RELATIONSHIP BETWEEN PRODUCER GAS PRICE AND RESERVES

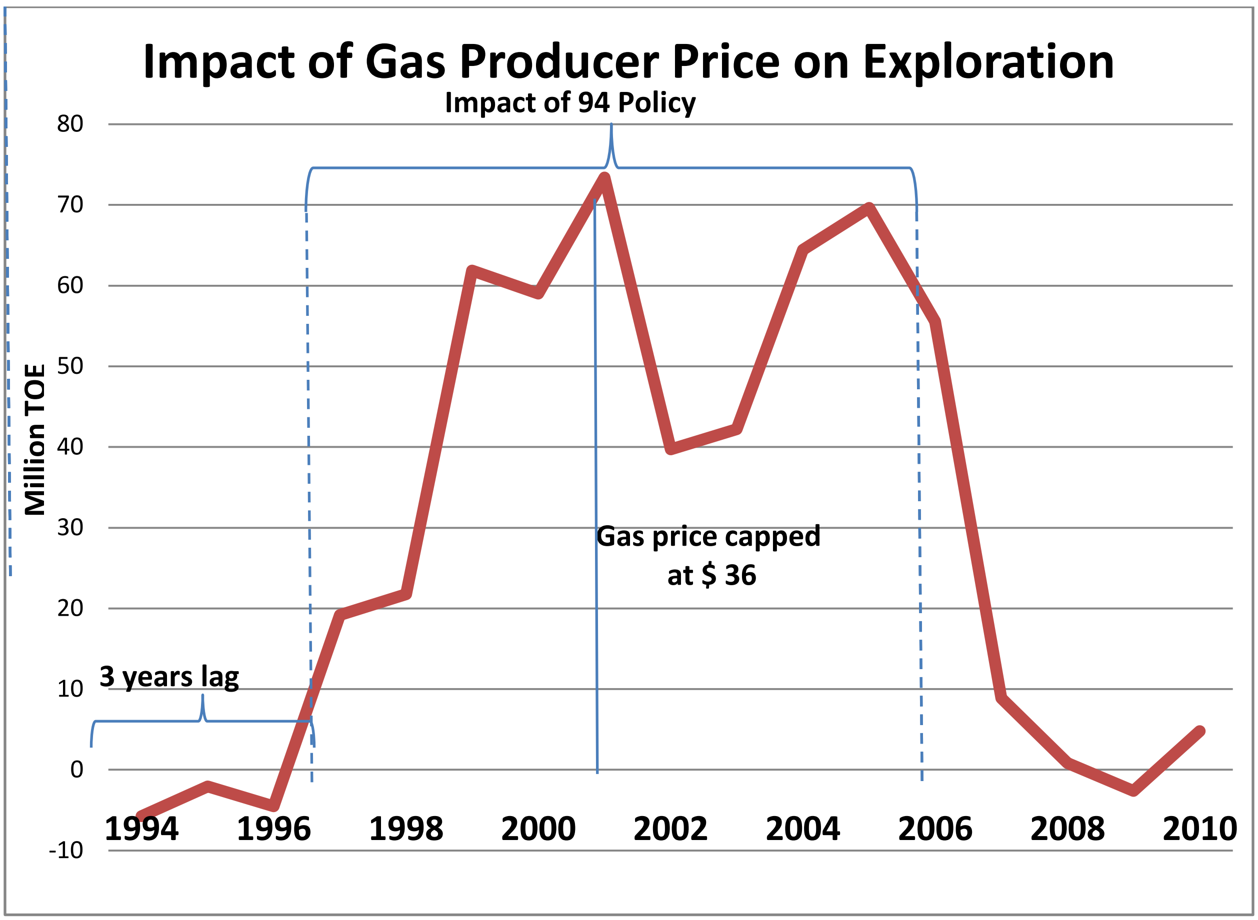
By
Faisal Jamil, Energy Specialist (Economics)

Pakistan heavily relies on gas for its energy requirements. The new discoveries of natural gas do not keep pace with the consumption and the result is depleting recoverable reserves. The exploration activity is further slowed down in recent years due to unfavorable gas producer prices. Ministry of Petroleum and Natural Resources announces petroleum policy that sets well-head gas producer prices in the country by indexing it with the international crude oil price.

The government introduced the first petroleum policy in 1991 which was of rudimentary nature and linked gas pricing with the fuel oil. This could not attract new investment. This was followed by successive petroleum policies of 1993, 1994, 1997, 2001, 2007 and 2009 with different packages of incentives and economic terms. Petroleum Policy 1994 links the gas price with the crude and applied proportional discount rates for the three zones. The Policy 1997 preserves the provisions of the 1994 policy with respect to onshore areas and introduced a new offshore package of terms based on production sharing arrangements (PSA). The empirical evidence shows that 1994/1997 policies stimulate E&P activity, which is evident from incremental gas reserves in Pakistan.

Generally, the impact of policy on the reserves is materialized with a lag of 3 years. Figure 1 showing 3-years moving average of recoverable reserves indicates that the reserves start elevating in 1997. A significant number of well known international oil and gas operators moved in, and their efforts have met with a high degree of success. These operators include BP Amoco and Premier from the United Kingdom, BHP from Australia, China Oil from China, OMV from Austria, Petronas from Malaysia, MOL from Hungary and Shell Oil from the Netherlands.

Petroleum Policy 2001 introduced another pricing regime where crude price was capped at $36 per bbl and progressive discount rates. It was then followed by policy 2007 and 2009. The impact of this policy regime can be seen by weakening reserves of gas (Figure 1). In 2007 and 2009 policies, the cap was increased to $45 and $100 respectively even then, these policies could not reverse the declining trend.



Keeping in view the numerous risk considerations in the upstream oil and gas exploration, the government has to design its fiscal system carefully to strike a balance between its own objectives vis-à-vis taking into account the risks assumed by exploration and production (E&P) companies.

Generally, government has objectives such as to increase indigenous oil and gas reserves, access to modern technology and foreign investments, ensure employment of its nationals and improve profit orientation in exploration activities, etc. To meet these objectives, government endeavors to maximize its share through a wide variety of mechanisms such as taxes, royalties, trainings and bonuses. The E&P companies' objectives are complementary in that by discovering the hydrocarbon reserves and producing from them at lower cost and the highest profit margin they can build equity and maximize shareholders' wealth. Generally government and E&P companies negotiate their interests through concession and contractual arrangements. Therefore, a pragmatic petroleum policy is essential to attract adequate amounts of investment in upstream sector.

The petroleum policy 2009 with crude oil capped at $100 and soft price curve with high discount rates for incremental blocks results in price of gas hover around $4-4.5 per MMBTU. This gas price indexation is not attractive to investors relative to options in countries competing for investment. There is a need to identify the opportunity cost of reduced exploration and discoveries in the country as given in Table. Conventional natural gas at well head is priced quite low resulting in lesser and lesser explorations over the years.

Alternative options and corresponding costs

Source	**$per MMBTU**
Crude Oil	17-18
LNG Import	15-17
Pipeline Import	11-12
Tight Gas	6-7.5
Current Producer Gas Price	4-4.5

Table shows that switching back to oil (imported for the most of instances) is the most expensive option followed by LNG import and Iran-Pakistan (IP) pipeline. The domestic exploration and production of conventional or tight gas are relatively inexpensive. Moreover, the government takes almost 40% of companies' revenues from sale of gas in the form of levies associated with commercial production.

It is worthwhile to mention that an increase in producer price level announced now will motivate exploration activity right away whereas, the impact of price increase on the consumers will occur with a lag of about 2-3 years. Furthermore, many social and economic benefits will accrue from increased exploration activity and saving of hard cash. Thus, the opportunity cost of lowering gas reserves in terms of price of alternatives is much higher, which eventually be borne by the end users.

The bottom line is;

- Increase in domestic gas reserves is economically most viable option of increasing gas supplies
- A pragmatic gas pricing is most robust instrument in stimulating exploration and development of domestic gas.

EMPIRICAL ANALYSIS

For the sake of empirical analysis, regression models for four different dependent variables are considered. Crude price (average of Brent, WTI, Dubai, and Nigerian crude prices) and actualized gas producer price are used as explanatory variables. The models regress E&P activity proxied by wells drilled and number of producing gas wells, on crude prices (lag 1) and gas prices (lag 3). The results of dynamic regression models are presented at Table below. Equation 1 shows that elasticity of total wells drill with respect to gas price is 0.68 showing that 1% increase in gas price raises the total wells drilled by 0.68%. In Equation 2, exploratory wells are regressed on same set of explanatory variables. Here, the elasticity estimates are slightly lower relative to Equation 1 but gas price elasticity is statistically insignificant. Equation 3 models number of development wells as a function of gas and crude price. The results shows that development wells drilling is perfectly elastic to gas price, which implies that a unit change in gas price will raise development wells drilled by 100%.

Furthermore, we run a regression with number of gas wells on same set of explanatory variables. The gas price elasticity of number of gas wells is 0.34, whereas crude price elasticity is 0.44. All the estimated equations perform well statistically with the exception of Equation 2 where R^2 and F-Stat are quite low indicating model fits the data poorly. The results indicate that gas well head price has significant and rather high effects on E&P activities in the country.

Estimation Results of Regression Models

Eq. #	Dependent Variables	Constant	Producer Price of Gas (Lag 3)	Crude Oil Price (Lag 1)	Statistics
1	Total Wells Drilled	1.70 (4.18)	0.68 (3.06)	0.46 (5.13)	R^2=0.85 F-Stat.= 20.13 DW= 1.87
2	Exploratory Wells Drilled	1.80 (2.90)	0.47 (0.92)	0.26 (2.20)	R^2=0.33 F-Stat.= 1.77 DW= 2.04
3	Development Wells Drilled	0.42 (0.78)	1.00 (2.85)	0.57 (4.94)	R^2=0.80 F.Stat = 15.16 DW = 1.99
4	Cumulative No. of Producing Gas wells	2.58 (11.09)	0.34 (1.78)	0.44 (9.30)	R^2=0.88 F-Stat.= 45.98 DW= 1.56