# Rethinking Pakistan's Energy Equation

## Iran-Pakistan Gas Pipeline

SDPI
Sustainable Development Policy Institute

By Engr. Arshad H Abbasi (Adviser SDPI)
Co-authors: Fareeha Mehmood, Ayesha Wasti,
Maha Kamal and Zohra Fatima

# Rethinking Pakistan's Energy Equation: Iran-Pakistan Gas Pipeline

**By Engr. Arshad H Abbasi (Adviser SDPI)**
**Fareeha Mehmood, Ayesha Wasti, Maha Kamal and Zohra Fatima[1]**

This policy brief/report seeks to analyze the Iran-Pakistan (IP) Pipeline Project and looks at the feasibility of the project from a geopolitical, economic and technical perspective. The report also intends to suggest economically viable recommendations for ensuring energy security in Pakistan.

[1] Energy Team at the Sustainable Development Policy Institute

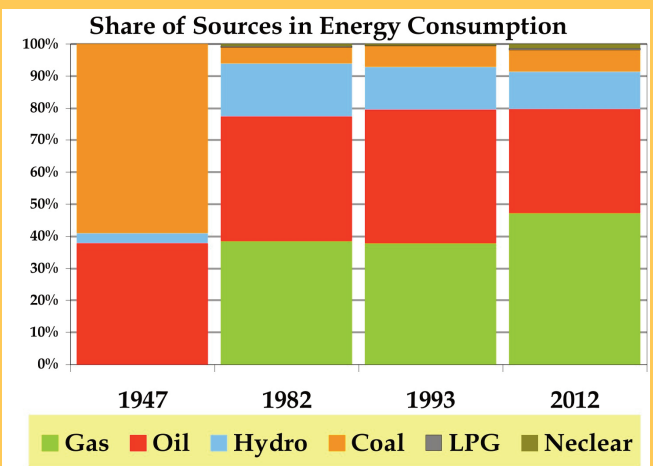
## Report Synopsis

Natural Gas has been described as Pakistan's lifeline and a vital instrument for socio-economic development. It has been labeled as one of the most pivotal strategic commodities.[2] The country's fuel requirements range from power generation to domestic and commercial usage and almost 49.5%[3] of Pakistan's energy needs are met through natural gas. Until 1990s, Pakistan was largely dependent on hydrothermal sources, however in the last decade of the twentieth century, the energy dependency was shifted from hydro to hydrocarbon based resources especially gas. Since then most of the energy needs of the country have been fulfilled through gas, considering that country has been endowed with abundant natural gas resources. In addition to this, a large number of new connections were provided to domestic consumers which subsequently led to a rapid increase in the consumption rate in the domestic sector.[4]

In this scenario, Pakistan's natural gas supply is directly tied to the energy security of the country. Hence, to ensure energy security, countries need sufficient supply of energy sources at affordable rates. Nevertheless, with many countries like Pakistan which are looking for investment in gas imports, the definition of energy security mainly revolves around exploitation of new resources, and reducing dependence on imported energy sources. This entails that while making agreements regarding gas exports, many factors are to be considered to ensure maximum energy security for the country.

## Energy Sector in Pakistan

The per capita primary commercial energy consumption has increased dramatically since 1947, reflecting rapid rate of industrialization and a shift from non-commercial to commercial sources of energy. In terms of oil equivalent, per capita commercial energy consumption in Pakistan was mere 0.02 Ton of Oil equivalent (TOE) in 1947.[5] In 2012, per capita commercial energy consumption is estimated at 0.37 TOE, indicating a compound growth rate of 6.5% for the period 1947-2012.[6]




Source: Authors' own compilation using energy consumption data

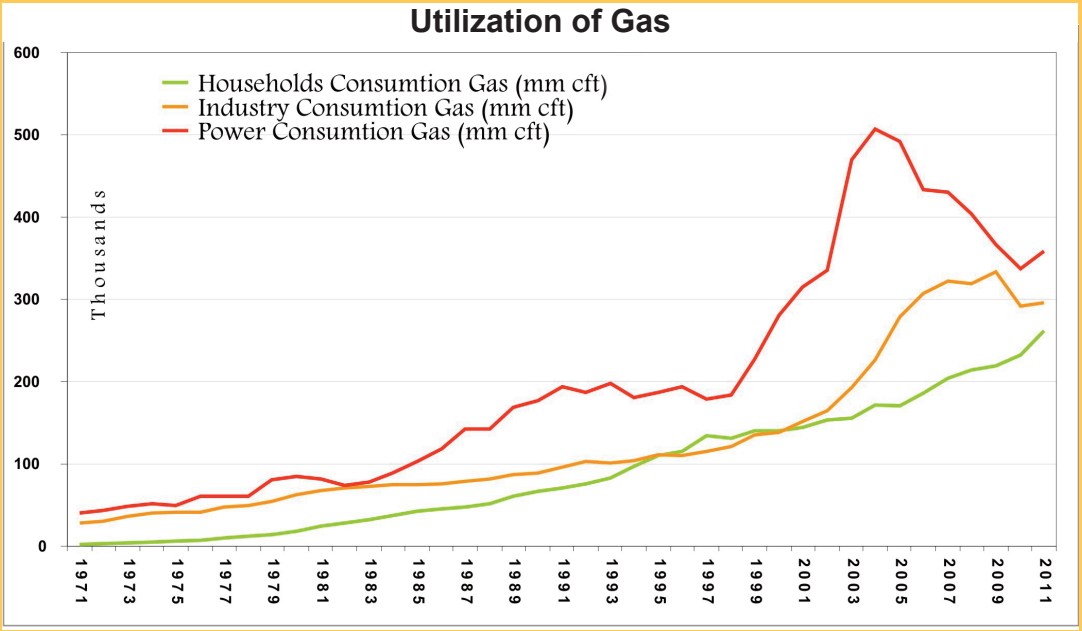
Oil and gas resources account for almost three-quarters of the energy consumption in the country[7] and natural gas due to its convenience and cheapness has proved over the years as the best source of energy - partly replacing coal.[8] Therefore, currently 49.5% of energy needs are dependent on natural gas, while Oil Imports account for 30.8%, LP 0.5%, Electricity (Hydro, Nuclear & Imported) 12.5% and Coal 6.6%,[9] thus indicating the maximum dependence on natural gas as illustrated in Figure 1.

---

2 Khan, A.M. & Ahmed, U.(2009). Energy Demand in Pakistan: A Disaggregate Analysis. Pakistan Institute of Development Economics. Islamabad. Pakistan.
3 Pakistan Energy Year Book (2012). Hydrocarbon Development Institute (2011-2012). Islamabad. Pakistan.
4 Internal Documents with Ministry of Petroleum and Natural Resources.(2013).Islamabad. Pakistan
5 WAPDA Annual Report.(1963) - Water and Power Development Authority. Islamabad. Pakistan
6 Author own calculation Based on data disseminated by Hydrocarbon Development Institute and other reports including (Economic survey reports).
7 Internal Documents with Ministry of Petroleum and Natural Resources.(2013). Islamabad. Pakistan
8 Natural Gas (1960). Planning Commission of Pakistan (1955-60). Islamabad. Pakistan
9 Pakistan Energy Year Book (2011-12). Hydrocarbon Development Institute of Pakistan

## Utilization of Natural Gas in Pakistan

In Pakistan, the commercial utlilization of natural gas began in 1955. The focus of gas utilization policy of governments from 1955 to 1970 was on industry and power generation sectors.[10] During 1956, the first full year of natural gas supplies in Pakistan, the total sales amounted to 6,866 Million Cubic Feet (MCFT), out of which 2,937 MCFT was sold to thermal power plants and the production of gas remained confined only to Sui field.[11] However, in 1970, the sales of natural gas increased to 121,892 MCFT out of which 58,370 MCFT was sold to power sector and for this purpose seven different natural gas fields were exploited.[12] Hence, the total gas sales during the first 15 years of operation amounted to 649,799 MCFT.[13] Similarly, the total sales by gas industry to thermal power plants if compared to percent of total sales, varied from the lowest of 29.5 % in the year 1955 to the highest of 44.9% in the year 1965 which later declined to 28% after completion of Mangla and Tarbela Dam projects.[14]




Source: Authors' own compilation using consumption of gas data

Moreover, in the seventies, there was a shift in policy, and gas was delivered to small towns and villages at an exponential rate (see Figure 2).[15] As a result of this policy shift, in the year 1971, the share of household was only 2%, which swelled to 21% in year 2012,[16] while the share of gas for industry and power sector was 25 and 36.5 % in 1971, which dropped to 23% and 28% for industry and power sector respectively, in the year 2012. Conversely, in India whose natural gas reserves amount 50 Trillion Cubic Feet (TCF), the gas is principally supplied to industrial and power sector. However, in Pakistan, particularly from 1988 onward, gas supply was irrationally prioritized to the domestic sector. Otherwise, Pakistan being ranked as 9th in livestock production[17] might have encouraged rural areas to use biogas for electricity generation and domestic use, instead of extending huge gas supply network to rural areas.

---

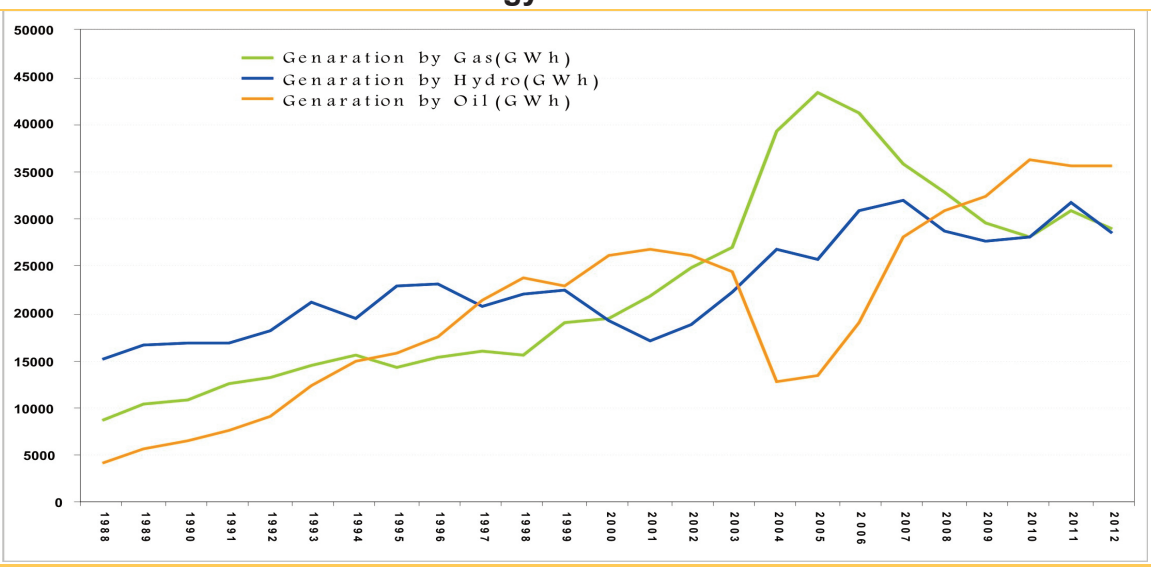
10 Fuels and Minerals (1970).Chapter no. XXII.(1965-70). Islamabad. Pakistan
11 Natural Gas (1960). Planning Commission of Pakistan (1955-60). Islamabad. Pakistan
12 Fuels & Minerals (1970). Chapter no. XXII. (1965-70). Islamabad. Pakistan
13 Energy(1970). Chapter no. XXII.(1965-70). Islamabad. Pakistan
14 WAPDA Annual Report (1983). Water and Power Development Authority.(1982-83). Islamabad. Pakistan
15 National Energy Plan (1970). Planning Commission of Pakistan. Islamabad. Pakistan.
16 Economic Survey of Pakistan (2013). Ministry of Finance (2012-13). Islamabad. Pakistan
17 Live Stock Profile.(2010). Punjab Board of Investment and Trade(PBIT). Islamabad. Pakistan

## Current Catastrophic Energy Crisis and Natural Gas Utilization Policy

The failure of successive governments to formulate a coherent energy strategy has resulted in Pakistan's present energy crisis. Today Pakistan is unable to meet the growing energy needs of economy. Consequently this has led to extensive load shedding, closure of industrial units, low levels of both local and foreign investment. It is indeed ironic, that even though Pakistan has the capacity, it is unable to meet its energy needs because of liquidity crunch and high fuel cost. The expensive fuel mix, poor governance, unprofessional management and irrational subsidies with surging circular debt are dragging the power sector towards a total collapse. Hence, prudent decisions are required to check this trend and available resources must be allocated wisely. There are numerous factors that has led to the current energy crisis, nevertheless the main cause of this crisis is the undiversified energy mix (power generation mix) which is highly dependent on thermal-based power plants resulting into a disaster.

The severe shortage of gas coupled with the skyrocketing cost of imported furnace oil, to which thermal power plants have been forced to switch to meet the gas shortage, is having a crippling impact on certain sectors of the economy. Estimates suggest that out of the total gas production, the power sector, being the major consumer of gas, consumed almost 40%.[18] Although Pakistan had a surplus of electricity in 2002, it now has a shortfall of over 7,500 MW. Its present peak demand is 18,100 MW.[19] As of June 2012, the country has an installed capacity of 24,100 MW, whereas the available capacity was 20,700 MW.[20] Yet, the consumption of electricity during 2012 remained 76,761 GWh as compared to 77,099 GWh in FY 2011, meaning utilization of available capacity was only by 59.02%.[21] The main reason for non-utilization of total available capacity was the shortage of gas and inability of the government to finance the purchase of furnace oil. On the other side, the heavy dependence on gas has also led to the depletion of gas reserves. It is estimated that Pakistan's daily gas requirement is 6.5 Billion Cubic Feet (BCF), against its current supply of 4.26 BCF,[22] thus leaving a shortfall of 2.5 BCF.[23]

**Energy Generation**



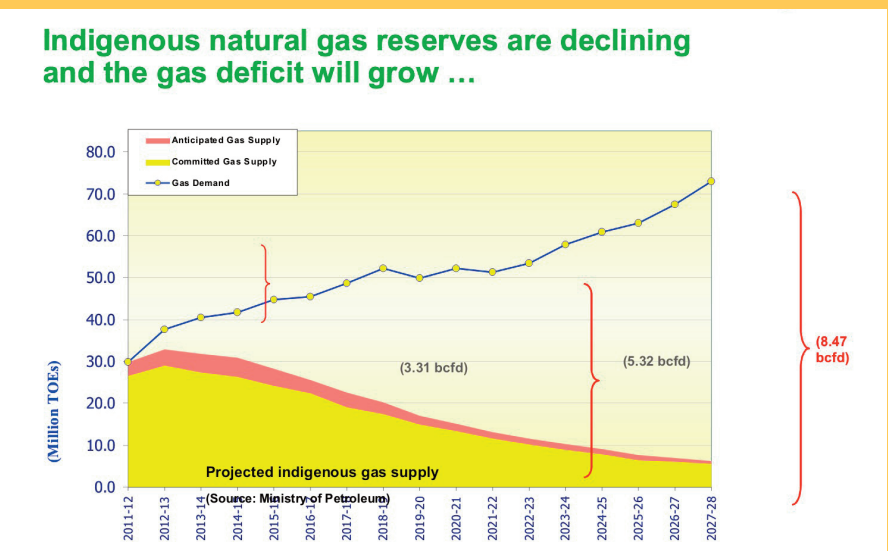

Source: State of Industry Report. 2012

[18] Total Gas Consumption.(2013). Documents of Ministry of Petroleum & Natural Resources (MPNR). Pakistan
[19] State of Industry Report.(2012). National Electric Power Regulatory Authority (NEPRA).(2011-12). Pakistan
[20] Ibid.
[21] State of Industry Report.(2012). National Electric Power Regulatory Authority(NEPRA).(2011-12). Islamabad. Pakistan
[22] SNGPL & SSGCL. (2012). Pakistan
[23] Total Gas Demand on System.(2013). Ministry of Petroleum and Natural Resources (MPNR). Islamabad. Pakistan

The gas crisis and the shift towards oil use for generation of power, coupled with the inability of the power distribution companies to pass on the cost of electricity to consumers, have rendered the power sector hostage to circular debt. The dependency on fossil fuel pushed the country's power sector into a grave dilemma: if the power plants continue to run on oil, they will cause circular debt; if they do not, in large-scale load-shedding.

**Hydropower Development-The case of Kalabagh Dam and Energy Crisis in Pakistan**
The proposed 3600 MW Kalabagh Dam was to become operational by 1993 and its total annual production would have equaled 11400 GWH. The conjunctive operation of Kalabagh and Tarbela will enable Tarbela to generate 336 million KWh of electricity in addition to its existing power production. Thus total power generation would be 11736 GWh. However, as the project never entered the construction phase, the energy which Kalabagh Dam would have supplied was met through the exploitation of gas reserves. To generate the same amount of energy that Kalabagh Dam would have produced, 141 BCF of gas reserves would have been saved annually. Consequently if Kalabagh Dam had been operational in 1993, at least as 2.820 BCF of gas would have been saved, by 2012.
*Source: Author's Calculations*

**Energy Supply Demand Forecast** Various studies have indicated that Pakistan's energy appetite is expected to grow at an Annual Compound Growth Rate (ACGR) of 4.37 to 6.09% over the next 15 years.[24] This growth in energy demand is contingent on GDP growth and is likely to be in the, range of 116 to 148 MTOE by FY2022.[25] Indigenous energy sources which have contributed 51.02 MTOE in FY 2012, are expected to peak in FY 2013 and stand at 54.37 MTOE.[26] This will be followed by a period of decline to 42.83 MTOE by FY 2022[27] primarily on the back of depleting indigenous natural gas reserves, as projected in Figure 4. Over the next 10 years, gas demand is anticipated to stand at 8.58 BCFd, while domestic supplies are expected to reach the level of 2.11 BCFd,[28] due to depletion of existing gas fields, resulting in a huge shortfall of about 6.47 BBCFd by FY 2022, which calls for an immediate action by concerned authorities.



Source: Pakistan Energy Outlook.2010-11

24 Energy Supply Demand Forecast.(2013). Ministry of Petroleum and Natural Resources (MPNR). Pakistan
25 Internal Documents of Ministry of Petroleum and Natural Resources (MPNR).(2013). Islamabad. Pakistan.
26 Energy Resources in Pakistan.(2013). Ministry of Petroleum and Natural Resources (MPNR). Islamabad. Pakistan
27 Ibid.
28 Energy Supply & Demand.(2013). Hydrocarbon Development Institute (HDIP). Islamabad. Pakistan

## National Gas Shortfall Mitigation Strategy

In the context of mounting energy needs and decreasing production from domestic gas reserves, the Ministry of Petroleum and Natural Resources (MPNR) had chalked out a strategy to meet growing energy needs of the country. This strategy was formulated without the indispensable contributions of other concerned ministries, think tanks and research institutes. The lack of transparent policies and absence of energy regulators has compounded into complexities. It is unfortunate that the fundamental focus of this energy strategy is to import natural gas and LNG rather than exploiting the country's indigenous resources especially investing in hydropower sector.[29]

[29] Mitigation Plan.(2013).Document of Ministry of Petroleum and Natural Resources (MPNR). Islamabad. Pakistan

## The Iran-Pakistan-India IPI Gas Pipeline

### A Brief History

The idea of an Iran-Pakistan-India pipeline dates back to the 1980s. In 1989,[30] an initial plan was envisaged by India to construct a pipeline from Iran to India. India had been looking for a route to access Central Asia for a long time when Iran offered a natural gas solution for India. At that time Iran's gas reserves were estimated to be the second largest in the world.[31] Due to security concerns, initially a plan undersea pipeline construction was proposed. However, these preliminary plans for an undersea pipeline were deemed unfeasible by an Italian firm Snamprogetti that was estimated to be 3000 miles long undersea. The increased cost of construction and maintenance would have caused too many technical and economic problems.

In 1994, there were talks about constructing the gas pipeline through Pakistan which eventually led to the 1995 agreement between Iran and Pakistan. According to the initial agreement the Iran-Pakistan-India Pipeline (IPI) was planned to have a total length of 2,670 km[32] (1,660 miles) out of which 1,115 km (690 miles) was to be constructed in Iran, 705 km (440 miles) in Pakistan and 850 km (530 miles) in India. The total investment was estimated to be USD 7 million and the pipeline was anticipated to be completed in four to five years. Subsequently another agreement was signed in 1999 and by the year 2005 the pipeline construction was on its way. Initially, the three parties agreed upon a price of USD 4.93% MMBtu. Crude oil benchmarking was agreed upon by the three parties for determining the gas price, using the JCC[33] Hub (via average Japan Crude Cocktail Price). In the initial plan, the total gas supplies were 5.3 BCFD[34] at Iranian border. Of the total, Pakistan and India would have got 2.1 BCFD and 3.2 BCFD, respectively.[35] In the first phase Iran was to deliver about 2.1 BCFD at the Pakistan's border which would be equally shared by both India and Pakistan and in the next phase another 3.2 BCFD of gas was to be transported from Iran.[36]

---

30 Khan, A. (2012). IPI Pipeline and its Implications on Pakistan, Institute of Strategic Studies, Islamabad, Pakistan
31 Maleki, A. (2007). "Iran-Pakistan-India Pipeline: Is It a Peace Pipeline?," MIT Center for International Studies
32 Ibid.
33 The Japan Customs-cleared Crude (JCC) is the average price of customs-cleared crude oil imports into Japan known as the "Japanese Crude Cocktail".
34 Project Financing. 2013.Document of Ministry of Petroleum and Natural Resources (MPNR). Islamabad. Pakistan
35 Ibid.
36 Ibid.

The US has being expressing many reservations about the IPI project, and this accounted partly for the slow progress of the IPI project. Iran also faces US-led international economic sanctions which have severely curtailed its international trade.

In this scenario, India subsequently raised many objections on the gas pricing and despite many negotiations during the years 2007 to 2009, ultimately, withdrew from the agreement in 2009. As a result, the so-called "peace pipeline" IPI turned into IP gas pipeline. India's dissolution of the pipeline agreement was attributed to issues of high gas prices, tariffs[37] and security concerns.

India's assertion on price and security concerns with reference to such scenarios and particularly its views about Pakistan can however be analyzed in the greater context of India's geopolitics. This is best summarized by the oldest Indian think-thank, The Centre for International Politics, Organization and Disarmament (merged with the Jawaharlal Nehru University in 1970) in a paper "**Energy geopolitics and Iran-Pakistan-India gas pipeline**,.[38] "The author of paper asserts that, "Pakistan's willingness to eventually pay a security at the cost of causing overwhelming advantages to India is doubtful. *On the strategic side, it is in India's interests to ensure economic instability in Pakistan*. For Iran and Pakistan, the gas pipeline project has socio-politico-economic and geo-strategic components…Thus the crux of the matter is that there are major politico strategic factors relating to all the involved players, including the US, which weigh against the on ground implementation of the project." For dissolving the gas pipeline project, India also argued that both the buyer countries will have to face U.S sanctions if the pipeline deal was to be realized under the Iran-Libya Sanctions Act.

Therefore, in view of increasing close relations with US and for larger interest, in 2008, India had signed two momentous deals with the US that included a commercial deal on nuclear energy and another on military cooperation. According to this deal, US had agreed to facilitate the licensing of AP-1000 nuclear reactor technology in India. The power plants were planned to be built in Gujarat and Andhra Pradesh regions of India.

Since increased ties with the US proved to be a good avenue for India to meet its energy needs, India retracted from the agreement in 2009. However, Pakistan signed the Gas Sales Purchase Agreement (GSPA) with Iran. The Presidents of both the countries signed the Inter-Governmental Framework Declaration on May 24th, 2009. Further modalities were finalized after an agreement was signed between the two countries (Iran and Pakistan) in 2013 at the price of USD13/MMBtu which would increase periodically depending on the crude oil prices.[39]

According to the 2013 agreement with Iran, Pakistan will import an amount of one BCF/day. This agreement would last for 20 years with the extension of another 5 years. Pakistan aims to capitalize the gas imported through this pipeline mainly for power generation of around 4000-5000MW in order to curb the energy crisis.

This project is scheduled to be completed by 2014 and would first inject 750 MMCFD through 781 km long pipeline with a diameter of 42 inches. However, afterwards the gas flow would increase to one BCF/day.[40] Iran, in this regard has already constructed more than 900 km (out of 1100 km) of the pipeline on its territory at a cost of $700 million. The Pakistan portion of pipeline would be constructed at a cost of $1.8 billion.[41] Iran will provide $500 million loan (out of $1.8) to partially finance the construction, while the remain-

---

37 Katzman, K. (2013). CRS Report for Congress Prepared for Members and Committees of Congress- Iran Sanctions

38 Verma. Shiv. Kumar. (2008). Energy geopolitics and Iran-Pakistan-India gas pipeline. Political Geography Division, Center for International Politics. Organization and Disarmament. School of International Studies. Jawaharlal Nehru University. New Delhi. India

39 Gas Sales Purchase Agreement. (2013).Document of Ministry of Petroleum & Natural Resources (MPNR). Islamabad. Pakistan

40 Internal Document of Ministry of Petroleum and Natural Resources (MPNR).(2013). Islamabad. Pakistan.

41 Project Financing. (2012). Document of Ministry of Petroleum and Natural Resources (MPNR)

ing cost will be paid by Pakistan. The amount of $500 million[42] would be paid through the cost of gas after commissioning of IP gas pipeline project. The state owned SSGCL and SNGPL would initiate mechanical work while the FWO, a subsidiary of the armed force would carry out the civil work of the project by laying the pipeline from Gabd to Nawabshah in Pakistan. It is claimed that this IP gas pipeline project is the only solution for the energy crisis of Pakistan.[43]

## Iran & Global Natural Gas Trade

Historically, Iran is one of the most hydrocarbon-rich areas in the world. Since the nation's first oil well was discovered in 1908, 145 hydrocarbon fields and 297 oil and gas reservoirs have been discovered in Iran, with many fields having multiple pay zones. It is estimated that Iran has 102 oil fields and the remaining 43 fields are gas, and there are 205 oil reservoirs and 92 natural gas reservoirs. Currently around 78 of these fields are active, with 62 onshore and 16 offshore, leaving 67 fields inactive at present.[44] 23 hydrocarbon fields lie in border areas and are shared between Iran and adjacent countries, including Kuwait, Iraq, Qatar, Bahrain, UAE, Saudi Arabia and Turkmenistan. Over 85%of Iranian natural gas reserves are located in non-associated fields and have not yet been developed. Major natural gas fields include South and North Pars, Kish, and Kangan-Nar.

The natural gas production in Iran has rapidly increased, rising from 0.9 TCF in 1991 to 5.667 TCF at the end of 2012 and accounts for 4.77%[45]of the world's natural gas production.[46] Domestic consumption, estimated to be 5.4 TCF in 2011, has also been rising. During 2009, Iran's imports of 216 Billion Cubic Feet (BCF) and exports of 209 BCF were roughly balanced, but available data for July 2011 through June 2012 suggests that Iran's net imports of natural gas have increased, with a total of 84 BCFover that period.[47] It is estimated that domestically produced natural gas is central to Iran's plans to increase crude oil pro-

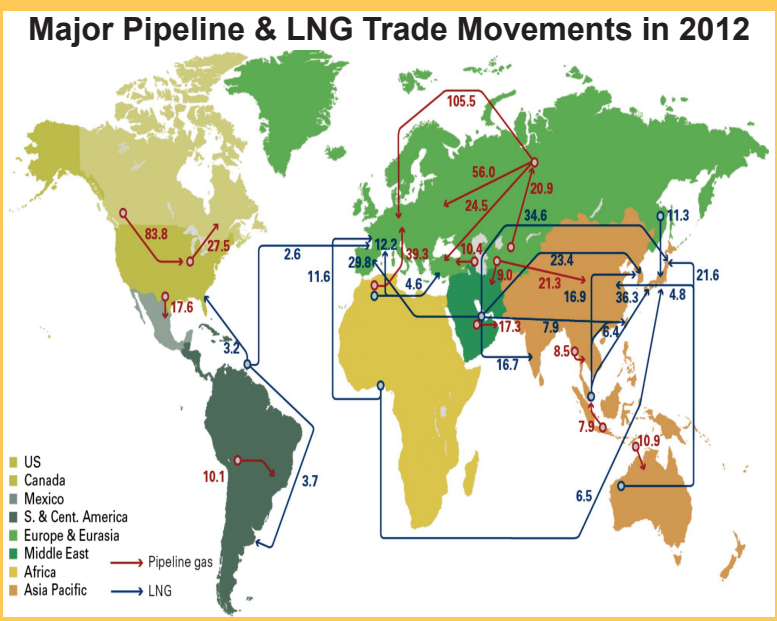
42 Project Financing. (2013). Document of Ministry of Petroleum & Natural Resources (MPNR)
43 Gas Shortfall Mitigation Strategy. (2013). Document of Ministry of Petroleum & Natural Resources (MPNR)
44 Ibid
45 BP. (2013). Statistical Review of World Energy
46 Cedigaz. (2013). FACTS Global Energy
47 US Energy Information Administration. (2012). Natural Gas Exports from Iran

duction through enhanced oil recovery techniques. In 2011, Iran re-injected more than one[48] TCF of domestically produced natural gas in its oil fields to help boost production. The amount of natural gas used for reinjection, which is not included in the production or consumption estimates, will also increase in the coming years.

The South-North Pars field, a natural gas condensate field located in the Persian Gulf is the world's largest gas field, shared between Iran and Qatar. The field holds an estimated 1,800 Trillion Cubic Feet (TCF) of in-situ natural gas and some 50 billion barrels of natural gas condensates.[49] The gas field covers an area of 9,700 square km of which 3,700 square km. South Pars is in Iranian territorial waters and 6,000 square km North in Qatari territorial waters. Iran's most significant natural gas project is the offshore South Pars field, which holds about 47%[50] of its total natural gas reserves and accounts for about 35% of its total natural gas production. The field is being developed in 24 phases, of which 10 were online as of February 2012.[51]

International Gas Trade has played a significant role in shaping the natural gas industry for the last twenty years. The trade of piped gas and LNG has collectively outstripped the total energy demand growth rates as natural gas continues to gain share of worldwide energy markets. The recent figures have identified that around 23.9% of the global primary energy needs are met through natural gas.[52]

At the end of year 2012, 24.9 TCF of natural gas from 20 countries has been exported though pipeline to 44 countries. The Figure 5 shows the gas though pipeline and LNG trade movements 2012 in Billion Cubic Meters (BCM).[53] Iran has the world's largest reserves of natural gas, as of 2013 with 1187 TCF,[54] yet, despite having a largest reserves of natural gas, its natural gas exports only account for less than 1% of global natural gas exports. Iran exported only 0.296 TCF of gas while its imports stood 0.332 TCF in 2012. The country exports gas to Azerbaijan and Armenia under swap deals, while Turkey is the biggest importer with 670 MMcfd (Million Cubic Feet per day) under a take-or-pay deal.




BP Statistical Review of World Energy. 2013

48 US Energy Information Administration. (2012). Natural Gas Exports from Iran
49 South Pars Gas Field(2013). Document of Ministry of Petroleum & Natural Resources (MPNR)
50 Ibid.
51 Ibid.
52 BP. (2013). Production of Gas. Statistical Review of World Energy
53 BP.(2013). Global Natural Gas Trade. Statistical Review of World Energy
54 BP.(2013). State of Energy in Iran. Statistical Review of World Energy

It is interesting to analyze Iran's MOU with different states to look at patterns that Iran needs to avoid to create long-term regional partnerships. Iran and Turkey signed natural gas contracts in 1996 but due to problematic relationship in natural gas and difficulties in infrastructure, the gas deliveries only began in 2001. Every year since then, the countries have run into demand and supply complications. During winter months when Iran's demand for natural gas peaks, it fails to meet its gas commitments, restricting supply to Iran. The natural gas pipeline has also had to face resistance from the terrorist Parti Karkerani Kurdistan (PKK) group. Turkey's Botas took its case to the International Chamber of Commerce Court in 2009 over price disagreements. The court ruled in Turkey's favor, ordering an 18% reduction in price and awarded USD 750 million in compensation.

Yet, Iran is important for Turkey for geopolitical reasons, as a vital natural gas partner for its energy security. The two countries want long-term natural gas cooperation, but had commercial reservations with each other. They have renewed their Memorandum of Understanding (MOU) but their natural gas relationship needs arbitration.

Iran had also signed MoUs with United Arab Emirates (UAE), Oman, Bahrain, Kuwait and Syria. Yet as of 2013, none of these memorandums culminated in a General Sales Price Agreement (GSPA). Other than political misunderstandings, the prime cause of breakdown in natural gas negotiations was pricing disputes. For example, in its contract with UAE, a pipeline was constructed in 2008, but the countries had disagreements on pricing. Fars News Agency, a news agency in Iran revealed that Iran and UAE has agreed to a "price five times more than Qatar's exported gas." Moreover, an expert[55] suggests that the pricing disagreements also reflect a lack of trust between the two countries: "allegedly, the plan of the petroleum ministry and National Iranian Oil Company (NIOC) was to start gas exports at a low price and then force the Emirates to pay a higher price by threatening to close the gas tap." Incidents like these revealed that Iran needs to rethink its international transactions by being more attentive to the needs of gas buyers.

Similarly, Iran is importing gas at the price of USD 4/MMBtu from Turkmenistan and it is assumed that this price has not been linked with crude oil.[56] It is argued that Iran, while importing gas at such a nominal price, is exporting gas at USD14/MMBtu, which is subject to periodic revisions in accordance with the prevailing market conditions. This is a death sentence for Pakistan's economy and it is unfortunate on behalf of Pakistan who has blatantly ignored the energy dynamics and its pricing while going for this deal.[57]

**Key Points:**

**1. The Gas Sale & Purchase Agreement (GSPA) between Iran & Pakistan**

Iran and Pakistan converted their MOU into a Gas Sale and Purchase Agreement (GSPA)[58] on 5th June 2009. The Presidents of both countries had signed an Inter-Governmental Framework Declaration (IGFD) on 24th May 2009. Under the GSPA, the Parties chose French law as governing law, UNCITRAL arbitration rules, with Parts as the seat of arbitration. The GOP shall act as the guarantor of ISGS performance obligations under the GSPA. However payment obligations of the Buyer are secured by a standby Letter of Credit, and ultimately through a GOP guarantee, executed in the favor of the Seller. On 16th March 2010, both countries signed Operations Agreement which describes in detail the operating and measurement procedures under the GSPA, followed by a government to government 'Cooperation Agreement' in December 2012. The final 'Information Mem-

55 Javiland.D.R.(2013). Iran's Gas Exports: Can Past Failure Become Future Success?. The Oxford Institute for Energy Studies

56 Joshi.M. (2011). Turkmenistan-Afghanistan-Pakistan-India Pipeline. Gateway House: Indian Council of Global Relations

57 Authors Calculations based on Pricing. (2013).Document of Ministry of Petroleum & Natural Resources (MPNR)

58 Under the GSPA supply contract, the National Iranian -Oil Company (NIOC), acts as the "Seller", bound to supply contracted quantities of natural gas, and Pakistan's Inter State Gas Systems (Pvt) Limited (ISGS) is the "buyer". The supply is to be ensured irrespective of the status of development and production from-any specific gas fields in Iran.

orandum' was signed on March 2013 by the Presidents of Iran and Pakistan. Both heads of state had officially inaugurated construction of the Iran – Pakistan (IP) Pipeline Project on 11th March 2013. The pipeline will carry gas at delivery point "Mile-250" on the Iran-Pakistan border, near the seaport of Gwadar. Pakistan will run along with Makran Coastal Highway, which is a 653 km-long road joining Gwadar and Karachi, the main industrial hub of country. The capital cost estimated for this section is USD 1.8 Billion. The gas pipeline under the IP project is designed to carry 1.05 BCF/day of natural gas from Iran's South Pars gas field to Pakistan. The pipeline will start from the onshore gas processing facility at Assaluyeh in Iran, to traverse a distance of 1,150 km up to the Iran-Pakistan border, which will be built and operated by Iran. The delivery pressure at the delivery Point shall not be less than 55 Barg.[59]

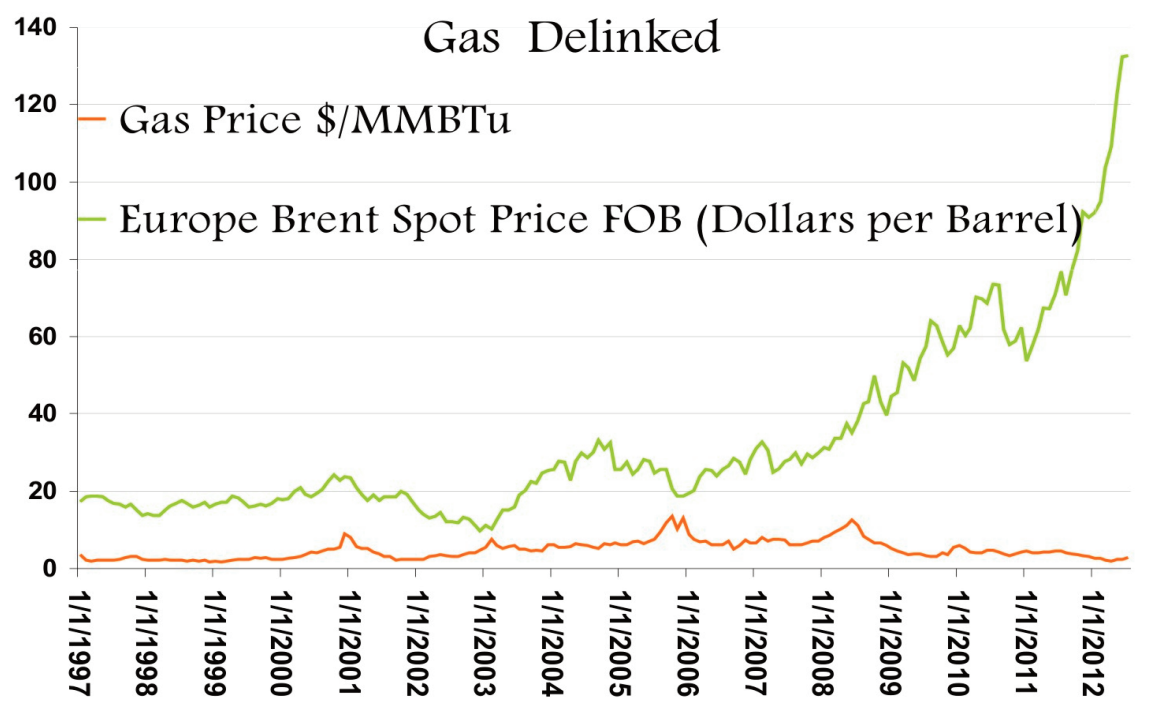
Pakistan will build and operate the pipeline section from the Iran-Pakistan border up to its high pressure gas transmission network at Nawabshah; with a distance of nearly 781 km. Iran has already completed a 900-km portion of 56-inch diameter pipeline from Assaluyeh to Iran Shehr. The remaining 200 km up to the 'Pakistan border is under construction with targeted gas flow.[60] According to the "Information Memorandum," the imported Iranian gas will be, used exclusively to augment existing and future power generation, and will support over 5000 MW power generation capacity, which will help in overcoming the power shortage crisis. The construction of pipeline will also create job opportunities in backward areas of-Baluchistan and Sindh. Natural gas fuel will ensure substantial carbon credits being an environmental friendly fuel.[61]

**2. Rethinking Gas Pricing:**

The price of the gas under IP will be determined through a formula linking the delivered gas price with Japanese Customs Cleared (JCC) crude at agreed crude oil parity. The GSPA offers scope for periodic revisions in gas pricing formula under prevailing market conditions. In addition to this, the payments under GSPA will be made on monthly basis in a currency widely available and convertible specified by the seller.[62] In order to evaluate the socioeconomic feasibility of this import price for Pakistan, a comparative analysis has been conducted to highlight the economics of IP gas with furnace oil, gas on gas markets and impact of using IP gas on cost of generation. The highlights of this analysis are as follows:

- **IP Price & Decoupling of Oil & Gas Prices:** Historically, the pipeline gas imports by continental European countries and LNG imports by countries in far East have been linked to oil products. However, the gas prices have been decoupled gradually from oil prices in current context of high oil prices and increased supply of gas (See Figure 6). This enhanced supply of gas is principally due to dramatic increase in development of unconventional resources. This decoupling of oil and gas prices have resulted in the price ratio of a barrel of crude oil to a Million Metric British Thermal Unit(MMBtu) of natural gas rising to over 25:1 on a sustained basis well in excess of 6:1 the ratio based on pricing energy content at parity.[63] The technology advancements and adoption of horizontal drilling and hydraulic fracturing have lowered the development costs and increased the production efficiency, thus flooding the US market with natural gas and natural gas liquids. This flooding of natural gas has not only changed the energy dynamics with the US but has also influenced the world energy market globally. However, contrary to this in GSPA agreement signed on 5th June, 2009,

59 Quantity of Imported Gas.(2013). Document of Ministry of Petroleum & Natural Resources (MPNR)
60 Iran-Pakistan Gas Pipeline Project(2013). Document of Ministry of Petroleum & Natural Resources (MPNR)
61 Socio-economic Benefits.(2013). Document of Ministry of Petroleum & Natural Resources (MPNR)
62 Gas Sale & Purchase Agreement: Salient Features.(2013). Document of Ministry of Petroleum & Natural Resources (MPNR)
63 Nassif.K.(2013). Do Recent Rulings Herald The Divorce of Oil And Natural Gas Prices, And Who Will Benefit?. Standard & Poors Rating Services




Source: US Energy Information Administration (EIA). 2013

under the clause 6.2(b), the Prevailing Contract Price (PCP) has been calculated using the formula which has indexed the price with Japan Crude Cocktail (JCC), thus ignoring the current decoupling trend between oil and gas prices.

**"PCP = 0.12 x Simple Average JCC (US$/Barrel) + USD 1"**[64]

According to the calculations of Inter State Gas Systems (ISGS), the subsequent prices of the imported Iranian gas in relation to per barrel cost of JCC are shown below in Table 1.

**Table 1: Gas Pricing of Iranian Gas, 2013**

| JCC price, USD/Bbl | 80 | 90 | 100 | 110 | 120 | 140 |
|---|---|---|---|---|---|---|
| IP Gas Price USD/MMBtu | 11.72 | 12.94 | 14.16 | 15.38 | 16.6 | 18.16 |

Source: Document from MPNR. 2013

In addition to this, the IP price is also contrary to the earlier prices of Iranian gas suggested by the Economic Coordination Committee (ECC) of the cabinet on 10th April 2007, chaired by the then Prime Minister of Pakistan(See Table 2 below).

**Table 2: Gas Pricing of Iranian Gas, 2007**

| JCC price, USD/Bbl | 60 | 70 | 80 | 90 | 100 | 110 | 120 |
|---|---|---|---|---|---|---|---|
| IP Gas Price /MMBtu | 4.93 | 5.56 | 6.56 | 7.06 | 7.875 | 8.614 | 9.353 |

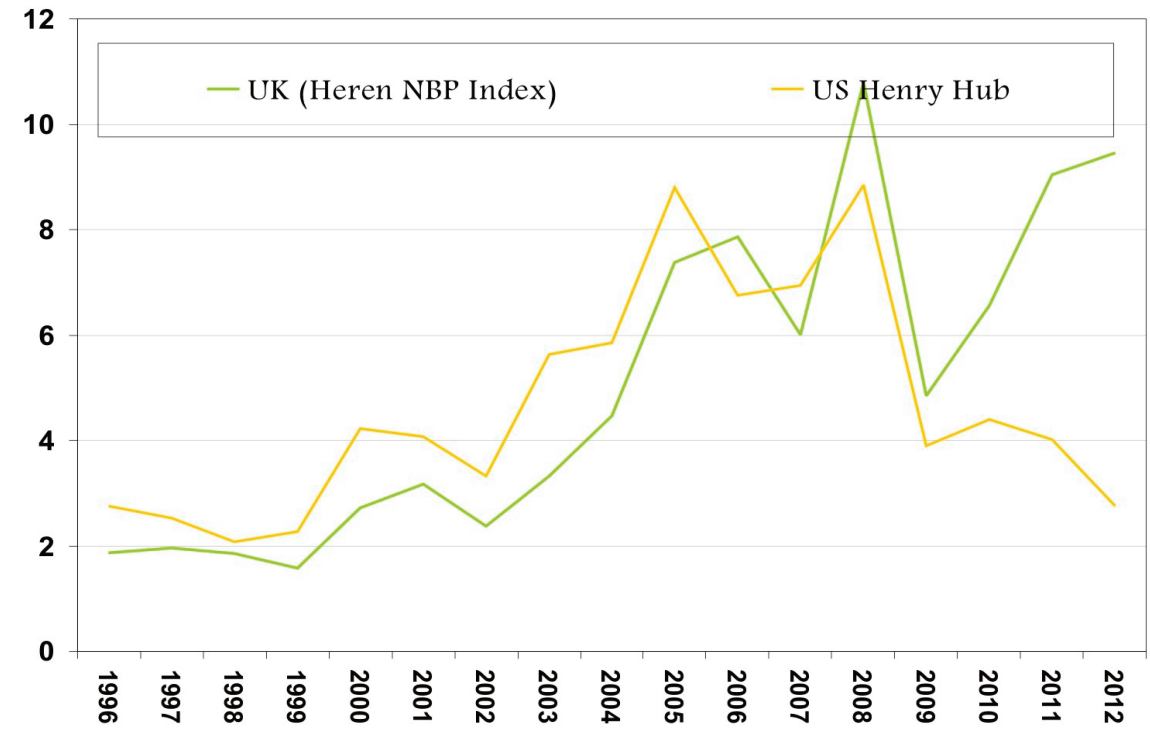
Source: Document from MPNR. 2013

- **IP Price & International Gas on Gas Markets:** Similarly, the transformed energy landscape across the world has also significantly influenced the international gas markets, substantially bringing down gas market prices. The international statistics

64 Pricing Formula. (2013). Document of Ministry of Petroleum & Natural Resources (MPNR)

of gas prices from 2007 to 2011, identifed that the economic bubble had subsided and the gas prices had fallen significantly in all the three hubs[65] as by the end of 2012, the Henry hub prices of gas was dropped to USD 2.76/MMBtu (See Figure 7) and USD 9.46/MMBtu in case of UK NBP. The Liquefied Natural Gas (LNG) import price after incurring the shipping and regasification cost (3% for transportation, 20% for liquefaction and 30% for re gasification) for year 2012 was also around USD 4.15/MMBtu, which identifies that the price of IP gas is even costlier than the LNG import price.

**International Gas Prices USD/MMBtu**



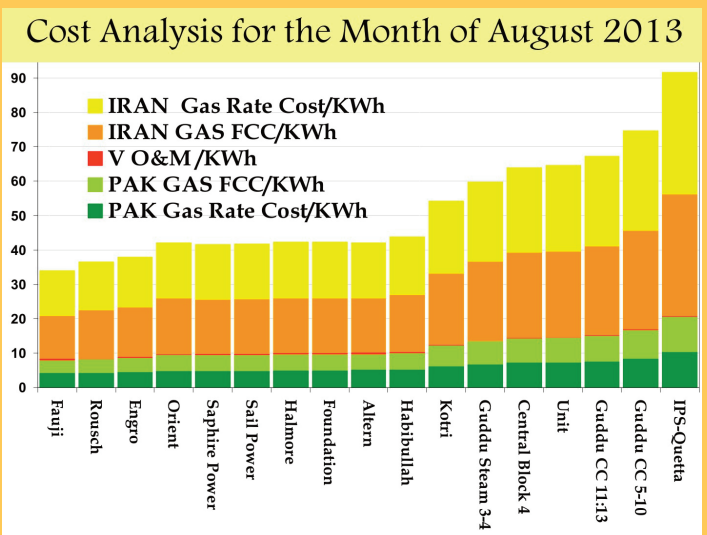

Source: US Energy Information Administration (EIA). 2013

In Europe, the high import gas prices due to increased oil prices as compared to Gas-On-Gas (GOG) markets and LNG prices has led to the importers filling arbitration cases for renegotiating long-term supply contracts with base price revisions outside the normal contract review cycle, yet in Pakistan there is total silence on this matter. European Commission (EC) set the first precedent when EC started an antitrust investigation against Gazprom.[66] In Asia,[67] Japan has already asked Qatar to consider a pricing mechanism different form oil linked contracts due to decoupling of oil indexation in long-term contracts. Similarly, the Russian gas export monopoly Gazprom's efforts to keep a link between the selling price of gas with expensive oil price were dealt a blow when court ruled in June, 2013 that Russia had to include market gas pricing in the rates it charged to Germany's RWE. In addition to this, the Gazprom must also reimburse Germany's second largest utility i.e. RWE for gas purchase since May 2010.[68] It is argued that this was the first court

65 US Energy Information Administration (EIA). (2013). Hubs of Gas Prices
66 Nassif.K.(2013). Do Recent Rulings Herald The Divorce of Oil And Natural Gas Prices, And Who Will Benefit?Standard & Poors Rating Services
67 Platts. 2012. LNG Daily. Volume 9.
68 Pinchuk. D.Akin. M & Soldatkin.(2013). Gazprom Dealt Pricing Blow as Loses Court Case to RWE. UPDATE-2. Reuters

ruling to impose spot pricing on Gazprom and such arbitration cases have set a legal precedent and may lead to flood of lawsuits.

- **IP Gas Price in USD:** Iran is the only country that accepts Indian Rupees for Crude oil. Moreover, Iran has offered to sell crude for 90-day interest-free credit and not complaint if payments are held up because of insurance or shipping hassles. Taking the advantage, now India has decided to raise quantity from 25500 tons to 425000 tons each month. While Pakistan will make payment in USD as per the contract specifications – especially according to the clauses 9.5.1 and 9.5.2 of agreement[69] titled 'Payment'. This will further over burden Pakistan's economy.
- **IP Gas & Increased Cost of Generation:** The major driver behind IP gas agreement was high cost of electricity generation from power plants using HSFO as fuel and it was considered that importing gas under IP will be the only penance for endemic energy crisis by reliving the import bill of Pakistan.[70] The annual savings were estimated to be USD 2.44 billion per annum. However, the price of the IP gas in this report has been reevaluated by using JCC price under the clause no. 6.2(a&b)[71] in accordance with the formula mentioned above and month of August 2013 and August 2013 are selected for the analysis. In the month of August 2013, the total dependable capacity of all power plants of country excluding KESC system was 19068.49 MW.[72] The total electricity generated was 9739.34 GWh, out of which 1,755.24 GWh was from 20 gas based thermal power plants at the rate of Rs 5.41 per KWh[73]. This cost of electricity generation is based on the cost of gas provided to thermal power plants of WAPDA and KESC at the rate of Rs. 488.23 per MMBtu.[74] Using the same formula and cost of Average JCC cost of crude oil during last six months was USD 110.55, therefore the cost of generation of electricity using Iranian Gas is calculated as shown in Figure 8, assuming the operation and maintenance cost of each power plant is constant. When the total cost is recalculated, assuming Iranian gas is used for the same month to generate same quantity of electricity, it comes out to be Rs.44628.04 Million. Thus, Iranian gas will create an additional cost of Rs.37996 million per month or 4222 Million USD per annum. Therefore, the argument that Iranian gas will help to save 2440 Million USD annually as a substitute for HSFO fuel for thermal power plants is proved false. Yet, the GOP will invest at least USD 1.8 billion for the construction of pipeline from Iranian border to Nawabshah.




Source: Authors' own compilations using data of actual generation

[69] Internal Documents of Ministry of Petroleum and Natural Resources (MPNR). 2013. Islamabad. Pakistan

[70] The comparison was made with cost of HSO at Brent crude price band.

[71] Pricing.(2013). Document of Ministry of Petroleum & Natural Resources (MPNR)

[72] Decision of the Authority in the matter of Fuel Charges Adjustments for the Months of August, September, October, November, December 2012 and January, February & March 2013 for XWDISCOs along with Corrigendum and Notifications.(2013). National Electric Power Regulatory Authority(NEPRA)

[73] Ibid.

[74] Oil & Gas Regulatory Authority (OGRA).(2013).Natural Gas Consumer Prices. Islamabad. Pakistan

- Based on gas consumption in power generation, it is revealed that during last four years, the average gas consumed for generating one unit of electricity remained around 12 CFt,[75] while in neighboring country India (See Table 3), the average is around 7.5, which is 37% less then Pakistan. Based on current consumption rate, thermal power plants will only able to generate 30420 GWh of electricity, which would jump to 45000 GWh if their efficiency were improved at least in accordance with efficiency of Indian thermal power plants.

**Table 3: Average Gas Consumption in Thermal Power Plants of India[76]**

| Fiscal Year | 2006-07 | 2007-08 | 2008-09 | 2009-10 | 2010-11 |
|---|---|---|---|---|---|
| GWh | 34976 | 39574 | 32557 | 36488 | 28992 |
| Gas Consumption BCF | 434 | 430 | 404 | 367 | 337 |
| Consumption CFt /KWh | 12 | 11 | 12 | 11 | 12 |
| Consumption in Indian TPS CFt /KWh | 6.81 | | | | |

Source: Indian Electricity Authority. 2012 & State of Industry Report. 2010-11 & 12

- In August 2013, Pakistan has imported 38.2 GWh[77] from Iran. The imported electricity is much cheaper than the electricity produced by the Independent Power Producers (IPPs) because Iran subsidizes oil and gas which feed the power plants. Iran has provided 50 million euro for laying of 170 km transmission line for the import of 1000MW of electricity from Iran in 2009. The current price of Rs.10/Kwh[78] cost effective than importing gas to generate electricity using existing thermal power plants has low efficiency

**TAPI in the light of the Iran-Pakistan Pipeline Project**

A closer analysis of TAPI shows that it may face significant hurdles, and might just remain a "pipedream" project. Pricing will remain a particular barrier and the involved countries will have to engage in negotiations to decide on a market-friendly price. Under the General Sales Price Agreement (GSPA) signed in 2012, tentatively prices under TAPI are also linked to a crude oil benchmark. In the light of this report on IP, it can be seen that the world is moving towards a delinked of gas and oil prices. In fact, at the current rate of oil prices, expected to soar even further in the next few years, a gas deal based on a formula such as 80% of Brent Crude Oil, linked to the Japanese Crude Cocktail (JCC) prices will be unreasonable with prices expected to be around $20/MMBtu.

In 2010, Turkmenistan has a deal with Russia of $4.25/MMBtu, $4.0/MMBtu with Iran and $5.4/MMBtu with China and the prices have not been linked to the oil basket[79] . Pipeline contracts can only be feasible if the price to buyer countries is lower than current LNG prices, because of the associated costs of maintenance and construction to be covered as well. In this regard, contracts like the TAPI and IP can only be possible for Pakistan if gas pricing is negotiated, and is ideally not linked to a crude oil benchmark.

---

75 Authors Calculation based on State of Industry Report. (2012). National Electric Power Regulatory Authority(NEPRA).(2011-12). Islamabad. Pakistan.

76 Two Gas-based Thermal Power Stations, 370 MW Vemagiri in Andhra Pradesh generated 148.27 GWh unit of electricity and 120 MW Karuppur in Tamil Nadu generated 62.58 GWh in the month of Jan 2012- Although the Gas Supplied was Gas Requirement at 90% PLF (Plant Load Factor) -Indian Electricity Authority

77 National Electric Power Regulatory Authority. (2013). Fuel Charges Adjustment

78 Ibid.

79 Joshi.M. (2011). Turkmenistan-Afghanistan-Pakistan-India Pipeline: Possibility or Pipe Dream?Indian Council on Global Relations

In the past, Pakistan has asked for a price to be linked to the domestic price of gas, while India had wanted a price linked to coal, and the countries proposed a price that was linked to the cost of production by Turkmenistan.[80]

Moreover, concerns about gas pricing aside, Pakistan may also have to consider the implications of a pipeline passing through war-torn Afghanistan, which may include risks such as terrorism, unrest, chain disruption, non-payments and various legal and regulatory disputes[81], among others. In particular, with reference to NATO withdrawal in 2014, it remains to be seen how governance is strengthened in Afghanistan, and there is a fear of resurgence of Taliban.

Overall, significant points to consider regarding this project are gas pricing, and security concerns. If the IP project raises questions related to economic feasibility of oil-linked prices, the TAPI project raises even more concerns regarding the security and safeguarding of the proposed pipeline itself.

**Developing Energy Solutions for Pakistan**

- It is argued that Pakistan, in order to address the grave concerns of this energy crisis, requires better and comprehensive understanding of issues and underlying factors which is dragging the nation's energy and economy at a devastating rate. It is estimated that around 35%[82] of electricity is produced using furnace oil, an expensive resource. The electricity tariff for industry in Pakistan is therefore the highest in the world when calculated in USD which constrains the country's ability to export.

- While, natural gas is a far more optimal fuel for power generation as compared to furnace oil but successive governments have neglected this fact and has continue to import furnace oil for power generation. Therefore, in current context, importing gas at high rate, linked with JCC, will further increase tariff of electricity which will ultimately encumber the national economy. Since natural gas in Pakistan, satisfying nearly 50% of the energy needs of primary energy mix, it becomes inevitable for Pakistan to re-negotiate the import price of natural gas at earliest, not only to cut down the cost of power generation, but also to supply this resource to industries, fertilizer manufacturers and especially for public relief in transport. In addition to this price revision, the authors of this report strongly recommend the following solutions:

- Development of unconventional oil & gas reserves is a viable option for Pakistan rather than going for natural gas imports at extremely expensive rates. Shale gas exploitation is the need of the hour for the country as Pakistan has been equipped with unique geochemical properties and vast natural gas infrastructure, thus providing favorable situation to initiate the process. The country however, has not taken any substantial step to initiate the process of developing this resource except developing a shale gas framework. In the context of current progress and development in shale gas across the globe and in lieu of grave energy crisis, Pakistan ought to follow the Indian example of developing shale gas to maintain high economic growth. Besides its civil nuclear deal, Government of India (GOI) has preferred to join Global Shale Gas Initiative (GSGI). USA and India have both signed an MOU on Unconventional Natural Gas Cooperation which is tailored with public-private partnership that will leverage

80 Joshi. M. (2011). Turkmenistan-Afghanistan-Pakistan-India Pipeline: Possibility or Pipe Dream?Indian Council on Global Relations.

81 Ibid.

82 State of Industry Report.(2012). National Electric Power Regulatory Authority (NEPRA)(2011-12). Islamabad. Pakistan

business in both US and India for commercial projects. Thus, this joint initiative will help India to achieve energy security in environmentally responsible ways.

- Similarly, China in order to realize their thick shale resource potential is exerting their efforts to build capacity and develop skills of their local personnel in understanding and developing their shale resources. In this regard, China's National Energy Administration (NEA) and US Trade and Development Agency (USTDA) organized a series of four technical training workshops in China on Shale gas Technology and Development. These training courses were arranged with collaboration of US Department of Energy, US Department of State and Foreign Commercial Service in China.

- It is significant to highlight that at a time when a number of countries are moving towards clean energy economy and developing low carbon energy resources, the GOP is spending billions of rupees in developing Coal Power Parks in Baluchistan. One Coal Power Park has been proposed at Gadani, Baluchistan with a capacity of generating 5200MW through eight coal-fired power plants, with a plan to raise its capacity to 6600MW.[83] This Coal Power Parks is not only an environmental hazard as witnessed across the global community but will also be an expensive induction to energy mix of Pakistan. As the recent upfront tariff for coal announced by NEPRA is around Rs 8.65/unit which is almost half as compared with the price of gas i.e. Rs 4/unit.[84]

- Pakistan ought to follow the Norwegian model. The country, besides having the largest reserve of natural gas and oil in Europe, is using hydropower as the principal source of electricity supply at 95%,[85] while only 4% comes from conventional thermal sources, followed by 1% from biomass, waste and wind. The country has 73.8 TCF of gas reserve at the end of 2012, yet the gas used for production of electricity and district heating is only 17.714 BCF out of total consumption of 152.65 BCF. UK having 54128 MW[86] of gas based installed capacity for which country import 1243 BCF[87] of gas annually from Norway and Netherlands mainly for electricity generation but the efficiency of its power plants is more than 44% to optimize the gas import utilization but the most impressive record of imported gas utilization is of Germany. The country import 3091 BCF of pipeline from Norway and Netherlands for its 25810 MW gas based power plants and the efficiency of power plants is more than 50%. The fascinating example set by Germany in the city of Vohburg, when Irsching Power Station[88] with the highest efficiency in the world (60.4%) was commissioned in July 2011. Another case of importing natural gas from power plants has been set by Italy. Italy's consumption on gas was 68.7 BCM[89] with the biggest consumption of gas in commercial and residential sectors. Furthermore, the power sector of Italy heavily relies on gas imports almost 50% of the total share of generation mix and as a consequence is exposed to international gas prices.

- The decision of importing gas from Iran under IP project is deemed to ease the en-

83 Development in Coal.(2013). Islamabad. Pakistan
84 State of industry Report.(2012). National Electric Power Regulatory Authority(NEPRA).(2011-12). Islamabad. Pakistan.
85 US Energy Information Administration (EIA). (2012). EIA Analysis-Norway
86 Eurogas. (2012). Statistical Report
87 BP. (2013). Trade movements 2012 by pipeline. Statistical Review of World Energy
88 Ibid.
89 Ibid.

ergy crisis but this is another example of ignoring the most cost effective and cleaner source of energy i.e. hydropower. It is estimated that 30417 GWh will be generated using IP gas at the cost of USD 5.8 billion annually, while the capital cost to develop run-of-rivers projects Dasu, Bunji, Pattan and Thakot Hydropower projects having capital cost 5.9, 5.2, 4.6 and 4.6 USD Billion Dollars have capacity to generate 21300, 24088, 14095,and 15230 GWh (million units) annually. The total cost these projects is less than total cost of IP-Gas that would be paid in four years, subjected to, if the current of rate of USD remain constant during next four years.

- The two run-of-river (ROR) hydropower projects i.e. Dasu and Bunji can be completed within the same cost of USD 11 Billion to generate 45388[90] GWh, which is cost effective, and economically feasible option. The completion of these hydropower projects will not only provide cheap and clean electricity as compared to thermal power generation using IP gas but will also generate economic activity and employment opportunities for unskilled and semi skilled personnel during construction phase and operational phase in project cycles.

[90] WAPDA. (2012). Hydropower Development in Pakistan

## Recommendations

1. The authors' calculations reveal that the IP gas pipeline project is not the panacea for Pakistan's energy problem, but seems like a bail-out plan. Terming the pipeline a "lifeline for Pakistan's economy and its future" seems like an exaggeration, particularly regarding the existing price formula. Pakistan's economy needs an urgent uplift that can only be made possible by overcoming the current energy crisis. Pakistan will have to look at more creative options that are not limited to unconventional and alternate energy sources. The Pak-Iran sovereign agreement stipulates construction of Pakistan's side of the pipeline by December 2014. If Pakistan fails to meet this deadline it will be liable to pay heavy daily penalties, which can run into millions of dollars per day. Iran has already made the investment and it has a legitimate expectation of return. If the Pakistani government is serious about this project, it must renegotiate the price in line with the GSPA, the price clause 6.3.2[91] has fully entitled Pakistan to request for revision of the Prevailing Contract Price PCP formula and then sincerely start implementing it while renegotiating the cut-off date for penalties.

2. Iran aims to be a bigger player in the global gas market, and needs to increase the share of its total gas exports, and the most viable avenue for Iran is towards its east. Iran's western neighbors are oil-rich countries, yet Iran may have a good potential for a gas market in Pakistan, India, and even Bangladesh & Nepal in the future. Iran will also have to increase its gas production to meet the greater needs of gas export, and create sufficient gas production in the country.

3. India presents a growing market for energy resources because of its economic growth, and will have greater energy needs in the future. Yet, its efforts towards shale exploration have so far not yielded any substantial results. The country had little geological data on thermal maturity and Total Organic Carbon (TOC), and based its calculations on coal formation surrounding the barren measure of shale. India also had limited technical knowledge and did not foresee the effects of pop-

[91] Pricing.(2013). Internal Documents of Ministry of Petroleum and Natural Resources (MPNR). Islamabad. Pakistan

ulation density in the shale-rich region. Furthermore, India's current energy mix is heavily reliant on "dirty" coal energy, with a total coal capacity of 133,188.39MW[92] as of August 2013, which is 58% of its total capacity. This is an unsustainable energy model because of its negative impact on the environment of the South Asian region. India will have to phase out its coal, and move towards greener energy solutions. The UN and the international community will need to emphasize the environmental stakes at hand. India will need to convert its thermal plants to gas based, in the light of regional global climate change. In order to meet its increased gas demand, therefore, the authors suggest that the IP project may present a good avenue for India to create greater energy security, and look toward greener energy.

4. Looking at TAPI in the light of this report's findings the authors foresee that the TAPI project, like the IP may face hurdles related to price negotiations. Pakistan will have to engage in negotiations to decide on a market-friendly price. Under the General Sales Price Agreement (GSPA) signed in 2012, tentatively prices under TAPI are also linked to a crude oil benchmark. In the light of this report, it can be seen that the world is moving towards delinking of gas and oil prices. Moreover, it will have to rethink concerns raised due to security (see box on pg. 17).

5. In one year before the commencement of IP, the improvement of thermal efficiency is indispensable for relieving the power shortfall in Pakistan. In this regard, Pakistan should learn from Iranian experience, which being the leader in natural gas reserves has been converting its open cycle power plants in to combined cycle power plants(Genaveh, Sirjan, Kahnooj & Khorramshahr Combined Cycle Power Plant)[93] for optimizing the use of gas and cost of electricity generation. Hence, Pakistan, with depleting gas reserve and suffering from endemic gas shortfall urgently, needs to improve the efficiency of its power plants. The increase in efficiency will lead to the more production of electricity as in the baseline with same quantity of gas, which will also reduces overall CO2 emissions, thus enable Pakistan to earn carbon credit.

In conclusion, the authors suggest a closer analysis of the IP pipeline project. Institutional weakness and lack of negotiation skills and knowledge with reference to gas pricing, and in light of the delinking of gas-oil prices, shows that the project needs serious attention. It is unfortunate that the energy regulators of Pakistan: OGRA and NEPRA have failed to resolve the country's energy issues. It is imperative that the government refocuses its attention on better governance and regulation of energy resources, and ensure that these mechanisms are strengthened to ensure scrutiny of projects, particularly in the oil and gas sector. The authors assert that the readers should only look at this report as an independent study in light of national interest of Pakistan.

92 Central Electricity Authority (2013). India
93 List of the CDM projects submitted to the UNFCCC