. **Amendment in Public Procurement Regulatory Authority (PPRA) Public Procurement Rules for spot purchases in LNG sector:** Under PPRA, Public Procurement Rules, 2004- *Procurement Advertisements, section 13(1) Response*

time, in public procurement where international competitive bidding is involved, the response time is 30 days from the date of publication of advertisement or notice by the procuring agency. Spot purchases play a vital role when there is a sudden/unforeseen additional demand for LNG that cannot be catered through the long term contracts. Because of the response time of 30 days for international competitive bidding, the benefits (lower price locked) due to fall in the LNG spot prices cannot be attained. Longer response time imposes risk due to price movement i.e Brent volatility. However if the validity period/ response time is shorter a sharper LNG price can be achieved. It is therefore recommended that amendment is made to PPRA procurement rules to address the spot LNG purchase and therefore the response time is lowered.

7. **Competitive Tolling Tariff:** In the midstream LNG market, the LNG received at Port Qasim is re-gasified at the Engro Elengy Terminal Limited (EETL) and Pakistan Gasport Consortium Limited (PGPC) terminal at the tolling tariff of $ 0.479/mmbtu and $ 0.4177/mmbtu respectively (approx. $250,000/per day). Currently the second terminal operational at Port Qasim, PGPC's capacity to regasify is underutilized and the fixed terminal charges are inbuilt in the RLNG price. As under the 15 year contracts negotiated with the terminals the tolling tariff is fixed at the above mentioned rates. It is therefore recommended that for efficient utilization of both these terminals their capacity must be maximum utilized.

8. **Reduction in Port Charges:** The Port Qasim Authority (PQA) charges an amount of $600,000 per LNG vessel received at Port Qasim. The port charges are distributed between the importer and the exporter and add up in the LNG price and eventually the RLNG price paid by the end consumer Under the PSO and Qatargas SPA out of the $ 600,000, $ 280,000 are paid by PSO as importer and $ 320,000 are paid by Qatargas. In the PLL and Eni SPA, PLL pays $100,000 and Eni pays $500,000. It is also pertinent to mention that PSO procures 6 cargoes each month, 5 under the long term SPA with Qatargas(2) and 1 under the term tender with Gunvor adding up to 600 mmcfd of gas received at the EETPL terminal for regasification. Similarly PLL is also procuring 2-3[105] cargoes under both long term contract for 15 years with ENI and a term tender with Gunvor. Additionally where LNG is procured through spot market, the port charges are inbuilt in the LNG price. Higher port charges result in higher price of LNG[106] and therefore higher price of RLNG which is ultimately paid by the end consumer. Based on the data presented in chapter 5 on, PQA charges comparison with other regional port charges, it is therefore recommended that the port charges should be competitive and comparable to other regional players procuring LNG and should be substantially reduced from $600,000/LNG vessel. Lower port charges will have a direct effect on the LNG

[105] Depending on the demand generated by SNGPL where additional cargoes are procured through spot tendering.

[106] The exporter will include the port charges in the DES price and on the importers end it is a fixed cost to be born with every cargo of LNG received at the port.

price procured by the LNG importers, since all costs incorporating port charges are incorporated in the price, and which ultimately has to be paid by the RLNG buyer.

9. **OGRA Ordinance:** Section 2 of the OGRA Ordinance has ambiguity around the definition of LNG, defined in section 2(xiv) and concurrently the Ordinance does not define RLNG. Whereas in Section 2, the Ordinance explicitly defines CNG in section 2(iii), crude oil in section 2(v), oil in section 2(xxi) and refined oil products in section 2(xxx). Additionally where the Ordinance defines natural gas in section 2(xvii) it does not say whether LNG is included in natural gas. Due to this there is greater ambiguity in the definition of petroleum in section 2(xxiii) since section 2(xxiii) defines petroleum as *'petroleum' means crude oil, refined oil products and natural gas*. Further to this on the directives of Federal Government RLNG is included in the schedule of petroleum products but LNG is not. It is therefore recommended that OGRA may make certain amendments to the Ordinance such that there is no ambiguity on the status of LNG and RLNG and to redefine 'natural gas' in addition to 'petroleum' definition.

10. **Sindh infrastructure Cess:** The Sindh provincial government under the Sindh Development and Maintenance of Infrastructure Cess Act, 2017 levy cess on goods entering and exiting the province. The cess is exempted on petroleum products however it is not exempted of LNG. Where RLNG is included in the petroleum products, LNG is not. It must be mentioned that with the requested amendments made to the OGRA Ordinance (petroleum definition) the status of LNG will be elucidated. In addition to this it is discriminatory to exempt petroleum products from Sindh cess but to levy it on LNG since the intended use of some of these petroleum products is the same as that of LNG after regasification. The provincial government therefore may make exemption of LNG from Sindh Infrastructure Cess.

11. **Implementation of a clear and stable policy for allocating domestic natural gas between consumers:** In line with international practice by other jurisdictions such as India and keeping in view the energy scarcity, the federal government may establish quotas and caps on the volume of domestic gas allocated to each group of consumers (commercial/industrial). Such a step would give consumers a clear sight of their domestic gas entitlement which would therefore allow them to form a clear view of their RLNG requirements. Consumers with domestic gas demand in excess of their allocated quota would then be required to purchase additional gas at LNG linked prices from both SSGC and SNGPL or the private sector. This would result not only in consumers being able to contract with confidence for additional RLNG supplies but will also send clear investment signals for LNG import infrastructure developers.

12. **Natural Gas Price Revision:** In comparison to natural gas the imported RLNG is an expensive source of energy. However when compared to furnace oil, RLNG is a cheaper source of energy. The domestic consumers, fertilizer sector, textile sector among some others are given a subsidy on natural gas. The textile sector is also

given a subsidy on the RLNG price[107]. Natural gas consumers are segregated into domestic, commercial, industrial, fertilizer, power and captive power sector. Within each group of consumers there are various slabs, who are charged a different price of natural gas depending on the usage of gas. In comparison consumers of RLNG excluding textile sector pay the same price who are on the transmission network of SNGPL/SSGC and similarly the consumers on the distribution network of SNGPL/SSGC pay the same price of RLNG as RLNG price is ring fenced. OGRA notifies the RLNG price on monthly basis since the import of LNG began in 2015 whereas the natural gas prices have been revised recently in September, 2018 after a period of 5 years.. There is difference in how the prices of natural gas are updated and revised in comparison with the imported RLNG price which is notified on monthly basis. Keeping in view the energy issues faced by the economy, depleting indigenous gas resources, and the continuous increase in the gas demand it is recommended that the Federal Government may revise the indigenous gas prices on annual basis[108] as a gradual price revision on annual basis will be less hurtful to consumers in comparison to a sharp increase after several years.

13. **Improvement in transmission and distribution network of SSGC and SNGPL:** The Sui Companies have a vast transmission and distribution network. Both SSGC and SNGPL play a significant role in RLNG handling and transportation to the end consumers. The Sui companies have transmission and distribution losses (T&D loss)[109] greater than 5%, SSGC have higher losses due to higher volume of RLNG handling. These T&D losses add up in the RLNG tariff determination, increasing the price of RLNG to be paid by the end consumer. The companies also have congestion issue dues to which they are unable to pipe increased amount of RLNG through their system. The 1.2bcfd/1200 mmcfd of gas network expansion from Karachi to Lahore is not complete due to which there is a swap arrangement of 600 mmcfd.[110] It is significantly important for both the Sui companies to not only expand their pipeline network but also to increase their efficiency, and improve their system in handling RLNG. Where the contracts of the first world are adopted to import LNG the pipeline network must have the requisite hardware and equipment to handle the re-gasified LNG. It is also expected that the gas sector reforms envisioned by the Federal Government will improve the performance of the gas sector and also the handling of LNG.

[107] For the textile sector the RLNG price is set at $ 6.5/MMBTU

[108] Where the national power policy of 2013 and 2015 focuses low cost energy, fair and level playing field, demand management, move to cheaper fuels, rationalization of electricity tariff, and protecting the poor and cross subsidizing their consumption from the affluent but it must be kept in mind that piped gas availability is to only 25% of population.

[109] T&D losses are also known as Unaccounted for gas (UFG). The developed countries have a UFG of 2-3%, while countries like Bangladesh, Turkey and Russia have UFG of 5%.UFG of around 5% is taken as a reference for comparison and the need to improve the pipeline efficiency and to curtail the losses

[110] Under this swap arrangement 600 mmcfd of RLNG is consumed in Sindh and the same volume of indigenous gas is pumped into the network of SNGPL

14. **Public-Private Partnership (PPP) to enhance network capacity issues:** At present with the current gas utility companies transmission and distribution capacity any new LNG contracts and terminal development will lead to serious physical congestion on the pipeline infrastructure. This physical congestion can become anticompetitive and the market foreclosed for new entrants in the LNG import. Additionally new terminal development is also dependent on the pipeline network for transportation of RLNG. Therefore new infrastructure development and upgrading of the existing pipeline infrastructure is significant to make the LNG sector more competitive. It is therefore recommended to build pipeline network infrastructure including transmission and distribution network on PPP model. Gas transporter in PPP mode will bring in the necessary efficiency in the gas transportation network. Furthermore network enhancement will give signals for investment in the sector and ensure gas supply security in the future.

15. **Stable Investment Environment:** It is critical that a stable environment for foreign investment and a level playing field for both public and private sector is created in the Pakistani LNG market. Investment in the energy industry often requires large sums of capital, with economic returns only seen after many years of operations. It is therefore critical that foreign investors have confidence in local business conditions to ensure reasonable return on investment. Stability in the regulatory and licensing framework is a pre-requisite for creating this stable environment. In such instances where the government is considering potential relocation of future LNG terminals to a new location in Port Qasim, will discourage potential LNG terminal developers who have invested significant financial resources and time into developing projects at the existing sites, therefore reducing competition in the LNG sector. Ensuring stable regulatory and licensing framework will create an attractive investment environment which will increase competition in the sector. Additionally increased competition will result in greater choice and lower prices for the domestic RLNG consumers.

16. **Alternate and Renewable Energy (ARE):** For energy security and sustainability there is a worldwide shift[111] to alternate energy sources or renewable energy. These renewable energy resources in the form of solar, wind, geothermal and biogas are environmentally friendly with less carbon emissions, have short gestation period[112], reduces dependence on imported fuel and have low infrastructure requirements.[113] In Pakistan however the policy focus for power generation has been on the non-renewable resources such as oil and gas and this is obvious from the share of

[111] In China power generation through solar installed capacity is 53,000 MW. In Europe and Russia heat in the form of steam to housing is supplied through geothermal energy. EU energy targets for 2030 is 50% through renewables. In Denmark 43% of electricity is generated through wind power and Denmark aims 0% fossil fuel energy use by 2050, https://www.rte.ie/news/newslens/2018/0111/932573-denmark-wind-farm/

[112] For power generation, 8-10 months for solar, 15 months for wind and 7-8 years for hydro

[113] Other benefits include utilization of waste land, employment creation and poverty alleviation, and meeting the SDG's through climate change mitigation

renewables in power generation which is only 5.1%.[114] In the face of growing domestic energy demand and depleting indigenous natural gas resources the alternate sources of energy (solar, wind, geothermal and small hydro < 50 MW) have great potential in Pakistan.[115] To meet the energy shortage the GOP imports fossil fuels including LNG impacting the already strained foreign exchange reserves. Pakistan's economy needs sustained energy supply and a diversified energy mix to meet its mounting energy requirements. According to the Asian Development Bank (ADB) prolonged power shortages have reduced Pakistan's GDP by 2%.[116] Renewable technology such as solar and wind has become affordable and easily accessible, international funding and technical assistance for such projects by the World Bank (WB), Asian Development Bank (ADB) and U.S Agency for International Development (USAID) is also available. To secure our energy needs it is recommended that the government may focus on the renewable energy sources and tap the renewable energy potential.[117]

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[115]Comparison of power generation through non renewables and renewable sources- RLNG cost of generating electric power is 12cents/unit and coal is 7 cents/unit. While for solar and wind it is 5.5 cents/unit. Additionally the renewable energy resources lead to lower network and line losses and improve network efficiency

[116] U.S. Energy Information Administration/Pakistan.

[117] For ARE some steps have been taken such as net metering by National Electric Power Regulatory Authority (NEPRA) under net metering regulations and revision of NEPRA Act to add ARE

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