ORF POLICY BRIEF

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Dash for Gas: Opportunities & Challenges

Key Messages

India imports about 120 million tonnes (MT) of oil at a price of $108 to $110 per barrel which amounts to about $22 per million British thermal units (mmbtu). LNG at $15/mmbtu to meet 20 percent of oil demand could save something $5 to $7 billion every year. India should leverage the strategic opportunity and use 'gas to gallop'?

There is ample LNG availability to meet India's growing gas demand. Globally, there are 56 MT LNG projects under construction or with final investment decisions (FIDs) and another 56 MT without FID but with good prospects for progress. This means that approximately a 110 MT of new capacity could potentially be created by 2020.

India's import dependence for natural gas is likely to increase ten fold in the next two decades and India will remain a price taker in the market. The energy planners in India need to double R-LNG capacity to 42 MT in the 12th plan period (2013-17) and further double in the 13th plan.

The energy planners in India need to realize that going from one hype to another to fuel dreams of energy self-sufficiency and consequently affordability of energy is not a substitute for long term energy planning.

Currently gas supplies at around 170 mmscmd lag pipeline capacity which stands at 330 mmscmd. In this light it is advisable for pipeline creators to depend on LNG supplies and not on domestic gas which is scarce and is subject to allocation.

The mindset that gas should be available at the same price as it was 20-30 years ago needs to change. The price of natural gas or the price of imported LNG would be decided by the market forces and consumers must accept this.

CGD is likely to be far more commercial compared to large gas consuming sectors like power and fertilizer and therefore CGD requires closer consideration by the regulator, so that it can be developed in tandem with other gas infrastructure.

India must use 'Gas to Gallop!'

Fifty years after the first LNG tanker sailed from Mississippi to UK in 1959 natural gas has finally matured into a global commodity. Gas is no longer limited to being a regional resource or a continental resource. The most dramatic changes that have shaped the maturity of the natural gas sector happened during the last decade. In 1990 there were 8 exporters of LNG, 30 terminals, 61 ships and LNG accounted for about 3 percent of global consumption. In 2010 there were 20 exporters, 90 terminals, 300 ships and LNG accounted for 10 percent of global demand and 20 percent of global gas trade. Shale gas and unconventional gas could push the frontier even further. In the United States shale gas accounts for 25 percent of gas consumption which is expected to increase to 50 percent in a few years. The abundance of global supplies is changing the economics of natural gas making it more accessible and affordable. India imports about 120 MT of oil at a price of $108 to $110 per barrel which amounts to about $22/mmbtu. LNG at $15/mmbtu to meet 20 percent of oil demand could save something $5 to $7 billion every year. The question for India is whether it will leverage the strategic opportunity and use 'gas to gallop'?

Prospects for LNG availability are Bright

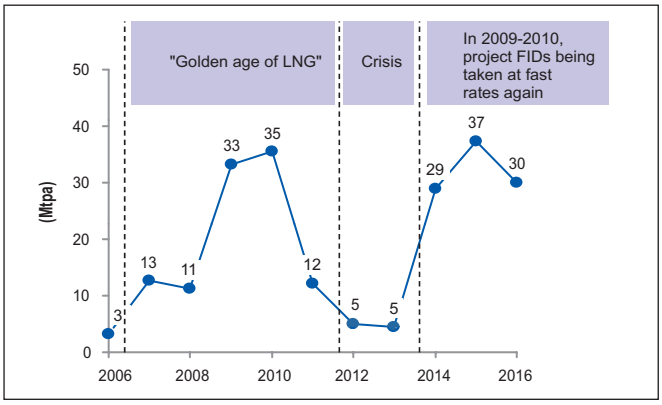
Globally LNG has registered a record growth of 22 percent in the last one year riding on the back of strong economic recovery in Asia, build up of deliveries from Qatar to Europe, the emergence of new markets in Latin America and the Middle East, growing prospects of trans-national pipeline gas supplies from Russia to Europe such as the Nord Stream and South Stream, prospective export of shale gas from USA consequent to the re-opening of the Panama Canal as well as increased CBM and LNG exports from Australia. The volume of natural gas traded globally in the form of LNG was 296 billion cubic meters (BCM) or 225 million tonnes per annum.

FIDs taken in 2009, 2010, 2011

Country	Project	Year start up	Operator	Capacity (Mtpa)
Algeria	Skikda GL1K	2013	Sonatrach	4.5
Papua N.G.	PNG LNG	2014	Exxon	6.6
Australia	Gorgon LNG	2014	Chevron	15
Australia	Queensland Curtis LNG	2014	BG	7.4
Indonesia	Donggi Senoro LNG	2014	PT Donggi Senoro LNG	2
Australia	Gladstone LNG	2015	Santos	4

The future for LNG looks even brighter. Globally, there are 56 MT LNG projects under construction or with final investment decisions (FIDs) and another 56 MT without FID but with good prospects for progress. This means that approximately a 110 MT of new capacity could potentially be created by 2020.

New Liquefaction Capacity



The signals from the three major demand centres for LNG-Asia-pacific, Europe and the Atlantic Basin shows that demand for LNG remains robust. Europe is embracing gas following the decision to show down on nuclear power. As of now gas accounts for about 23 percent of Europe's energy mix and their policies aim to increase it to 30 percent. Traditionally Europe has sourced a lot of gas from Russia via pipelines. The two planned routes Nord Stream and South Stream are meant to by-pass certain countries that are seen as a threat to gas supply security. However in all of Europe's policy briefings, over-dependence on Russia is mentioned which means that European demand for LNG will increase.

Expected New Liquefaction Capacities

	Country	Project	Start Up	Operator	Capacity (Mtpa)
Projects with FID	Australia	Pluto LNG	2011	Woodside	4.3
	Qatar	Qatargas 4	2011	Qatargas	7.8
	Angola	Angola LNG	2012	Chevron	5
	Algeria	Skikda GL 1K (replacement)	2013	Sonatrach	4.5
	Australia	Gorgon Australian LNG	2014	Chevron	15
	Australia	Queensland Curtis LNG	2014	BG	7.4
	Papua N.G.	PNG LNG	2014	Exxon	6.6
	Indonesia	Donggi Senoro LNG (DSLNG)	2014	PT Donggi Senoro LNG	2
Projects with FID but with significant progress	Australia	Gladstone LNG (GLNG)	2015	Santos	4
	Nigeria	NLNG Seven Plus	2015	Shell	8.4
	Australia	Darwin LNG T2	2015	Conoco Phillips	5
	Australia	Pluto LNG-tran 2 and 3	2015	Woodside	5
	Australia	Wheatstone LNG	2015	Chevron	15
	Algeria	Arzew GL3Z	2016	Sonatrach	4
	Australia	Ichthys (Drawin)	2016	Inpex	8
	Nigeria	Brass LNG	2016	Conoco Philips	10

In North America, LNG demand has gone down, but there are new markets emerging in South America and the Middle East particularly Saudi Arabia, UAE and

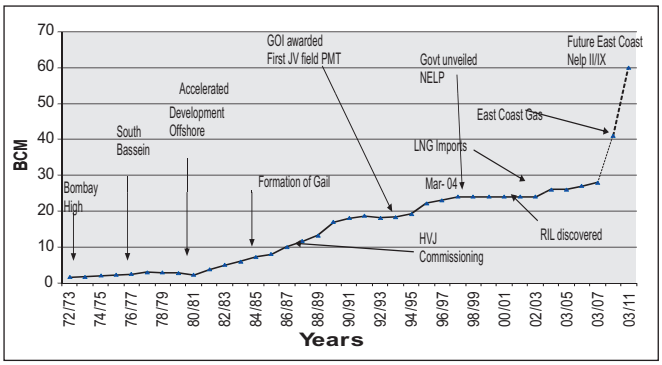
Dubai. India and China continue to expand demand for gas. China has about 40 to 50 MT of re-gasification capacity under construction which is despite the fact that China has the largest shale gas reserves and has secured pipeline supplies from Turkmenistan.

'Irrational Exuberance' led to Complacency

India has been complacent in securing natural gas supplies as it has been overly optimistic on the price and availability of domestic natural gas. Following recommendations in India Hydrocarbon Vision 2025, the Government enacted the New Exploration and Licensing Policy (NELP) in the mid 1990s to increase domestic gas production. Three RLNG terminal initiatives were undertaken in 1998-99 (Petronet LNG in Dahej & Kochi, Shell in Hazira & Dhabol). Demand-supply projections after the KG D 6 gas discovery in 2001 showed anticipation of similar successes from other NELP I licensees and also from subsequent NELP rounds. The mood of optimism over domestic supplies swept over Governments plans. The 11th Plan projections for natural gas demand in 2012 was revised to 283 million metric standard cubic meters per day (mmscmd) while supply was pegged at 238 mmscmd leaving a gap of only 45 mmscmd. At the end of the 11th Plan (2012), the availability of gas was projected to be 238 mmscmd out of which over 100 mmscmd was to come from new domestic discoveries.

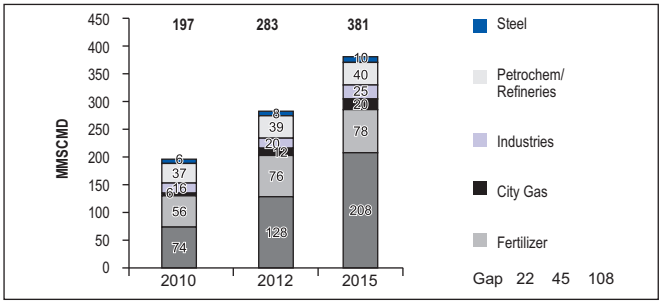
Against a projection of 100 mmscmd, new domestic gas is currently only about 40 mmscmd. The current gas deficit is over 100 mmscmd, more than double the budgeted deficit of 45 mmscmd. The equivalent of 2.5 Petronet LNG terminals will be needed to close this deficit. Adding to the sense of 'irrational exuberance' was the low price quoted for new domestic gas supply to the power sector in 2003. New discoveries along with the low price signals for domestic gas gave the illusion of abundant availability at affordable prices which initiated viability concerns on green-field LNG projects and trans-national pipeline initiatives. No LNG projects were initiated in the next decade nor were there any movement in negotiations for trans-national gas pipelines (which had problems other than that of planning such as the ability to bear geo-political risk and possibility of securing an investor for an extremely risky project). Significant portion of the market for natural gas now remains un-served as the capacity to source low priced LNG has been relinquished.

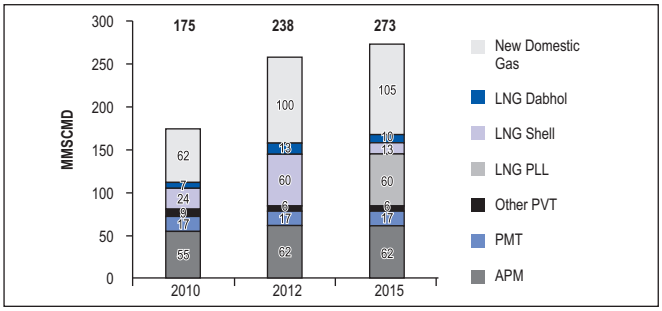
Gas Milestones



The more recent euphoria is over shale gas with talk of some 300 D6 fields in India. In all probability India's import dependence for natural gas is likely to increase ten fold in the next two decades and India will remain a price taker in the market. The energy planners in India, whoever they are, need to realize that going from one hype to another to fuel dreams of energy self-sufficiency and consequently affordability of energy is not a substitute for long term energy planning.

11th Plan Gas Projections: Demand/Supply





RLNG Investments Need to be Accelerated

If India continues to grow at 8 percent until the end of the 13th Plan period (2022), it will need 40 MT equivalent of LNG which is equivalent to 160 mmscmd of gas just to meet the demand from the power sector which accounts for 40 percent of domestic gas demand. Overall demand for gas could be about 360-380 mmscmd by 2022 and most of it needs to be imported in the form of LNG.

Total Projected Gas Availability

12 th Five year Plan (Figures in MMSCMD)					
	2012-13	2013-14	2014-15	2015-16	2016-17
Domestic Sources	124	149	170	177	210
Imports-LNG	73	101	101	156	184
Expected Total Availability	197	250	271	333	394
13 th Five year Plan (Figures in MMSCMD)					
	2017-18	2018-19	2019-20	2020-21	2021-22
Domestic Sources	216	222	229	236	243
Imports-LNG	258	258	258	258	258
Imports (Trans Border Pipelines)	30	30	30	30	30
Expected Total Availability	504	510	517	524	531

To meet demand for LNG, the current 73 mmscmd of LNG capacity must be increased to 184 mmscmd in the 12th Plan and 258 mmscmd in the 13th Plan. 184 mmscmd is equivalent of almost 42 MT which means a doubling capacity of existing capacities by 2017 and then further doubling in the subsequent plan period.

LNG Receiving Terminals in India

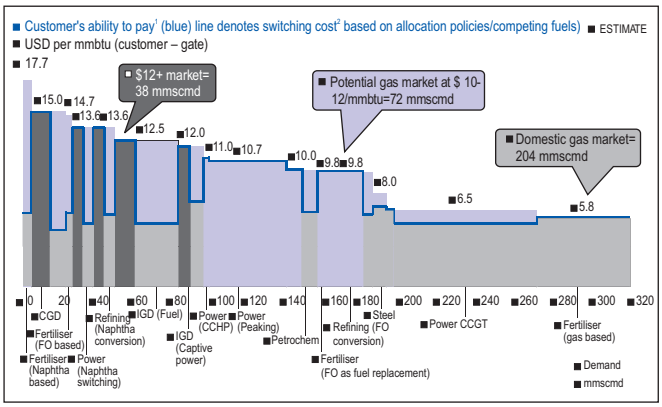
LNG Terminal	Status	Capacity (MMTPA)	Remarks
Dahej (PLL)	Existing	11	
Hazira (Shell)	Existing	3.5	
	Sub-Total	14.5	58 MMSCMD
Dhabol	Under Const.	5	Commissioning 2012-2.5 MMTPA. Expandable to 7.5 with breakwater and third tank
Dahej (expansion)	Under Const.	4	2nd Jetty-July 2013 + 2 MMTPA; re-gas expansion-mid 2015 + 2 MMTPA
Kochi (PLL)	Under Const.	5	Commissioning end 2012
	Sub-Total	14	
West Coast			
Adani/GSPCL	EPC under award	5	Commissioning mid-2015
Mundra			
Dighi Port	Under Planning	2.5	Commissioning mid-2017
East Coast			
Ennore (IOCL)	FEED	5	Commissioning mid-2016
Kakinada Port	Under Planning	2.5	Commissioning mid-2016
Kandla Port (FSRU)	Under Planning	2.5	Commissioning mid-2015
	Sub-Total	17.5	
	TOTAL CAPACITY	46	By terminal year of 12th Plan

India's existing LNG capacity is 14.5 MT and another 14 MT can be anticipated as shown in the Table. This means that India could have the capacity of about 30.5 MT or 120 mmscmd of gas during the 12th Plan but India needs to increase LNG capacity to 40 MT to meet growing demand.

Affordability need not be a Figure carved on Stone!

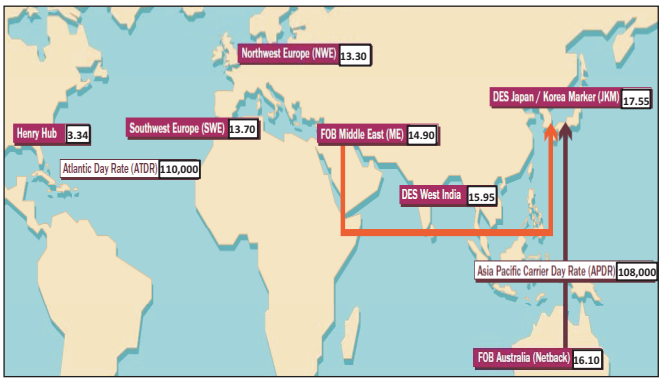
As per expert projections, at a price of $6.5 per mmbtu a demand of more than 204 mmscmd is anticipated from the power and fertilizer segments. At a price of up to $ 12/mmbtu, an additional demand of 72 mmscmd is expected. Beyond $12/mmbtu, demand is expected to increase by another 38 mmscmd. It must be cautioned here that these figures are not carved on stone. In 2003-04, when Petronet was set up, it was widely believed in the industry that not even a 'single molecule of gas' can be sold to the power sector at prices above $2.5/mmbtu, a belief that has been disproved by subsequent developments in the power and natural gas sectors! Very broadly it would not be a fault to assume that demand for gas would be large within reasonable price levels. For example, between Shell and Petronet the total volume of LNG which was imported and sold in the current year was close to 14 MT. Out of this only 7.5 MT was through long term contract at lower price while customers paid $15-18/mmbtu for the balance 7.5 MT.

Sector-wise Demand against Gas Price



The price of natural gas is likely to converge across the globe given the increasing mobility of LNG. Currently US Henry Hub gas prices are $3.34/mmbtu but prices in the Asia Pacific region are at $14-15/mmbtu. Given the increasing global fungibility of LNG these prices should converge eventually.

Global Price Outlook - Spot LNG



However caution is advised against making assumptions on affordability. As demand for nuclear power may slow down in the next two decades there is going to be upward pressure on natural gas demand and therefore price. It will not be prudent to assume that Henry hub will be the lowest marker price for natural gas. LNG buyers would probably be well advised to use the portfolio approach and have a link to one or the other markets. In the near term JCC is likely remain the marker for India.

World over commodities are in a high price era because supply is unable to keep up with demand especially from fast growing developing countries. This situation is generally an opportunity to open up the market and attract investments in the supply chain. In this context there is a message for Indian energy planners. If India is importing LNG at $15/mmbtu or coal at $120/tonne why can't the domestic markets also be allowed to charge the same? This will allow investments to come in and increase the production of domestic fuel. If domestic production is incentivized to create a glut of domestic supply it will actually contribute to reducing global energy prices.

Infrastructure continues to be a bottleneck

Pipelines are a pre-requite for developing a gas market. Europe has more than 1 million km of gas pipelines whereas South East Asia has only 10,000 km. Europe's gas consumption is more than 10 times of South East Asia even though South Asia has gas reserves unlike Europe which depends on imported gas. The question before India is whether it should build pipelines before demand materializes? Traditionally all over the world pipelines or the market has developed when supply and demand co-exist.

In India trunk pipeline infrastructure is primarily limited to the western and the northern part of the country for historical reasons. There is a limited availability of surplus capacity in trunk pipelines and this is a bottleneck for many sellers of gas and many consumers of gas. In addition connectivity of the southern states to LNG terminals, especially Tamil Nadu and Karnataka and Andhra Pradesh is limited. GAIL has an expansion plan to add 6,500 km (180 mmscmd) pipelines approved by Ministry of Petroleum and Natural Gas. Expansion plan also involves up-gradation of existing lines along the Dahej-Vijaipur Pipeline (DVPL) and Gas Rehabitation Expansion Projects (GREP) network. Recently GAIL won rights to lay a 1,550 km natural gas pipeline from Surat in Gujarat to Paradip in Orissa, connecting west to east coast under Petroleum & Natural Gas Regulatory Board (PNGRB) bidding. GAIL expects the total capacity to be operational by 2013-14, however it may be delayed by 2 to 3 years. After augmentation, GAIL's network capacity is expected to be 320 mmscmd. Reliance Gas Transportation India Limited (RGTIL) had proposed adding approximately 3,000 km (84 mmscmd) on the eastern and southern coast. These pipelines will give access to large markets primarily in South. However, in near term no significant additional supply is anticipated from KG basin, and therefore RGTIL pipelines are unlikely to be built before 2015.

Recently, a consortium led by GSPC and the three oil marketing companies—Indian Oil, Hindustan Petroleum and Bharat Petroleum were awarded Pipelines by PNGRB under bidding–Mallavaram (near Kakinada in Andhra Pradesh), Bhopal, Bhilwara (Rajasthan), Vijaipur (near Guna in Madhya Pradesh–Mehsana (Gujarat), Bhatinda (Punjab)–Bhatinda and Jammu. These pipelines would connect KG gas to Southern and Western region and LNG supply to Northern region. With clear domestic and LNG supply visibility through 2015, an expanded pipeline network totaling over 400 mmscmd is under development. Several pipelines are already in progress, and the remaining have been approved for implementation with preparatory work at advanced stages. The emerging pipeline structure is being designed as a ring around the periphery of the country and intended to move the new gas from the east to demand centers in the north, south and west and vice versa.

Pipeline Infrastructure by 2015

Pipeline capacity for east coast gas exceeds the projected supplies by 2015. East-West pipeline (80 mmscmd) connects the demand centres in Andhra Pradesh, Maharashtra and Gujarat–Mallapuram-Mehsana pipeline (22 mmscmd) provides connectivity to Andhra Pradesh, Madhya Pradesh, Gujarat and Rajasthan demand centres. Dabhol LNG terminal would have a combined evacuation capacity of 28 mmscmd through two pipelines–Dabhol-Banglore pipeline (16 mmscmd) and Dabhol-Uran pipeline (12

mmscmd). Kochi LNG terminal will have enough pipeline evacuation capacity (16 mmscmd) to Karnataka and Tamil Nadu. Dahej and Hazira terminals are well connected to DVPL (60 mmscmd) and Gujarat regional pipeline (22 mmscmd). Dahej and Hazira are also expected to be connected to Mehsana-Bhatinda (16 mmscmd) pipeline by 2015. GAIL's Surat-Paradip will connect the west coast terminal to east coast (60 mmscmd). Overall there would be enough pipeline capacity available for West coast LNG terminals with extended regional reach. Currently gas supplies at around 170 mmscmd lag pipeline capacity which stands at 330 mmscmd. In this light it is advisable for pipeline creators to depend on LNG supplies and not on domestic gas which is scarce and is subject to allocation.

With the addition of new trunk pipelines, development of more regional networks in Karnataka and Kerala in Southern region, Punjab, Haryana and Uttar Pradesh in Northern region, West Bengal and Jharkhand in Eastern region can be expected. As in the case of all infrastructure projects in India, implementation risks remain. Uncertainty in land acquisition and regulatory clearances can impede or kill many of the planned projects.

Pipeline capacity expansion which is close 400 mmscmd may or may not serve demand depending on the scope and pace of development of the regional pipeline network which is the critical last mile connection. Pipeline creators are not really connected to the gas supply today and all the planned pipelines are not driven by the supply.

CGD could lead Commercialization of the gas sector

CGD is likely to be far more commercial compared to large gas consuming sectors like power and fertilizer and therefore this requires closer consideration. Though CGD started primarily because of the Supreme Court mandate, it is now being driven by favourable economics. 16 cities have CGD systems and consume about between 12 to 15 mmscmd. There is a national ambitious aspiration to have about 200 cities connected to CGD systems over the next two to three years. There has been good momentum from PNGRB in terms of awarding licences to develop networks in these cities. Two rounds have been successfully awarded. The third round bids are under evaluation and the fourth round has been postponed.

CNG which is a cleaner burning fuel can potentially replace subsidized domestic LPG and diesel. However the scope for CGD to absorb high priced gas may be limited as long as subsidies for LPG and diesel continue. It is expected that within the next few years subsidies for these fuels will be removed given their impact on India's fiscal sustainability. In this context a commercial market for CGD can be envisaged. In terms of heat value in paise per kilo calorie, CNG is very close to the price regasified LNG at $ 12/mmbtu.

Comparison of Price and Heat Value: CNG and Substitutes

			Unit	Retail Selling Price (RSP)	Calorific value in Kcal per unit	RSP converted to heat value in paise per K Cal
1.	Motor Spirit	Delhi	Rs/Litre	63.38	8,798	0.7204
2.	HS Diesel	Delhi	Rs/Litre	41.12	7,700	0.5340
3.	CNG	Delhi	Rs/Kg	29.80	10,956	0.2720
	CNG	Mumbai	Rs/Kg	31.47	10,956	0.2872
	CNG	Ahmedabad	Rs/Kg	40.25	10,956	0.3674
4.	R-LNG	CIF	$/mmbtu	12.00		
		Ex-Delhi	Rs/Kg	42.07	12,870	0.3269

The current weighted average of the long term contract of Petronet LNG and the spot contracts is about $ 12/mmbtu. Distributed power generation in the range of 50-100 MW could be supplied through CGD networks. It is only CGD which can supply 0.01 or 0.02 million standard cubic metres or 3 million standard cubic metres or 2 mmscmd for distributed power generation. In order to realize this potential, infrastructure development which is subject to regulatory approval must be expedited.

Fair Regulation requires Independence

Regulatory oversight is inescapable in order to bring equity in the field and to balance the complex spectrum of issues in the sector until the market matures. In India Regulatory reforms assume significance given that there are only a limited number of players in the arena which in turn has serious infrastructural constraints. As it is in the nascent stages of regulation the Regulator's first task is to create confidence:

- Confidence in the customer that he will not be a victim of monopoly pricing
- Confidence in the producer that he will be treated fairly
- Confidence among competitors that they operate in a level playing field
- Confidence in the investor who pours in millions of rupees in infrastructure that policy of the Govern-ment would be consistent.

To gain confidence of all players in the field, the key is to ensure independence of the Regulators. The Regulator cannot create that confidence in customers if he/she is not independent of Industry and the Regulator cannot create the confidence in Investors if he/she is not independent of the Government.

Apart from awarding licenses to new pipeline networks, the Regulators have the responsibility of diligently monitoring the implementation of earlier licences that have been awarded in order to send out the right message to industry that slack implementation or non-implementation would not be tolerated. Regulators have to encash performance guarantees if licensees do not adhere to performance bonds.

Coming to more recent rounds of CGD bidding, issues have been raised on what has come to be labelled 'aggressive bids' by potential CGD operators. Low tariffs quoted in bids and the sustainability of these tariffs in the longer term has raised issues of bankability of these projects. The adjective 'aggressive' may be seen to describe a relative position and not an absolute position. The bid may be aggressive in relation to existing tariff but to assume that existing tariff is reasonable is as good an assumption as that of the bid tariff being 'aggressive'.

The bid tariff also reflects the investors willingness to bear the risk of his 'aggressive' bid being accepted. Irrational bids could be made for two reasons. One is because of ignorance or the other is to develop a monopoly or capitalize on hidden opportunity. If it is a mistake then sooner or later, the bidder realizes it and the project is stalled and if it is to cash in on some opportunity others catch up on that opportunity. However, the penalties are large, in both cases, and it is the bidder who pays the price for the irrational bid.

At this early stage of market development, no player or stakeholder in the segment including the regulator has the capacity to discern between rational and irrational bids.

However this does not mean that the Regulator can relinquish his responsibility of ensuring that bids are implemented as quoted. As gas price is not regulated 'zero bids' or 'irrational bids' could potentially allow the bidder to transfer the tariff to the gas price. In other words the bidder can transfer the price from the regulated portion to the unregulated portion which cannot be verified.

It must also be noted that aggressive bidding and zero-tariffs could be a step towards increasing the efficiency in the CGD business model. With multiple revenue streams CGD projects could absorb aggressive tariffs as compared to trunk pipeline projects, which have only one revenue stream.

As per recent media reports, BG India's stake in Gujarat Gas is valued at more than Rs 3,000 crore. This demonstrates the potential value creation in the CGD business, which the regulators can unleash.

Other Issues for Consideration

During the last one year there was no authorization for CGD distribution whereas the PNGRB has authorized so many new pipelines. This has given rise to a mismatch in demand and supply.

Open access in gas pipelines cannot work unless a customer who is looking for open access in an LNG terminal or in a pipeline has both (open access to RLNG and open access to pipelines). RLNG terminals cannot hold one cargo for more than five days in their tanks and the cargo has to be evacuated at the rate of at least 15 to 20 mmscmd.

Gas is not a declared good like coal and so taxation on LNG and gas differs from State to State. In cases where the sale is inter-state, the local state governments charge VAT on gas whereas CST is only 3 percent. There are power plants in Andhra Pradesh who want to buy LNG and swap that gas but they are not being able to because of taxation issues and also because of the ability of the transporter or the willingness of the transporter to give out that capacity.

Several ports which were awarded through the bidding process cannot be used for RLNG terminals as request for RLNG terminals was not included in the bid. The Ministry of Shipping and other Maritime Boards need to look into this issue.

- In this context, Floating Storage and Re-gasification Units (FSRU) may be a viable option because the risk is lower.

Asian buyers' cartel for gas may not materailise as there is no Asian gas stockpile and the customers are fragmented in terms of geography, objective and ability to pay.

Cooperatives can be used by small gas buyers to economize on size. If 200 gas customers with consumption of less than 0.001 mmscmd could be harnessed together through a cooperative to invest

Rs 3500 crore or $750 billion in an LNG terminal the burden on each customer would not be more than Rs 25 crores. Small consumers can come together and contract their own supplies and use surplus capacities in LNG terminals or work on tolling models so that they can contract their own supplies at whatever price they can afford and use the terminal to re-gas and store and supply to themselves.

Standards for gas transportation, agreements to harmonize linkage between different pipelines and different gas sources, effect of pipeline expansion on pipeline charges, procedures for assessing over-delivery and under-delivery charges will have to be addressed by the Regulator.

Additional pipeline capacity may be used by owners to trade capacity. The procedures for trading pipeline capacity among shippers or otherwise making use of under-utilized pipeline capacity is uncertain but this must be clarified to manage imbalances and pipeline inventory. In fact, there is a big possibility that sufficiently tight standards for the balancing pipeline capacity could lead to a situation similar to the power sector where the Unscheduled Interchange (UI) mechanism which was a balancing or the disciplinary mechanism led to a spot market and price discovery which in turn led to the development of power exchanges.

Balancing mechanisms and the penalties for over drawal can actually lead to ancillary services, such as storage services that can be provided by different players or it can actually lead to relevant price discovery which will reflect the demand-supply scenario.

Distinguished Speakers

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