

Natural Gas Allocation and Management in Pakistan: Issues and Actors

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Abstract

Energy is considered a vital factor for economy. Pakistan is an energy-starved country and its energy appetite is expected to grow further in coming years. Pakistan heavily depends on natural gas, which constitutes about 50 percent of primary energy mix. This share of natural gas has been supplied from country's own resources for its usages in power generation, domestic, commercial, industry and CNG-fitted transport. Natural gas' proven reserves of Pakistan at the end of 2012 are 22.7 trillion cubic feet and they would last for approximately 16 years more, if they are used at current rate of production. Its supply is expected to decline from current status of 4 billion cubic feet per day (Bcfd) to less than 1 Bcfd by 2025-26. This would create a shortfall of 8 Bcfd. Irrational policy decisions in the past, introduction of CNG transport and conversion of power generation on gas, have become somewhat cause of today's gas crisis in the country. Government is following a multi-pronged strategy to mitigate the crisis. But the short term solution lies with the rationalization of existing gas resources and import of liquefied gas. The mid term solution rests with the import of gas through pipelines. It is expensive and time-consuming endeavor. The long-term and stable solution lies with the exploitation of country's gas potential.

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1. Introduction

Energy is considered a vital factor for any economy. Its significance is established for socio-economic development¹. It is considered the backbone of almost all modern day human activities, and accomplishments of human civilization have been achieved through the efficient and extensive production of various forms of energy.² Realizing the importance of energy, its demand is continuously increasing in the world and world energy consumption will grow by 56 percent between 2010 and 2040. Renewable energy and nuclear power are the world's fastest-growing energy sources; each is increasing by 2.5 percent per year. However, fossil fuels continue to supply nearly 80 percent of world energy use through 2040 and natural gas is the fastest-growing fossil fuel.³ By the middle of current century, energy demand would be more than double as the world population grows rapidly and developing countries expand their economies. All energy forecasts show that the world will rely on fossil fuels (liquid fuels, natural gas, and coal) for the decades to come.

Pakistan is an energy starved country and its energy appetite is expected to grow at an Annual Compound Growth Rate (ACGR) of 4.37 to 6.09 percent over the coming 15 years. This growth in energy demand is contingent on GDP growth and is expected to fall in the range of 116 to 148 Million Tons of Oil Equivalent (MTOE) by the year 2022.⁴ The energy shortfall for the year 2011 was 19777.988 Kilogram of Oil Equivalent (KoE). During the fiscal year 2012,

¹ Khan & Ahmad (2008).

² Khan, Begum, & Sher (2012).

³ International Energy Outlook (2013).

⁴ Inter State Gas Systems (Pvt) Ltd. (2014).

primary energy supplies in Pakistan increased by just 0.3 percent at the time, when demand has risen to 64.7 MTOe, compared to 64.5 MTOe in the fiscal year 2011.⁵

Oil and gas are two major components of Pakistan's energy mix, and country's current natural gas production is 4 Bcfd (billion cubic feet per day). There is a demand-supply gap in the country, which becomes severe, especially during winter season. According to Government estimates, during the next 15 years the demand for natural gas would increase to 13.27 Bcfd against domestic supplies of just 2.17 Bcfd because of depletion of existing gas fields. So there would be a huge shortfall of about 11 Bcfd by the year 2025.⁶

Pakistan made some policy blunders in the past while making natural gas a prime energy source and allocated it to different critical sectors of the economy (households, commercial industry, power, transport), as it never had a natural gas surplus. Moreover, pricing of the natural gas was not based on the principle of scarcity and optimal utilization. It was severely over allocated, underpriced and excessively misused.⁷ Now the country is witnessing severe gas crisis. Government has been actively pursuing different options to fulfill its increasing energy demand, including pipeline projects (Turkmenistan-Afghanistan-Pakistan-India Pipeline (TAPI), Iran-Pakistan gas pipeline), import of liquefied natural gas and liquid petroleum gas. With this backdrop, the objective of this paper is to examine energy situation of Pakistan in general and natural gas scenario in particular. It further aims to review critically the natural

⁵ Pakistan Energy Yearbook (2012).

⁶ Inter State Gas Systems (Pvt) Ltd. (2014).

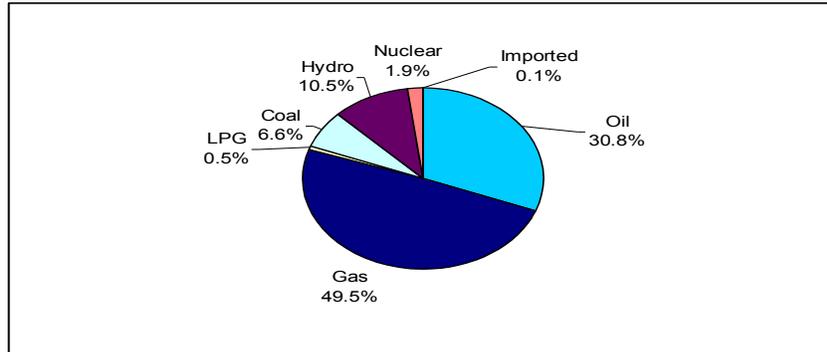
⁷ Masood (2013).

gas supply and consumption phenomenon and sectoral allocations of natural gas dilemma.

2. Hydro-carbon Based Energy Mix of Pakistan

Pakistan upto the 1980s was able to meet less than two-third of its energy requirements through domestic resources. During the 1990s the country was struggling to fill the gap between energy demand and supply. In the early 2000s, the energy sector, especially electricity, received greater attention because of the faster economic growth rate. During the year 2012, net primary energy supply remained 64,727 thousand TOEs compared to 64,522 thousand TOEs, during the preceding year, thus, having a growth of 0.32 percent, and on average the growth rate of net primary energy supply remained 1.8 percent for last six years. Statistics on energy consumption by source show that gas and oil have got the largest share as shown in Figure-1 below:

Figure 1: Primary Commercial Energy Supply Mix (2012)



Data Source: Pakistan Energy Year Book 2012

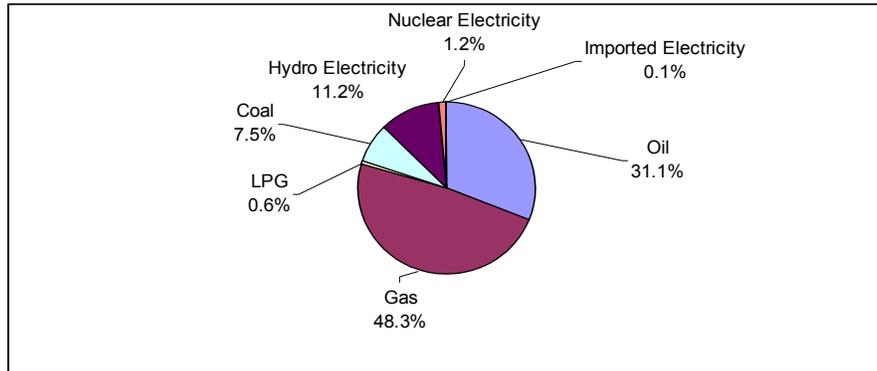
In Pakistan's energy mix, gas and oil are the major components. According to Energy Year Book (2012), the share of each source in primary commercial energy supply mix during the year 2011-12 was: oil 30.8 percent; gas 49.5 percent; LPG 0.5 percent, coal 6.6

percent, hydro-electricity 10.5 percent; nuclear electricity percent; 1.9 percent and imported electricity 0.1 percent. Both oil and gas together constitute 80.3 percent.

The primary energy supplies in Pakistan, increased by just 0.3 percent at the time when demand has risen to 64.7 MTOe, compared to 64.5 MTOe in fiscal year 2011. Gas contribution, however, to energy mix has increased to 50 percent in the year 2012 (48 percent in the previous year), while oil contribution moderately declined to 31 percent from 32 per cent in the last year.

The annual growth of primary energy supply decreased from 4.4 percent to in 2006-07 to 0.32 percent during 2011-12. Figure-2 presents the shares of primary energy supply in Pakistan. The share of natural gas reached to 48.3 percent, oil 31.1 percent, hydro electricity 11.2 percent, coal 7.3 percent, nuclear electricity 1.2 percent, LPG 0.6 percent and imported electricity by 0.1 percent. It shows that energy supply in country is heavily dependent on gas and oil, which constitute more than 79% of the total primary energy supplied.

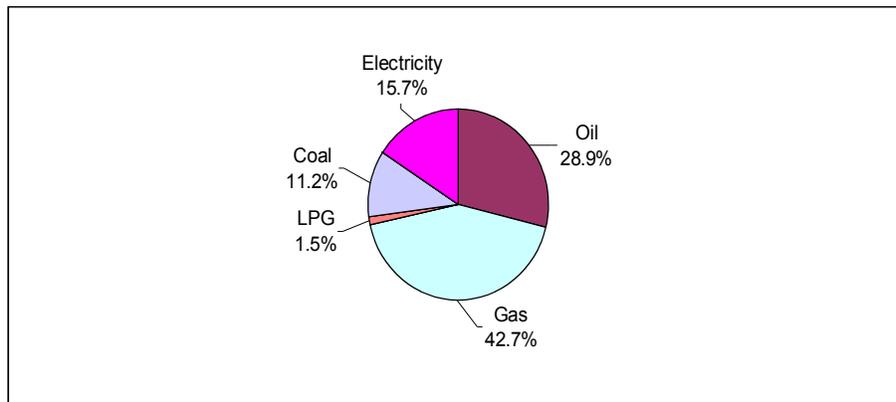
Figure 2: Percentage Share of Primary Energy Supply from 2006-7 to 2011-12 (in TOE)



Data Source: Pakistan Energy Year Book (2012)

During the 1980s about 86 percent of the energy demand was met by domestic sources of energy and remaining 14 percent gap was filled by the imports. Since then, the demand-supply gap has been widening and reached around 47 percent by the end of 2000. Currently 48 percent of energy needs are met with indigenous gas, while oil imports account for 32 percent, electricity (Hydro, Nuclear & Imported) 13 percent and coal 7 percent.⁸ Natural gas has come up as the major fuel in the recent past and the trends indicate its dominant share in the future energy mix. Figure-3 highlights the percentage share of the source-wise energy consumption in Pakistan during the period 2006-07 to 2011-12.

Figure 3: Share of Source-wise Energy Consumption during 2006-07 to 2011-12 (in % of total TOE)



Data Source: Energy Year Book 2012

Figure-3 suggests that the average percentage share of gas in energy consumption was 42.7 percent during the period 2006-07 to 2011-12, followed by oil 28.9 percent, electricity 15.7 percent, coal 11.2 percent and LPG 1.5 percent. A significant change took place in energy consumption during this period. During the period 1997-98

⁸ Inter State Gas Systems (Pvt) Ltd (2014).

to 2006-7, average percentage share of oil in energy consumption was 40.9 percent, followed by gas 34.6 percent. However other areas almost observed no significant change (electricity 15.7 percent, coal 7.5 percent and LPG 1.3 percent).⁹

It is established from the world energy and Pakistan energy statistics that gas plays and will continue to play a significant contribution in the consumption of energy.

The analysis of the sectoral consumption of gas indicates that during July-March 2012-13, the highest share in consumption of gas remained in power sector (27.5 percent), followed by industry (22.6 percent). The share of household in gas consumption remained 23.2 percent. However, the trend of providing gas to power sector is declining since 2005-06, except in 2012 when there was positive growth of 6 percent. The transport sector is the other significant sector that its share in total consumption of gas has increased from 0.6 percent to 9 percent in last ten years. Over the time period the share of fertilizer has declined but still its share is significant (16 percent).

In Pakistan, in addition to electricity crisis, a severe gas crisis is also witnessed and the former is somewhat because of the latter. The demand and supply situation of gas has been changed from affluence to deficiency and after 2006 the country has entered into the deficiency phase¹⁰. The natural gas proven reserves of Pakistan at the end of 2012 are 22.7 trillion cubic feet (0.6 trillion cubic meters) with reserve to production ratio is 15.5¹¹ (R/P ratio).¹² It

⁹ Khan & Ahmad (2008).

¹⁰ Khan et al (2012).

¹¹ British Petroleum, BP Statistical Review of World Energy (2013).

¹² For definition see End Note.

shows that the reserve would last for approximately 16 years more, if they are used at current rate of production.

Pakistan's home-grown natural gas reserves are declining. If current gas scenario prevails, Pakistan would bear gas shortfall of 8 Bcfd by the year 2025-26. It also seems unlikely that the country would be in position to develop dams to generate electricity, and also to explore indigenous coal reserves by the year 2025-26 under current policies. This would increase country's import requirements from the current 30 percent to over 75 percent of the energy mix by the year 2025-26, which would cost over \$ 50 billion per annum in foreign exchange.¹³

To meet the growing energy deficiency, and in particular shortages in gas supplies, which constitute nearly almost 50 percent of the energy mix, Government of Pakistan is pursuing different options to mitigate the gas shortages in the country. Among them the short term solution has been envisaged in gas allocation and load management. And for that matter, Natural Gas Allocation and Management Policy, 2005 was formulated.

3. Sectoral Allocations of Gas: Prioritization Dilemma

The primary energy mix of Pakistan is heavily tilted towards gas, which constitutes about half of the mix. The pie of this prime energy source is to be distributed among five critical sectors i.e. households, commercial, industry, power, transport. The shortfall of natural gas worsened during the fiscal year 2012, crossing the one bcfed mark.¹⁴ The growth in demand for natural gas has outpaced the growth in supply, therefore, resulting in a shortfall, this leads to

¹³ Pakistan Energy Outlook (2010-11 to 2025-26).

¹⁴ State Bank of Pakistan, Annual Report (2011-12).

curtailment of gas supplies to different sectors. This scenario has forced Government to adopt gas load management and prioritization policy. Natural Gas Allocation and Management Policy, 2005, prioritizes different sectors, wherein, domestic and commercial consumers are at the top priority.¹⁵

Table 1: Sectoral Prioritization under Gas Load Management Policy 2005

Gas Utility Companies will observe following merit-list for the consumers connected to the system.		
S.No.	Category of Consumers	Priority Order
1	Domestic and Commercial Sectors	First
2	(i) Fertilizer Sector; and (ii) Industrial Sector to the extent of their process gas	Second
3	Independent Power Plants as well as WAPDA and KESC's Power Plants having firm gas supply commitment under GSAs.	Third
4	General Industrial and CNG Sectors.	Fourth
5	(i) WAPDA's and KESC Power Plants other than those listed against S.No. 3 above. (ii) Captive Power Sector.	Fifth
6	Cement Sector	Sixth
Gas Utility Companies will observe following merit-list for the consumers on independent network.		
1	Fertilizer Plants	First
2	Power Sector including WAPDA, KESC and IPPs having firm gas supply commitment under GSAs	Second
3	Power Sector other than those listed against S.No. 2 above.	Third

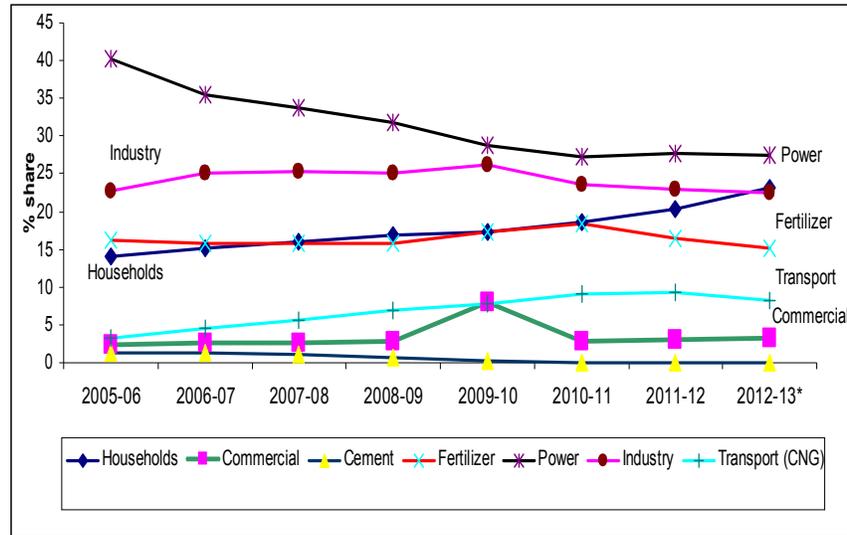
Source: Oil and Gas Regulatory Authority (OGRA)

The Natural Gas Allocation and Management Policy 2005 merits evaluation. The natural gas consumed by different sectors since the formulation of the policy is portrayed in the Figure-5 below. Gas allocations, as envisaged in the policy, have been

¹⁵ Natural Gas Allocation and Management Policy, 2005 (September 2005).

violated since 2005. Domestic (households) and commercial sectors are placed at the top priority, but in reality households falls at third, while commercial at the bottom just above the cement sector. According to the Policy, industry & CNG were fourth on priority list, generally became the largest beneficiary of incremental gas supplies during the period. Even fertilizer sector witnessed an increase in gas allocation with 46 percent share in the incremental gas supplies. Power sector was the major loser during this period, where gas was actually diverted from the power to other sectors, with absolute reduction of 33 percent in gas allocation during the period.¹⁶

Figure 5: Sectoral Gas Consumption share (2005-6 to 2012-2013)



Data Source: Economic Survey of Pakistan 2012-13

*Statistics of 2012-13 are upto March 2013.

The consumption share of gas of transport (CNG) has dropped from about 59 percent in 2006 to 5.3 percent in 2012. The reason could be attributed to gas loading shedding to CNG stations. In the

¹⁶ Economic Survey of Pakistan (2012-13), Page-190

last a few years, CNG has become 'The Fuel' rather than 'The Alternate Fuel' for the petrol engine vehicles throughout the country. The Government has been promoting the use of CNG to reduce pollution and to reduce heavy import bill. During past a few years CNG Industry has observed a tremendous growth. According to the statistics provided by the Natural Gas Vehicles (NGV) Europe, Pakistan has become the third country in the list of countries with the most natural gas vehicles, as over 26 percent of the vehicles on the roads consume natural gas. Pakistan has observed the fastest growth in natural gas vehicles since the year 2000, as the number of gas vehicles has surged to around 3.5 million from less than 100,000 vehicles back in the year 2000. While Pakistan is the country with the highest number of CNG refilling stations in the world¹⁷, and there are more than 3,395 CNG stations are operational in the country.¹⁸ Now the CNG sector has become an industry in the country and is very well politically connected. CNG perfect substitution in the form of petrol is available. Moreover, its opportunity cost is high, as it does not have any value-addition.

Other sectors like fertilizers, industry and power sectors are value-added sectors. There are 10 fertilizer units, which are operational in Pakistan. Their total installed capacity is 6.9 million metric tons, while the annual urea demand of the country is 6.5 million metric tons. Despite surplus installed capacity, Pakistan needs to import urea fertilizer to cope with the local demand of agriculture sector, as sufficient gas supply is not available to them

¹⁷ Mirza (2012).

¹⁸ Pakistan State Oil (2013).

due to the ongoing energy crisis.¹⁹ The basic chemical that is used to produce nitrogenous fertilizer is 'Ammonia', which is obtained from hydrocarbon. And natural gas is considered to be the most efficient route for the production of ammonia. Coal and heavy oil can also be used to produce ammonia. But they are not efficient sources²⁰. Pakistan can become self-sufficient in urea production and save a huge amount of foreign exchange, if fertilizer plants are provided non-stop gas supply. With full capacity utilization, Pakistan could even export an extra urea and could earn foreign exchange.

On the other hand it is narrated that Pakistan could save an estimated amount of \$3 billion, if the government diverts gas being supplied to fertilizer sector to power sector, as the Pakistan's annual spending on the import of Furnace Oil stands at around \$7.5 billion and in case of suspending gas supply to fertilizer sector, the country would have to import urea annually at a cost of \$4.5 billion. Secondly, the diversion of 700 million cubic feet per day (MMCFD) gas to the power sector, currently being provided to fertilizer sector, would generate an additional 4,000 megawatts (MW) of electricity and an additional 1,500 MW of electricity could be generated, if gas to CNG stations were suspended. Pakistan's total power shortage during peak times in summer hovers at 5,500 to 7,000 MW daily, so there is an option available but the implementation of this option does not seem politically feasible.²¹ It is also not economically prudent, as it would shatter the investors' confidence and national exchequer would be deprived of annual tax revenues. Pakistan being

¹⁹ Rizvi (2014).

²⁰ GSE Systems (2014).

²¹ Azad (2014).

an agriculture country cannot undermine the significance of indigenous fertilizer industry.

Cement is also a value-added industry. It uses natural gas as a fuel, and alternatively it could use coal and petroleum. During the six years from 2006-07 to 2011-12, cement industry has shown massive decline, with -38.7% Annual Compound Growth Rate (ACGR), in the use of natural gas as fuel. The industry has been shifted to coal as a source of fuel. This would bring a sigh of relief for the Government.

Domestic sector demand uninterrupted supply of natural gas especially in winter and uninterrupted supply of electricity, especially in summer. Electricity load-shedding is linked with the power sector, which needs natural gas. Fertilizer and textile industries are the value-added industries. They contribute to economy of Pakistan. But they have been facing heat because of suspension in natural gas supply. Pakistan's power sector is heavily depended on gas. Reduction of gas has crippled its performance. Power sector was the major loser during the period 2006-2012, where gas was actually diverted from the power to other sectors with absolute reduction of 33 percent in gas allocation. Low gas supplies have been substituted by expensive oil imports.²² Pakistan's National Power Policy 2013 also outlines gas conservation for power generation, by reducing its utilization in CNG and Unaccounted For Gas (UFG) in particular and 10 percent gas diversion can generate 2,000 MW.²³

²² Economic Survey of Pakistan (2012-13).

²³ National Power Policy (2013).

These natural gas consumption sectors (commercial, domestic, industries, power sector, and transport) need to be managed and prioritized keeping in mind the larger and the long-term interests of the country. As public policies are the outcome of group struggle, these sectors fight to influence the policy-making. Therefore, it is the duty of the Government to manage already depleting resources prudently.

Apart from gas allocation and load management policy, Pakistan has been considering importing piped gas and LNG. Pakistan, an energy deficient country, cannot afford further delay in the import of natural gas. The contractual deadline for the completion of Iran-Pakistan gas pipeline project is December 2014. Iran has almost completed the pipeline work in its territory, but Pakistan has yet not started construction of 780 kilometers of the pipeline on its side. Delay in completion of the project could be attributed to several reasons. Pakistan is directly involved in the New Great Game²⁴, being partner of two important pipelines that will cross the country, the Turkmenistan-Afghanistan-Pakistan-India (TAPI) gas pipeline and the Iran-Pakistan (IP) gas pipeline.²⁵ Other manifestations of politics could be US's economic sanction on Iran and Pakistan being a close ally of United States. Besides geopolitics, other-reasons which are highlighted are landed price of gas, financing of the construction of pipeline on Pakistan's side and transition of political government in Pakistan. The estimated price of imported gas from Iran would be \$14 per MMBTU and the project is labeled as

²⁴ For phrase explanation see End Notes.

²⁵ Abbas (2012).

‘economic death sentence’ to Pakistan.²⁶ But the pipeline project was also called as the Peace pipeline.²⁷ The same fate is witnessed by other gas pipeline project, TAPI gas pipeline, on pretext of geopolitical, technological and security reasons. This is unfortunate on the part of policy-makers that they ignore the economic cost of not importing gas.

To mitigate the gas demand-supply gap, Government of Pakistan has framed LNG Policy 2011, which plans to import 400 MMCFD Re-gasified Liquefied Natural Gas (RLNG) through open competitive bidding and other 400 MMCFD under Fast Track LNG Import Project through a facilitator. The media has reported violations of Public Procurement Rules (2004) in bidding processes of LNG import projects. On reports, Supreme Court of Pakistan took a suo-moto notice of the violations and directed all concerned to stay the proceedings till the decision of the case.

To sum the discussion on sectoral share distribution, gas pipeline projects and import of LNG, the Government has been struggling to cope with ever-widening gap between demand and supply of natural gas. Prioritisation in the gas allocation share needs to be reconsidered. No perfect substitution of gas is available for households, fertilizers, industry and commercial sectors. CNG sector has perfect alternative of petrol and it has not been contributing any value addition to the economy. Price difference between CNG and petrol is the only incentive, which is promoting growth of this sector. Besides gas load management dilemma,

²⁶ Abbasi et al (2013).

²⁷ Abbas (2007).

Government has shown lukewarm action on import of pipeline gas and liquefied natural gas.

4. Conclusion and Policy Considerations

Energy is the lifeline of economy and its importance for the socio-economic development of any country has been proven and established. Now the national security paradigm is more compelling, in addition to military security, economic security, environment security and social security. Energy security depends on uninterrupted availability of energy with affordability. Pakistan is energy starved country, and its this deficiency is a hurdle in achieving development and prosperity.

Pakistan is facing an energy shortfall of 19777.988 (KOE). This shortfall may aggravate in future, if rational policy decisions with prudent use of energy resources are not taken immediately. Pakistan's energy supply mix comprises of gas, oil, hydro and nuclear. It is highly tilted towards natural gas, which constitutes 49.5 percent. This share of natural gas has been supplied from country's own resources for its usages in power generation, domestic, commercial, industry and CNG-fitted transport usage. The natural gas proven reserves of Pakistan at the end of 2012 are 22.7 trillion cubic feet, with reserve to production ratio is 15.5 (R/P ratio).²⁸ It shows that the current reserves would last for approximately 16 years more if they are used at current rate of production. Natural gas supply is expected to decline from current 4 bcf/d to less than 1 bcf/d by 2025-26. This would create a shortfall of 8 bcf/d (over 50 million TOEs).²⁹

²⁸ BP Statistical Bulletin, 2013.

²⁹ Pakistan Energy Outlook (2010-11 to 2025-26).

Apart from other reasons, in the immediate past two key irrational policy decisions have become the cause of today's gas crisis in Pakistan. Historically, until 1990s, Pakistan's energy requirements were largely dependent on hydro-thermal sources, however, a policy shift occurred and this dependency was shifted from hydro-thermal to hydrocarbon, where natural gas was the prime energy source. Natural gas has been used a fuel for power generation and the sector on average since 2001 has got 35 percent share of natural gas. The power sector can switch back to oil, which is rather expensive mean of electricity generation. This would be heavy on the country's import bill, and most importantly has political consequences, as gas-generated electricity is cheaper in price, as compared to oil-based. Though oil costs more but importantly it can be imported. On the other hand, gas (piped or liquefied) import is an expensive and time consuming endeavor.

Irrational policy decision was the promotion of CNG sector. Pakistan is the leading CNG-fitted vehicles user in the world. The sector consumed 0.1 percent in 1997 and now it gets about 9 percent share of natural gas. The country witnessed an extraordinary growth in the sector, and the reason could be attributed to price differential and government's policy to promote more cleanly and environmental friendly energy usage, and to slash oil import bill. The ill-planning and future short-sightedness of policy planners has resulted into natural gas load-shedding in the country. Provision of gas to CNG sector at the cost of other value adding sectors has hampered the growth prospects of the country and also unrest among the populace. The closure of CNG stations, especially in winter season, strikes by commercial vehicles owners and grievances of domestic gas users have almost become a daily affair.

Government has now been considering phasing out CNG gradually and the policy options, banning of CNG use in private cars, availability of CNG only for 1000cc vehicles etc are consideration. But no concrete steps have been taken so far. The reasons could be attributed to powerful policy actors, against whom the Government seems helpless, and bad institutional governance on part of importing LNG.

Domestic gas users are hard-hit under gas shortage crisis. Though domestic sector is on the top priority list under gas load management policy, but the policy has been blatantly violated. Gas shortage has been badly affecting industry (for example fertilizer), which is like power sector a value added sector. Pakistan's fertilizer and petro-chemical industries have no perfect substitute to natural gas. Methane, the primary constituent of natural gas, is the raw material used in their manufacturing process. Cement industry's share is very small and further it is being shifted to coal, as it already uses 56 percent³⁰ of coal as a primary fuel.

Now the Government is in critical situation to mitigate the gas shortage crisis in Pakistan. The immediate and short-term solution lies in the rationalization of the current gas usage. The sectoral allocations of gas need prudent and rational reconsideration. Besides this, Government on short term needs to consider seriously and with proper planning the import of LNG as the gas pipeline projects, take considerable time in completion. The mid-term solution rests with the envisaged gas pipeline, projects especially Iran-Pakistan gas pipeline as Iran has already laid down pipeline on its territory. The long-term gas shortage solution is with the

³⁰ Economic Survey of Pakistan 2012-13.

exploration of indigenous gas resources, and the country can capitalize its own natural gas resource potential. For power generation relying on hydro-thermal will be preferred over hydrocarbon.

Government should adopt a multi-pronged strategy to tackle the energy crisis in the country. There is no single panacea to solve energy shortfall. Natural resources are prone to depletion and natural gas is a strategic commodity. Existing gas reservoirs would last for 16 years and if new reservoirs are not explored, the country's dependency on outside country sources will increase. This would put country's energy security at stake. The short term solution lies in the rationalization of existing gas resources and import of liquefied gas. But the long-term and stable solution rests with the exploitation of country's gas potential. The sectoral distribution of natural gas demands from government utilization of appropriate policy instruments (regulatory and economic). The manifestations of bureaucratic redtapism and 'go slow' policy need to be tackled with coercive measures.

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