



The role of Gas in Pakistan's Power Sector and the recent LNG crisis

Table of Contents

1	<i>Introduction</i>	2
2	<i>The role of Natural Gas and RLNG in Pakistan’s energy sector</i>	4
2.1	Overview of Primary Energy Supply	4
2.2	Overview of Indigenous gas Resources and Natural Gas production vs. Consumption in Pakistan	5
2.3	Introduction of RLNG into the Generation Mix	8
3	<i>The problematic overreliance of Pakistan on LNG imports</i>	10
3.1	Gas Crisis and Economic Stability	10
3.2	The economic Implications of the Gas Crisis.....	11
3.3	The Environmental impact of the gas crisis in Pakistan	13
4	<i>Conclusion and policy recommendations</i>	13

List of Figures

Figure 1 Breakdown of Pakistan's Primary Energy Supply over the years.	Error!
Bookmark not defined.	
Figure 2 Indigenous Natural Gas Production in Pakistan.....	5
Figure 3 Natural Gas consumption in Pakistan (Bcft)	6
Figure 4 Comparison of gas consumption by sector- 2013-14 vs 2018-19.....	7
Figure 5 percentage contribution of thermal power to Pakistan's generation mix	10
Figure 6 Fuel-wise contribution to Pakistan's generation mix.....	10

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1 Introduction

Energy is considered to be an integral variable to economic growth. Its implication is well-understood for socio-economic enhancement. The demand for energy is continually growing in the world and the world energy consumption is predicted to grow by nearly 50% between 2018 and 2050¹. Coal, oil and natural gas remain the world's biggest primary energy sources, despite the fact that renewable energy has been growing at an exponential rate. Pakistan is no exception to the case and is reliant on oil and natural gas (mainly in the form of imports) for the operation of many central sector of its economy.

Pakistan's reliance on domestic natural gas moved to an all-time high of 50.4 % in 2006, in the inclusive energy mix. However, this figure declined to 34.6 % in 2018. The decrease of gas share in the energy mix is attributed to tumbling natural gas reserves and also depletion of gas in the transport and industry. In addition, exploration firms in Pakistan have failed to find new meaningful gas reserves for over a decade now. The government has thus been left with no alternate except to import RLNG to bridge this gap causing the share of imported LNG to surge from 0.7 % in 2015 to 8.7 % in 2018.

In 2015, the government started importing LNG to overcome the unrelenting energy needs of the commercial, industrial and the power sector. Since the domestic production of the country had been stagnant for almost a decade, the government turned to imported LNG as a form of salvation. The power policy of 2015 particularly helped this cause. Following its approval, three RLNG projects were announced in Punjab with capacities up to 12000 MW. These power plants were bound to take a minimum of 66 % of imported RLNG through Gas Supply Agreements²³. In return the national power purchaser also had a minimum off-take requirement of 66% as well. To ensure that these power plants had a reliable supply of fuel, the government entered into a 15 year long-term LNG supply agreement with Qatar; hailed as a success at that time but a move that ultimately led to locking in high prices and purported losses of

¹<https://www.eia.gov/todayinenergy/detail.php?id=41433#:~:text=Worldwide%20renewable%20energy%20consumption%20increases,growth%20in%20natural%20gas%20consumption>.

²<https://tribune.com.pk/story/2290833/govt-mulls-ways-to-recover-lng-cost>

³<https://www.thenews.com.pk/print/549522-end-to-gas-deal-for-rlng-power-plants-pso-scuttles-power-division-s-move>

about Rs. 1.54 billion so far ⁴. In addition, the power purchaser and the gas suppliers had minimum off-take requirements of 66% but the three RLNG power plants had utilization rates below that, this led to a rise in the amount of capacity payments due the power producers by the government, adding to the circular debt that plagues Pakistan's ailing power sector.

The phenomenon of circular debt is not just limited to the electricity generation sector. The existence of circular debt in the gas sector was brought to the public's attention through the energy minister Omar Ayub's address in September 2020, where he highlighted the fact that the gas sector's circular debt stood at Rs. 250 billion, mainly caused by the government's inability to introduce a weighted average price⁵.

Just two months later the entire Asian continent was gripped with an unprecedented cold wave, plunging many countries in Northeast Asia to scramble for LNG supplies, as the sudden jump in demand led to spot prices skyrocketing for the commodity. Pakistan didn't enjoy a reprieve from this shortage as well and had to face spot prices as high as \$32.50/MMBtu. Even before the North-Asian gas crisis occurred, Pakistan had been facing gas shortages, especially in the domestic sector. To plug the supply deficit, the government injected LNG into the residential system, as it had done so during the last two winter seasons. The residential sector receives natural gas on highly subsidized rates and pipelines being utilized for transmission to residential consumers can incur up to 17pc system losses. Due to such heavy losses and a huge price differential, the government's decision to inject LNG towards domestic consumption adds to the circular debt in the gas sector. The winters of 2018 and 2019 added Rs. 78 billion worth of debt to the circular debt in the gas sector, and the winter of 2020 is estimated to have added another Rs. 60 billion to the balance⁶. As a result, the circular debt of the gas sector has now gone beyond Rs350bn⁷.

The rising circular debt in the gas sector, crippling gas shortages during the winter season and the price volatility of the LNG spot market all warn against the risk of relying too heavily on imported fuels for the provision of gas and electricity to the public. Public demand for these commodities will always remain inelastic, but procurement prices are always subject to market forces. This iteration of RDPI's quarterly energy monitor will therefore unpack this issue further and shed light on why this overdependence on RLNG is detrimental to the economy and the environment of Pakistan.

⁴ <https://www.arabnews.pk/node/1539016/pakistan>

⁵ <https://tribune.com.pk/story/2265493/pakistans-circular-debt-in-gas-sector-jumps-to-rs250b>

⁶ <https://tribune.com.pk/story/2290833/govt-mulls-ways-to-recover-lng-cost>

⁷ <https://www.dawn.com/news/1594446>

2 The role of Natural Gas and RLNG in Pakistan’s energy sector

2.1 Overview of Primary Energy Supply

The recoverable balance of Pakistan’s indigenous natural gas reserves stood at just 21.4 trillion cubic feet in June 2019⁸. Despite being limited in numbers, natural gas has always been a central source of primary energy supply for the country. Pakistan was reported to be gas sufficient till 2005. However, due to an ever increasing demand, lack of alternative fuels and in-efficient price subsidies⁹, the gap started ascending and imported LNG had to brought in to substitute for domestic reserves.

The figure below illustrates the percentage share of different sources, contributing to Pakistan’s primary energy supply.

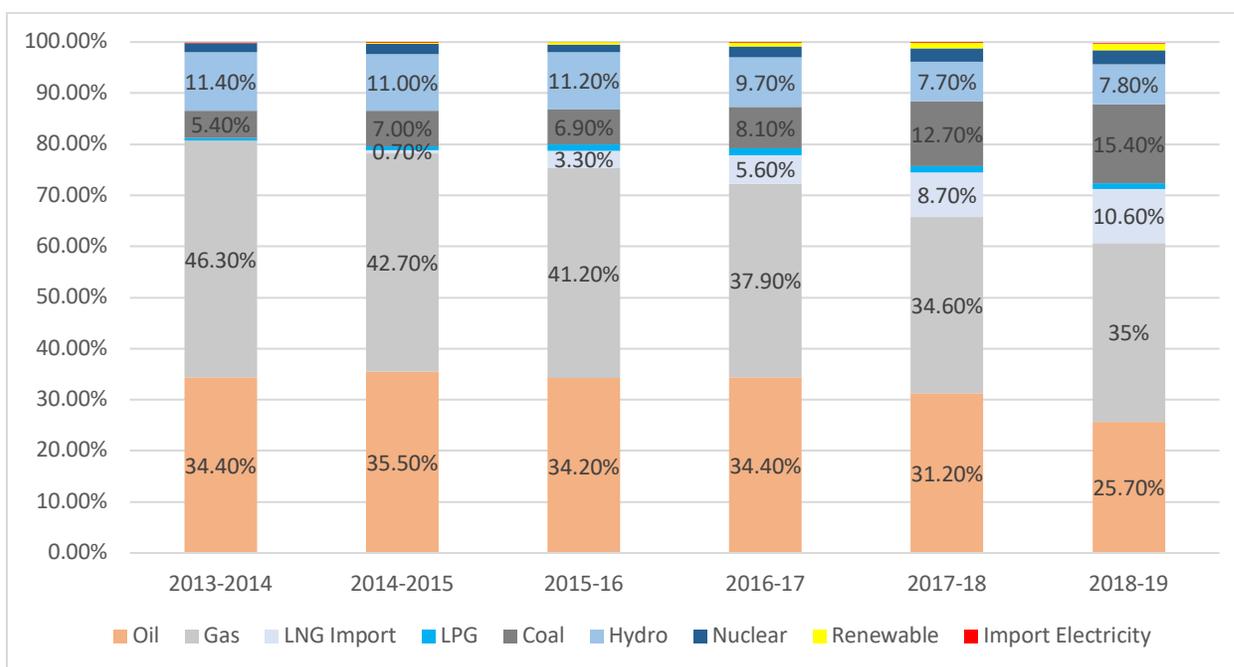


Figure 1 Breakdown of Pakistan's Primary Energy Supply over the years.

Source: Pakistan Energy Book Year 2019

Compared to 2013-14, the percentage share of natural gas declined from 46.3 to 35 % in 2018. However, at the same time, the share of LNG imports can be seen progressively increasing from 0.7% in 2015 to 10.6% in 2019. This is a clear indication of how fuel imports have been replacing domestic gas supply in the country. RLNG imports are mainly destined for the power sector in Pakistan, but recently are being routed towards the fertilizer and residential sector too.

⁸ Pakistan Energy Yearbook, 2019.

⁹ <https://eneken.ieej.or.jp/data/6883.pdf>

2.2 Overview of Indigenous gas Resources and Natural Gas production vs. Consumption in Pakistan

The Government of Pakistan is ramping up its policies for improving indigenous gas production as well as LNG imports to meet the growing demand for energy in the country. Pakistan's indigenous natural gas production capacity has been steadily declining as shown by Figure 2 below; in 2013-14, 1494 billion cubic feet of indigenous gas had been produced, whereas by 2018-2019 this figure dropped to 1437 billion Cft, a decline of 57 billion cubic feet in domestic production of gas in five years.

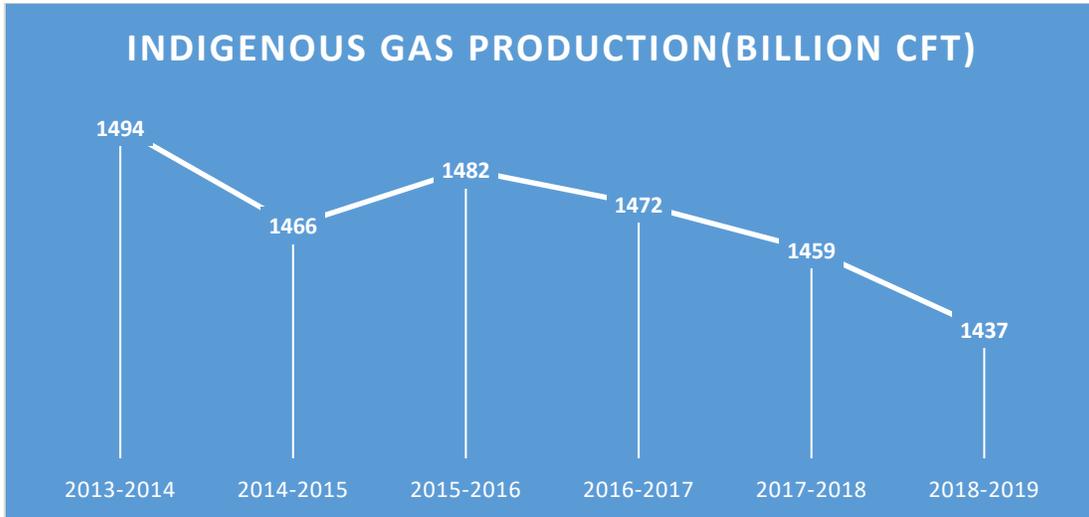


Figure 2 Indigenous Natural Gas Production in Pakistan

Source: Pakistan Energy Book Year 2019

While domestic production has been decreasing, the sector-wise consumption of gas has demonstrated an increasing trend. In total quantum, Pakistan uses more gas than Indonesia, and roughly the same amount as Korea - and about 75% as much as Japan.

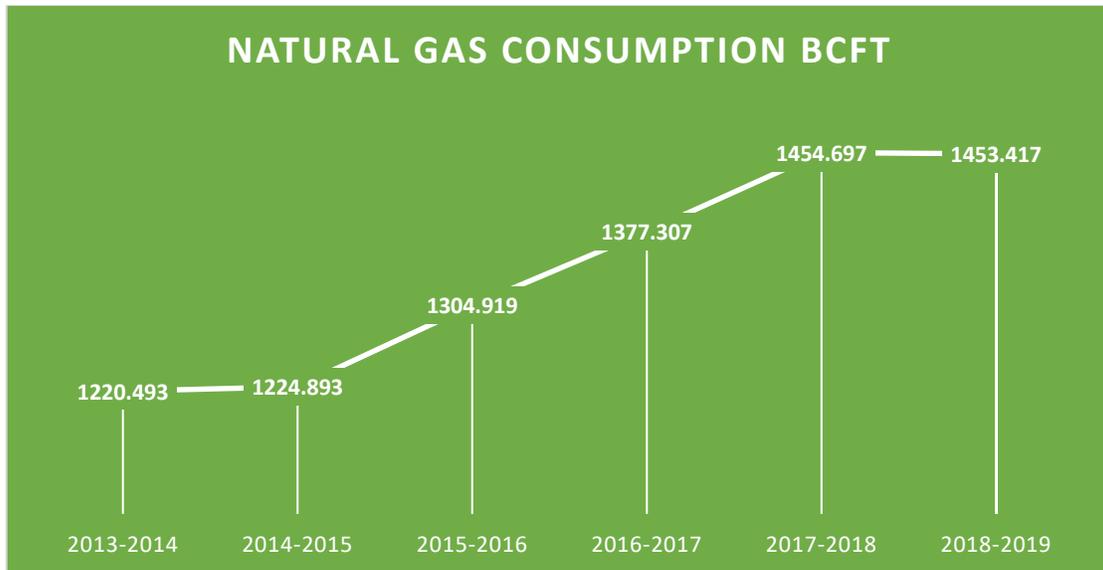


Figure 3 Natural Gas consumption in Pakistan (Bcft)

Source: Pakistan Energy Book Year 2019

Sectors mainly responsible for this increase include the power sector and the domestic sector. As more connections are made available to residential consumers, gas consumption increases.

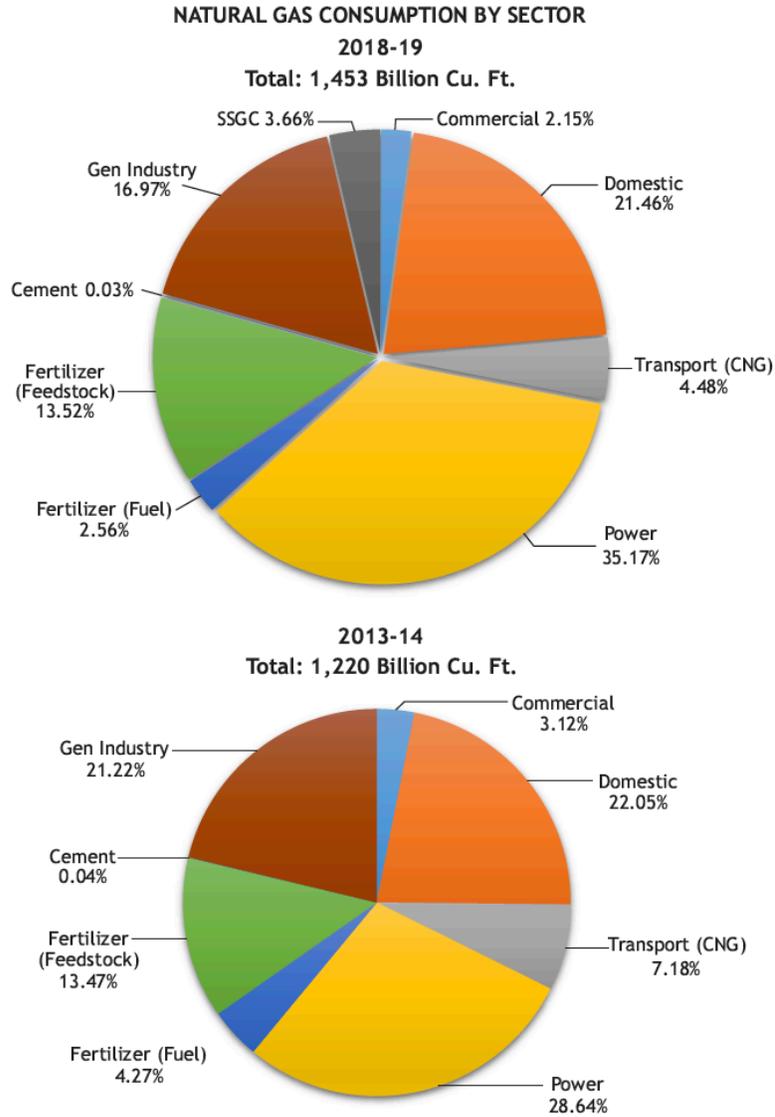


Figure 4 Comparison of gas consumption by sector- 2013-14 vs 2018-19

Source: Pakistan Energy Book Year 2019

Table 1 Average Sector Wise Gas Consumption in Million Cubic Feet per Day (July2018-Feb2019)

	Gas Consumption in MMCFD	RLNG in MMCFD	Percentage Share	Total
Power	865	546	36.50%	1411
Domestic	889	-	23%	889

	Gas Consumption in MMCFD	RLNG in MMCFD	Percentage Share	Total
Commercial	84	5	2.30%	89
Transport(CNG)	136	47	4.74%	183
Fertilizer	621	24	16.69%	645
General Industry	485	163	16.77%	648
Total			100	3865

Source: Pakistan Economic Survey 2018-19

Table 1 above also illustrates the average sector-wise gas consumption in Million Cubic Feet per Day. The power sector is a major consumer with 36.5 %, followed by domestic consumers having a 23 % share. The fertilizer sector in the country is also a major consumer of natural gas, receiving about 17% of the country's natural gas and enjoys gas rates as low as \$0.7-2 per mmbtu¹⁰.

2.3 Introduction of RLNG into the Generation Mix

For years, the issue of balancing the country's supply in contrast to the demand for electricity had continued as a generally unsettled problem. In 2015, Pakistan was confronted with a massive gap of up to 6000 MW in its electricity supply and demand. The incumbent government at that time tried to diversify the country's energy mix by allowing Re-Liquefied Natural Gas imports to reduce this gap.

Three combined cycle RLNG power plants were initiated at Balloki (1223 MW), Haveli Bahadur Shah (1230 MW) and Bhikki (1180 MW) in Punjab. Simultaneously, private investor was also attracted towards the power sector to set-up LNG power plants through IPP mode. Lucrative returns and upfront tariffs were also offered by NEPRA towards this end¹¹. A minimum off-take requirement of 66% was built into the take or pay, power purchase agreements for the power plants up till 2032. These guaranteed payments for 66% of the electricity produced by these power plants, even if the plants were not fully utilized. To ensure a reliable supply of RLNG to these power plants, a 15 year long term supply deal to import up to 3.75 million tonnes of LNG energy was signed

¹⁰ <https://tribune.com.pk/story/2282947/govt-to-end-discounted-tariff-for-fertiliser-firms>

¹¹ <https://www.dawn.com/news/1199493>

between Pakistan State Oil and QatarGas. According to the deal, “LNG arriving in any particular month will fetch 13.37 % of the preceding three-month average price of a barrel of Brent crude oil” (Brent Crude is the international benchmark of crude oil prices, based on supplies from Brent in Northwestern Europe). In addition, a price-review would be allowed after 10 years. In return the power plants had to sign gas supply agreements (GSA), guaranteeing an offtake of 66% of the LNG imports from PSO¹².

To further facilitate fuel supply to the three RLNG plants, two LNG import and regasification terminals were set up at Post Qasim, Karachi. Engro Elengy Terminal was Pakistan’s first LNG terminal, completed in 2015, supplying fuel to Sui Southern Gas Company’s electrical grid¹³. The second LNG terminal is owned and operated by Pakistan Gas Port Consortium Limited (PGPC), with a capacity of 750mmscfd, and supplies fuel to both the public and private sector. The PGPC LNG terminal was made operational in 2017¹⁴.

Thermal power has always enjoyed a lion’s share in the country’s generation mix and the addition of RLNG to the mix has cemented this position further as demonstrated by Figure-5 and 6 below.

¹² <https://www.reuters.com/article/pakistan-qatar-lng-idINKCN0VJ1YS>

¹³ [https://exceleerateenergy.com/project/port-qasim-lng-import-terminal/#:~:text=Engro%20Elengy%20Terminal%20is%20Pakistan's,to%20February%2028%2C%202015\).](https://exceleerateenergy.com/project/port-qasim-lng-import-terminal/#:~:text=Engro%20Elengy%20Terminal%20is%20Pakistan's,to%20February%2028%2C%202015).)

¹⁴ <http://www.ag.com.pk/pakistan-gasport/>

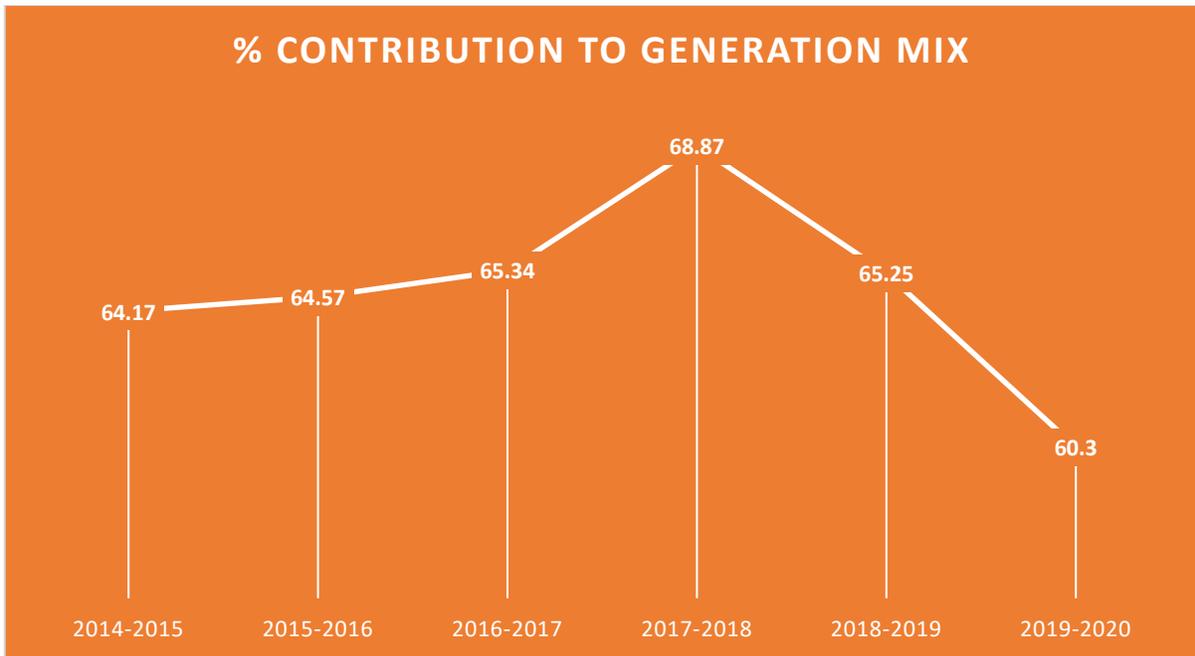


Figure 5 Percentage contribution of thermal power to Pakistan's generation mix

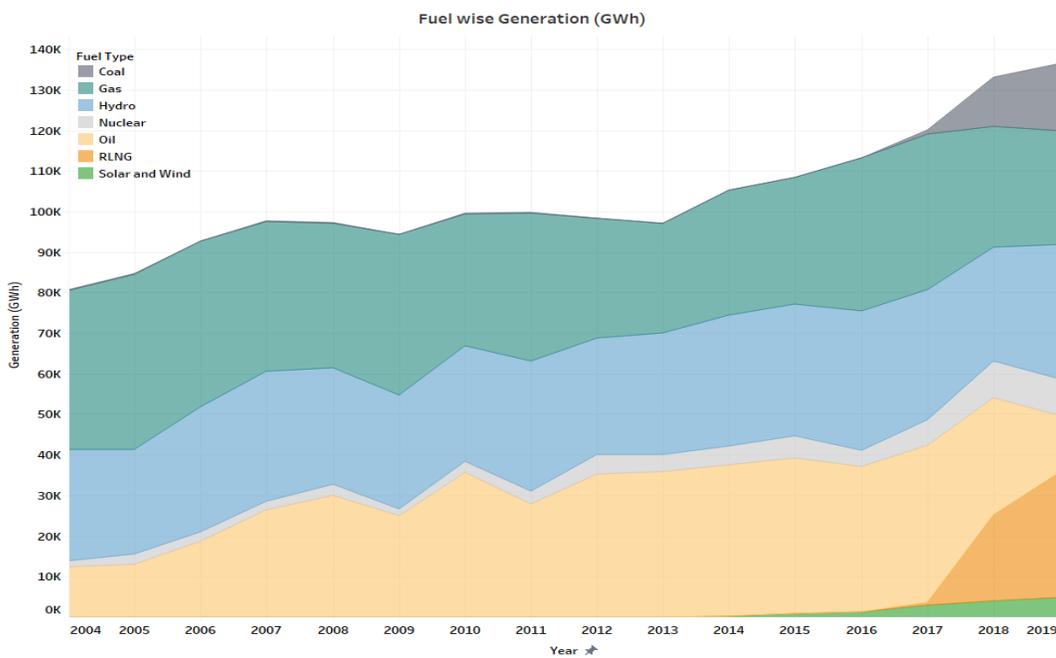


Figure 6 Fuel-wise contribution to Pakistan's generation mix (Source: NEPRA State of Industry Report-2019)

3 The problematic overreliance of Pakistan on LNG imports

3.1 Gas Crisis and Economic Stability

LNG import raises several challenges: as it is a price-sensitive market, it is very vulnerable to de-stabilizing trends in international markets. As an extremely cold winter gripped

the North-east Asian region, in the last quarter of 2020, many LNG dependent countries including Pakistan feared that they wouldn't be able to procure enough cargoes to meet their increasing consumption. As LNG spot prices hit record highs, generators and utilities scrambled for spot cargoes. China was forced to restrict power supply in many provinces and Japan appealed its citizens for voluntary restraint¹⁵.

The extra buying in Asia prompted Pakistan to lose out on LNG supplies as well. Pakistan LNG Ltd, a public-sector company that specializes in arranging LNG cargoes for delivery, invited bids for six LNG spot cargoes to be delivered in December 2020 in October. However, the bids received were very costly and offered prices up to 19.3% of Brent crude¹⁶. The same process was repeated for January, but this time bids were received for only 3 cargoes out of six, with prices even higher than before. In fact, no bids were received for the period Jan 8 to Jan 18 2021. The month of February fared even worse. PLL invited bids for two spot LNG cargoes in November for the month of February, which were awarded to SOCAR Trading UK and Dubai-based Emirates National Oil Company (ENOC). The bids received by Pakistan for these spot cargoes ranged from \$10.7 to \$11.70 per MMBTU, but international spot prices went almost twice as high. ENOC is reported to have been approached with offers almost twice as high, which is why it forfeited on the deal and defaulted on its promise to deliver a cargo in February¹⁷. There have also been reports¹⁸ that a similar default was made on a shipment in December by Vitol, providing half a vessel instead of a full one.¹⁸

Faced with such high prices, the government refused to procure such costly LNG bids received only for three cargoes and those too higher than the long-term settlement signed during the previous government¹⁹. The month of January faced a cumulative gas shortage of 1700 million cubic feet per day (mmcf), with 500 mmcf of this being faced by Sui Northern Gas Pipeline Ltd (SNGPL). Both utilities SNGPL and Sui Southern Gas Company (SSGC) prioritized the need of the domestic consumers, diverting supplies from the industrial and power sector to the residential sector instead²⁰. As a result non-export and export Industries with captive generation were refused gas supplies.

3.2 The economic Implications of the Gas Crisis

Unpacking the reasons behind the gas crisis of 2020-2021 reveals that this fiasco could have been avoided if a timely procurement of LNG cargoes had been made. Pakistan LNG Ltd. asserts that it asks gas utilities and the power division to communicate their

¹⁵ <https://www.reuters.com/business/energy/big-freeze-exposes-asias-underlying-energy-crisis-kemp-2021-01-14/>

¹⁶ <https://www.dawn.com/news/1593742>

¹⁷ <https://www.thenews.com.pk/print/775574-govt-fails-to-buy-subsidised-lng>

¹⁸ <https://www.thenews.com.pk/print/775574-govt-fails-to-buy-subsidised-lng>

¹⁹ <https://nation.com.pk/11-Dec-2020/country-likely-to-face-gas-shortage-in-jan>

²⁰ <https://tribune.com.pk/story/2279579/1>

RLNG demand well in advance of the time of delivery. According to the RLNG supply company, it needs a lead time of at least 90-120 days to get the best prices for LNG cargoes. In 2019, PLL received demand forecasts by the month of April and drew up a procurement plan for the entire year except for the months of November and December, for which tenders would be floated in August. Bidding took place in August and 10 cargoes were procured in time to serve these winter months²¹.

This year was a little different though. In August, the LNG market was in a slump due to COVID-19 related shutdowns. PLL got lucky and was able to receive spot cargoes for September at a price of 10.88% of Brent Crude. This was a very lucrative price, as Pakistan's long-term supply agreements with Qatar Gas, were providing LNG at 13.37% of Brent Crude²².

According to Industry experts, this would've been the ideal time for PLL to procure spot cargoes for the month of November and December as well. In fact, at least three LNG contracts were locked in at these discounted rates in the international market. However, the same did not happen for Pakistan unfortunately and bidding was instead carried out in September and October. Since the North Asian, gas crisis was already underway by then, much higher bids were received leading to big losses for the economy²³.

A single percentage change can have economic repercussions worth millions of dollars when it comes to international LNG and crude oil prices. Procuring LNG at prices up to 21% of Brent Crude²⁴ certainly had an effect and an estimated loss of \$200 million has been borne by the government due to mismanagement of LNG supply during the winter months of December to February²⁵.

The government understandably diverted LNG supplies to the domestic sector during the gas crisis. However, it is worth mentioning that the domestic sector is heavily subsidized and pays only a fraction of what it costs to import LNG. Spot cargoes in times of gas shortages can cost up to \$9-12 per MMBTU in Pakistan²⁶. In comparison around 80% of residential consumers do not pay more than \$3-4 per mmtbu²⁷. This results in a huge imbalance of recoveries from the gas sector, which are low as it is. This adds further to the circular debt in the gas sector.

²¹ <https://www.dawn.com/news/1593742>

²² <https://www.dawn.com/news/1593742>

²³ <https://www.dawn.com/news/1593742>

²⁴ <https://globallnghub.com/pakistan-loses-out-to-asia-for-spot-cargo-after-bidder-cancels-february-delivery.html>

²⁵ <https://www.dawn.com/news/1593742>

²⁶ <https://www.dawn.com/news/1603058>

²⁷ <https://www.dawn.com/news/1594446>

3.3 The Environmental impact of the gas crisis in Pakistan

Natural gas itself is a carbon intensive fuel and contributes to the emissions arising from the power sector in Pakistan. When the gas crisis struck, the power sector discouraged by the high fuel prices of RLNG found solace in fuel oil as it proved less expensive. Standard & Poor (S&P) global quotes Shankar Talreja, deputy head of research at Topline securities as saying that fuel oil based power generation in Pakistan costs Rs. 12-13 per KWH, while due to the rising prices of LNG, power generation costs from RLNG had surpassed Rs. 15/KWH. Under such circumstances, power producers had no choice but to switch to fuel oil based generation based just on economic reasons²⁸.

This decision was further cemented, when the government announced diversion of RLNG supplies from the power and the industrial sector. Even though the move makes economic sense, it would have had severe environmental repercussions, for fuel oil is an even more carbon intensive and polluting source of power generation. If real time monitoring of the power sector's emissions was being carried out, the gas crisis would have surely led to a spike in the emissions trajectory.

4 Conclusion and policy recommendations

The RLNG crisis is a classic example of how overdependence on imported fuels can be a threat to a nation's energy security. In Pakistan, natural gas has a far-reaching impact not just on the domestic heating sector, but also on the power generation and the industrial sector. On the advent of every winter, the government is riddled with an extremely difficult task of balancing supply & demand and keeping the price of gas and its associated commodities low. Even when the government is not scrambling to secure spot cargoes, there's a huge financial deficit called circular debt that continues to grow in the gas sector. Unless the government doesn't want to face a similar situation like the one it is facing in the power sector, something needs to be done to address the underlying causes beneath this phenomenon.

Unaccounted for Gas (UFG), is said to be the biggest factor contributing to circular debt in the gas sector. While it stood at 11% in FY 14, it has now reached 16%²⁹. This is a huge loss to the system, as the provision of gas is already quite subsidized across the entire economy. Such discrepancies then further add to the financial woes of the relevant authorities.

The absence of a weighted average cost for gas has also been cited as a major reason for circular debt and financial troubles within the gas sector. In concept, the implementation of a weighted average cost for natural gas would mean blending the

²⁸ <https://www.spglobal.com/platts/en/market-insights/latest-news/natural-gas/012021-pakistan-finds-answer-in-oil-as-gas-shortage-hits-power-sector>

²⁹ <https://nation.com.pk/04-Dec-2020/more-circular-debt>

price of LNG into consumer prices according to the proportion it is being consumed in the gas supply . The idea has been vehemently opposed by the provinces of Sindh, KP and Balochistan on account of the fact that this would lead to a rise in consumer prices for them. The provinces are also of the view that since Punjab is the main province dependent on gas imports, it should have to pay the price for it. While a weighted average price might resolve the circular debt problem, it would not be an easy solution to implement. The government should not divert imported LNG towards domestic consumption at all. Rather alternative means for meeting domestic heating such as electrical heating and stoves should be explored. However there's a caveat to that as well. For such a move to be truly sustainable, Pakistan needs to ensure that the electricity generation mix isn't fossil heavy and the cost of electrical heating is lower than that of gas based heating. It would be possible only if a significant amount of renewable energy is brought in the generation mix.

Hence policy recommendations in the energy sector need to involve bringing about a gradual phasing out of dirty, fossil based power generation that relies on expensive fuel imports. The government has already taken a step in the right direction by taking away the 66% minimum off-take requirement from both the gas supply and power purchase agreements of these power plants. This would now allow using these expensive power plants as peaking plants which had been their intended use from the beginning and pave way for more competitive energy sources to fill in as baseload. This would also lead to a reduction in capacity payments that are diverted towards these power plants on a monthly basis, despite low utilization. The results of these policy shifts would materialize in the years to come. If immediate changes are needed in the shorter term, better management and timely communication from the gas utilities would definitely be needed to avoid such crises in future.