GAS INDUSTRY OF PAKISTAN – A HISTORICAL PERSPECTIVE OF GAS MARKET TRANSFORMATION

Mohammad Kalim
ESCON (Private) LIMITED
Karachi - Pakistan

1. INTRODUCTION

The Pakistan Gas Industry started in 1952 with the discovery of major gas field at Sui in Balochistan with initial reserves of 0.31 x 10^{12} m^3 (10.78 x 10^{12} ft^3) of pipeline quality gas.

At the time gas was discovered, the fuel used in the domestic sector was coal, kerosene, and wood with oil and coal in the power and industrial sector.

Use of gas expanded rapidly with the share of gas energy increasing to 19% by 1960, 30% by 1966, 34% by 1972, 37% by 1995, 41% by 2000 and 44% by 2001. Gas usage covers domestic, commercial, industrial, power, fertilizer and agriculture sectors.

The 50 years of development and operational experience of the Gas Industry in Pakistan makes it one of the earliest and most developed natural gas distribution and transmission systems in the region.

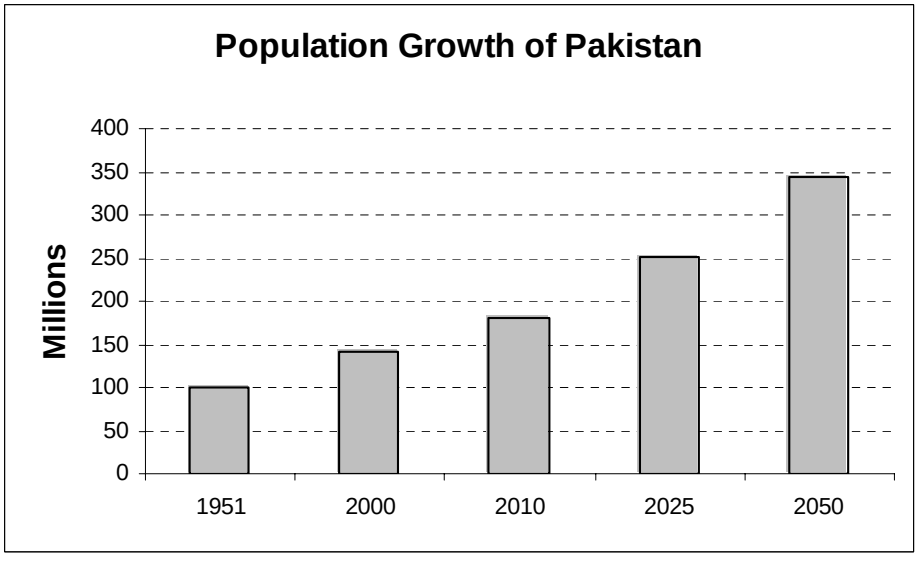
The gas reserves of Pakistan which started with gas discovery at Sui with 0.31x 10^{12} m^3 (10.78 x 10^{12} ft^3), in 1952, are estimated at 0.68 x 10^{12} m^3 (24 x 10^{12} ft^3) as of 30th June, 2001 with production at 67.90 x 10^6 m^3 (2,938 x 10^6 ft^3). The capacity and production of old and new gas fields will reach its maximum in the next five to six years, when import of gas will be needed, unless new discoveries are made.

This paper will cover the various stages of developments of the gas industry, its achievements, shortfalls, lessons learned, which would be helpful in guiding other countries, who are in the process of starting the transformation to natural gas-based energy supply.

2. GENERAL ECONOMIC DATA

Pakistan came into existence in August 1947 with the division of the Indian Subcontinent into Pakistan and India. Pakistan has an area of 796,093 Sq. Km, about the same as Turkey. In the 1951 census the population of Pakistan was 34 million which in 2002 is estimated to be 143 million registering an increase of 109 million people in 50 years. At present, with the accelerated population growth rate, we can expect an addition of 40 million in population in the next 10 years to be 183 million. With the land area fixed and water resources declining, there is tremendous pressure of high population growth on the limited natural resources of Pakistan.

Figure 1



The GDP growth in the last five years averaged at 3.5% resulting in an average 4.5% energy demand increase per year. The rate of inflation in consumer price index came down to 3.5% in the year 2002 as compared to 4.4% in the previous year. The per capita income increased from Rs.10,853 (US$ 452) in 1991-2 to Rs.26,413 (US$438) in 2002 at current market prices. Compared to 1980-1 prices the average growth in per capita income has been nominal or 1.46% per year for the last eleven years.

Pakistan is an agri-based economy with one fourth of total output (GDP) and 44% of total employment being attributed to agriculture.

Pakistan's energy consumption has increased seven times in the last 20 years. From 1.79 x 10^6 KJ (1.7 x 10^6 Btu) per capita in 1980 to 12.98 x 10^6 KJ (12.3 x 10^6 Btu) per capita in 1998. Pakistan's level of 12.98 10^6 KJ (12.3 x 10^6 Btu) is higher than Bangladesh's 3.48 x 10^6 KJ (3.3 x 10^6 Btu) but virtually at par with India's 13.61 x 10^6 KJ (12.9 x 10^6 Btu). In comparison, China's per capita energy consumption in 1998 was 28.49 x 10^6 KJ (27 x 10^6 Btu), Iran was 13.08 X 10^6 KJ (12.4 X 10^6 Btu) and Russia was 187 x 10^6 KJ (177.3 x 10^6 Btu) while US per capita consumption was 369.25 x 10^6 KJ (350.7 x 10^6 Btu). Pakistan accounts for only 0.5% of total world energy consumption, whereas its population is 2.28% of the world population.

The above numbers show that there is a huge potential for energy demand in Pakistan to satisfy the needs of its growing population and demand for economic growth.

The fully-developed gas transmission and distribution system, covering the whole country, makes Pakistan an ideal country to import gas from the countries like Iran, Qatar and Turkmenistan which have huge reserves of gas within 1650 Km of ground / offshore pipeline distance. The great potential of these pipelines being extended to India, meets the huge demand of energy in India, making them a strategic necessity for the region's development. Besides the Sui field with capacity of 0.31 x 10^{12} m^3 (10.78 x 10^{12} ft^3) is ideal for use as a peak shaving reservoir.

3. THE PAKISTAN GAS INDUSTRY – A BRIEF HISTORY

The gas industry in Pakistan started in 1952 with discovery of a major gas field at Sui in Balochistan.

Initially a 406.4 mm (16 inches) gas transmission line was laid from Sui to the industrial city of Karachi with a length of 559 KM (347 miles). The initial customers were the power stations in Karachi. Subsequently, the industrial areas of Karachi were given priority and finally to domestic and commercial consumers.

Initially, the gas companies were established in the Private Sector with operatorship with Burmah Oil Co. of UK. There was a Sui Gas Transmission Company which was established for operating the gas transmission line from Sui to Karachi. The distribution companies were Karachi Gas Co. (KGC) with license for distributing gas in Karachi, Indus Gas Company (IGC) for distribution of gas in Sindh and Balochistan provinces excluding Karachi. For the supply of gas to the Northern Areas of Pakistan, comprising Punjab and N.W.F.P. provinces, with over 70% population of Pakistan, an integrated gas Transmission and Distribution Company named Sui Northern Gas Pipelines Ltd was established. Over thirteen years ago, the two distribution companies viz. KGC and IGC were merged in 1985 were subsequently merged with Sui Gas Transmission Company. This resulted in Pakistan having two integrated transmission and distribution companies covering the whole of Pakistan.

The Gas Industry presently has 8,187 Km (5085 miles) of high pressure transmission line and 56,955 Km (35,776 miles) of distribution lines with a customer base of 3.69 million consumers. Assuming eight persons per household, this gas is being supplied to about 30 million people.

As of 2002, the two gas companies have provided 153,606 new connections with 2,259 Km (3637 miles) of additional pipelines at a growth rate of 4.16%.

With additional gas availability of nearly 25.48 x 10^6 m^3d (900 x 10^6 ft^3d) from three new fields viz. Bhit, Zamzama and Sawan, rapid expansion of the transmission and distribution network is envisaged in the next 3 to 5 years to use this additional gas.

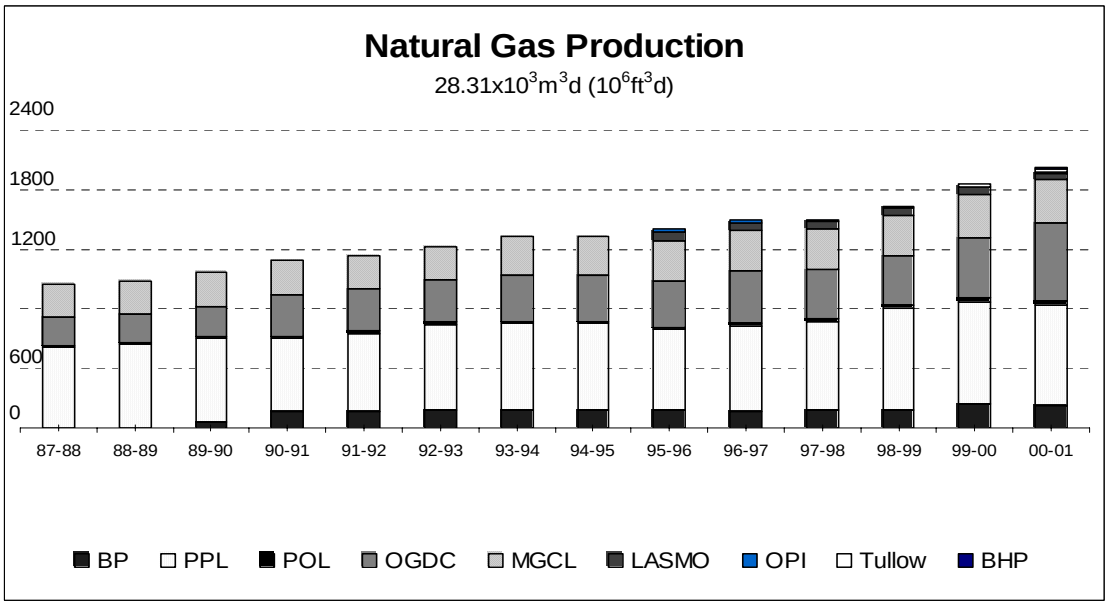
The Pakistan gas industry matured very fast and by 1960 all gas transmission and distribution lines were designed and constructed from indigenous sources. The pipeline system follows the American ANSI B 31.8 code for all its activities.

The supporting products industry has also matured and all steel pipes, polyethylene pipes, small valves, regulators and small domestic gas meters are manufactured within Pakistan. The gas meters are manufactured by Sui Southern Gas Co. Ltd with annual manufacture of 300,000 gas meters of G1.6 and G4 sizes. The gas industry is using computerized billing since 1970 and recently Sui Southern Gas Co. Ltd introduced computerized meter reading using hand-held electronic units to read meters, thus eliminating any additional manual input of data into main computer or maintaining manual meter reader books.

3.1 Production

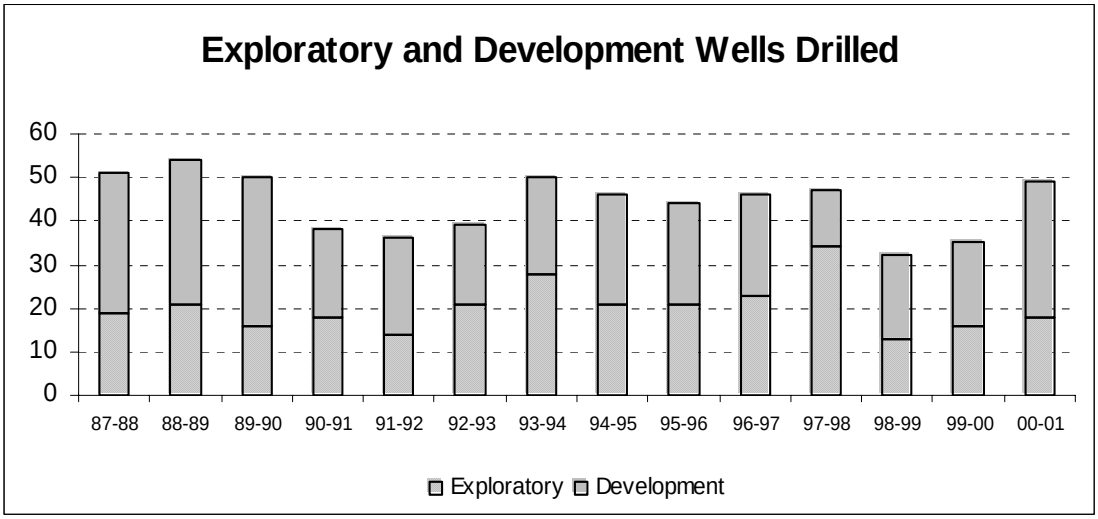
The production of gas from various gas fields is shown in Figure 2 and drilling activity in Figure 3 to indicate the level of development work ongoing.

Figure 2



BP	BP Pakistan Exploration & Production	**LASMO**	LASMO Oil Company Limited (now AGP)
PPL	Pakistan Petroleum Limited	**OPI**	Orient Petroleum Inc.
POL	Pakistan Oxygen Limited	**Tullow**	Tullow Pakistan (Development) Ltd.
OGDC	Oil Gas Development Company	**BHP**	BHP Petroleum (Asia/Pacific) Inc.
MGCL	Mari Gas Company Limited		

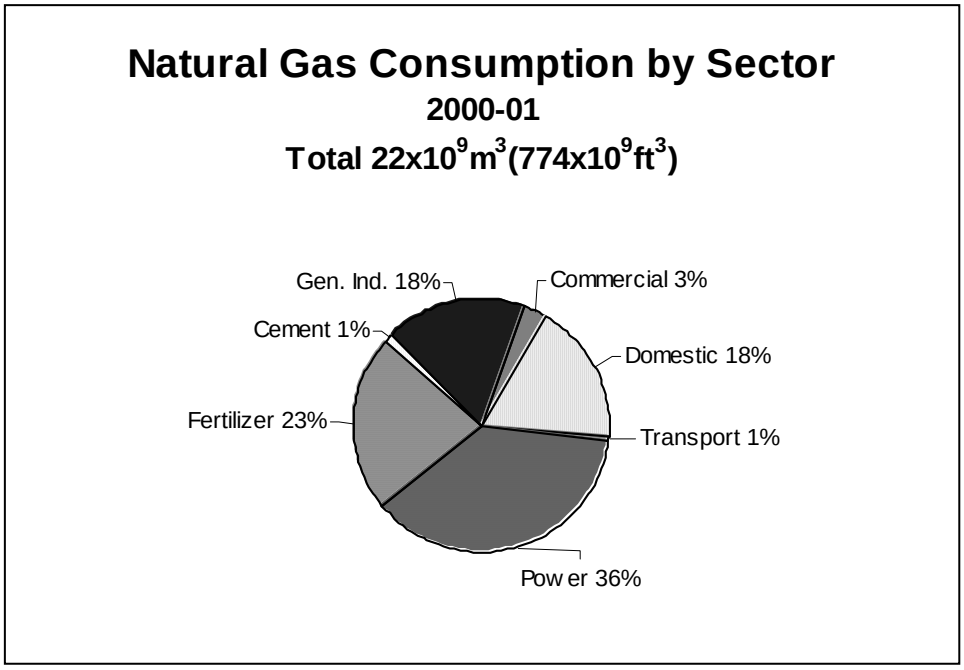
Figure 3



3.2 Consumption

Gas use in Pakistan is widely spread in all sectors of the economy viz. Domestic, Commercial, Transport (CNG), Power, Fertilizer, Cement and General Industry. Figure 4 below shows the natural gas consumption by sector.

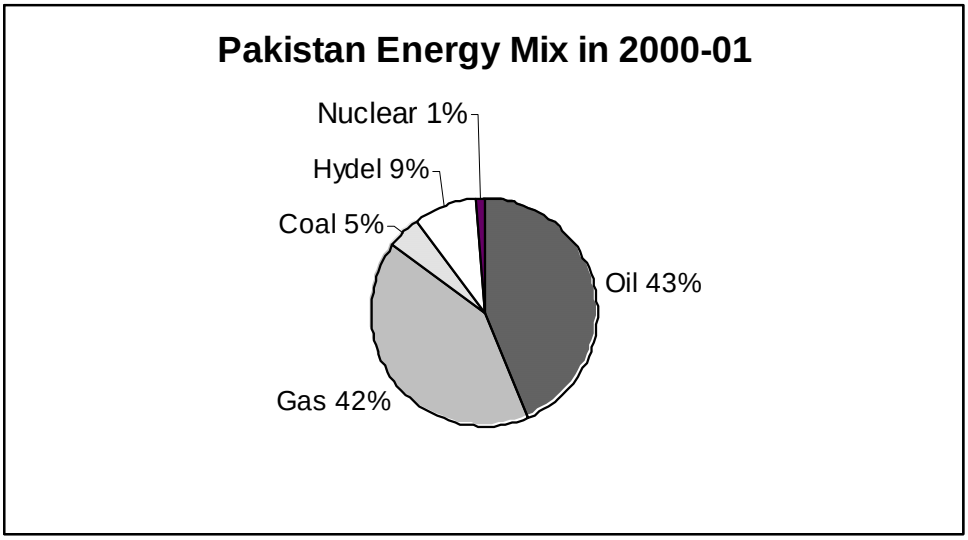
Figure 4



3.3 The Pakistan Energy Scene

The Pakistan energy mix is shown in Figure 5 to demonstrate the increased usage of natural gas and its high preference. The price of gas was rationalized for use in CNG in the transport sector. The result was rapid conversion of vehicles to CNG. To date, about 240 CNG stations are servicing 240,000 vehicles running on CNG.

Figure 5



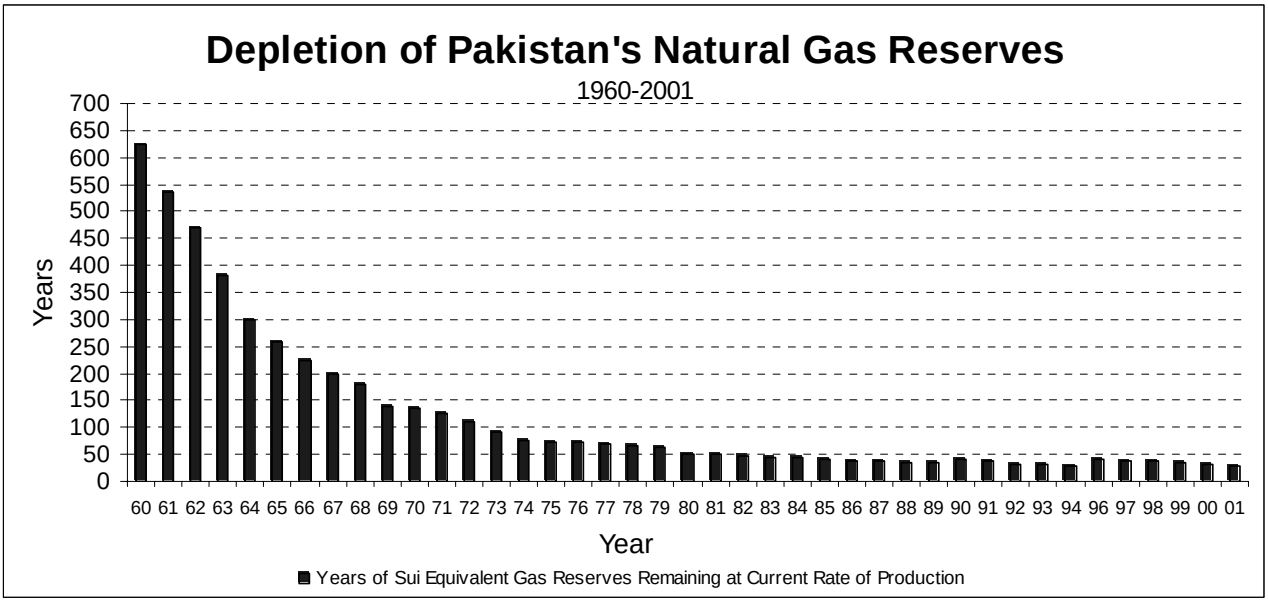
3.4 Environment

With the increased gas production, the share of gas in energy consumption has increased to 41% of the primary energy mix. The impact on pollution is noticeable. In the last few years, the policy efforts of the Government of Pakistan encouraging the use of CNG in vehicles have borne fruit and 240,000 vehicles are using gas. It is expected that numbers of vehicles using CNG will increase to 300,000 by the end of 2003. This large scale conversion of vehicles to CNG has had a positive impact on reducing of vehicular pollution in large cities.

4. PAKISTAN'S PETROLEUM POLICY

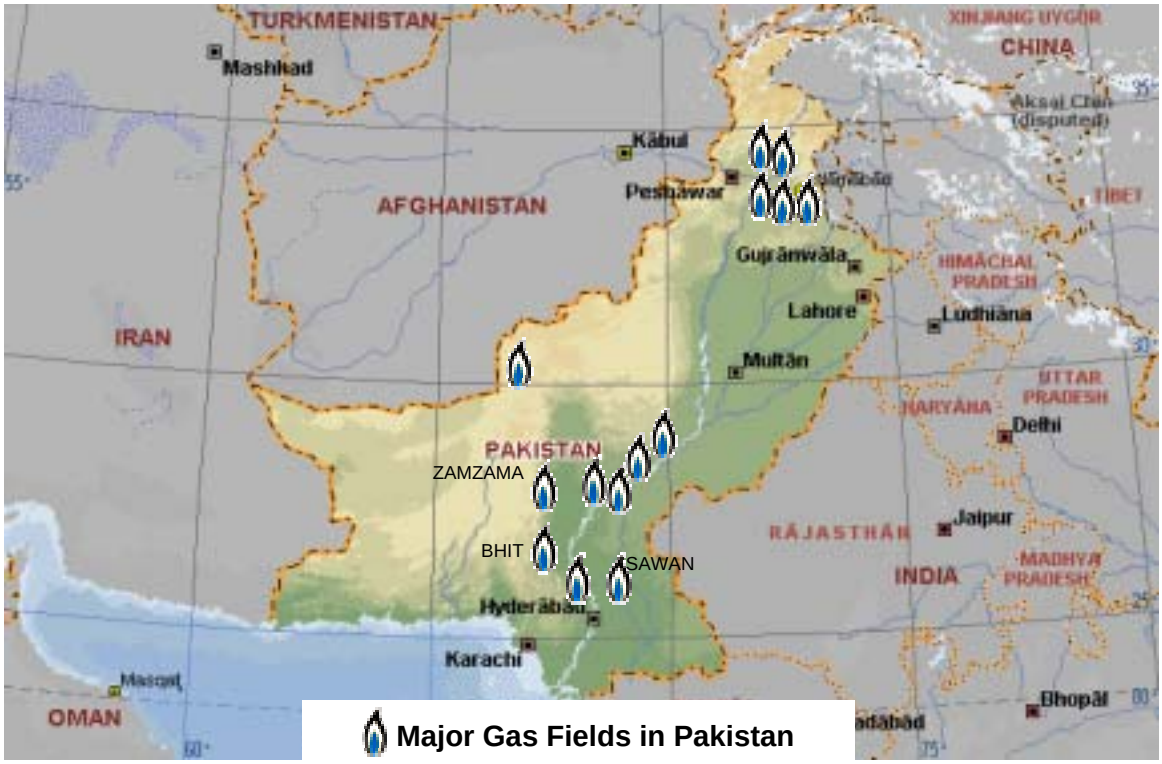
New discoveries of gas were not keeping pace with the demand and gas reserves were depleting. A serious shortage of gas is anticipated by 2000-2001.

Figure 6



The Government of Pakistan took the initiative with the introduction of an attractive new Petroleum Policy in 1994.This Petroleum Policy resulted in a sharp rise of interest by the international oil and gas exploration companies in Pakistan. The result was that by July 1995, twenty-two international companies were active in oil and gas exploration. Between the years 1994-5 and 1998-99, 13 to 34 wells per year were drilled. This effort resulted in three major discoveries viz. Bhit, Zamzama and Sawan gas fields and other minor discoveries.

Figure 7



These discoveries are anticipated to add 25.48 x 10^6 m^3d (900 x 10^6 ft^3d) per day of gas production. These three fields will start supplies in 2003, and by 2005 these fields should be at their maximum production potential. So the shortage of gas anticipated in 2001 has been shifted to 2008. By the year 2008, Pakistan would need to import gas if further discoveries are not made.

At the peak of activity in 1995, there were twenty-two major oil and gas companies involved in Pakistan, or showing interest and seeking shares in the increased activity of exploration of gas and oil. These Companies were SHELL, OMV, UNOCAL, ESSO, TULLOW, POL, BHP, UTP, HEMCO, OGC, DIGON, PREMIER, PEL, OMAN OIL, PLAN RESORUCES, MURPHY, LASMO, BRITISH GAS, CRESCENT OXY plus major local companies OGDCL and PPL.

With the three new discoveries, the additional gas production will be good till 2005-6, and so the interest in exploration will be reduced due to insufficient immediate local demand, political uncertainty in the region and other similar factors.

The policy was further improved and simplified and the latest policy in force has the following salient features.

4.1 Onshore Petroleum Package – May 2001

- Gas producers will be allowed to enter into gas sales agreements for supplies directly to gas distribution companies, power plants, industrial consumers or third parties other than residential or commercial consumers.

- Gas producers will have an option to export gas if it is in excess of internal demand.

- In order to promote third party gas sales, the Government will allow foreign exchange remittances of gas sales proceeds, keeping in view the Rupee requirements, in different Zones.

- At the request of exploration and production companies, the Government can also purchase gas through a nominated buyer at the policy price.

- Income tax rate will be reduced to a uniform of 40 percent from the current rate of 50 percent to 55 percent and royalty will be allowed to be expensed.

- Government Holdings “carry” at exploration stage will be abolished.

- Local companies will be promoted to take 15 percent to 25 percent interest in the foreign joint ventures on full participation basis.

- Initial term of the Licenses will be increased to 5 years with two renewals of 2 years each.

- 5 years will be allowed for retention of significant gas discoveries.

- In order to make marginal discoveries attractive for development, first production bonus of US$ 0.5 million will not be payable.

- The Government will encourage early production schemes as well as schemes for secondary/tertiary recoveries.

- Expatriates’ security clearance has been streamlined.

4.2 Offshore Petroleum Package – January 2001

- The offshore petroleum package would be available to all new as well as existing license holders for a period of five years.

- Cost limit is 85 percent including the royalty of 12.5 percent. The contractor can recover 100 percent of the cost up to a limit of 85 percent of the gross revenues.

- The corporate income tax has been reduced from 50 percent to 40 percent of the profits and gains.

- Import duties and taxes will be 0% for exploration and after the first commercial discovery; the same will be 3 percent.

- Shallow Zone is the offshore area covered by a well of shallower than 4,000 meters and in less than 200 meters water depth. The Government's profit oil/gas share varies from 10 percent to 80 percent, based on the accumulated production from a field.

- Deep Zone is the offshore area covered by a well of shallower than 4000 meters and/or in over 200 meters and in less than 1000 meters water depth. The Government's profit oil/gas share would vary from 5 percent to 70 percent based on the accumulated production from a field.

- Ultra-Deep Zone is the offshore area covered by over 1000 meters water depth from which the Government's profit oil/gas share varies from 5 percent to 60 percent on the accumulated production from a field.

- The price will be as per the Government's policy or "Arms' Length Sales Value" whichever is lesser.

- Exploration period will consist of an initial term of 5 years and two subsequent renewals of two years each, for a total exploration period of 9 years.

- A maximum retention period of 10 years will be considered on a-case-by-case basis to enable the companies to evaluate commercial aspects of the discovery and make arrangements for disposal of discovered gas.

- Total term of the Contract will be up to 44 years, which will also cover the retention period and the longer exploration period.

- The Contractor has to return 20 percent of the Original Contract Area prior to the termination of the initial term, 30 percent of the Original Contract Area on the termination of the first renewal and another 30 percent of the Original Contract Area prior to the termination of the second renewal.

- Modest acreage rentals of $ 50,000 plus $ 10 per square kilometer will be applied.

4.3 Producer Pricing

4.3.1 Crude Oil

The Producer Policy price or Crude Oil delivered at the refinery gate shall be based on the C&F price of a comparable Crude Oil or a basket of Arabian/Persian Gulf crude oils plus or minus a quality differential between the basket and the local crude oil. No other adjustment or discount will apply.

4.3.2 Condensate

The price for Condensate will be the FOB price of internationally quoted comparable Condensate. No other adjustment or discount will apply.

4.3.3 Non-Associated Gas

The Producer Policy Price for Non-Associated Gas of acceptable pipeline quality specifications will be indexed at 67.5%, 72.5% or 77.5% (for Zone III, Zone II and Zone I respectively) of C & F price of a basket of imported Arabian/Persian Gulf Crude Oils (Marker Price) delivered at the transmission system. This basket will reflect the actual mix of imported crude oils in the previous Six months (January to June and July to December) and notified by the Ministry of Petroleum and Natural Resources. Transportation tariff for non-associated gas deliveries at transmission system will be payable separately.

4.3.4 For purchases by GOP nominated entity pursuant to Section 2.1.6 (iv), the following floor, ceiling and price discount arrangements will apply with respect to the non-associated gas Policy Price:

Floor and ceiling will be US$ 10/barrel and US$ 36/barrel of C&F price, respectively with following discounts:

--Over US$10/barrel and up to US$16/barrel: 100% of Marker Price

--Over US$16/barrel and up to US$21/barrel: plus 50% of incremental Marker Price.

--Over US$21/barrel and up to US$26/barrel: plus 30% of incremental Marker Price; and

--Over and above US$26/barrel and up to the ceiling: plus 20% of incremental Marker Price.

The floor and inflection points may be reviewed every 5 years for appropriate adjustments keeping in view the then prevailing conditions.

4.3.5 Associated Gas

The producer price for associated gas shall be equal to the price of non-associated gas in the respective Zones.

4.3.6 Liquefied Petroleum Gas

For new projects, the LPG price will be determined by the market under a deregulated regime.

4.3.7 Fixed Return Formula: Application of fixed return formula to the industry will be progressively changed to market- related formula after giving due consideration to relevant factors.

5. GAS IMPORT OPTIONS

The gas demand during the decade of 1990s averaged a growth of 2.7 percent per annum. This low expansion was due to constrained gas supply.

The attractive Petroleum Policy of 1994 gave impetus to exploration, and additional discoveries were made with potential of gas production of 25.48 x 10^6 m^3d (900 x 10^6 ft^3d). The new gas fields will come into full production by 2003/2004.

The gas reserves as of June, 2001 stood at 0.70 x 10^{12} m^3 (24.65 x 10^{12} ft^3). At present rate of production these reserves will last only 28 years. By 2005 the gas production is expected to touch 85 x 10^6 m^3d (3000 x 10^6 ft^3d) resulting in faster depletion of gas reserves which will be good for 19 years only. By 2006 the gas curtailment will start, with switch over to oil.

There is a projected shortfall in supply versus demand for gas, by 2010, of about 22.65 x 10^6 m^3d (800 x 10^6 ft^3d) of base load demand. Add to this 20% peak demand, in three winter months, the supply shortfall during these months would be 27x$10^6$$m^3$d (960 x 10^6 ft^3d). Presently peak shaving is done by switching-off fertilizer plants and switch over to oil by power and industrial consumers.

It would, therefore, be viable to import gas earlier and use part of the indigenous gas field for peak load to optimize the pricing. By 2005, the gas supply including old and new discoveries are estimated at 85 x 10^6 m^3d (3000 x 10^6 ft^3d) after which the decline in supply will start unless additional and new discoveries are made between 2003/2004.

A figure of 3.54 x 10^6 m^3d (125 10^6 ft^3d) of new discoveries is anticipated starting year 2003. By 2010, the production from existing fields is expected to go down to 73.62 x 10^6 m^3d (2.6 x 10^9 ft^3d), whereas, the demand is expected to be 119 x 10^6 m^3d (4.2 x 10^9 ft^3d) or a shortfall of 45.3 x 10^6 m^3d (1.6 x 10^9 ft^3d). If additional discoveries, on the basis of anticipation of 3.54 x 10^6 m^3d (125 10^6 ft^3d) per year, are discovered, the shortfall will then be reduced by 20.53 x 10^6 m^3d (725 x 10^6 ft^3d) to 24.78 x 10^6 m^3d (875 x 10^6 ft^3d).

These figures do not take into account the peak demand in three winter months which can be as much as 20% or 23.79 x 10^6 m^3d (840 x 10^6 ft^3d) over the base demand. The prospects of making new major discoveries in Pakistani offshore areas is there, but unless there is a clear agreement between India and Pakistan for export of Pakistani gas, no major investor will sink substantial funds in this offshore exploration.

Another reason why major investment is hesitant in this region is that there are viable options available for import of gas not only for Pakistan but for India via Pakistan. The costs of onshore pipelines or shallow water offshore pipelines are very attractive compared to LNG imports by India or deep water sub-sea pipelines to India.

Presently, Pakistan has three options for import of gas which are discussed below.

5.1 Turkmenistan-Pakistan Gas Pipeline

Turkmenistan has 2.86 x 10^{12} m^3 (101 x 10^{12} ft^3) of proven gas reserves with a present production of 45.31 x 10^9 m^3 (1.6 x 10^{12} ft^3). These reserves are large enough for investment for export of gas by pipeline. UNOCAL of USA has carried out detailed economic and engineering studies. The pipeline can be laid within two years of financial close of a project. Unfortunately, the political conditions in Afghanistan are still high risk for such a major investment. The length of the pipeline from the Daulatabad gas field to the central supply point near Multan (Figure 8) is estimated at 1400 Km (870 miles) with 1219 mm (48 inch) diameter line of 65 x 10^6 m^3d (2.3 x 10^9 ft^3d) capacity. Since Daulatabad gas field is an old developed field it is indicated that the well head price is attractive resulting in a good price cost of gas delivered to Pakistan or India.

Asian Development Bank has recently decided to fund a fresh feasibility of this pipeline. The result of this study is expected by the middle of this year.

5.2 Iran-Pakistan Gas Pipeline

The second option is of gas import via onshore pipeline from Iran to Pakistan and its extension to India. This project has the least political/country risks because only Iran and Pakistan are involved and both have political stability and good relations. However, due to international sanctions on Iran, major investments may not get the backing of international financial institutions.

The project envisages a 1650 kilometer 1219 mm (48 inch) diameter pipeline with capacity of 85 x 10^6 m^3d (3 x 10^9 ft^3d). This capacity is obviously too much for Pakistan even in the year 2010 but could be cost-effective, if pipeline is extended to India.

The proven reserves of Iran are stated to be at 22.99 x 10^{12} m^3 (812 x 10^{12} ft^3) which makes such a pipeline, just a starting point from which other pipelines from Iran can be followed.

This project is agreeable to Pakistan subject to India's agreement/acceptance.

5.3 Qatar-Pakistan Offshore Pipeline

Qatar's North Field has proven reserves of 25.48 x 10^{12} m^3 (900 x 10^{12} ft^3) and very insignificant demand of its own. This project has been pursued by Crescent Petroleum Company of Sharjah for over a decade or even more.

The proposed pipeline is of 1117.6 mm (44 inch) diameter with a length of 1,650 Km (1025 miles). Initial flow rate is advised as 45.31 x 10^6 m^3d (1600 x 10^6 ft^3d) with ultimate capacity of 96.28 x 10^6 m^3d (3.4 x 10^9 ft^3d). The route is offshore which reduces some of the onshore route risks and maybe more acceptable to international financial institutions. This project has an additional advantage of injection of Iran gas when international sanctions are lifted.

Latest update from M/s. Crescent Petroleum of Sharjah are given below. The pipeline project is named Gulf-South Asia Gas Project (GUSA) and has following the technical features:

- Proven Gas Reservoir 25.48 x 10^{12} m^3 (900 x 10^{12} ft^3).

- Main Elements
  - GUSA Upstream Development in Qatar
  - Sale of liquid products to GUSA's account
  - Transfer lean gas to GUSA Pipeline
  - GUSA pipeline Qatar to Pakistan
  - Sale of gas to the Government of Pakistan
  - Potential for regional cooperation

- Main Technical Features
  - GUSA Upstream Development
    Offshore drilling & production facilities
    Sub-sea pipeline to Ras Laffan
    Onshore facilities to produce: Condensate, LPG, ethane, and 45.31 x 10^6 m^3d (1600 x 10^6 ft^3d) Lean gas for export

  - GUSA Pipeline

Outside diameter	1117.6 mm (44 inches)
Pipeline length	1650 Km (1025 miles)
Initial flow-rate	45.31 x 10^6 m^6d (1600 x 10^6 ft^3d)
Ultimate capacity	96.28 x 10^6 m^3d (3400 x 10^6 ft^3d)

  - Upstream Development at Qatar
    Currently, finalizing Development & Fiscal Agreement (DFA) (virtually complete)

  - Gas Sales Arrangements
    Updated MOU with Pakistan signed July 2000
    Currently negotiating Gas Sales Agreement (GSA)

  - Route Survey
    US$ 4 million contract completed
    Fugro (Holland) main contractor
    Environmental issues addressed
    Viable technical and commercial routes determined

  - Engineering Work for Pipeline
    Basic Engineering completed by Brown & Root
    Design of pipeline completed by Brown & Root

Figure 8

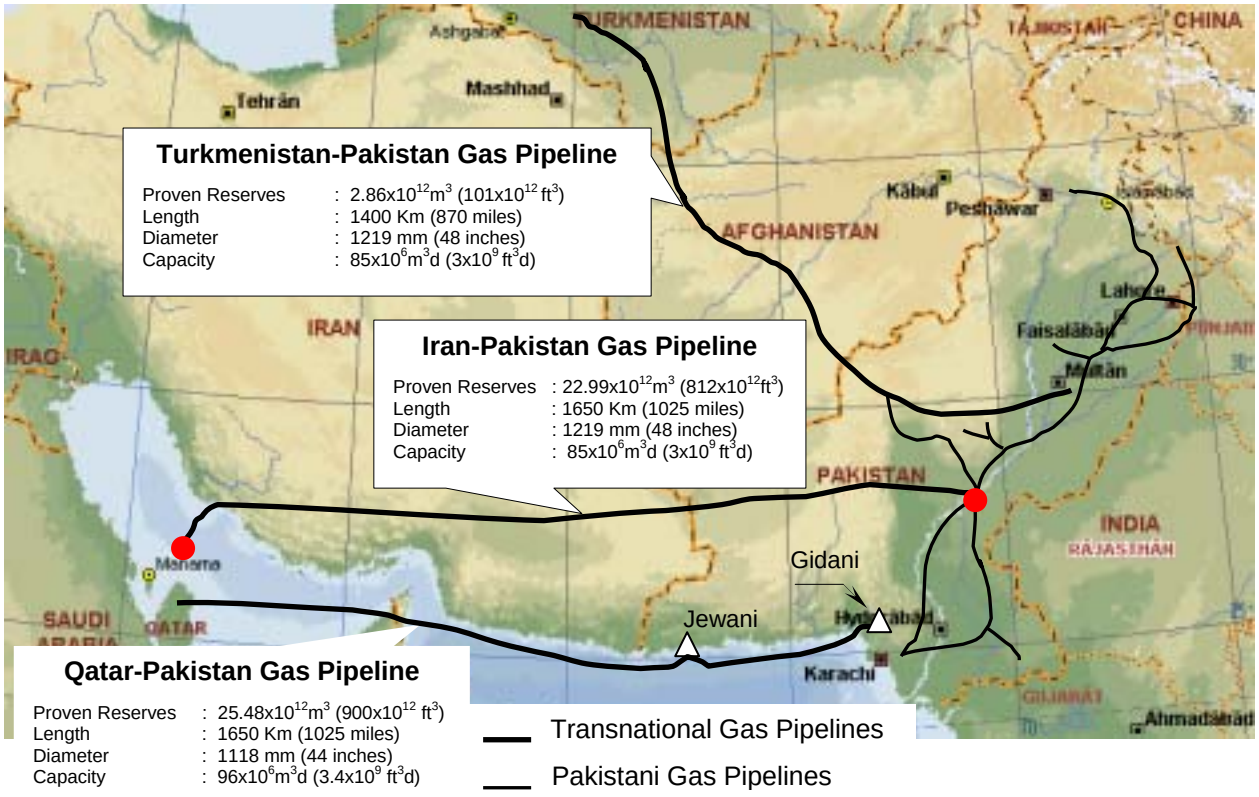


Figure 8: Three Transnational Gas Pipelines and Pakistani Gas infrastructure

This pipeline will involve agreements between Qatar, Iran, Pakistan and of course India. The complexity of the agreements increases due to four countries involved and hopefully, if this project is successful earlier than expected, then it would open the doors for the other two pipeline projects also.

5.4 The total proven reserves of Turkmenistan, Iran and Qatar add up to 51.34 x 10^{12} m^3 (1813 x 10^{12} ft^3) which amounts to 34% of the total world reserves. If the reserves of Russia, which are expensive to exploit, are taken out, then the figure goes up to 51%. This poses a challenge to the gas industry of the world, to get these reserves in production, to meet the growing needs of clean and low-cost energy, especially of this developing region.

6. PRICING POLICY

Pricing policies are critically important to a healthy development of the gas energy sector.

The gas industry was managed and controlled by Private Sector since its birth in 1952 till 1971 with the Government controlling primarily the purchase and sale price of gas. Even though the Government was controlling the sales and purchase price of gas, the operators/managers had incentives to perform to get higher returns by reducing capital, operating and maintenance costs. After nationalization, in 1971, the priorities changed.

The price of gas where economic value was highest viz. domestic consumer was subsidized and kept much below the price of other fuels. This was possible because the well head price of gas from Sui field from 1955 to 1981 ranged between Rs. 0.40 (US$0.11) to Rs. 0.74 (US$0.08) per 28.32 m^3 (1000 ft^3). The Table-1, below gives the price of gas versus other fuels.

Comparison of fuel prices in Pak Rupees and **US $** per 28.32 m^3 (1000 ft^3):

Table 1.

Year	Natural Gas			Fuel Oil	Kerosene Oil	LPG (In 11.8 Kg Cylinder)
	Domestic	Commercial	Industrial			
1955	**1.89**	**1.05**	**0.49**	**0.43**	**1.03**	-
	9.00	5.00	2.35	2.07	4.92	-
1970	**1.34**	**1.34**	**0.67**	**0.58**	**1.52**	-
	6.40	6.40	3.21	2.76	7.23	-
1980	**0.97**	**1.90**	**1.09**	**3.01**	**7.28**	-
	9.64	18.85	10.85	29.88	72.31	-
1990	**1.29**	**2.57**	**2.28**	**2.48**	**4.43**	-
	27.84	55.40	49.23	53.40	95.45	-
1995	**1.23**	**2.89**	**2.57**	**2.38**	**4.43**	**5.71**
	40.27	94.57	84.05	77.93	145.06	186.94
2001*	**1.32**	**2.93**	**2.45**	**4.96**	**7.80**	**7.20**
	78.08	173.68	144.96	294.11	462.00	426.00

*Average gas prices of SSGC system for general industries excludes Cement, Fertilizer, Pakistan Steel & Power. For Power the average rate was Rs.145.45 (US$2.45) per 28.32 m^3 (1000 ft^3) in 2001 which was increased to Rs.162.61 (US$ 2.74) in 2003. Gas for use as feed stock in manufacture of fertilizer is subsidized and so is Rs.36.00 (US$0.61) per 28.32 m^3 (1000 ft^3). The use of gas in Cement Plants is discouraged as coal can be used and resultantly it increased the cost of gas from Rs.155.73 (US$2.63) per 28.32 m^3 (1000 ft^3) in 2001 to Rs.182.66 (US$3.08) per 28.32 m^3 (1000 ft^3) in 2002.

As can be seen the prices of gas up to 1980 were kept so low that funds were not generated for enough investment in the exploration of new gas fields and the result was that reserves were depleting with very little additions.

The decision to select new areas for gas expansion is based on a simple formula which has been decided by the Government keeping in view the population density in the four provinces for increased gas connections and pressure from the less developed provinces. The criteria are as follows.

A survey was done of a number of areas where there is demand for gas from the constituencies. The capital cost of laying of distribution network is calculated and the figure of capital cost per household is estimated. The areas which meet the requirements, as detailed below, are then included in the distribution expansion plan.

For Province of Punjab & Sindh	Rs. 20,000 (US$338)
For Province of N.W.F.P.	Rs. 40,000 (US$675)
For Province of Balochistan	Rs.100, 000 (US$1688)

The economics of returns on investment is not calculated, nor there is a forecast as to how many households will apply for gas connections and for what period of time. Sometimes, even after ten years the density of connections remains below 50% to 70%.

The reason for the above policy is because the World Bank sets the loan covenants, whereby, the efficiency of gas operations is not a factor. The pricing mechanism to arrive at a gas price, which is mandated by a World Bank loan covenant, is that the gas companies should get 17.0% - 17.5% return on net assets after depreciations, irrespective of the profitability of additional investment sector-wise. This policy may have been good in the initial stage of the gas industry. However, it should have been abandoned 20 years or more ago. The negative aspects of this policy are as follows:

- Decisions for expansion of network were not based on economic justifications but political expediency. It would have been better if both could be taken into consideration.
- The formula for returns on net assets to pay back the loans resulted in over capitalizations.
- There was no incentive for efficiency and safety of operation. Companies had to keep on investing in system expansion irrespective of the financial viability.
- The aspects of maintenance of systems, human resource development, operational safety was made insignificant.
- The result is that today gas losses or unaccounted for gas (UFG) has reached a figure of 6% to 8%.

The Government of Pakistan is looking into the pricing policy through the newly established Oil & Gas Regulatory Authority. It is expected that the old formula of pricing will be modified and improved to create incentives for efficient operations and disincentives for poor operations.

One of the main focuses is on how to reduce the UFG.

The pricing policy must always be based on economies, in order for it to be viable and self-sustaining. Any uneconomic expansion needs to be priced and clearly shown as subsidy in the balance sheet of a company. Such a formula is best for the healthy growth of company to provide the facility equitably to a maximum number of citizens at the minimum of cost.

With the rapid expansion of gas system, it becomes more and more difficult to rationalize and optimize. It is best to make a start on a sound footing i.e. prices of gas must be fixed keeping in view the relationship of alternate fuels like Kerosene, LPG and Furnace Oil, from the very beginning. In the absence of this approach, the long-term development of such industry suffers, which in turn results in large percentage of the population using more expensive fuels like Kerosene and LPG and is, thereby, deprived of this convenient, reliable and clean fuel.

7. OIL & GAS REGULATORY AUTHORITY (OGRA)

Over twelve years ago, the Government of Pakistan realized that it is essential to privatize and de-regulate the oil and gas industry. However, due to six changes in the government between 1990 and 2000, the goal of privatization of gas industry could not be achieved.

One of the main reasons, for lack of interest by foreign investors, was the absence of clear rules and regulations and no neutral institutions like the Oil & Gas Regulatory Authority (OGRA) which presently regulates the business on clearly defined rules in a transparent way.

Efforts to establish OGRA did not succeed for various political and administrative reasons. Finally, the Oil & Gas Regulatory Authority Ordinance 2002 was issued in March, 2002.

OGRA is headed by a Chairman with one Member each for Gas, Oil and Finance, who are appointed by the Federal Government, through a competitive process. Administratively, OGRA has been placed under the Ministry of Law, Justice, and Human Rights & Parliamentary Affairs.

OGRA has notified Natural Gas Licensing Rules in February, 2002 and Tariff Rules in November, 2002.

Initially, OGRA will be performing the functions which were performed by the Ministry of Petroleum and Natural Resources, Government of Pakistan, with the main difference, that now there will be public hearing on any or all issues related to the regulation of the gas industry.

One key aspect which is being looked into by OGRA is to prescribe uniform terms of accounts and accounting practices.

A new authority such as OGRA has to climb a learning curve. It would take three to five years before rules are fine tuned, modified, improved so that equal weighting is given to all aspects of gas business vis a vis:

- Interest of stake-holders without which additional investment will not come
- Interest of consumers without which healthy growth of gas industry is not possible
- Safety of operations as an essential criterion without which regulatory function would be ineffective and could cause serious problems
- Efficiency of operations

If OGRA starts to micro-manage the gas industry, there will be no improvement from the past. At the same time, proper guidelines need to be clearly defined.

Lessons learned from experience are that OGRA should have been operative in 1970 or even earlier in Pakistan rather than nationalization of the gas industry.

8. PRIVATIZATION

The gas industry of Pakistan started in the Private Sector in 1952. The development and expansion of the industry was a model for other utilities like electricity, water and telephones which were Government-owned and operated.

The difference in quality of service, efficiency of operation and all aspects of safety was far superior to the Government-run utilities.

As a Private Sector industry, major emphasis was on the following:

- Service
- Prices based on market conditions
- Staffing and selection for company's needs and abilities of individuals
- Training of the technical and management staff
- High level of operation and maintenance quality
- Controls on cost elements
- Maximizing sale of gas from existing pipelines for better utilization of investments in pipeline capacity

Although the Government of Pakistan was controlling sale and purchase price of gas, even then the Managing Agents had incentives to perform, to get higher returns by reducing capital, operating and maintenance costs.

After nationalization in1971, the priorities changed and emphasis shifted as follows:

- Very high emphasis on providing gas to maximum number of domestic consumers irrespective of the economics
- Decisions as to where to extend the gas mains and which areas to be supplied were taken by GOP, who were now the owners, on political grounds.
- Domestic gas prices were kept very low and subsidized due to unfounded reactions expected from consumers against the GOP.
- Staffing and selection criteria were diluted and were no longer on competence and need of the country but to provide jobs.
- Because of the above, quality of operations and maintenance suffered.
- Human Resources Development was neglected. No institution like a Gas Institute was developed to support R&D and long-term energy planning, on national basis.
- Planning of long-term supply/demand and optimization of fuel prices was neglected.

Along with the increase of gas consumers, there was a great reluctance to increase gas prices.

As can be seen from the pricing history, the pricing and expansion policies were distorted.

The Government's efforts to improve the performance of the gas industry could not succeed due to inherent problem of the nationalized industry, that is the ownership and regulatory authority was vested in one organization. Attempts at privatization failed, because neither the governments nor the organizations were interested in the privatization, having adverse impact on the owners and operators. Efforts are still continuing. The negative effect of the threat of privatization for over fifteen years has been that owners and operators are not making long-term plans and so the industry is suffering which is reflected in the share prices.

The Government of Pakistan has realized that in order to get good value for its shares in privatization, improvement needs to be made. So in the last thee years Boards of Directors has been given additional authority and management changes are being made on a professional basis. However, the absence of private ownership, with directors responsible to shareholders rather than Government, is still an impediment.

Although the increase in UFG seems to have been stopped, it is still a very difficult battle to win, as it involves all aspects of gas industry management. The figure of 6 to 8% is still being talked about. In 1980, the UFG of Karachi Gas Co. Ltd under private management was below 1%.

9. CONCLUSION

The management and operation of gas utility industry has undergone a quantum jump in the last ten to fifteen years.

Privatization of the industry, allowing use of gaslines as common carriers, sub-contracting of functions like meter reading, billing etc, has transformed the industry from a monopoly, controlled and operated by the Government, into a reasonably competitive industry.

The benefits of competition are being reaped by investors, customers as well as the Government.

In order to achieve full benefits, the gas industry needs to be broken up into economic but competitive units and gas producers should be allowed to use pipelines as common carriers. A gas regulatory authority to monitor and regulate such privatized utility should be manned by specialists with experience and qualifications. The body would need economists, engineers, lawyers, information technologist and gas operation experts.

There is a need for benchmarking and monitoring the gas regulatory function, with respect to the results, in terms of reducing the net gas prices to customers, increase of returns to investors and increase of royalties/taxes to the Government.

The historical data of Pakistan's gas industry and its analysis should provide some guidance to upcoming gas industries in the world, especially in developing economies.

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