Regulation of Natural Gas in India

The Petroleum and Natural Gas Regulatory Board was established in 2007. But what is the policy of regulation in this sector? What are the entities involved? How do they function? How can they be efficiently regulated?

The ministry of petroleum and natural gas, government of India by its gazette notification (No 299 of July 3, 2007) has notified the establishment of the Petroleum and Natural Gas Regulatory Board (PNGRB). The newly established PNGRB has also commenced its work and issued a draft regulation for the local natural gas distribution network and the determination of tariffs for natural gas pipelines.

Significant economic research and analysis has been carried out in the field of market regulation, which has changed the whole concept of regulation. These latest developments are extremely relevant for the newly notified PNGRB. This article examines the regulation policy in the natural gas sector in India in the light of the findings of economic research and analysis in the field of market regulation.

Objectives of PNGRB

The board will regulate the refining, processing, storage, transportation, distribution, marketing and sale of petroleum, petroleum products and natural gas excluding the production of crude oil and natural gas. In other words, the PNGRB is mandated to regulate the downstream industry of petroleum, petroleum products and natural gas. Its jurisdiction ranges from transportation of oil/gas from the well to marketing to the final consumer.

The Petroleum and Natural Gas Regulatory Board Act, 2006 (PNGRB Act) also states the objective of the Act and the board, viz, “so as to protect the interest of the consumers and entities engaged in specified activities relating to petroleum, petroleum products and natural gas and to ensure an uninterrupted and adequate supply of petroleum, petroleum products and natural gas in all parts of the country and to promote competitive markets and for matters connected therewith or incidental thereto”.

From the preliminary to the Act, it is clear that the major objective of the PNGRB is to (i) protect the interests of consumers; (ii) entities engaged in these activities; and (iii) to promote competitive markets. While the promotion of competitive markets protects the interest of consumers automatically, competition in the market may not always be in the interest of the entities.

In the natural gas sector the PNGRB Act has provisions for an: (i) authorised entity registered by the board (under section 15) to market natural gas; (ii) authorised entity registered by the board (under section 16) to lay, build, operate or expand any pipeline as a common carrier or contract carrier; and (iii) authorised entity registered by the board (under section 16) to lay, build, operate or expand a city or local natural gas distribution network.

Thus, three separate entities can be identified as per the provisions of the Act, namely: (i) the natural gas producer (who is not subject to regulation of the PNGRB for upstream activities); (ii) the pipeline operator – as a common carrier and/or contract carrier; and (iii) the local distributor.

The PNGRB can authorise (under section 15) an entity, which meets the eligibility criteria as prescribed by the rules/regulations to market natural gas. Thus, legally and technically, it may be possible for any of the above three entities to market natural gas.

Natural Gas in India

The production of natural gas in India is estimated to be around 87 million standard cubic metres per day. The main producers of natural gas are the Oil and Natural Gas Corporation (ONGC), Oil India Limited (OIL) and joint ventures of Tapti, Panna-Mukta and Ravva. Most of the gas is produced in the western offshore area. The onshore fields in Assam, Andhra Pradesh and Gujarat are other major producers. Smaller quantities of gas are also produced in Tripura, Tamil Nadu and Rajasthan.

The Gas Authority of India (GAIL) and OIL are the primary sellers of natural gas. GAIL is marketing the gas produced by ONGC, a part of gas produced by the joint venture consortiums and the gas produced by OIL in Rajasthan. OIL is marketing the
With this background on the PNGRB Act and the natural gas sector in India, let us now get into the economics of regulation of natural gas.

Natural Monopoly and Market Regulation

The traditional theory of regulation is that markets have failures, like in the case of a market failures caused by a natural monopoly and these market failures are best addressed by regulation (by an appropriate government agency) that serves and maximises public interest. This traditional public interest theory of regulation has been often challenged on the assumptions made in this theory that the regulators are (i) perfectly informed of the market; and (ii) they are solely guided by the goal of maximisation of social welfare.

Natural monopoly is defined as an industry where the economies of scale are so persistent that a single firm can serve the market at a lower cost than two or more firms. In other words, it means that over the relevant demand range, the average cost of the firm declines as market output increases.

The recent economic research on natural monopoly has found that the economies of scale (an increasing return to scale) is not a necessary condition for “natural monopoly” and it can be defined better using the concept of sub-additivity of costs. Baumal, Panzar and Willig (1982) have stated that “an industry is said to be a natural monopoly, if, over the entire relevant range of outputs, the firm cost function is sub-additive”.

With either of the definitions of natural monopoly above, local gas distribution as well as “long distance transportation of gas in pipelines” would be classified as a natural monopoly. The reasons are obvious. The cost function of laying long distance pipelines as well as local distribution networks has large fixed costs, with only a small marginal cost for each additional unit of quantity of gas distributed/transported, over a fixed output range. The fixed costs are also in the nature of a sunk cost and the sunken capital is not transferable.

Thus, local gas distribution as well as long distance transportation of gas in pipelines is a natural monopoly. The traditional view is that because an industry is a natural monopoly it should be regulated. This is where the extensive knowledge created by economic research becomes relevant. The recent economic analysis of regulation has revealed that even in markets with natural monopoly structure, there are ways to introduce competition in the market. The possible competitive approaches for the regulation of natural gas sector in India have been examined in the following sections.

Bundling versus Unbundling

The first issue in the industry structure is whether the three entities in the natural gas sector, which provide natural gas to consumers, can be one entity. The classic example in the Indian context is that of the electricity boards, where the electricity boards ran the power generating stations, built and operated the transmission lines and also stepped down the power and supplied it to the consumers through distribution networks. Extensive economic research on power reforms advocated unbundling. A number of states have taken steps towards the unbundling of the electricity sector.

Is there any reason for the natural gas sector to be different?

Natural gas producers may argue for a single bundled entity on the ground that it would entail least cost for the industry, as it is a natural monopoly.

Technologically, drilling a gas well is a distinct activity. A number of producers can be producing gas individually. The production of gas is also likely to spread over different parts of the country. The 57 blocks offered in NELP VII have a wide geographical spread – Rajasthan basin, Cambay basin, Himalayan foreland and Punjab basin, Ganga basin, Kutch basin, Saurashtra basin, Vindhya basin, Mumbai offshore basin, Kerala-Konkan basin, Purane basin, Bengal basin, Mahanadi basin. The
basin, Krishna-Godavari basin, south Rewa basin, Palar basin, Assam-Arakan basin, Deccan Syncline, Cuddapah basin and Andaman basin.

The above information indicates that there can be many producers competing to supply natural gas to the same or different markets, spread over different parts of the country. Undoubtedly, the fixed cost is high (especially due to low success rate) compared to the marginal cost for a unit of additional output of each well but the output of one well is never likely to satisfy the market-demanded output range. Thus, there is bound to be a number of wells and hopefully, a number of producers. The production of gas does not display the characteristic of a natural monopoly, just as electricity generating stations did not.

In these circumstances, one would do well to rely on the extensive economic research carried out in the electricity sector and keep the natural gas producing entities separate, different from the carriers and distributors. The ideal situation would be that there are a number of entities operating different natural gas producing wells, each competing to supply natural gas to the market separately.

The next question which needs to be addressed is: should the carrier and local distributor be the same? Both, the long distance pipeline carrier and local distribution gas network exhibit characteristics of natural monopoly. Accordingly, it can be argued that no great harm would result by combining these two natural monopolies. However, the argument has two drawbacks. One, it goes against the concept of unbundling as propounded in the electricity sector, where the distribution companies are separate from the transmission companies. More importantly (as we shall see later) the bundling of the carrier and local distributor precludes the creation of a competitive local distribution market. Promoting competitive markets is not only recommended by economists but has also been mandated in the PNGRB Act. In these circumstances, it is essential that the carrier and the local distribution entity should be different.

PNGRB, as a regulator, should work towards unbundling the structure of the natural gas industry and should promote a separate natural gas producer, long distance pipeline carrier and local distribution entity.

An issue which needs to be addressed in this context is the marketing of natural gas by the three different entities, namely, the natural gas producer, the long distance pipeline carrier and local distribution entity. The PNGRB Act makes all the three entities legally competent to take up marketing of natural gas, subject to the terms and conditions specified by the regulatory board.

**Marketing by Producing Entities**

There is a lot of merit in the contention that the producing entities may like to market the gas produced directly. A similar concept of merchant power plants is being experimented in the power sector, where the independent power producer is free to sell power as per its choice. However, the factor which makes natural gas different is that it is much scarcer. This may lead the government to make certain policies prioritising usage of natural gas – say in power sector, fertiliser, petrochemicals, steel, etc. Subject to such policy restrictions, direct marketing by producing entities can be permitted, provided sufficient allocation is also made for local gas distribution network for homes and other industries as may be decided by regulation. The exact percentage of usage is something the regulations need to prescribe, depending upon the desired utilisation of the natural gas. The regulation could specify the minimum percentage of the total gas produced by the entities on a daily basis, which is to be made available for the local distribution network. The balance could be marketed directly by the producing entities, if they so desired.

**Local Distribution Market**

The local distribution entity is the main agency, which would be entrusted with the task of marketing natural gas. It is also important to note that the structure of the local distribution market for natural gas is a natural monopoly. The fixed costs for the network of pipelines is significantly large compared to the marginal cost of delivery of an additional unit of gas. In such a situation, how can competition be brought about in the market? Demsetz (1968) in his classic article on regulation of public utilities has propounded the concept of “competition for the market” instead of “competition within the market”. He recognised that with the substantial economies of scale involved, it may not be possible for a number of entities to establish and operate public utilities in a given area. He suggested that there could still be competition for the right to operate in a given market. Thus, “one could envision bidding among prospective aspirants for the franchise rights to serve the market” [Braeutigam 1989].

Demsetz competition is an appealing concept as it introduces an element of competition, even in market characterised by natural monopoly. Ideally, the bid should be consumer-centric, i.e., the bid should be on the price for local distribution to the consumer (price to the consumer will be = price of natural gas at which it is delivered by the common carrier to the local distributor + bid price amount for local distribution/per unit of natural gas). The bid document would need to specify the minimum network requirements, which the local distribution entity would be required to build and operate and minimum quality standards for the service to be provided. These are essential; otherwise, the local distributor may adopt the short-term strategy of providing lower quality services, once it wins the franchise rights. The bid document would also need to specify the transfer period when the assets (the network) get transferred to the government. In addition, the regulator would need to ensure that natural gas is available to all bidders through the common carrier, and there is no collusion among producers, carriers and most importantly, bidders for the local distribution network.

Strictly, in terms of economic theory, Demsetz competition is not the most efficient solution but the bidding process (if done fairly) will ensure that the price quoted by the lowest bidder is the average cost of distribution of the estimated demand quantity. In economics, it will be termed as “second best solution” (as it is still not the marginal cost) and may still have significant deadweight losses, especially if the average cost at the estimated demand is still high compared to the marginal cost. However, it is by far a much better solution than the one where
the regulator is to fix the prices on a cost plus basis.

The bidding process helps reveal the average cost not only in one market but across geographic markets too. Thus, there is not only competition for obtaining the franchise rights in one local market but continually, as the average costs are set in other local markets too. Even in the operating phase, consumers residing in one local area would always compare with another local area – not only on the price but also the quality of gas and other service parameters. Thus, the Demsetz competition among the local distribution entities does not end with the bidding of franchise rights but continues across geographic markets. Accordingly, it is important to define the geographic area for local distribution network carefully. For larger cities, it may be desirable to split the area into two or more local network areas to introduce competition across geographic areas.

Regulation of Pipeline Carrier

This brings us to the intermediary, the long distance pipeline carrier, where the natural monopoly characteristics and economies of scale are large. For long distance pipeline carriers, fixed costs are large. The market is just not contestable, with no possibility of any other potential entrant.

The most important regulatory requirement for pipeline carriers is that they should provide open access to both the producing entities and local distribution networks. This open access regulation would need to be the primary focus of the PNGRB in the long distance pipeline industry in India.

The question that arises is whether the carrier should also be allowed to market the gas directly? The analogy with the electricity sector in the field of market regulation would advise a limited role for the long distance pipeline carriers to transport gas from the producing station to the local distribution markets, with no role in marketing. Further, as the carrier is required to provide open access to the producer and distribution entities, any direct marketing by the carrier is likely to disturb the local area market and cause tremendous conflict of interest with the open access policy. Direct marketing by the carrier will also lead to a cumbersome set of regulations that could be very difficult to implement. In the circumstances, the carriers – common and contract – should not be allowed to market the natural gas directly. This would enable the PNGRB to have (i) simple regulations; (ii) ensure open access to all producers; and (iii) provide inputs to all local distribution entities.

The regulator will have to apply itself to the pricing mechanism of the carrier. Economic research has suggested various pricing alternatives like differential pricing (peak load pricing, Ramsey pricing), non-linear tariffs, fully allocated cost pricing, etc. The applicability to the natural gas sector in India would need to be fully studied, following which, appropriate pricing would be applied.

However, the above does not imply that no competition can be generated in the long distance pipeline carrier industry. Perhaps, as per present technology, no effective competition can be generated over very long distances. However, over comparatively shorter distances, perhaps competition can be introduced in the form of “Chamberlinian monopolistic competition” [Chamberlin 1962]. This is also referred to as “inter-modal competition” [Braeutigam 1979] and can be used to describe the competition between natural gas transported through pipelines, railway compressed natural gas (CNG) tankers and the road CNG tankers. Although they may not be very efficient at present due to technological limitations, the regulator can encourage them on a small scale.

Conclusions

Economic research and the analysis of market regulation have brought about a number of new concepts, which enable the introduction of competition even in markets and industries that exhibit natural monopoly characteristics. It is obvious that the local gas distribution network and long distance pipeline carriers in the natural gas sector exhibit characteristics of a natural monopoly. However, it is possible to promote competition in the local gas distribution market by means of Demsetz competition or competition for franchise rights to operate local distribution network. Similarly, it is possible to introduce limited competition in the long distance pipeline carrier by means of inter-modal competition.

In the interest of the competitive market, the natural gas producer, long distance pipeline carriers and local distributor should be separate entities. While the producing entities could be permitted to market the natural gas produced by them after meeting the specified supplies to the local distribution network, in the interest of competition, the long distance pipeline carriers should not be allowed to market natural gas directly.

The natural gas sector is a new sunrise sector in India and the newly constituted PNGRB needs to study the implication of economic research in this area to bring out regulations, which introduce competition in this market. It is a competitive market, which will ensure consumer and producer welfare and lead to efficient allocation of resources in this important sector.

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