Emerging Issues in the Indian Gas Sector: A Critical Review

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1. Introduction

The Government of India (GoI) introduced the New Exploration and Licensing Policy (NELP) about 8 years ago to spur exploration and development in oil and natural gas. Since then, significant gas finds have been found off the Indian shore, thus achieving NELP's goals and also helping to move India towards self-sufficiency in natural gas. While this is a very positive development of the NELP regime, there are also some concerns regarding utilization, pricing and policy issues surrounding NELP and gas finds under it.

This paper gives an overview of the natural gas sector in India including the NELP regime, and then critically examines it from different perspectives such as supply-demand situation, pricing, market structure, and policy/governance issues. Based on the study, it provides suggestions for mid-course correction.

2. Background

2.1 Importance of natural gas

Though the earliest discovery of natural gas in India dates to the late 19th century, its commercial use only began in the 1970s, following the discovery of the Mumbai High oil and gas field. Initially, the dominant use of natural gas in India was as feedstock to the fertilizer industry. However, according to data from the Ministry of Petroleum and Natural Gas (MoPNG), the power industry consumed about 32.5 million cu m of gas per day (mmscmd), i.e. about 38%, while the fertilizer industry consumed about 21 mmscmd (about 25%)[1] of gas in 2005-06.

Given the energy-hungry economic growth of the country, gas can form up to 22% of the total energy basket by the year 2031-32 [KPMG 2007]. The Planning Commission [Planning Commission 2006] estimates that *all* of India's urea-based fertilizer would be gas based in 2031-32. Therefore, it is an important fuel from the point of view of energy and food security of the nation.

Natural gas is also a 'clean' fossil fuel because it burns relatively cleanly and emits only about 50% of carbon dioxide compared to coal for generation of a unit of electricity. So, it also has an important role to play in light of increasing concerns about the environment and climate change. It is also a versatile fuel that can be conveniently and economically used for many other applications such as domestic usage, fuel for transport, petrochemical industry and powering small to very large power plants. Moreover, the quantum of gas finds from the first three rounds of New Exploration and Licensing Policy (NELP) can supply about 77 billion cubic metres (BCM) of gas per year, which is equivalent to about 50% of our oil consumption and about 72% of our net import of crude and petroleum products in 2006-07.

It is evident from the above that policies or decisions regarding natural gas are likely to have a significant impact on the country's energy security, food security, industrial development and environment.

2.2 Pre-NELP gas regime

In the early 1990's, the natural gas economy in India was a tightly controlled one. Under this regime, the government decided what price the gas producer would get, the

[1] Excludes off-take by some city gas networks.

price that can be charged for transmission and the profits that various players could make. Gas was produced by public sector organizations such as ONGC and OIL, while another public sector organization (GAIL) transported and marketed it. Long term gas sale-purchase agreements were signed between GAIL and consumers of gas at prices administered by the Government. Since gas supply was lower than the demand, an inter-ministerial Gas Linkage Committee was responsible for deciding how much gas would be allocated to different customers.

In the early to mid 90's, the Government of India adopted some initiatives to spur exploration of new oil and gas fields in the country. As part of this exercise, it invited private players into the exploration field and appointed a committee led by Mr. T. L. Sankar to recommend a pricing strategy for gas. In view of the then perceived shortage of domestic gas and the need to import gas as LNG and/or through pipelines, the Sankar committee recommended that for the period 1996 – 2002, gas producers be paid on a cost-plus basis while the consumer prices be gradually increased so that it reaches import parity levels by 2002 [Sankar 1996]. However, due to a sharp increase in international prices, the goal of achieving import parity by 2002 was not achieved.

Currently, the supply of natural gas comes from three main sources: gas produced by the national oil companies (NOCs), gas produced by private or joint venture companies (JVs), and imported LNG. While talks are on to import gas through pipelines from sources such as Iran and Myanmar, they have not been realized yet. The average gas supply in 2006-2007 was about 84.9 mmscmd[2] out of which the NOCs supplied about 65%, private producers supplied 21% and imported LNG was about 14%.

Figure 1 shows the consumer price of gas from the 1998 to 2006 under the administered pricing regime (APM), assuming a constant exchange rate of Rs. 41 / US dollar[3]. During this period, gas from the private (JV) fields was available at a non-APM price ranging from about $2.1/mmbtu (million British Thermal Units) to $4.5/mmbtu, resulting in dual pricing.

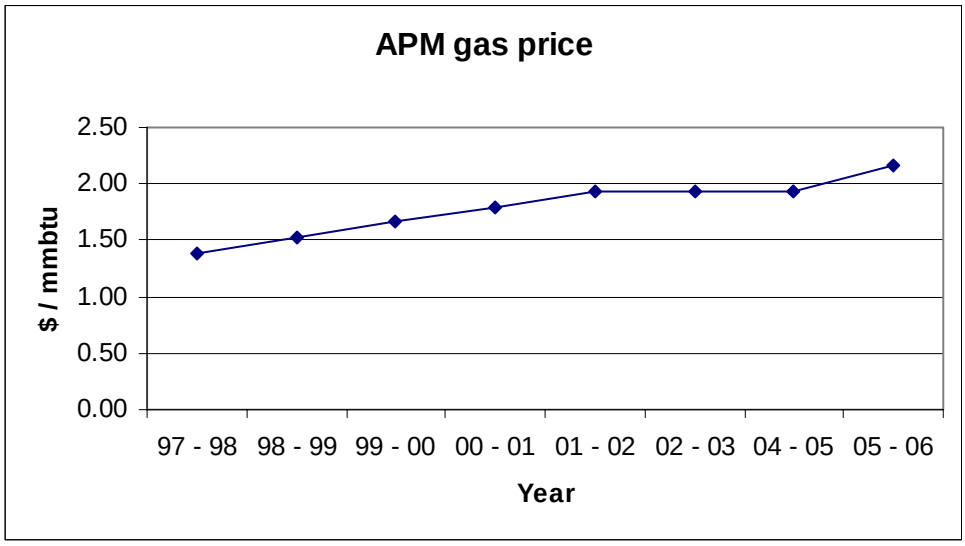

Figure 1: APM consumer price of gas[4]

[2] This works out to about 31 BCM.

[3] This exchange rate is assumed only to enable comparisons with current prices which are quoted as $/mmbtu. Prices in the pre-NELP regime were quoted as Rs./thousand cu m., with the price from 2001 – 05 being Rs. 2850/thousand cu m. These prices are not for the north-east of India, which had special rates.

[4] [Sankar 1996] and www.infraline.com

2.3 The NELP regime

The New Exploration and Licensing Policy (NELP) was proposed in 1997 and the first blocks were offered for exploration to private parties in 1999 – 2000. This was an extension of the policy used to invite private players to fields such as Panna-Mukta and Ravva. The idea behind NELP was two-fold: to explore vast regions of the country (and its offshore) that had been unexplored and, to increase domestic production of oil and gas in view of the rising demand-supply gap and import dependence.

Under this scheme, the government offered specific onshore, offshore and deepwater blocks to exploration companies (or consortia) based on a bidding process. These consortia could not only involve private but also foreign companies. The primary incentive for the bidders was that the discovered gas would not be sold at APM prices, but at 'arms-length determined' prices, which would enable the contractor to recover the investment and make a good return on the investment.

The bids were based on a 'model production sharing contract' (MPSC) that stipulated the responsibilities of the contractor and the government respectively. The contractor would then bid for block(s) by presenting its credentials, submitting a work programme (that outlined the timeframes and details of different phases of exploration and development) and declaring how it would share its profit with the government. These bids were then evaluated using different weightages for the different components such as technical ability, fiscal package and work programme, and the highest bidder won the contract for a block. The MPSC filled with details of the winning bid would become the Production Sharing Contract (PSC) between the government and the contractor. We outline some of the important features of the PSC and bid evaluation below:

1. The PSC itself has evolved over the six rounds of NELP bidding so far. In particular, some important aspects of bid evaluation have changed as described later.

2. One of the critical sections of the PSC is the one that details how profit would be shared between the contractor and the government. It describes the notion of 'profit petroleum', which is the surplus obtained from the sale of gas in a year after recovering operating and exploration costs, and government taxes and royalty together described as 'cost petroleum'. The profit petroleum expressed as a multiple of the capital investment by the contractor is called the 'investment multiple', and the profit petroleum is shared between the government and the contractor in different ratios at different investment multiples as given in the winning bid.

3. The PSC requires the constitution of a management committee (MC) consisting of representatives from the government and the contractor, who would be entitled to take many decisions regarding exploration, development and production.

4. The PSC stipulates certain maximum timeframes available to the contractor for different exploration phases. It also stipulates the extent of area the contractor has to relinquish after each exploration phase, in case it is not successful in finding oil or gas. It also provides certain extenuating circumstances under which the relinquishment can be deferred and procedures for doing so.

5. The PSC describes the procedures to be followed if the contractor finds a reserve of oil or gas regarding how it should be exploited further.

6. The PSC stipulates that the government can take its share of the profit in either cash or kind, though it does not specify details of how and where the profit gas would be delivered, if it were taken in kind.

7. The bids for NELP are evaluated in a single-step, i.e. there is no separate technical evaluation and short-listing followed by a financial evaluation, unlike usual bidding processes. The importance given to the different components of the bid has varied over the 6 rounds of NELP as given in Table 1, taken from a Director General of Hydrocarbons (DGH) presentation. NELP VI classified blocks as lower risk or higher risk blocks, indicated as Types A and B respectively.

Criterion	NELP II, III	NELP IV, V		NELP VI			
		Onland, shallow	Deepwater	Onland, shallow		Deepwater	
				Type A	Type B	Type A	Type B
Technical ability	6	6	9	15	15	20	20
Financial ability	4	4	6				
Work programme	60	60	55	25	35	20	30
Fiscal package	30	30	30	60	50	60	50
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Table 1: Bid evaluation criteria across NELPs

The authors do not have the bid evaluation criteria for NELP I. In fact, the names of bidders, their bids, the marks obtained and other such information is not available in the public domain, and only limited information is available through commercial databases. As can be seen from Table 1, technical and financial abilities, which are fairly subjective criteria, receive significant weightages in NELP VI (15 – 20%). Moreover, initial rounds of NELP had a very low weightage for the fiscal package and a very high weightage for the work programme but these have changed dramatically in NELP VI.

3. Exploration and finds under NELP

The first round of bidding for NELP blocks took place in 1999, and there have been six rounds of NELP blocks that have been auctioned thus far, with the seventh round of NELP bidding reportedly planned in November 2007.

3.1 Exploration

Over the first six rounds of NELP, PSCs for 161 blocks covering an area of over 1.3 million sq km. have been signed. These include onshore, offshore and deepwater blocks. While 18 contractors won blocks across these 6 rounds, two of them – ONGC and RIL[5] – won about 87% of the acreage and 71% of the blocks between them, while all the other contractors put together won just 13% of the acreage.

Given that the focus of this article is natural gas, and that about 98% of the gas finds have been in deepwater blocks, we shall restrict our attention in this paper to deepwater exploration and finds. Deepwater blocks are inherently more difficult to explore but have yielded the bulk of the gas finds in India. As shown in Figure 2, the dominance of the two major players only increases if we focus on deepwater blocks. Out of a total of about 832000 sq km, RIL has acreage of about 41% (337000 sq km), ONGC has about 55% (456000 sq km) and others have just about 4% (39000 sq km). Thus, just two contractors have won about 96% of deepwater blocks.

[5] Throughout this article, our references to ONGC, RIL and other organizations also include consortia led by these organizations.

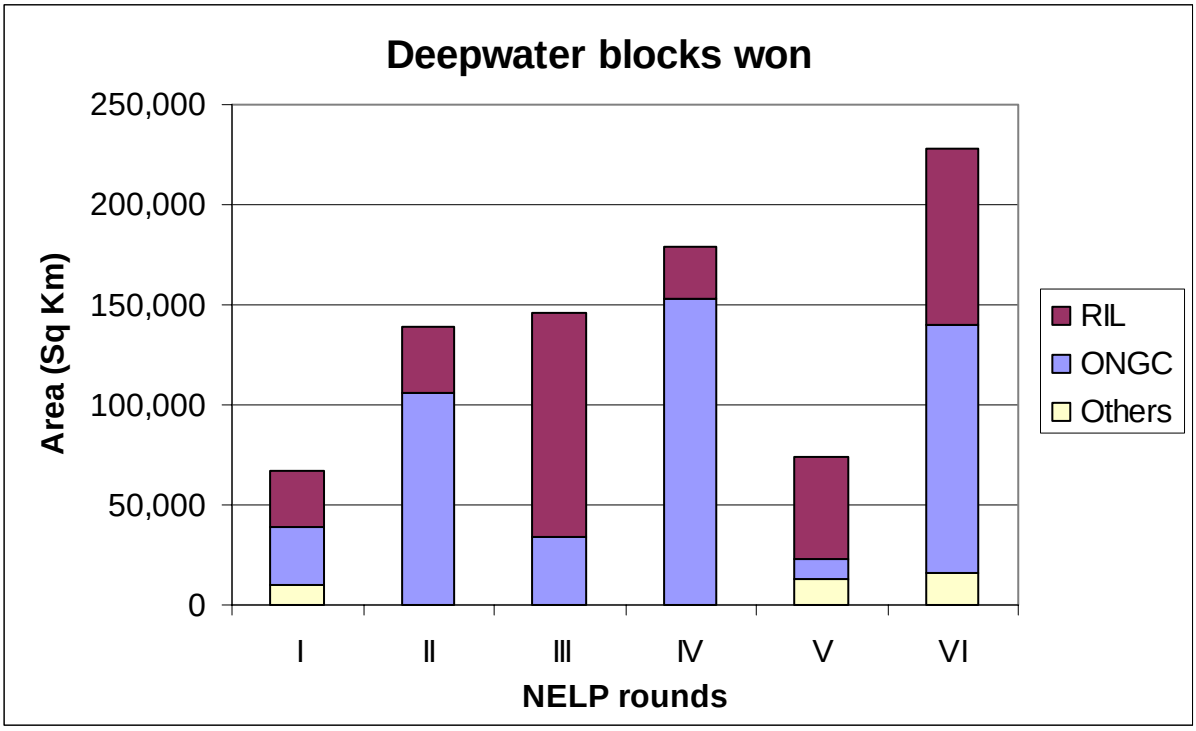

Figure 2: Summary of deepwater acreages won in NELPs I - VI[6]

3.2 Gas finds

How successful have different contractors been in finding gas under NELP? All the gas finds so far have been from NELP rounds I – III. Therefore, in this section we only consider deepwater blocks from the first 3 rounds of NELP during which 352446 sq km of deepwater blocks were auctioned. Three players, RIL, ONGC, and Cairn Energy, won the bids in these 3 rounds and, as shown in the first column of Figure 3, the duopoly of ONGC and RIL was prominent as they won 97% acreage from these blocks, with RIL winning about 45% and ONGC 52%.

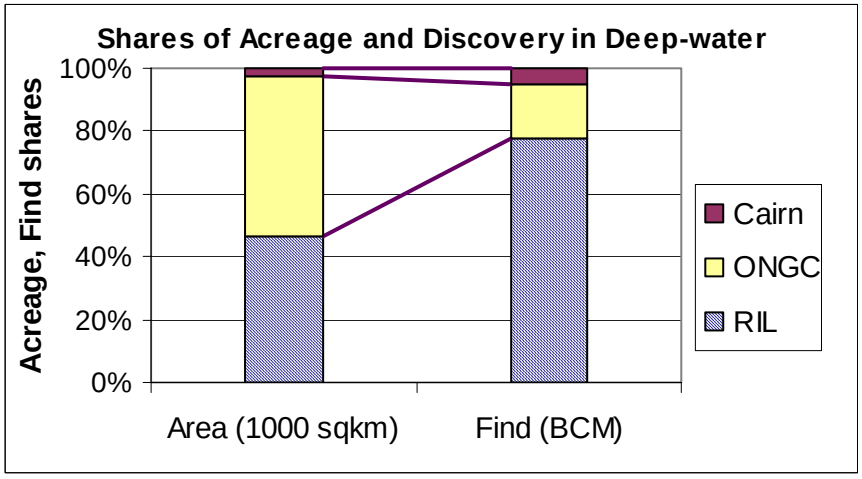

Figure 3: Relative shares of acreages and finds in NELPs I - III[7]

Reliable data on gas finds is hard to get for recent finds compelling us to rely on media reports for some of this analysis. This is particularly true for ONGC finds, hence these numbers should be considered tentative. The approximate quanta of reserves found by

[6] www.infraline.com
[7] Various media reports and MoPNG data.

the three players are indicated in Table 2. The second column of Figure 3 depicts the percentage of finds by the different contractors.

Operator	Find (BCM)
Cairn	60
RIL	900
ONGC	200
Total	**1160**

Table 2: Gas finds in NELPs I - III

This results in the following observations:

1. RIL has found about 78% of the gas found under NELP so far.
2. If one compares the 'effectiveness' of different contractors in finding gas, i.e. the number of BCM of gas found per 1000 sq km of area explored, it turns out that Cairn Energy was the most effective finding almost 6.7 BCM of gas per 1000 sq km, while RIL found 5.5 BCM per 1000 sq km. As against this, ONGC found just 1.1 BCM of gas per 1000 sq km. So, Cairn Energy was about 6 times as effective as ONGC and RIL was about 5 times as effective. This is so in spite of RIL and ONGC having roughly equal acreages in the fertile KG and Cauvery basins. It follows that either ONGC's blocks are less rich in hydrocarbons than RIL's or ONGC's exploration approach is not as sound as RIL's or both.

4. Impact on supply

What is the impact of the recent large gas finds on the gas supply situation? We assume that the supply in 2011-12 will be from currently operative gas fields and the gas finds announced so far. By 2011-12, the supply from the old fields of the NOCs is likely to be about 51 mmscmd. Given the 1160 BCM of finds by Cairn, RIL and ONGC, and assuming a 15 year life for the gas fields, supply from these fields would be about 212 mmscmd in 2011-12, making the total supply available 262 mmscmd.

For 2016-17, we assume that the fields of 2011-12 would be producing at 90% of their 2011-12 rate (to account for any degradations), and supplies from the NELP IV – VI finds would be available. For the blocks of NELP IV – VI, we consider two scenarios of finding gas, both of which are pessimistic in that they assume that gas would be found only at half the rate it is found in rounds I - III. The first or 'equal effectiveness' scenario assumes that all contractors would find gas proportional to the acreage won by them, unlike the experience in the first three rounds. The second or 'current effectiveness' scenario assumes that the three players would find gas at half their current effectiveness rates, i.e. Others would find 3.35 BCM / 1000 sq km, RIL would find 2.75 BCM / 1000 sq km and ONGC would find 0.55 BCM / 1000 sq km. Table 3 summarizes the gas supply in 2016-17 under both these scenarios, which is significantly different from what was anticipated earlier.

Scenario	NELP IV – VI finds (BCM)	Additional supply from NELP IV – VI (mmscmd)	Total supply (mmscmd)
Equal effectiveness	790.25	144.34	**380.92**
Current effectiveness	710.22	129.72	**366.31**

Table 3: Estimated gas supplies in 2016-17

It is also interesting to study how the different contractors will stack up in terms of gas supply. Note that, as we are considering only deepwater blocks, these projections do not consider RIL's gas finds in the shallow basin off the North East coast where the estimated reserves recently went up from about 28BCM to 90BCM[8]. Figures 4 and 5

[8] The Hindu Business Line, 4th August 2007.

estimate how the gas supplier situation would look in 2011-12 and 2016-17 compared to 2005-06. Note that these figures do not include (R)LNG, which was to the tune of about 12 mmscmd in 2005-06. Figure 4 presents the projections under the equal effectiveness scenario and Figure 5 presents the projections under the current effectiveness scenario.

Given the duopoly in exploration, it is not surprising that RIL and ONGC also dominate the supply situation. In 2011-12, RIL would be the pre-dominant supplier of gas with more than 60% share, while the share of NOCs will be down to 33% from 75%. In 2016-17, RIL would have about 52% of the share and NOCs about 43% (with 31% coming from NELP fields and only 12% from APM fields) in the equal effectiveness scenario (Figure 4), while in the current effectiveness scenario, RIL would have 63% share and NOCs would have only about 30% (Figure 5).

So, in both scenarios, RIL will be the single largest supplier with more than half the market share, and practically the entire market would be divided between two organizations, namely RIL and ONGC.

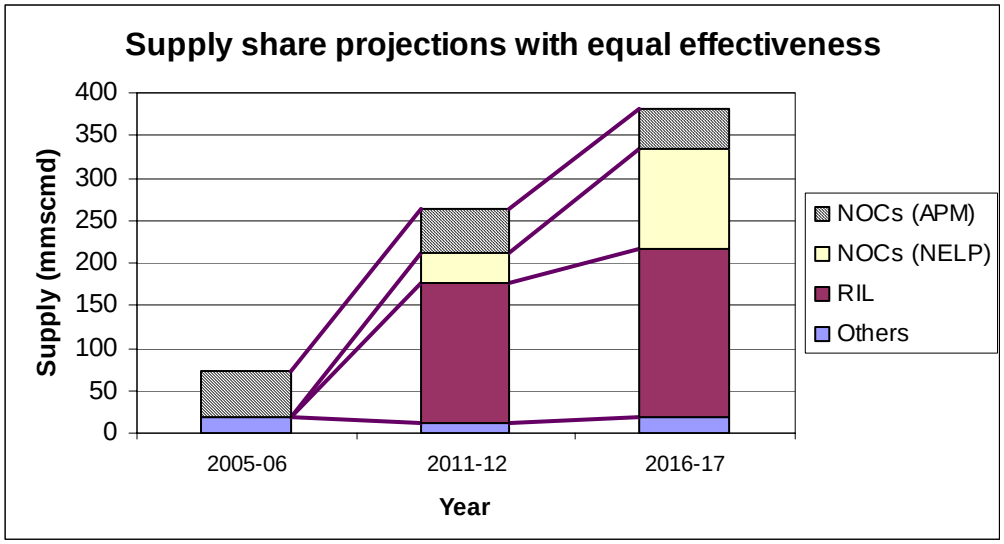

Figure 4: Supply projections at equal effectiveness

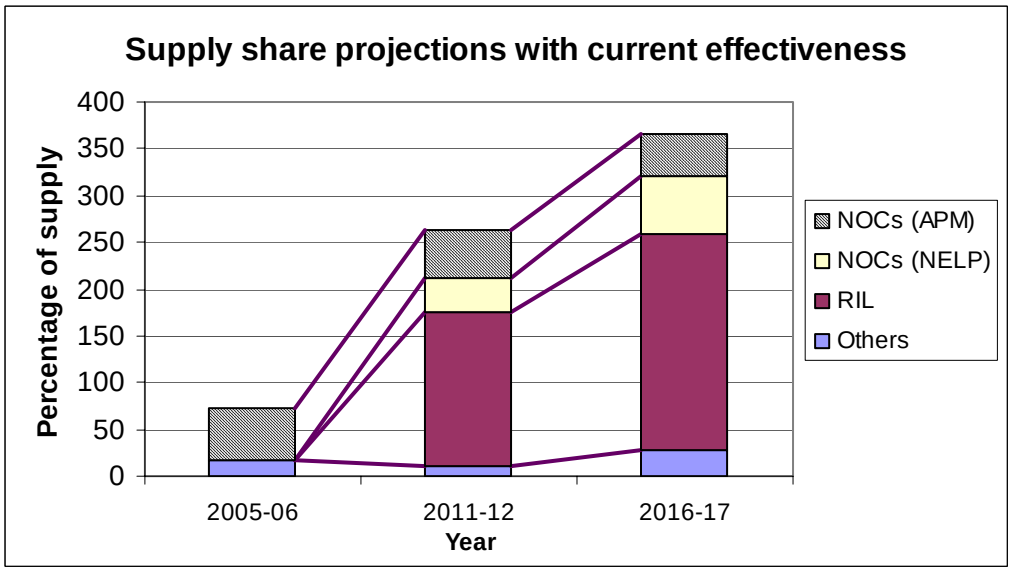

Figure 5: Supply projections at current effectiveness

5. Gas demand

In economics, 'demand' for any product is defined as likely off-take backed by purchasing power. Hence, there is an intrinsic relationship between demand and price. Unfortunately, the word is often used very loosely in different studies, leading to widely varying demand figures without a proper explanation for the variation. For example, Figure 6 shows the projected demands for gas in 2011-12 according to different studies. The first column represents the demand as projected in [WorkingGroupPNG 2006], a report prepared by MoPNG. The second and third columns represent the demand as projected in the Hydrocarbon Vision 2025 report [HV2025 1999] at two different prices of gas in $/mmbtu. The third and fourth columns represent the projections in the Integrated Energy Policy [Planning Commission 2006] at two different rates of GDP growth.

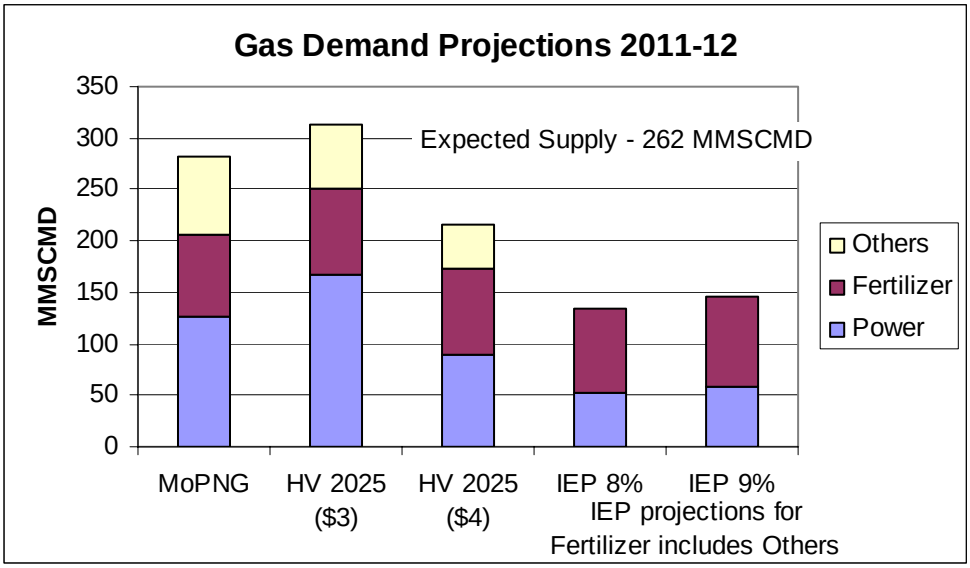

Figure 6: Different projected demands in 2011-12

As is obvious, there is a huge difference between the projections even for the near future, with the difference being about 180mmscmd (nearly double the current supply of gas) between the highest and the lowest projections. Further, these projections, with the exception of [HV2025 99], do not consider the price sensitivity of the demand at all! However, as discussed below and stated in a presentation by Prof. David Victor on expanding gas markets in India (April 2006), gas demand is very sensitive to gas prices.

But before addressing price sensitivity, let us analyse a few other issues in the demand projections. [WorkingGroupPNG 2006] projects a demand of about 126 mmscmd for the power sector in 2011-12, which translates to about 32000MW. This is surprisingly very different from the projections in [WorkingGroupPower 2007] made by the working group on power and led by the Ministry of Power, which estimates a gas-based power capacity of about 13000MW (representing a capacity addition of just 2114MW) and a gas demand of 89 mmscmd by 2011-12. This indicates a lack of communication between different ministries concerned with energy!

The projections have also not given due weightage to the likely impact of other applications such as usage of CNG for transport and gas for combined heating and power (CHP) plants, in light of increased gas finds. Both these applications are highly desirable as they represent a much more efficient use of gas[9]. If these applications take off, it would lead to an increase in demand for city gas and sizeable decrease in power sector demand for gas. Similarly, if the coal sector liberalization is not expedited leading to a fuel crunch for power plants, it may result in many large industrial power

[9] Centre for Fuel Studies and Research presentation to MoPNG, December, 2004.

consumers setting up their own captive gas-based power plants, leading to an increase in demand for gas. Moreover, these consumers may also be able to afford a higher price of gas, leading to an increase in government's subsidy as a result of a reduction in the number of subsidizing consumers.

The power industry is highly sensitive to the price of fuel. An increase of Rs. 1 per unit in the price of fuel translates to an increase in cost of about Rs. 5 crores / MW over the life cycle of the project computed as NPV basis at 10% discount rate. Therefore, a fuel price increase of Rs. 1 per unit matches the cost of putting up a new power plant even after discarding an existing plant! The fuel costs bid for Sasan (Rs. 0.30 / kWh) and Mundra (Rs. 1.26 / kWh) have set new benchmarks for coal-based power plants based on domestic and imported coal respectively. Therefore, any fuel price above say, Rs. 1.50 / kWh (which translates to $4.5/mmbtu delivered at the plant) , becomes uneconomical. Both [Planning Commission 2006] and [ICRA 2004] endorse that gas-based power generation is only attractive if other fuels prove costlier. Of course, the solution to this problem of gas being an expensive fuel is not to impose taxes on coal so that its price also goes up, as recently suggested by the Deputy Chairman of the Planning Commission[10]! The environmental concerns, which may have prompted such suggestions, can be met much better through other avenues such as quick implementation of appliance efficiency standards, replacing old coal plants with efficient plants, reducing technical losses, promoting gas use through efficient CHP plants and so on.

Similarly, the department of fertilizers says that the price for gas for fertilizer production should be such that it becomes cheaper to manufacture fertilizer locally than import urea, which works out to about $5/mmbtu at the fertilizer factory gate.

The conclusion from this is that the pricing of gas is closely related to the quantity and sector of usage. Moreover, it is advisable to promote energy-efficient applications such as CHP in view of the country's energy security. Hence there is a need for a policy on utilization of gas before determining the price at which gas can be sold.

6. Gas Pricing

As we discussed earlier, gas produced under NELP contracts does not have to be sold at administratively determined prices. Such gas is to be valued on the basis of competitive arms length sales[11], and the Government has to approve the basis or formula used for determining prices. In June 2007, RIL announced its process and formula for valuing gas it had found in the KG Basin. Using the formula, RIL arrived at a supplier price of about $4.59/mmbtu that was later revised to about $4.33/mmbtu. Transportation charges and sales tax would need to be added giving a delivered gas price of $5.5 to $6/mmbtu. Because the proposed gas price announced by RIL was much higher than what most consumers are paying, the proposal has generated considerable controversy and protests.

One of the protesting parties was NTPC, which had a higher stake in the pricing debate than the others. In 2003, NTPC had held an open solicitation for gas supply for its planned expansion of plants at Kawas and Gandhar, and RIL had emerged as the winning bidder with a delivered gas price of $2.97/mmbtu. However, RIL did not sign a formal gas contract with NTPC. Legal differences regarding liability clauses led to NTPC filing a lawsuit against RIL and the matter is sub-judice. After RIL's formula was announced, NTPC wrote to MoPNG seeking approval of the RIL's bid of $2.97 per

[10] Times of India, 27th April 2007.

[11] Section 21.6.2 of the model PSC says, "Gas which is sold or disposed of otherwise than in accordance of (a) or (b) shall be valued on the basis of arms length sales in the region for similar sales under similar conditions." As written the meaning of this sentence is not completely clear.

mmbtu[12]. According to the undated letter referred to in media reports, MoPNG has said that the NTPC bid was not valid because the bidder offering the lowest price was selected by NTPC which was inconsistent with the requirement of the PSC that the gas be sold at the maximum price. While the PSC requires the price to be arrived at through a competitive arms length transaction, it does not mandate the maximum price. Payment of the new price being proposed by RIL will mean an additional burden of about Rs. 880 crores per year for NTPC.

Before the demerger of Reliance group, RIL and RNRL had entered into an gas supply agreement whereby RIL was to supply gas to 28 mmscmd to RNRL at the same price as it was being provided to NTPC ($2.34/mmbtu). Furthermore, if the agreement with NTPC collapsed, then the 12 mmscmd earmarked for NTPC were also to be supplied to RNRL. There have been disagreements between RNRL and RIL over these contracts and the matter is in court. The Bombay High Court has restrained RIL from selling gas from the KG basin find to anyone other than RNRL and NTPC[13]. The Court has allowed the Government and RIL to continue with the process to determine prices for gas from the KG Basin finds[14]. Further, the Government is planning to become a party to the court case. It appears that MoPNG is now trying to maximize the Government's revenue, which makes one wonder why it did not act earlier when these events are a few years old.

In its comments on RIL's gas pricing, the AP Government said that the higher costs would impose a high burden on the State particularly because of over 2000 MW of stranded combined cycle gas power plants. The CM suggested that: (1) a regulatory body be set up to decide upstream price of gas; (2) GoI to come up with a gas utilization policy with at least 50% of the gas recovered off the coast of AP to be allocated to the state as part of GoI's share of profit gas in kind; and (3) GoI to allow state governments to levy charges on right of way for gas pipelines.

Given the controversy generated by the pricing method being proposed by RIL and the impact of prices on demand for natural gas and on government revenues under NELP, we now look at what has happened regarding pricing of gas under NELP.

6.1 Gas Pricing Under NELP

In August 2006, a committee was constituted to formulate guidelines for approving the formula or basis for pricing gas under PSCs. However, the TOR for the committee was more restrictive and said that because the ideal way to determine prices was an open competitive bidding process, the committee should come up with alternative approaches when competitive bidding cannot be, or was not, carried out. Therefore, the committee made recommendations for those cases where arms length transactions have not been possible. It recommended that for such cases, the price used for valuation of gas should be the most recent competitively determined price in the region appropriately indexed to the present. For those periods where an index is not specified, the price escalation of furnace oil is to be used because it is the cheapest fuel and has shown the least volatility in price.

As examples of cases where price discovery has been done on the basis of competitive bidding, the committee gives two examples: one for Cairn India and the other for British Gas. Both the examples use limited tenders and therefore, by definition, are not open tenders, which the committee itself believes is the appropriate tendering process for pricing gas. Furthermore, the British Gas example uses a short term contract and may not be representative because as we discuss later, long term contracts are preferred in the gas industry.

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[12] Economic Times, July 24th 2007.
[13] RIL&RNRL Gas Sales Purchase Agreement: The Legal Angle (Infraline) and Hindustan Times, July 2nd 2007.
[14] DNA India, July 24th 2007.

It is unfortunate that GoI waited a full three years after the RIL find was announced to appoint a committee to look into the pricing issue. It is even more unfortunate that the committee did not take up the pricing issue. Given that just the RIL gas find in the KG basin is worth about Rs. 250,000 crores over the life of the field, one can see that an extremely large amount of money is involved in the issue of how gas is priced under the PSCs. It would have been good if the Committee had developed guidelines for competitive bidding as has been done in the power sector.

6.2 RIL Pricing Method

Having looked at what has happened so far regarding the interpretation of the requirements of the model PSC on pricing issues, we now look at the pricing method proposed by RIL. We first describe the process proposed by RIL and then discuss its shortcomings.

Process Used

In April 2007, RIL sent out an invitation to select customers for quotations. The bidders were given a formula, shown in Box 1 in which the only thing to bid was the value of an integer constant which could vary between 1 and 10. The total amount of the bids was 34.4 mmscmd. RIL stacked up the bid prices calculated based on the bid integers. The discovered price according to RIL was the price quoted by the price at which about 50% of the total bid quantity (17.6 mmscmd) was taken. Using this method, RIL arrived at a supplier price of $4.59/mmbtu which was later revised to $4.33/mmbtu. Transportation charges and taxes would need to be added giving a delivered gas price of $5.5 to $6 per mmbtu.

Box 1:

Price (Rs./mmbtu) = 112.5*K + ER * (CP – 25)^0.15 + C

Where:
CP is the annual average Brent crude price for the previous FY with a cap of $65/barrel and a floor of $25/barrel;
ER is the average exchange rate (USD/Rs.) for the previous FY;
K is 1 for ER between 25 and 65,
ER/25 when ER is less than 25,
ER/65 when ER is more than 65;
C is the premium in Rs./mmbtu (positive integer) quoted by bidder.

RIL's Pricing Formula

Shortcomings of RIL Process

Earlier, we discussed the questions left unanswered by the MoPNG Pricing Committee's report issued in November 2006. If for argument's sake, we assume that the November 2006 Pricing Committee report's recommendations are appropriate, we find that the process used by RIL for price discovery violate even those requirements of the Pricing Committee.

The Pricing Committee report says, "Ideally the prices ought to be determined through a transparent open bidding process to discover gas price…[emphasis added]". Given that the invitation to quote was sent by RIL to a few selected entities and was not widely advertised means it was not an open bidding process. The violation is more egregious because RIL chose consumers who had stranded assets and were willing to pay high prices for the gas. The PSC specifically excludes restricted or distress sales

and we leave it to lawyers to decide whether distress purchases also violate the definition of “arms length sales”[15] as given in the PSC.

RIL’s formula required bidders to bid in a very narrow price range of $4.54 to $4.75 per mmbtu, assuming crude oil prices at $70 per barrel and an exchange rate of Rs. 41 to a dollar. Normally in an auction, bidders reveal the prices at which they are willing to buy the product. In contrast, here RIL set the price and simply identified potential purchasers. Severely restricting the bid price in this way violates the requirements of open bidding.

In Figure 7 we show how price discovery would be done in a situation where demand bids were invited similar to the process used by RIL. Q(total bid) is the sum of the total amount bid and represents the total demand. Q(production) is the amount projected to be available. The intersection of the Q(production) with the stepped demand curve determines the price. It seems that for the purpose of determining price RIL set Q(production) to be 17.6 mmscmd while Q(total bid) was 34.4 mmscmd. RIL has not clarified why it sets Q(production) at 17.6 mmscmd when its expected production is expected to be 40 mmscmd in the second year and 80 mmscmd in the third year. From Figure 7 it can be seen that the price should be determined using the total production. If less than the total production is used as seems to be the case with RIL’s method then the price is much higher than the market-clearing price.

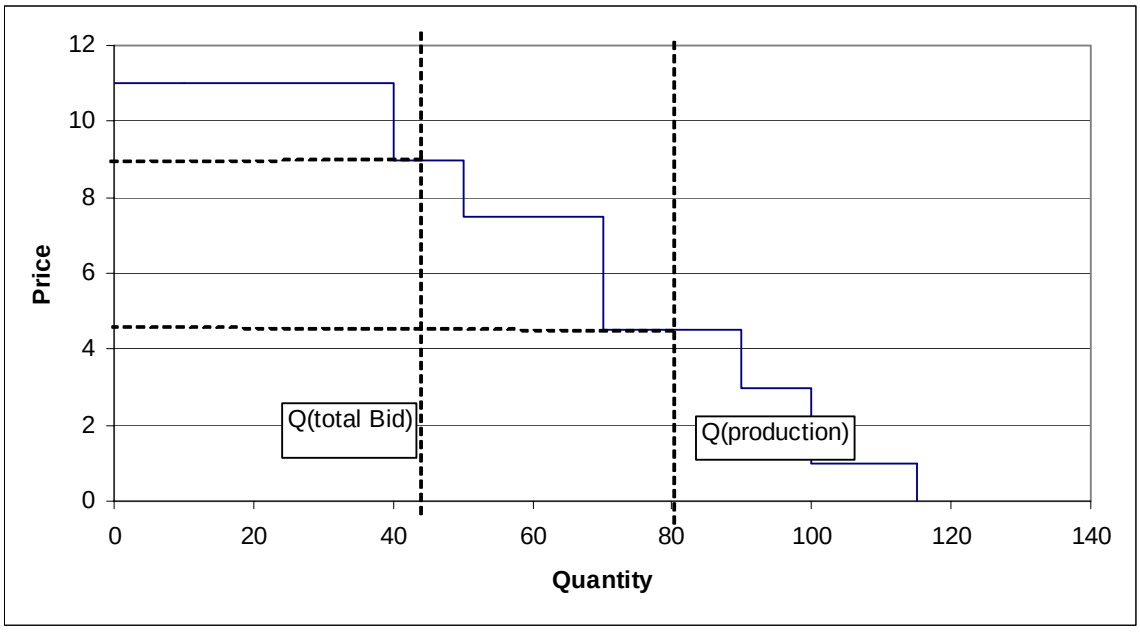

Figure 7: Use of Demand Bids to Determine Price

Furthermore, there is a predominance of long term contracts in the gas industry because new investments often require longer contracts to provide an assurance of supply. The price discovery method of RIL uses medium term contracts of duration less than four years and thus may be excluding a significant fraction of the potential market for its gas.

[15] The PSC defines "Arms Length Sales" as sales made freely in the open market … shall, inter alia, exclude sales (whether direct or indirect, through brokers or otherwise) involving Affiliates, sales between Companies which are Parties to this Contract, sales between governments and government-owned entities, counter trades, restricted or distress sales, sales involving barter arrangements and generally any transactions motivated in whole or in part by considerations other than normal commercial practices.

Issues with RIL's Proposed Formula

The discussion above has dealt with the process used by RIL to "discover" the price for gas. We now look at the formula proposed by RIL. Here are some issues:

- The gas price is capped when the Brent crude index reaches $65/barrel (assuming other factors are constant), which is to the benefit of consumers.

- Decreases in crude prices from their current high levels have a much smaller impact on price compared to increases in crude prices from low levels such as $25/barrel.
- The impact of foreign exchange variation is also asymmetric. If the rupee continues to appreciate relative to the dollar as has been the trend recently, then the price increases much more rapidly.

- Domestic supplies are likely to increase considerably in the coming years, and therefore, prices are likely to be lower. It is not clear how long the prices "discovered" by RIL will be considered valid. If it is beyond the period specified by the bidders, then the price would no longer be appropriate.

NTPC, the AP Government, RNRL and others have pointed out some of these limitations.

6.3 Comments of Other Parties on RIL's Pricing Proposal

Many parties have commented on RIL's pricing proposal since it has come out. These include a Committee of Secretaries (CoS) and the Prime Minister's Economic Advisory Council (EAC). Their comments, as they appeared in media reports, are discussed below.

Committee of Secretaries

The CoS that looked into the issue of RIL's pricing proposal said that, "prima facie, the formula appears to suffer from several infirmities in respect of the formula employed and the bidding process"[16]. Asserting the sovereign right of the government to come up with a gas pricing policy and gas utilization policy, the report recommends that these policies should be in place before the government takes up the issue of RIL's pricing method. However, the report maintained that the sanctity of the PSC must be maintained and that the price must be market determined.

The CoS report also says that rather than the Government, a specialized body such as a regulatory agency would be more appropriate for tackling this issue, thus ensuring transparency and accountability. The report also pointed out that the way the Management Committee approves the development costs is inadequate, and more effective audit mechanisms need to be put in place.

Economic Advisory Council

Following the CoS report, the EAC partially endorsed the approach used by RIL[17]. The EAC said that the gas should be sold at market rates according to the provisions of the PSC.

The EAC also said the RIL approach needs to be fine-tuned. Some of the suggestions were: (1) A more broad-based auction with bids from more players; (2) a minimum of 10 year contract instead of the 4 year contract duration used by RIL; (3) periodic review of the gas price through indexation to the Brent crude price; and (4) offering the entire volume of gas (80mmscmd) for auction. EAC has recommended that RIL go for fresh bids based on these suggested changes to the bidding process.

[16] Economic Times, 14th August 2007.
[17] Economic Times, 16th August 2007.

In spite of the above observations, it said that the price of $4.33 per mmbtu "discovered" by RIL compares well with the price obtained for gas from the Ravva fields and current coal-based power generation. One wonders how the EAC has accounted for the change in gas supply-demand scenario and new benchmarks set by low cost coal-based ultra-mega power plants.

Now an empowered group of ministers (EGoM) is to decide the issue of pricing of gas proposed by RIL. This gas pricing is likely to also affect prices of other gas finds, and may have a cascading effect on the gas and energy sector by exerting an upward pressure on APM gas prices as recently demanded by ONGC[18].

6.4 Considerations for Pricing of Gas

The government's pricing policy for gas should be an integral component of the gas utilization policy. These policies should balance economic efficiency, affordability, and energy security. More specifically, they must address the level and price for fuels for essential sectors such as power and fertilizers so as to ensure reliability and affordability of service. Similarly, they must address how to ensure that the pattern of gas production and consumption is consistent with having an adequate supply of fuel now and in the future.

The PSCs recognize that gas production and pricing should be consistent with broader policy goals of the Government. Article 21.1 of the model contract says that the Indian domestic market shall have the first call on the utilization of natural gas produced from the contract area, and that the production of gas from the contract area "…shall be made in the context of the Government's policy for the utilization of Natural Gas and shall take into account the objectives of the Government to develop its resources in the most efficient manner and to promote conservation measures."

Based on the discussion so far, the following suggestions for improving the pricing method should be considered:

- Competitive bidding for determining prices should have the following features: (1) the entire volume of expected production should be auctioned; (2) the price should be based on the marginal bidder's bid price; and (3) only committed sales should be considered for determining prices.
- Because Brent crude price is highly volatile and is not reflective of changes in Indian gas prices, another more appropriate index should be considered, such as: (1) an appropriate basket representing alternate fuels for the Indian market; (2) inflation; or (3) furnace oil prices.
- Ideally there should be no floor on the price that potential buyers can bid. In case a floor price is necessary, it should be based on costs plus a reasonable return, and it should be approved by MoPNG.
- Given the recent large gas finds and the resultant change in the supply-demand scenario, where gas imports are likely to be significantly reduced, using import parity as a benchmarks is inappropriate. Instead, using export parity as a benchmark may be more appropriate.

7. Impact of Gas Pricing and investment on revenues

What is the impact of the 'discovered' price for the KG basin gas ($4.33/mmbtu) on the revenues of the Government of India (GoI)? We compare the revenues of the GoI at two different price levels, the proposed landfall price of $4.33/mmbtu and the benchmark price of $3/mmbtu, which is approximately what was quoted for the NTPC

[18] Financial Express, August 8th, 2007.

bid of 2003. The winning bid for this basin had proposed the profit sharing formula as given in Table 4, which is used to compute the revenue shares.

Investment multiple	1.5	2	2.5	3	3.5	>3.5
Government share	10%	16%	28%	85%	85%	85%
RIL share	90%	84%	72%	15%	15%	15%

Table 4: Profit sharing for the KG basin

However, we also bring in another element into the comparison, namely the investment levels of the contractor. Over time, the expected exploration and development investments in the basin have increased from $2.5 billion to $9.08 billion[19]. An increase in the investment affects GoI's revenue in two ways. Firstly, since a large investment has to be recovered as cost petroleum, the profit petroleum each year is lower, until the investments are recovered. Secondly, since the investment is larger, its multiples are also larger and therefore the investment multiple milestones at which GoI's revenue moves to the next slab come later. Therefore, investment is also a vital parameter in determining GoI's revenue.

Figure 8 depicts GoI revenue under four scenarios, which are the combinations of the two prices ($3/mmbtu and $4.33/mmbtu) and two investment levels ($2.5 billion and $9.08 billion). For this analysis, we have assumed the following: i) the block has a 12-year life span, ii) it produces 20 mmscmd in the first year, 40 mmscmd in the second year and 80 mmscmd thereafter, iii) the operational cost is about Rs. 1200 per thousand cu m, iv) a discount rate of 10% has been used to compute net present values (NPV) and v) the royalty paid by the contractor is constant at 5% through the life of the block, though the model PSC is surprisingly silent[20] about this after the first seven years!

As expected, for a given investment, GoI revenues are greater for the greater price. Thus, for the $9.08 billion investment, the total GoI revenue increases by $12.7 billion between the two price levels. However, for a given price, GoI revenues are smaller for the greater investment. At $4.33/mmbtu, GoI loses about $10.8 billion between the two investment levels.

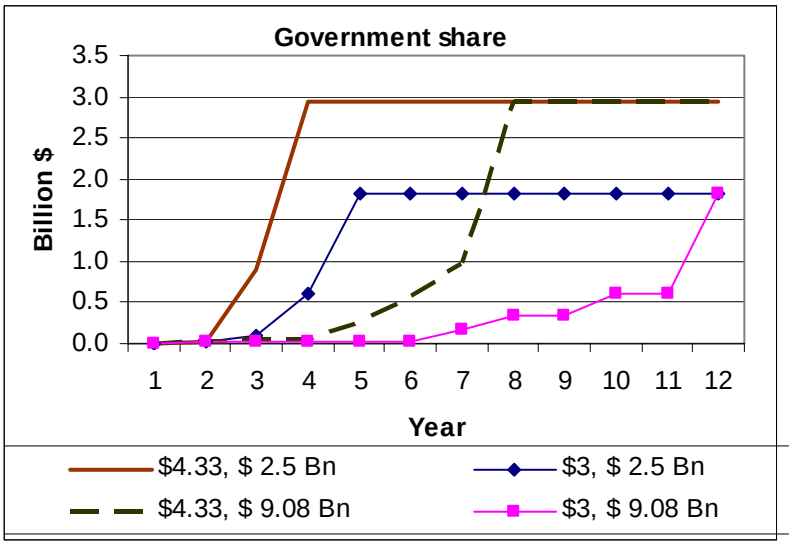

Figure 8: GoI revenues at different prices, investments

It is also interesting to compare the NPV of GoI and RIL revenues from the block. Table 5 presents this data. It can be seen from this that as price increases, not only does the GoI revenue (and NPV) increase, but also the contractor's, though at a much

[19] Business Standard, 8th August 2007.
[20] Section 17.4 of the model Production Sharing Contract.

smaller rate. However, this incremental revenue of GoI *decreases* at a higher investment level! For example, the GoI NPV increases by $6.4 billion at an investment of $2.5 billion, while it increases only by $5.3 billion at $.9.08 billion investment. However, the incremental revenue of the contractor *increases* as the investment level rises. In this case, the contractor's gain goes up from $1.2 billion at the lower investment to $1.7 billion at the higher investment.

Price, investment	Total GoI revenue ($ bn)	Total contractor revenue ($ bn)	GoI NPV ($ bn)	Contractor NPV ($ bn)
$3, $ 2.5 bn	15.3	5.2	7.1	3.1
$3, $ 9.08 bn	4.0	9.9	1.5	4.6
$4.33, $ 2.5 Bn	27.5	7.3	13.5	4.3
$4.33, $ 9.08 Bn	16.7	11.6	6.8	6.3

Table 5: GoI and contractor revenues and NPV

Latest media reports[21] indicate that the investment levels are back at $5.2 billion dollars but with a higher flow rate of about 120 mmscmd. Thus there have been widely fluctuating reports of investment levels (ranging from $2.5 billion to $11 billion) and extraction levels (from 40 to 120 mmscmd).

Under the NELP structure, the contractor has a strong incentive to maximize extraction rates, and set high prices in a shortage situation to maximize its return. Therefore, it is the government's duty to ensure that production levels and prices are in the broader national interest and that the investment claims are appropriate.

8. Policy and governance issues

Considering that natural gas is an extremely important energy resource especially for transitioning into a new energy future, the shortcomings in policy and governance witnessed in this sector are of serious concern. It becomes all the more stark when a parallel is drawn with electricity sector, which also underwent reforms in the same period.

8.1 Industry Structure

In late 1990s, when the government decided to involve private companies for exploration and marketing of oil and gas, the government should have clearly articulated the expected industry structure. In case of electricity, for encouraging competition the government took several steps. The E-Act 2003 forced state owned power sector monopolies to unbundle and allowed private companies to compete for consumers. The government was so keen about this, that it was not desisted by the strong opposition of the employee unions and the UPA government went to the extent of not following the promise in its Common Minimum Plan to review the E-Act 2003.

But during the same period, the gas sector seems to be moving in a totally different direction. The industry was already vertically unbundled and large new infrastructure was being created. So, it should have been a simpler task to keep it unbundled. But the government has allowed creation of nation-wide oligopoly and vertical integration – with private producers being allowed to lay transmission pipelines, distribute gas, and also market the gas. RIL, which will be producing 60% of India's gas, plans to lay cross-country transmission pipelines, is marketing its gas, and has massive plans for building gas distribution grids. Recently it has even announced plans to setup India's largest Greenfield fertilizer project to consume the gas[22]. GSPC, GAIL and others too

[21] Hindustan Times, August 20th 2007.
[22] Economic Times, 24th July 2007.

plan to be involved in more than one vertical segment of the gas market, though on a much smaller scale.

Usually, several precautions are taken to ensure competition if a free market is desired. The US, for example, has serious restrictions on mergers/acquisitions or new investments by private players. The US focuses on a pre-emptive approach to ensure a competitive industry structure rather than wait for evidence of anti-competitive practices to take corrective action. USA has 10,000 gas producers and sector is vertically un-bundled. In a free market framework to promote competition, the situation developing in India would be unacceptable and would have attracted anti-trust actions. In the absence of such a competitive market, the prices are likely to be higher than the economically efficient level.

8.2 Sequencing of reforms

The second set of governance problems relate to the sequencing of reforms. Despite the well-recognized need for a regulatory institution (especially for building consensus on pricing principles and cost / investment review) prior to creation of major private interests, the formation of a regulatory commission was delayed by a full decade [Sankar 1996]. The commission was set up with restricted authority and is yet to start functioning fully.

Despite clear data that gas supply situation is undergoing radical change (with the country on the verge of becoming self-sufficient for gas and private players about to dominate the supply), the government has yet not articulated a gas utilization policy or even a pricing policy.

8.3 Implementation of Reforms

In the limited context of implementation of the reforms, namely the NELP process there appears to be several lacunae.

Clarity in PSC: Surprisingly, on a number of issues the PSC lacks the level of clarity required for such an important legal document. For example, it is not clear whether Section 21.6.2 (b)[23] of the PSC permits a different formula or basis for gas sold to the government or its nominees – something that could make a crucial difference to the power and fertilizer sectors that are government controlled.

The management committee: The Management Committee (MC) has an overpowering role in implementation of PSC (the MC is referred to 150 times in the PSC). One wonders if the government has taken sufficient care to oversee the functioning of these committees, which take decisions[24] regarding tens of thousands of crores of Rupees of public money. This becomes particularly relevant in the context of the recent controversy[25]

Lack of prompt actions by government: Until forced by contractor action, the government did not develop clarity on implementation of critical parts of PSC, such as interpretation of gas pricing principles and has not yet articulated gas-utilization policy. This has a long term negative impact on the sector.

Transparency: The most glaring deficiency relates to the lack of transparency. None of the PSCs signed by government are in the public domain – despite them being worth lakhs of crores of Rupees. The lack of transparency also extends to the composition of

[23] The section says: “Gas which is sold to the Government or any other Government nominee shall be valued at the prices actually obtained”
[24] The decisions range from approval of investments, production schedule, relinquishment of blocks, etc.
[25] Business today, July 15th 2007, and rejoinder by DGH.

the MC, major decisions by the MC, details of investments, monitoring of timelines for different phases, committed work program, relinquishing of blocks etc.

8.4 Role of MoPNG and the structure of NELP:

An undated note from MoPNG[26] is reported to have said that the NTPC invited gas bid was not valid as it attempts to reduce the cost of gas. This is extremely surprising, since the role of the ministry is to maximize citizen's welfare through oil and gas resources, and not just to maximize revenues through oil and gas. Further, the ministry should realize that truly competitive market, as desired by the ministry, would result in lowering the price of gas rather than increasing it.

Similarly, the tax benefits associated with the NELP structure strongly encourage rapid extraction of oil and gas discoveries. The profitability (IRR) for contractor is maximised if it extracts gas as early as possible. Early benefit to the government (high initial share of profit) is also valued very positively during bid evaluation. If NELP IV to VI result in sizable gas finds, then there is a possibility of a supply glut resulting in inefficient utilisation. Such rapid exploration and extraction from the country's gas fields can seriously jeopardise country's long-term energy security as we quickly use up the country's gas reserves in the medium term. It is particularly illustrative to contrast this approach with some other countries that have chosen to restrict using up their own gas! Therefore, it should be seriously considered whether NELP VII should be postponed, or its terms restructured to invite bids for exploration (with suitable incentives) but not necessarily for production.

Given that the exploration has become a duopoly, the NELP bidding process could have ensured competition by limiting the acreage and gas reserves controlled by any contractor. If the aim of NELP is to promote competition, future NELP rounds must have such a condition.

8.5 Better estimation of risks

Several committees have discussed the massive investments required for oil / gas exploration and development. The Hydrocarbon Vision 2010 report of 1995 had estimated it to be in the range of 180 to 340 thousand crore Rupees till the year 2010. Such figures can create a shortage psychosis, if the difference between the risky investment in exploration and the relatively less risky development expenditure is not distinguished. Based on available experience, a realistic assessment of risk involved in exploration should be undertaken by contrasting exploration expenses involved in successful blocks against unsuccessful ones. This will help estimate the amount of risk involved in exploration in Indian waters, and therefore, help reward the risk commensurately. This would be also useful to evaluate the possibility of separating exploration from development.

9. Recommendations

The NELP regime has resulted in the welcome development of finding massive gas reserves. However, the shortcomings in governance and policy and the resultant market structure that is emerging are issues of concern. As a first step to addressing these concerns, there is an urgent need to articulate the country's Gas Utilization and Pricing Policy. The recommendations of the Committee of Secretaries in this direction are laudable. These policies should be drafted in a transparent, inclusive manner and give due consideration to issues such as the most efficient use of gas, the subsidy burden, the market structure and the country's energy security in the medium and long term.

Formulating these policies should be quickly followed by framing of 'bidding guidelines' to arrive at 'competitive arms length' price, and all contracts should follow these

[26] Financial Express, August 11, 2007.

guidelines. A mid term evaluation and course correction in the following issues is highly desirable.

- Creating an industry structure that fosters competition and innovation,
- Transparent and participatory functioning of a gas regulator with increased powers,
- Evaluation of the risk involved in exploration, and possibly separating exploration and development activities. The timing and structure of NELP VII should be reviewed based on this study.
- A substantially improved method of evaluation and control of investments, and decisions regarding relinquishment and extensions.

There is also an urgent need to review the performance of ONGC in terms of the blocks they bid for, the exploration costs, the gas/oil finds, and take appropriate corrective actions.

Overall, the NELP experience once again highlights the need for transparency and inclusive decision-making, particularly when dealing with such a large national asset.

References

[Planning Commission 2006] Expert committee report on Integrated Energy Policy for the Planning Commission, 2006.
[KPMG 2007] India Energy Report 2007, KPMG.

[Sankar 1996] Report of the Committee on Natural Gas Pricing, chaired by Mr. T. L. Sankar, 1996.

[ICRA 2004] Indian Natural Gas Business – on the threshold of change, ICRA Business Report, February 2004.

[WorkingGroupPNG 2006] Report of the Working group on Petroleum and Natural Gas Sector for the 11th plan, 2006.

[HV2025 1999] Report on Hydrocarbon Vision 2025, 1999.

[WorkingGroupPower 2007] Report of the Working group on Power for the 11th plan, 2007.