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Securing the Energy Basket by Optimizing Resource Potential

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Founded in 1925, Indian Chamber of Commerce (ICC) is the leading and only National Chamber of Commerce operating from Kolkata, and one of the most pro-active and forward-looking Chambers in the country today. Its membership spans some of the most prominent and major industrial groups in India. ICC is the founder member of FICCI, the apex body of business and industry in India. ICC's forte is its ability to anticipate the needs of the future, respond to challenges, and prepare the stakeholders in the economy to benefit from these changes and opportunities. Set up by a group of pioneering industrialists led by Mr G D Birla, the Indian Chamber of Commerce was closely associated with the Indian Freedom Movement, as the first organised voice of indigenous Indian Industry. Several of the distinguished industry leaders in India, such as Mr B M Birla, Sir Ardeshir Dalal, Sir Badridas Goenka, Mr S P Jain, Lala Karam Chand Thapar, Mr Russi Mody, Mr Ashok Jain, Mr. Sanjiv Goenka, have led the ICC as its President. Currently, Mr. Roopen Roy is leading the Chamber as its President.

ICC is the only Chamber from India to win the first prize in World Chambers Competition in Quebec, Canada.

ICC's North-East Initiative has gained a new momentum and dynamism over the last few years, and the Chamber has been hugely successful in spreading awareness about the great economic potential of the North-East at national and international levels. Trade & Investment shows on North-East in countries like Singapore, Thailand and Vietnam have created new vistas of economic co-operation between the North-East of India and South-East Asia. ICC has a special focus upon India's trade & commerce relations with South & South-East Asian nations, in sync with India's 'Look East' Policy, and has played a key role in building synergies between India and her Asian neighbours like Singapore, Indonesia, Bangladesh, and Bhutan through Trade & Business Delegation Exchanges, and large Investment Summits.

ICC also has a very strong focus upon Economic Research & Policy issues - it regularly undertakes Macro-economic Surveys/Studies, prepares State Investment Climate Reports and Sector Reports, provides necessary Policy Inputs & Budget Recommendations to Governments at State & Central levels.

The Indian Chamber of Commerce headquartered in Kolkata, over the last few years has truly emerged as a national Chamber of repute, with full-fledged State Offices in New Delhi, Mumbai, Guwahati, Bhubaneswar, Patna and Ranchi functioning efficiently, and building meaningful synergies among Industry and Government by addressing strategic issues of national significance.

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Introduction

India is the fourth largest energy consumer in the world after China, United States and Russia and its need for energy supply continue to rise. Over the last decade, India's primary energy consumption grew at a CAGR of 5.64 %, outpacing the global average of 2.3 % by more than double. This persistent demand for energy has catapulted India from being the world's seventh largest energy consumer in 2000 to the fourth-largest within a decade. However in terms of per capita energy consumption, India's 2014 consumption of ~503 kilograms of oil equivalent (kgoe) compares significantly lower than the global average of ~1,785 kgoe¹. Increasing population, economic activity and rising income levels is expected to further push the demand for energy in India. India's demand is expected to grow at 3.7% CAGR between 2015 and 2035 making it the fastest growing country in terms of energy requirement².

Fossil fuels make up ~90% of India's primary energy requirement. While coal accounts for 56% of the energy mix, oil & gas account for 28% and 7% respectively³. India's energy mix is likely to remain heavily dependent on fossil fuels through 2035 with oil becoming the dominant fuel (36%) followed by gas (30%) and coal (21%)⁴.

India has an oil & gas Reserves to Production (R/P) ratio of 17.6 years⁵. The domestic production in 2014 was about ~900,000 barrels of oil per day (bopd) accounting for ~23% of its current consumption of 3.8 million bopd, creating a wide gap to be met through imports. This has led to an annual oil import bill in excess of \$100Bn in the recent years. While the decline in oil prices has helped reduce the oil & gas import bill over the past year, any future increase in prices will have an adverse impact on the Indian economy.

While a spate of major gas discoveries between 2000 and 2005 provided hope for the development of a gas based economy, significantly delayed developments, falling production of key fields (KG-D6 field) and high cost of gas imports has led to very slow uptake of gas in India. This has led to current gas consumption of 45.6 mtoe accounting for only 7% of India's energy basket vs. ~20% in other developed

Oil & Gas will continue to be the major source of energy to meet India's growing energy requirements

economies. The alarming levels of pollution in the country and requirement for cleaner fuel is bound to increase the requirement of gas in the future.

Going forward, the increasing demand accompanied by the current decline from key fields such as Bombay High, KG-D6, Mangala and Cambay is expected to widen the oil and gas supply-demand mismatch further.

1 BP Statistical Review of world energy 2015

2 World Energy Outlook 2014

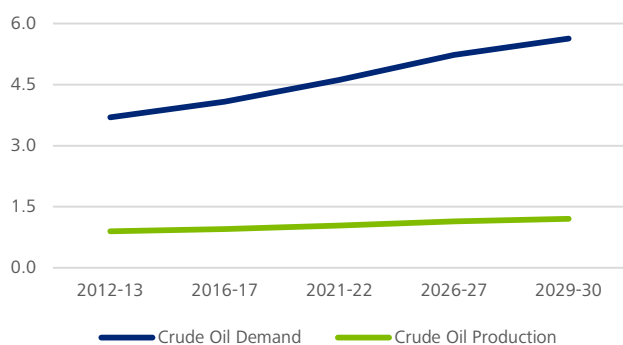
3 World Energy Outlook 2014

4 BP Energy Outlook 2035

5 BP Statistical Review of world energy 2015

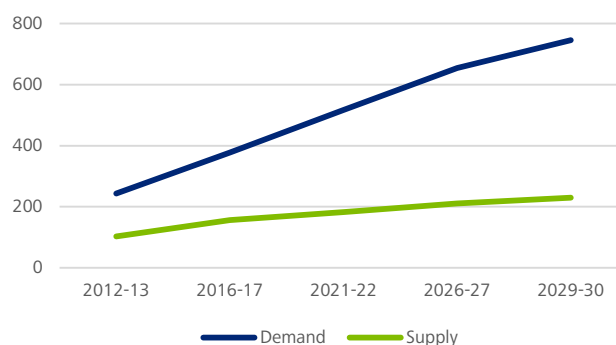
Current estimates project that oil production would reach 1.2 mbpd by 2030 compared to the national demand of 5.6 mbpd, thereby requiring 4.4 mbpd to be met through imports⁶. The gas demand is expected to soar to 746 mmscmd vs. domestic production of 230mmscmd leading to a shortfall of 516 mmscmd that will have to be primarily met through LNG imports⁷. While it will be unlikely to eliminate the import dependency, focused efforts to increase exploration and production efforts across various resource categories can help reduce the gap by 30-40% of the demand requirement.

Figure 1: India-Crude Oil Demand Supply Scenario, mbpd



Source: IEA Estimates, 2014

Figure 2: India-Natural Gas Demand-Supply Scenario, mmscmd



Source: PNGRB

Increasing domestic production has been identified by Prime Minister Narendra Modi and MoPNG as a key focus area and they have set themselves ambitious targets of reducing oil imports by 10% by 2022 and 50% by 2030. This will require integrated energy initiatives including domestic production increase.

Ever widening gap between demand and supply of Oil and Gas is a cause of growing concern for the Indian economy

6 IEA Estimates 2014
7 PNGRB Vision 2030

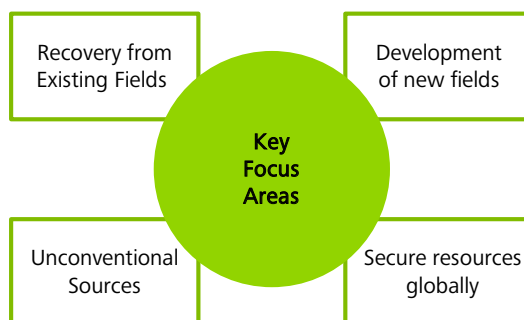
Towards Energy Independence - Upstream Oil and Gas

India should focus on four key areas in order to meet its energy security (fig 3). Firstly, Production optimization should be carried out as a standard practice across all producing fields to enhance production in the near term. Secondly, there needs to be a renewed focus for development of existing contingent resources and discovering new resources especially deep water and ultra-deep water resources. Thirdly, greater emphasis and robust framework for development of unconventional resources like Shale gas, Coal Bed Methane etc. should be put in place. Finally, India should also look to make strategic investments in assets globally in order to meet its demand-supply deficit. Each of the focus areas is discussed in detail in the following section.

I. Increase production and recovery of existing fields

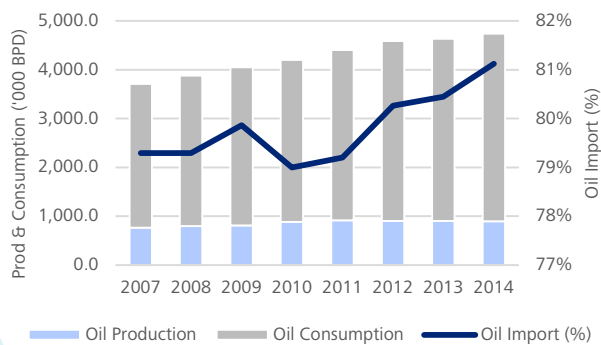
According to the MOPNG the estimated hydrocarbon resources in India as on 1.4.2014 were 28.1 billion tonnes (oil & oil equivalent of gas). More than half of India's current domestic oil production is from maturing fields or fields in declining stages of production. The total production from fields have been declining over the past few years, leading to an overall decline in production post-2010. From peak levels the oil and gas production declined by 2.3% and 38% respectively (fig 4 and 5).

Figure 3: Key Focus Areas for Energy Security



Source: Deloitte Analysis

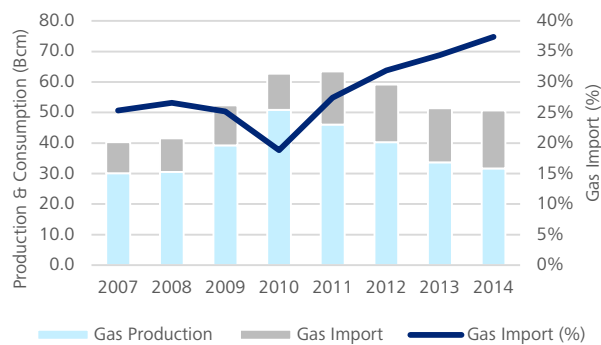
Figure 4: Production & Consumption - Oil



Source: BP statistical review 2015

Average recovery rates of Indian fields are 30%-40%, while state of art developments globally has witnessed recovery rates of up to 50% or more. Production Optimization, Enhanced recovery technologies & Near Field developments are a few options which can be quick wins to increase production and recovery in the near to medium term.

Figure 5: Production & Consumption - Natural Gas



Source: BP Statistical Review 2015

Increased production and recovery from existing fields can help increase domestic supply in the near term

Production optimization can increase current production by ~10% in the near term

EOR can increase recovery by up to 10%, thereby boosting production from existing fields

Full potential of existing fields can be attained through redevelopments and identification of stranded oil pools

Production optimization

Production optimization is the single biggest focus area for the major oil & gas companies in their mature fields. Use of advanced production optimization processes and technologies can increase immediate production by ~10%. Operators should be encouraged to carry out surveillance, regular workovers, improved water handling and well stimulations to enhance production. Regulations and incentives should be put in place to ensure that production optimization is being performed on a regular basis to realise the full potential of the field.

Enhanced Oil Recovery (EOR) and Improved Oil Recovery (IOR) Techniques

Implementation of EOR and IOR techniques can help improve the average recovery rate of existing mature fields from the current levels of 30% by around 5-10%. While a few fields such as Mumbai High (ONGC), Mangala (Cairn India) are already implementing EOR/ IOR technologies, significant potential still exists in the producing fields. Going forward implementing EOR/ IOR technologies should become a norm rather than an exception. Government can encourage deployment of enhanced recovery technologies by providing fiscal incentives, encouraging bringing in technology partners and making IOR/EOR implementation mandatory for extension of contracts.

Near field exploration and development

Operators should also be encouraged to conduct near field exploration and identify stranded oil pools through use of technology such as 4D seismic surveys. Further field development should be carried out based on favourable outcomes of these studies e.g. multiple redevelopments have helped the Rawva field recover over 50% of the in-place reserves in an economically viable fashion. PSCs could be altered to provide greater share of the increased production in these mature fields.

Over the next 10 years, production optimization, EOR and near field developments can add ~200mtoe of cumulative production. This leads to a potential incremental production of ~250,000 bpd, translating into savings in the import bill of around USD 150 billion over the next 10 years⁸.

II. Discover and develop new fields

India has 26 sedimentary basins covering 3.14 million sq km of area. About 44 % of India's total sedimentary basin area is onshore, covering an area of 1.39 mn sq km, and balance 56 percent covering 1.75 mn sq km is offshore, including deepwater of 1.35 mn sq km.

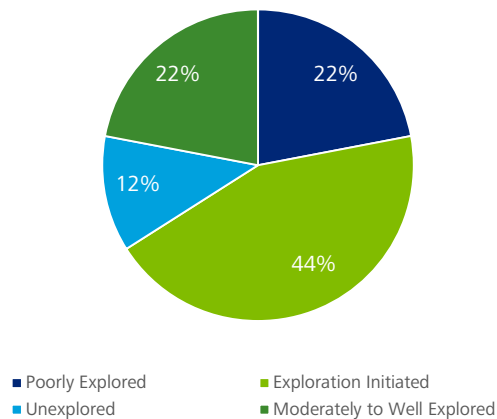
Only 22 % of the total area has been moderately to well explored (fig 6). Exploration efforts have been initiated in 44 % of the area and the balance 34 % remains poorly to completely unexplored.

Since 1993, the Government of India has signed Production Sharing Contracts (PSCs) for 28 exploration blocks under Pre-NELP rounds, 11 of which have already been relinquished or surrendered. Major hydrocarbon discoveries made in the pre-NELP blocks are in the Gulf of Cambay by Cairn Energy, Gujarat State Petroleum Corporation (GSPC) and Essar.

Out of the 360 blocks which have been offered in the NELP rounds till date only 148 are active blocks in various stages of exploration, appraisal, development or production, 106 have been relinquished and 106 blocks have not been awarded due to lack of participation. Furthermore, while 128 hydrocarbon discoveries were made in 42 blocks, production has been limited to 11 fields in 4 blocks (as of 1-Jul-2014).

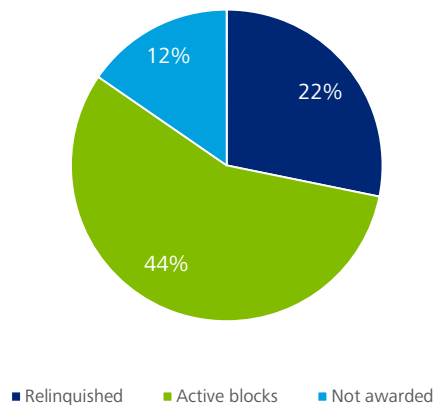
A number of large gas discoveries were announced during the period 2001-2005 under the NELP rounds. However, these fields are yet to commence production or have under produced significantly as in case of RIL KG-D6 field whose production declined significantly after 2010 due to geological complexity and suboptimal developments. Going forward, efforts should be made to not only develop discovered fields but also discover the full potential of our sedimentary basins.

Figure 6: Status of Exploration in the Indian sedimentary basins



Source: DGH

Figure 7: NELP block wise status



Source: DGH

Significant untapped potential exists as three-fourths of India's sedimentary basins are under-explored or unexplored

Gas fields have not produced to their full potential- capable of meeting 10% of demand by 2030

Discovering the full potential of Indian basins can help India bridge the supply-demand gap in energy requirements in the long term

Development of major deep-water gas discoveries:

11 major gas fields with a resource base of around 3 billion tonnes oil equivalent of gas⁹ have been discovered of which only KG-D6 is under production. Most of these gas fields are yet to see the light of day due to poor geological understanding, sub-optimal developments and lack of government incentives. These developments (excluding shale gas) alone can cater to 10% of demand by 2030¹⁰.

Development of marginal fields already discovered:

Marginal fields are small fields which do not have very high reserves. While majority of these were allocated to NOCs before the licensing rounds on a nomination basis, a number of other marginal fields have been discovered in NELP rounds. ONGC holds about 165 marginal fields (79 offshore and 86 onshore). These fields have ultimate total reserves of more than 340 mtoe. However, due to the relatively lower commercial attractiveness of these fields to the large E&P companies, none of these marginal fields are presently being developed.

Discovery and development of new fields:

Over 75% of India's sedimentary basin is yet to be explored and this calls for increased exploration focus through new exploration licensing rounds. The remaining estimated potential in these basins is around 28 billion tonnes with 12 billion tonnes of recoverable resources. While these resources are unlikely to add production in the next 5-7 years, they will be critical to add and grow production significantly by 2030.

Discovering the full potential of Indian basins can help India bridge the supply-demand gap in energy requirements in the long term.

9 DGH, ONGC
10 Deloitte Analysis

III. Increase focus on unconventional sources of energy

To meet our growing energy needs, there is a need to tap into additional non-conventional sources of gas such as shale gas, coal bed methane, coal gasification, gas hydrates etc. which require significant R&D effort.

Shale Gas Developments

India has estimated technically recoverable shale gas resources of ~96 tcf. The KG basin has the highest reserves of ~27tcf followed by the Cambay basin with reserves of ~20tcf¹¹. Though India passed regulations to support the development and exploration of shale resources in 2013, it is still a significant laggard as compared to other nations in the world. While private players have invested in global shale gas assets, India shale developments can only be undertaken by state entities ONGC and OIL under the current policy.

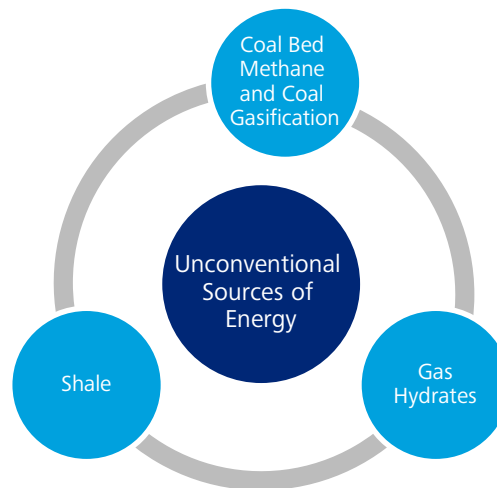
A positive step towards unlocking India's shale potential is ONGC's plan to drill 30 shale gas exploratory wells. Conoco Philips would provide technological support to ONGC.

Keeping in mind the critical role played by niche and independent players in the Shale industry in the US, it's important to encourage private players (local, international, small and big) to develop shale in existing acreages and also obtain new leases for shale development. Shale resources can help ramp-up the much required domestic gas production.

Coal Bed Methane

India has a proven CBM reserve of ~92 tcf. While a large number of private developers like Cairn India, ONGC, GECL, Essar, SAIL etc. have invested in the exploration and production of CBM, multiple issues in most of the 33 awarded blocks have hampered developments of these blocks. E.g. Essar has 5 blocks with a capacity of 10 tcf. Its Ranigunj asset produces ~0.5 mmcmd of CBM, significantly lower than its expected peak production. Resolving gas pricing premium, land acquisition issues and delay in clearances can help ramp-up CBM production in India.

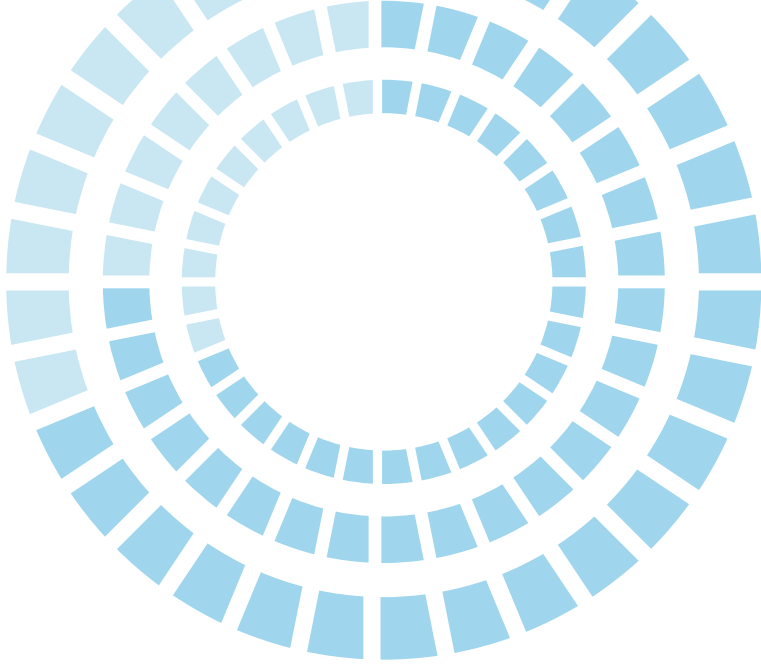
Figure 8: Unconventional sources of energy



Source: Deloitte Analysis

Significant shale resource potential exists in India - Dedicated focus required to commercialize these

Accelerating CBM production key to increase gas uptake at attractive pricing



Developing a strategic plan and identifying focus areas at a National level will help to acquire attractive resources globally

IV. Secure resources globally

India is currently and will continue to be dependent on crude oil and gas imports. Apart from spot and long-term contracts, India like other major oil import countries like China, Korea etc. has made efforts to secure exploration and production assets overseas. Over the last five years, Chinese NOCs have invested over USD 90 billion to secure resources globally vs. ~USD 10 billion by the Indian NOCs¹². While OVL, the overseas arm of ONGC was established in 1989 with this very purpose, India has lagged behind China and Korea in its quest for securing resources globally. In the recent past, India has lost to Chinese and Korean companies in a number of strategic acquisitions across the world e.g. Nigeria, Kazakhstan and Russia. The current low oil prices provide another opportunity to secure global resources.

Increase stake in current ventures

While Oil and Natural Gas Corporation (ONGC) through its wholly owned subsidiary ONGC Videsh Limited (OVL), has taken the lead in acquiring oil and gas assets abroad, there is significant room for increasing our global footprint. Currently OVL is a non-operator in most of its international blocks with very little stake. Proactively increasing stake from partners in existing assets can help add to its international resource base.

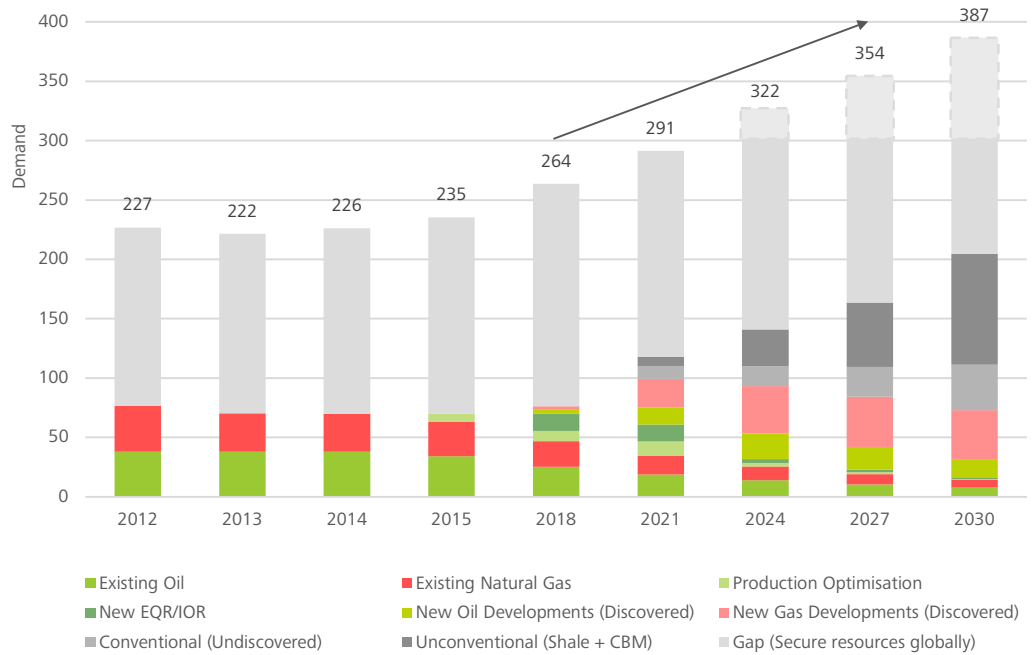
Strategically acquire new producing and exploration assets

Improved coordination of Indian NOCs and the Government can enable India to acquire key global assets. Developing a strategic plan and identifying focus areas at a National level will help optimize efforts and support from GoI to acquire attractive resources globally. A consortium or a strategic fund led by the Prime minister's office and involving all key PSUs would ensure focus and increased bargaining power to acquire resources globally.

V. Production Outlook

As per Deloitte analysis, we expect that the 4 key initiatives will not only help arrest the decline but also ramp-up current production levels by ~50% by 2020 and triple the production by 2030 over current levels. Production optimization and EOR/IOR will help expand the field life of existing fields and will account for 30-40% of the production in 2020. However, their impact beyond 2020 would diminish as we expect them to become standard practices in new developments going forward. New developments from existing discoveries will add substantial production only beyond 2020. These developments will account for ~25% of the production by 2030, with gas accounting for 2/3rd of the new production. There is still a lot more undiscovered potential both in conventional and unconventional (shale and CBM) sources. However, there is a wide uncertainty in the potential production addition possible. Focussed and successful exploration and developments can add ~150 mmtoe to the annual production by 2030, which is more than a 100% increase over current oil and gas production levels of 70 mmtoe.

Figure 9: Production Outlook, mmtoe



Source: Oil Demand (EIA), Gas Demand (MoPNG), Production Forecasts (Deloitte Analysis)

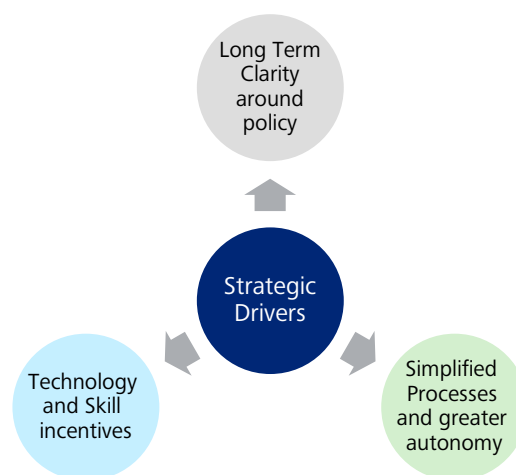
Strategic Drivers for Oil & Gas

UPSTREAM OIL & GAS

The existing fiscal regime, regulatory and E&P procedures, access to attractive funding and use of optimal technologies prevented not just exploration and development activity but also led to sub-optimal developments. While the Government in the last couple of years has taken a number of decisions in the right direction, still major reforms are called for. In order for the oil & gas sector to grow to meet the energy requirements and witness 50% increase in production by 2022, the Indian Government needs to bring about significant changes in doing business in the oil & gas industry. Ongoing efforts are required to ensure greater data availability, improve transparency and clarity, ensure single window clearances, provide greater autonomy to operators, incentivise faster developments especially marginal and complex fields and encourage deployment of advanced technologies across the entire value chain of the sector.

Deloitte has identified three key requirements (fig 10) to transform the Upstream oil and gas sector in India.

Figure 10: Key requirements to Secure Energy Basket



Source: Deloitte Analysis

I. Long term clarity around policy

Numerous recommendations have been provided by the committees appointed by the Government to identify the causes for the poor success of NELP rounds. Consistency of policy and its implementation has been identified as one of the key reasons for lack of interest or abandonment of leases acquired during the NELP rounds. Fig 11 identifies the areas around which policy clarity is required in the near-term. Specifically clarity and consistency around licensing regime, resource rights (e.g. Shale), PSC extensions and taxation will be critical.

Clarity on Licensing Regime

Clarity on the licensing regime going forward and also the timeframe for the next licensing round will be the 1st step towards renewing interest in the sector. While there have been multiple debates and reports on the advantages and disadvantages of the Production Sharing Contracts (e.g. gold plating, micromanagement) vis-à-vis Revenue sharing contracts (e.g. lower RoI), operators have successfully participated and operated under multiple regimes. Long-term clarity and consistency of policy and processes will help instill investor confidence.

The announcement of Revenue sharing contracts as the way forward for the marginal fields auction is a welcome step in this regard. As next steps, it is important to elucidate the policy clearly highlighting the incentives to operators. Furthermore, NELP X should be announced at the earliest.

Clarity and consistency around policy critical to attract international and private players

Policy for unconventional

Another policy which has been debated for long and needs clarity is that for developing unconventional sources. While a shale policy has been issued for the NOCs, clarity on the terms of private sector participation is desired. Furthermore, the proposed 'unified licensing policy' would enable the licensee to get automatic clearances to explore any hydrocarbon reserves, including shale, coal, coal-bed methane, oil or gas in the current license area. This can help accelerate the development of resources as the incumbent will have the most knowledge of the sub-surface.

Marginal Fields Policy

In order to increase production from the marginal fields the Government plans to auction 69 such fields which have been surrendered by the NOCs (63 from ONGC and 6 from OIL). This would allow smaller firms with a lesser operating cost to develop these at a much faster and economic rate.

The Government is yet to announce if any premium would be provided to the production from these fields. However it has announced that the auction would take place based on a new revenue sharing model instead of the production sharing model. Incentives provided in Nigeria, Malaysia and UK to develop marginal fields include slab-wise royalty, market pricing, provision for faster depreciation and lower taxes. The same could be considered in India for encouraging greater participation.

Open Acreage Licensing Policy & Creation of a National Data Repository

Government is considering the adoption of an open acreage licensing policy (OALP) over the block auctioning system under NELP. In this, rather than Government auctioning the pre-defined blocks in various NELP rounds periodically, any explorer can evince interest in any unallocated area at any time, which would then be put out for bidding by other interested explorers as well. This would offer technically competent E&P companies the flexibility to explore new basins and plays, which might be of little interest to others.

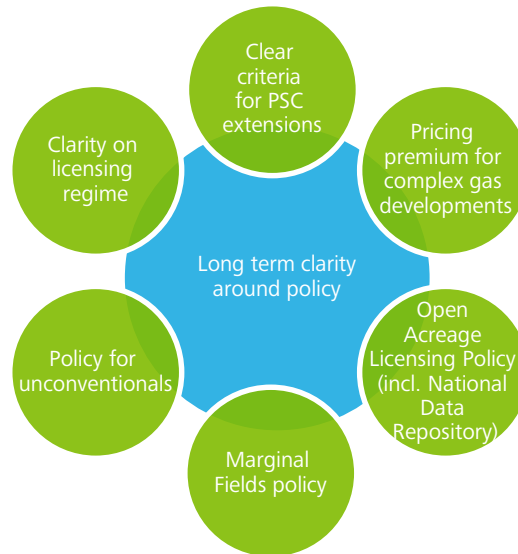
However, International companies have been apprehensive to invest in the Indian Oil & Gas sector due to lack of reliable information with respect to the geological data. Presently, only around 45% of the total sedimentary basins are covered through the usage of 2D seismic data, whereas the penetration of 3D seismic data is much lower. For OALP to be implemented, extensive data coverage across all basins and a national data repository (NDR) is a prerequisite. DGH's plan to establish a National Data Repository (NDR) by 2016-17 is a key step in this regard.

Clarity on pricing premium for complex gas developments

As a positive step towards aligning the prices towards international prices, the Government in October 2014 announced the new pricing policy for domestic gas. The domestic gas prices have now been linked to the international indices and would be reset every six months.

For promoting the development of deep water (DW), ultra-deep water (UDW) and high pressure and high temperature (HPHT) fields, the Government has indicated a price premium over and above the formula driven price. It is well appreciated that global E&P business model usually have a high IRRs in the successful blocks to offset the capital sunk in the failed blocks. Thus clarity on the premiums for existing and new DW, UDW, HPHT discoveries are critical for commercially viable development of these projects.

Figure 11: Areas requiring long-term clarity around policies



Source: Deloitte Analysis

Clear criteria for PSC extensions

Uncertainty around PSC extension criteria can deter operators from implementing EOR/IOR technologies or making investments to optimize production. While, clarity and transparency should be brought about on the criteria for extension of existing contracts, Government should assess the efforts of the operator in maximising the field performance prior to awarding extensions to ensure optimal field developments.

Rationalisation of tax structure for domestic crude in order to make it more competitive

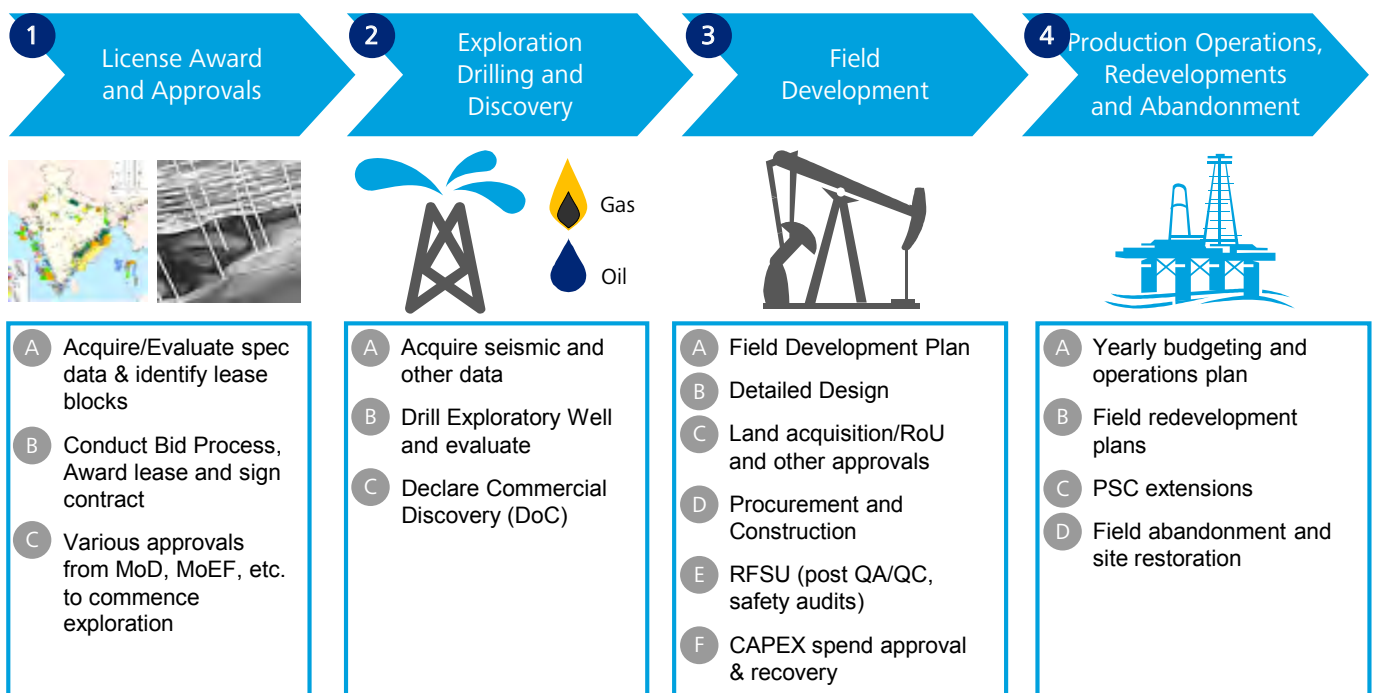
Current tax structure/cess makes the delivered cost of domestic crude oil uncompetitive as compared to imported crude with zero import duty. This could lead to lower demand of domestic crude viz-a-viz imported crude and deter development of riskier complex oil developments with lower commercial attractiveness. This issue needs to be addressed and parity brought about between domestic and international crude prices to enhance investments in domestic upstream projects.

II. Simplify Processes and enable greater autonomy

Apart from policy uncertainty, laborious approval processes, lack of synchronization among various regulatory bodies and excessive oversight have led to diminished interest in NELP and lack of developments. Providing greater financial and operational autonomy in decision making to the operating companies could be a key step towards accelerated developments. The current control mechanisms need to be aligned with international best practices. This can be achieved through a favorable contract regime and streamlined approval and clearance process and empowering the board to make farm-in and farm-out decisions while adhering to broad principles and guidelines laid-out by the government.

Greater operational autonomy to operators required for accelerated developments and participation in upcoming bid rounds

Figure 12: Current E&P process in India



Single Window Clearance

Historically a number of blocks awarded in the NELP rounds faced significant delays due to clearance issues. Around 52 blocks (out of total 254 awarded) have been hit due to the lack of clearances from either defence or environmental departments. ~19 out of these have been relinquished by the operators for clearance-related issues. Most international companies including BHP Billiton and Santos have stated long-drawn clearance procedures as one of the key reasons for their exit from the Indian E&P sector.

In order to reduce such delays the Government is contemplating a single window clearance system. While the guideline to develop and implement a single window clearance system in infrastructure development is in place, it is important that the Government must synchronise various central and state laws/departments in order to ensure minimum lead time. Ensuring all clearances are in-place prior to awarding the new leases will be desirable.

Flexibility in Field Development Plans

Post declaration of commerciality, currently a Field Development Plan (FDP) is submitted for approval to DGH prior commencement of field development. Any deviation from the plan to optimize the field development based on newly obtained data will need a FDP revision and this process is as rigorous and stringent as the original approval process. While this helps DGH closely monitor changes in field development, it deters operators from optimizing developments due to the fear of potential long delays in approval. Furthermore, sub-optimal developments have led to long drawn arbitration for cost recovery thereby creating an environment of trust deficit between the Government and operators.

Globally it is very common to develop large complex fields in multiple phases due to the uncertainties that still exist prior to development. Greater autonomy should be provided to operators in the field development process. Operators should be allowed to submit outcome-based multiphase development plans and be provided discretion in making optimal decisions for future phases. This will be useful to maximise recovery and production. Also, the process of FDP revisions should either be simplified or eliminated.

III. Technology deployment, Skill development and Local manufacturing

Currently Indian E&P operators are heavily reliant on expensive imported technologies, international service providers and global staff/consultants for performing the E&P activities in accordance with global standards. Hence, in some cases, use of suboptimal technologies have impacted the overall recovery and production from the fields. Furthermore, the ratio of India's R&D expenditure to revenue (in upstream oil and gas) is significantly below the international benchmark of 1-3% for major developed and developing economies. Thus there is an increasing need to undertake reforms that will not only encourage usage of technology but also position India as a global hub and destination for innovation in the oil and gas sector. To achieve this, the government, E&P operators, field service companies, local manufacturers, academic institutes, research institutes and other stakeholders will have to work closely to deploy latest technology while developing local skills and manufacturing.

Encourage Technology Usage and Adoption

India's oil & gas industry lags behind the global leaders in terms of technology development and usage. This is evident by the lack of desired exploration success and/or sub-optimal developments. It is important to encourage deployment of best possible technologies (without cost trade-offs) to ensure optimal developments. Operators should be incentivised to tap into international E&P expertise to deploy state-of-art and most relevant global technologies.

Technical capabilities in evaluating and developing resources key to optimal developments. Skill development and local manufacturing to be geared for innovation

As an example, Shale Gas technologies like hydraulic fracturing and advanced reservoir fracture monitoring might need to be imported from other countries and specifically tailored to individual fields. International technology leaders' participation might also be encouraged by providing them equity and transferring operatorship in existing leases in exchange for access to technology.

Periodic Technology and R&D mapping has to be performed specific to the capabilities of the Indian industry to identify the technology shortcomings and encourage import of specific technologies. Furthermore, specific roadmaps should be developed to build local capabilities in these identified areas.

Increase importance of technical capabilities as a bidding parameter

Despite India's poorly explored sedimentary basins, the technical capabilities are not given high weightage in the bidding process. Presently zero weight is provided in the bid evaluation for onshore/shallow water blocks and 25% weightage for deep water blocks. In contrast 50% weightage is given to the financial terms. Such a skewed weightage system provides a smaller company the chance of outbidding a technology focussed major oil & gas operator by bidding aggressively on the financial terms. This in turn could compromise the quality of exploration and production of oil & gas.

Some operator companies do try to bring in technology partners by providing higher weightage to the technical capabilities when selecting consultants. For e.g. ONGC sometimes provides over 50% weightage to technical parameters. The Government should consider increasing the importance of demonstrated technical capabilities in the bid evaluation.

Cost Recovery of pilot projects under existing production

Development of complex and unconventional projects entails high amounts of investment in the appraisal phase. In some cases, R&D projects with tens to hundreds of million dollar investments will be required. In case these large pilot projects are not successful it leads to significant losses. This has become a deterrent for operators to invest in large pilot projects.

It has been witnessed that structured and coordinated efforts by the Government, Industry and the R&D institutes have helped countries like Norway and Brazil not only to explore and exploit resources but also become global leaders in deepwater and sub-salt developments. In order to support operators to invest in R&D projects, the Government should agree for cost recovery of these pilot projects from the existing producing fields or other business activities.

Skill development in India

State-of-art technology usage is only possible when skilled and well trained manpower are available. Availability of skilled E&P manpower is a key challenge in the sector. Like most developing oil economies, India is reliant on expensive expatriate staff and international consultants/service providers for technical expertise. Hence, both the Government and E&P companies should focus on building capabilities through industrial training, enhancing international exposure, attracting world class researchers and faculty re-training.

Entrepreneurship encouragement for local small players

Local industry can propel the upstream oil & gas sector by providing the necessary goods and services in a timely and cost effective manner. Providing attractive financing and necessary skill development training can encourage local entrepreneurs to manufacture equipment and provide services required for the oil & gas sector. The Make in India campaign started by the present Government is an initiative in the right direction and should promote the local manufacturing units and firms to provide local services.

Gas midstream and downstream

India’s gas uptake is only 7% of its primary energy basket vis-a-vis the global average of 20%. Limited domestic supply, lack of gas network and price sensitivity of Indian customers has hampered increased gas uptake in India. Going forward, it is critical for India to increase usage of cleaner gas fuel not just to optimize its primary energy basket but also to rein in the alarming pollution levels in the country.

India presently has a network of about 15000 km of natural gas transmission pipelines with a design capacity of approximately 337 mmscmd. The gas infrastructure both in terms of LNG terminals (currently 23.5 MMTPA capacity) and the pipeline networks are largely catering to the demand centers in western and northern regions. The said regions have around 60% of the overall network in the country and consume around 80% of the overall volume of gas utilized in the country.

| Region | % of Pipeline network | % of consumption | States having infrastructure | States lacking infrastructure |
|---------|-----------------------|------------------|-------------------------------|---|
| West | 40 | 53 | Gujarat, Maharashtra | Goa |
| North | 20 | 26 | Delhi, UP, Haryana, Rajasthan | Punjab, J&K, HP, Uttarakhand |
| Central | 13 | 3 | MP | Chhattisgarh |
| South | 16 | 14 | AP, TN | Kerala, Karnataka |
| East | 0 | 0 | - | West Bengal, Orissa, Jharkhand |
| NE | 10 | 4 | Assam, Tripura | Meghalaya, Sikkim, Arunachal Pradesh, Manipur |

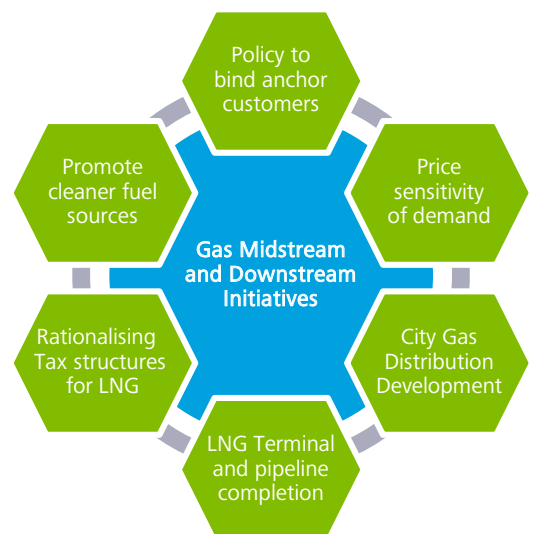
A large part of the country especially the eastern states lacks LNG infrastructure (terminals/pipelines) and hence the potential energy demand in such states is largely met through conventional fuels viz. diesel and petrol and other fuel oils.

In order to bring parity of supply/connectivity on a pan India basis, the Government has formed aggressive plans to add another 15,000 kilometers of pipelines to complete the national gas grid. The grid envisages to connect all upstream supply sources including the upcoming LNG terminals to the demand centers spread across the state geographies.

However the plan for development of gas grid would require resolution of following key issues facing the midstream and downstream sector:

1. Framework to create anchor demand customers
2. Sourcing of gas at competitive prices- address price sensitivity of demand
3. Expediting development of LNG terminals and pipelines
4. Regulatory Challenges in recovery of network costs for midstream and CGD networks

Figure 13: Gas Midstream and Downstream Initiatives



The initiatives required to address the challenges are discussed in the section below.

Policy to bind anchor customers

Investments across the downstream gas value chain are dependent on the committed presence of anchor customers. Hence, it is important to bring in integrated policies that encourage gas usage by the end customers to foster sector growth. Some of the policy factors that may be considered by the Government could be:

- 1. Commitment to procure peak power from gas based projects:** MoPNG has recently introduced a mechanism for utilisation of stranded projects where support of INR 3500 crore and INR 4000 crore has been considered for 2015-16 and 2016-17 respectively. The initiative spans across Ministries and Governments at central and state level for successful implementation of the scheme. However, sustainability for such schemes needs to be ensured for the life of the assets and hence going forward, a peaking power policy that mandates usage of gas based portfolio based on current stranded projects may be made mandatory.
- 2. Policy directives on revival plans for fertilizer plants:** Framing sustainable policies and defining clear timelines for reviving the fertilizer plants can help implementation of national gas grid. Fertiliser plants consume about 42.25 mmscmd of gas for manufacture of subsidised urea. Out of this, 26.50 mmscmd comes from domestic fields and the rest 15.75 mmscmd is imported LNG. The plants running on imported R-LNG are not able to compete with imported urea which is available at a price of ~\$300/tonne. A price pooling mechanism would make a lot of fertilizer plants competitive with imported urea thereby leading to reduction in the subsidy burden for the government.

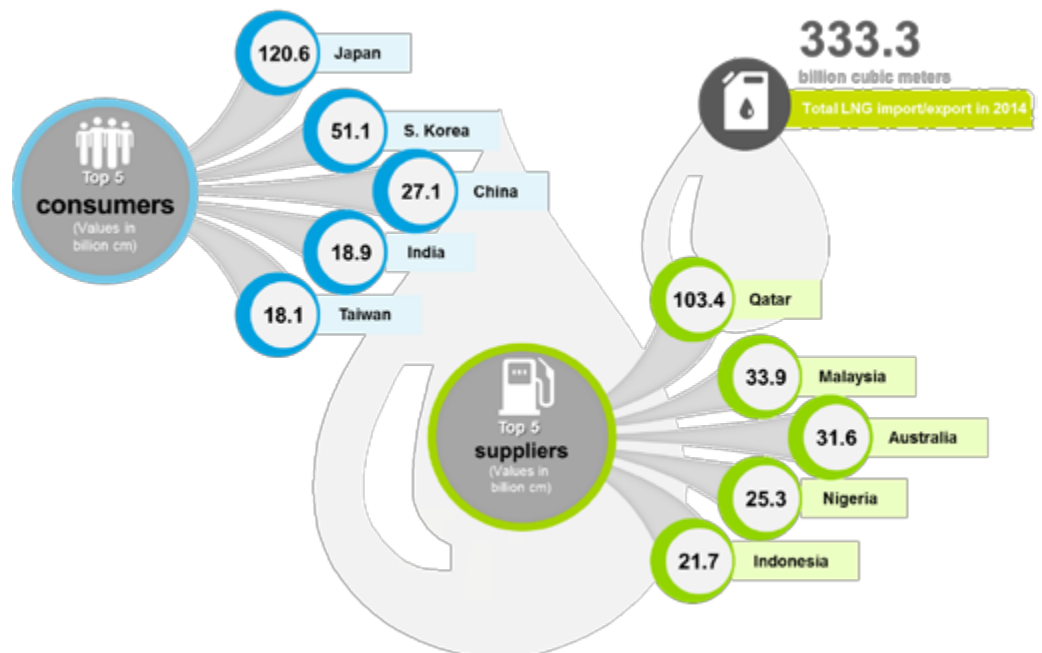
Sourcing of gas at competitive prices

Recent oil price drop has been a boon to many major oil consuming countries. Mexico, Brazil, India, China, Indonesia, Kuwait, Oman, Egypt, Tunisia, Morocco and Malaysia all took the opportunity to cut fuel subsidies, easing pressure on public finances. On account of the fall in prices and changing economics of oil and gas trade, new trading patterns are emerging in which US-Canada-Mexico and Russia-China-India are converging into distinct blocs. While the former represents an increasingly self-sufficient bloc, spurring a move towards a more regional trade, the latter envisages possibility that Russian gas could pass through China not only to India but into SEA too. As a result of the global developments, the Spot price of LNG delivery to Asia fell to \$10.70/MMBtu in February 2015.

An interesting trend observed is the Hub-linked pricing, destination flexibility and new tolling models which are increasingly shifting market power from sellers to buyers—a trend that will only accelerate if spot-linked pricing contracts become more prevalent.

On account of the current market scenario, Indian traders may look into renegotiating their existing long term contracts (~20 MTPA) to more favourable terms that suits the customer requirements and make LNG a more competitive option.

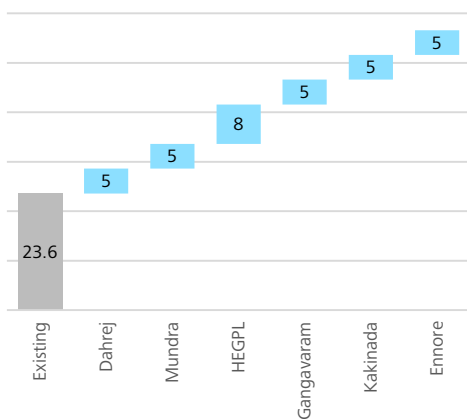
Figure 10: Key requirements to Secure Energy Basket



Expediting development of LNG terminals and pipelines

Current LNG Terminal capacity of around 23.6 MTPA is expected to reach 55 MTPA by FY18 (~90 MMSCMD to increase to 215 MSCMD). However, the development of LNG terminals has to be ensured in synchronization with the timelines for pipeline development. Any delay in development will have cascading impact on LNG traders, terminal operators and the potential customers.

Figure 15: LNG Terminal Capacity
(Existing/Under construction/Proposed)



Source: Deloitte Analysis

Accelerate approvals for pipeline Developments

In order to boost investments, the Government has identified around 4 pipelines that may be taken up through the PPP route. Ranchi- Talcher-Paradip pipeline is the pilot project being pursued at the moment under the VGF mode. GAIL has been entrusted to undertake the bid process management pursuant to seeking approvals from the competent authorities. Based on its successful implementation, the model will be extended to the other remaining pipelines.

However, several of the pipeline projects have been stalled on account of Right of Use (RoU) and other approval issues.

Addressing Regulatory Challenges in recovery of network costs for midstream and CGD networks

The current utilisation of several new pipelines is below 20% on account of sensitivity of demand and lack of anchor demand customers. Similarly for CGD networks the demand built up for domestic customers is low and other segments (viz. industrial and commercial segments) have high price sensitivity. On account of the lower demand, recovery of capex through network tariffs impose a significant challenge to the developers who have envisaged significant demand built ups at the time of bid submission.

Petronet LNG's Kochi Terminal ability to market and distribute got hampered due to delays in Kochi-Bangalore-Mangalore pipeline

Intervention by the Government for expeditious resolution of land acquisition issues would boost development of the pipelines

Identification and prioritizing potential areas having desired consumer mix critical to support CGD development

Results of bidding for both pipeline projects as also the CGD bidding rounds conducted so far needs to be analysed to identify key issues in network development and recovery of costs of the developers. Regulatory mechanism should prudently examine the demand projections submitted by the bidders, provide incentives and ensure timely network completion.

CGD presence is limited in India with 23 CGD networks operating in 47 Geographical Areas (GA) with the average demand being ~0.35 mmscmd. So far only 5 of the 21 GAs actioned have been commissioned. Developers have not responded enthusiastically in the recent CGD bids (5th round). Out of 20 GAs -no bids received for 8 GAs and single bids received in four other districts.

Rationalizing taxes to improve competitiveness of gas

In the current taxation regime, differential taxes are levied by different states on natural gas. The VAT on gas varies from 0% to 25% in different states. Some states also allow for a VAT credit while others do not. Apart from leading to a significant variation in prices across the country, it also leads to double taxation in case of gas swaps. Initiatives of gas pooling currently considered for stranded power projects partly address this issues in the short run, however long-term sustainable solutions need to be looked into.

Institutional framework for promoting cleaner fuels across customer segments

On a broader level, taking into account the very high pollution levels in the country, norms for usage of alternative fuels could be made stringent. This will also help increase parity for usage of natural gas by industrial consumers as Natural gas is a cleaner fuel source compared to alternate fuels such as coal, diesel, kerosene and naphtha, which have high carbon content. High carbon tax could deter customers from switching to alternate fuels there by increasing uptake of imported natural gas.

Conclusion and Way forward

Securing India's energy requirements is critical to ensuring fast paced growth. Oil & Gas will play a critical role in India's growth over the next 2 decades and securing these resources is of utmost importance.

The ongoing changing dynamics in the global oil and gas industry due to the low oil prices provides opportunities and poses challenges for India with regards to securing oil and gas resources. While the low oil prices help secure global resources at attractive prices, they further hamper development of domestic oil and gas resources. Hence, alongside acquiring global resources, a holistic approach encompassing the following is required to realize the full potential of the domestic resources:

- Maximizing mature field production and recovery through Production Optimization and EOR/IOR
- Accelerating developments of discovered gas and marginal fields as well as renewed focus on exploration of unexplored basins
- Dedicated focus to discover and develop unconventional resources

This can be made possible through continued policy reforms, process simplification, financing and skill development.

Another key focus area going forward should be development of LNG and pipeline gas infrastructure to increase gas utilization. While the lack of infrastructure and price sensitivity of Indian customers has led to low gas uptake, going forward addressing the following challenges in a sustainable manner can help provide consumers access to cleaner gas fuels:

- Framework to create anchor demand customers as currently being undertaken for power and fertilizer sectors
- Sourcing of gas at competitive prices- leveraging the sovereign powers of the government to renegotiate some of the long term LNG contracts
- Expediting development of LNG terminals and pipelines by resolving land acquisition issues
- Resolving regulatory challenges in recovery of network costs for midstream and CGD networks
- Rationalization of Tax structures across states for usage of LNG in order to increase competitiveness of gas vis-à-vis alternative fuels and
- Institutional framework for promoting cleaner fuels across customer segments

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