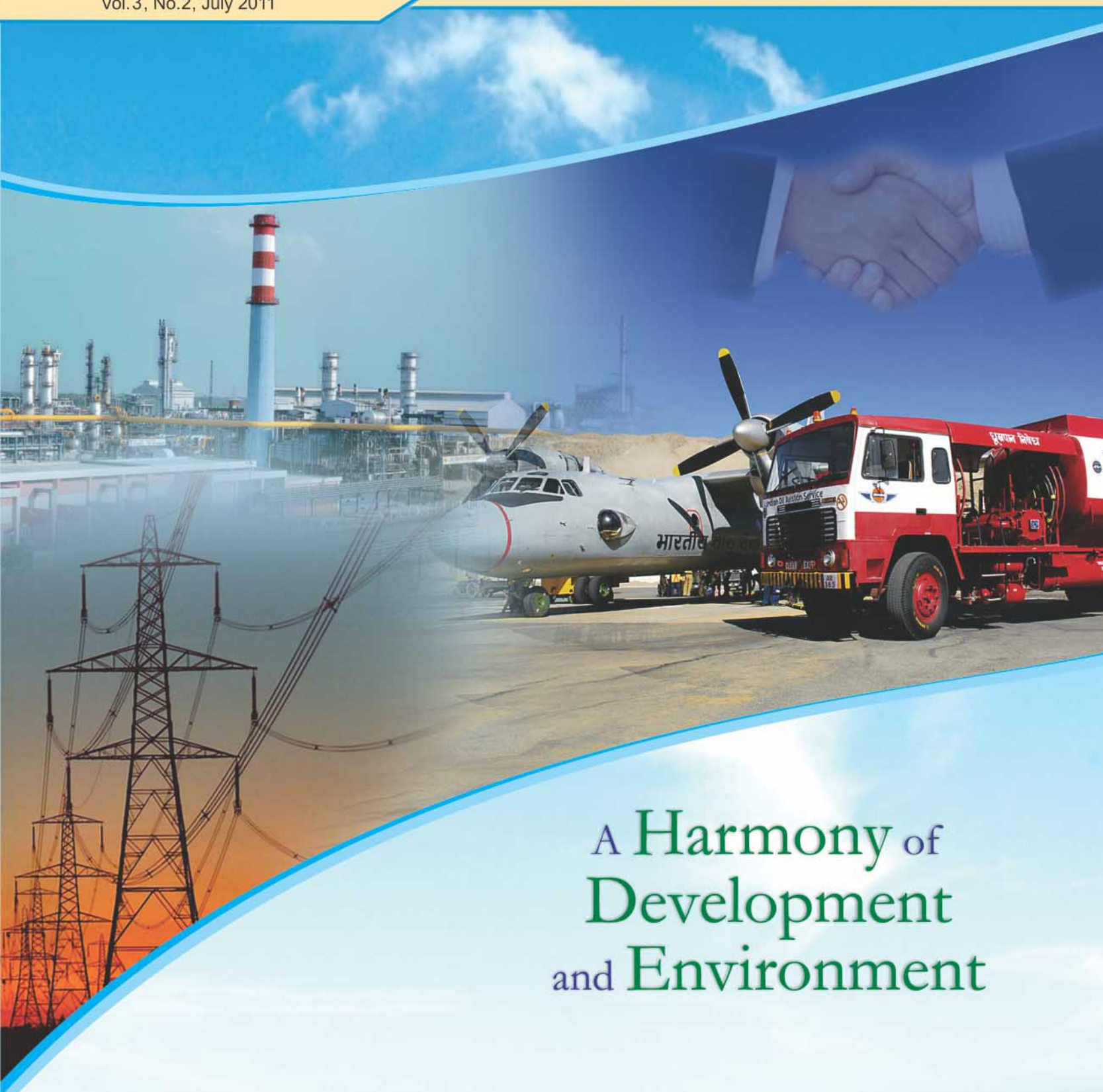
इंडियनऑयल

IndianOil

ENERGY DIGEST

Vol.3, No.2, July 2011

Economy • Energy • Environment



A Harmony of Development and Environment

CONTENTS

Vol. 3, No. 2, July, 2011

ENERGY DIGEST
Vol. 3, No. 2, July 2011

From the Editor's Desk

India witnessed a GDP growth rate of 8.5 percent in 2010-11 as compared to growth rate of 8 percent in 2009-10. On global front, emerging & developing economies have shown an impressive recovery with a growth rate of 7.3 percent in 2010 which was only 2.7 percent in 2009. This performance on economic front clearly shows that world economy has come out from grasp of the financial crisis. However, fears have turned to commodity prices now which have increased more than expected due to a combination of strong demand growth across the globe and unexpected supply shocks. As per IMF-WEO report (April 2011), oil and nonfuel commodity prices were increased by 27.9 percent & 26.3 percent respectively in 2010 as compared to (-)36.3 percent and (-)15.8 percent respectively in 2009. Significant hike in oil prices, owing to structural and special factors, increasing demand in emerging & developing countries are contributing to structural changes and have lifted the graph of oil consumption. On the other hand, unfavorable geo-political conditions prevailing in Middle-East and North Africa are accounting for special factors. In context of India, this scenario of high crude oil prices may create hurdles in the path of economic and social growth. Being an oil importing and energy deficit country, major challenge is to sustain the GDP growth rate of 8-9 percent in XII plan and this can be achieved only by formulating and implementing policies effectively for public and private sector.

Energy sector development is a priority area for the Indian economy. With the economy not being very well blessed with conventional energy sources, it is a major challenge to meet the growing energy demand of the economy. The article **"Policy Challenges in the Energy Sector during the XII Plan Period"** discusses the challenges which are being faced by India in order to satisfy the energy demand required for desired economic and social development in XII plan.

Participation of both public and private is required to optimally utilize our limited energy sources. India provides a growing market to multinational oil companies and on the other hand, it gets technical and financial assistance from them to efficiently exploit own energy reserves. The article **"Transformation of BP's Portfolio Continues"** discusses about the impacts of BP-Reliance deal on Indian oil & gas sector. Besides the article **"Changes in Tax Law: Impact on Oilfield Services Companies"** discusses about impact of resent amendments made in tax laws on operations and financials of oilfield service companies.

Price of crude oil has a huge impact on the profitability of transport industry. The article **"Aviation Fuel Prices and Airline Economics"** presents a detailed analysis of various challenges which are being faced by airline industry with a focused approach on the impacts of aviation fuel prices. The article also describes in detail the vital role which aviation industry plays in promoting sustainable development and should remain safe, affordable and accessible in order to ensure mobility on an equitable basis to all sectors of society. In addition to this a summary of **"Low Carbon Strategies for Inclusive Growth"**, an interim report issued by planning commission, has also been included.

Hope the readers would enjoy reading the quarterly journal and we look forward to your comments, suggestions and feedback.

20 June, 2011

(A.K. ROY)

Published by :
Corporate Planning & Economic Studies Department, Corporate Office
Indian Oil Corporation Limited
3079/3, Sadiq Nagar, J.B. Tito Marg, New Delhi-110 049
(Send in your contributions and suggestions to rajr2@iocl.co.in and +91-11-42122016)

Policy Challenges in the Energy Sector during the XII Plan Period

Jessica Singh
Assistant Manager, (CP&ES)
Indian Oil Corporation Limited

Jessica Singh is working in the Corporate Planning & Economic Studies (CP&ES) Department of IndianOil. She is a Post Graduate in Economics from the Department of Economics, Delhi School of Economics.

Management of Energy Situation in India is being viewed as a critical challenge for the XII Plan Period (2012-13 to 2016-17). On one hand, the economy is not very well endowed with conventional energy sources, on the other its energy demand is expected to grow at amongst the highest rates in the world. According to the Planning Commission, during the XII Plan period if the economy is to grow at 9% p.a., it would entail a 7% p.a. growth in energy demand. Meeting this demand would require a major supply side response. Appropriate policy changes and reorientations need to be brought about for bringing the required supply response. Along with this, a significant thrust would also be have to placed on demand side management for meeting the economy's energy challenge.

Today, India has a liberalized economy with much of its GDP generation in the domain of the private sector. In the pre liberalization period of command and control economy, economic central planning process through national five year plans, which began in the 1950s with the establishment of the Planning Commission, had been at the helm of affairs. However, even in the liberalization era, central economic planning holds relevance, albeit in its new avatar. In the present times, it has evolved to provide an indicative path of development and set out policy priorities for the medium term. In addition, in the context of widespread poverty and unsatisfactory levels of human development in the country, the Government has a crucial role to play through its welfare schemes and programmes and hence the significance of planning.

The terminal year of the XI plan (2007-08 to 2011-12) is an appropriate time to assess the past performance and identify policy priorities and challenges for the next plan period. This article attempts to do so with a special focus on the energy sector.

Indian Economy: Review of XI Plan

The XI Plan aimed at *faster inclusive* growth. GDP growth rate target for XI Plan was 9% p.a. vis-à-vis a 7.8% p.a. average growth rate achieved in the preceding X Plan. The Plan delivered on the growth front, with the growth likely to average 8.2%, which though below the target, is commendable as it came in the face of the global economic crisis of 2008. Indian economy exhibited remarkable resilience in face of the crisis and has been the front runners of the present economic recovery. However, on the inclusiveness front, the performance during the plan was below expectations. The table below provides a snapshot of how India fared in terms of some of the inclusiveness indicators.

Indicator	**FY 2001**	**FY 2011**	**XI Plan Target**
Literacy Rate %	64.83	74.04	85.00
Gender Literacy Gap %	21.59	16.68	10.00
Child Sex Ratio (number of girls per 1000 boys, 0-6 age group)	927	914	935
Indicator	**X Plan Average**	**Upto 2010-11 Average**	**XI Plan Target**
Agriculture Growth %	2.3	3.0	4.0
Indicator	**2006 Average**	**2009 2010-11 Average**	**XI Plan Target (2012)**
Infant Mortality Rate per 1000 live births	57	50	28

Sources: Census of India 2011, CSO, Sample Registration System, Planning Commission

Indian Economy: Approach to XII Plan

In view of the large inclusiveness deficit in the country, during the XII Plan period, focus needs to continue on 'Inclusive Growth'. The Planning Commission intends taking up **'Faster, More Inclusive, and Sustainable Growth'** as the basic objective of the XII Plan, with the GDP growth target being positioned in the range of 9-9.5% p.a. While the inclusion of sustainability and targeting more inclusive and faster growth is desirable. However, in terms of practicality and feasibility, there a number of issues that could constrain the realization of the trio of faster, more inclusive and sustainable growth.

Macroeconomic Challenges

First of all, looking at the target of faster growth, a favorable macroeconomic environment will be the first pre-condition. In this context, the presently flaring inflation in the economy is a major challenge, which poses a major threat and could take a toll on even the present growth rates, unless addressed urgently. Besides, the existing downside risks to global growth if aggravated could undermine Indian economy's growth prospects. World Bank in its latest Global Economic Prospects Report, June 2011, projects GDP growth in India to slow down to 8.2% in 2011-12 and projections are 8.5% & 8.6% respectively for 2012-13 & 2013-14, i.e. the first two years of XII Plan.

Structural Constraints

Agriculture Sector: It is widely documented that the per capita availability of food grains in the country has been stagnating; this if unaddressed poses the risk of structural inflation. It is pertinent to raise the growth rate in this sector by bringing a quantum leap in productivity and efficient water management. According to Montek Singh Ahluwalia, in his latest article titled 'Prospects and Policy Challenges in the Twelfth Plan' in the Economic and Political Weekly (henceforth referred to as Ahluwalia (2011) this calls for a move away from present subsidy based interventions to policies that incentivize change in farming practices and adoption of new technologies.

Employment Generation: Indian economy is saddled with a serious structural imbalance; more than 60% of India's population is dependent on agriculture while the sector generates less than 15% of the country's GDP. This is at the crux of the impoverished state of the majority of rural population. Surplus labour from agriculture needs to find productive employment elsewhere, and the onus is on manufacturing. According to Planning Commission, growth in manufacturing sector required to accelerate to 11-12% p.a. from 8% p.a. in XI Plan to create 2 million additional jobs per year. At the same time, this needs to be matched by initiatives for raising the levels of education, skill and health.

Infrastructure Deficit: Both agricultural and manufacturing growth will depend upon the creation of appropriate infrastructural facilities in a widely dispersed manner. According to Ahluwalia (2011), rate of investment in infrastructure will need to increase from 8.5% (likely by the end of XI Plan) to 10.5% by 2017-18, this implies investment in infrastructure will have to be targeted to increase to $1 trillion in XII Plan from $ 500 million in XI Plan. Financing this investment requirement will present a sizeable challenge. It will be pertinent to make the PPP route deliver, investor friendly policy framework and transparent, effective & stable regulatory regime will have to be put in place.

Sectoral Challenges

In addition to these, four critical sector challenges facing the economy in the XII Plan, which according to Ahluwalia (2011) are "perhaps more serious than they were at the start of Eleventh Plan" are:

Managing Energy Situation: The Planning Commission estimates that GDP growth of 9% would require commercial energy growth of 7%. This in the era of rising global energy prices and increasing scarcity of conventional energy sources, embodies a major obstacle in India's aspirations of high growth.

Ensuring Protection of Environment: The target of faster sustainable growth entails that this higher growth should come without resulting in irreversible environmental degradation. However, higher growth with present set of policies could come in conflict with environmental protection. New policies, regulatory mechanisms, fiscal schemes and infrastructure development are required to meet this challenge.

Managing Urbanization: India is getting urbanized at a faster rate than the rest of the world and by 2030, 40.7% of the country's population will be living in urban areas.

This will call for massive scaling up of urban infrastructure and also pose a lot environmental stress. As per Planning Commission Estimates, Rs. 60, lakh crore investment is required in urban infrastructure over the next 20 years.

Managing Water Economy: Water is emerging as a major problem, both for drinking as well as for irrigation. Urban and industrial demand for water is going up rapidly, without commensurate augmentation of supply. The Planning Commission is advocating for putting in place an integrated strategy to address this problem.

Indian Energy Sector: Review of XI Plan

The XI Plan envisaged an increase in primary energy availability at an average 6.4% per year, taking the total availability from 550 Mtoe in the terminal year of the X Plan to 715 Mtoe in the terminal year of the XI Plan. The table below presents the performance on the supply front of coal, power, oil & gas sectors. While in all sectors the performance has lagged behind the original XI Plan targets, in some even achieving the revised Mid Term Appraisal targets seems difficult.

XI Plan Targets & Performance

Annual	2006-07 X Plan Terminal Year	XI Plan Terminal Year Target	2010-11	Mid Term Appraisal XI Plan Terminal Year Target
Coal Prod'n (MMT	430.8	680.0	526.0	629.9
As on	**End March 2007**	**End March 2012 XI Plan Target**	**End April 2012**	**End March 2012 Mid Term Appraisal Target**
Installed Power Gener's Capacity (GW)	132.3	225.0	174.5	186.9
Cumulative X Plan	**XI Plan Target**	**XI Plan Target**	**2007-08 to 2010-11**	**Mid Term Appraisal**
Crude Oil Prod'n (MMT)	166.6	206.7	139.0	186.9
Natural Gas Prod'n (BCM)	158.7	255.8	164.5	243.5

Source: XI Plan Doc, MTA XI Plan Doc, CEA, MoP&NG & CMIE

Indian Energy Sector: Approach to XII Plan

Challenges

How well India tackles its energy challenge will be crucial in enabling India to meet its growth and development aspirations. Various dimensions of the energy challenge are discussed below:

Rapidly Growing Demand: Energy is a vital input in economic production. As Indian economy grows, its energy requirements are also set to grow. It is projected that over the next two decades India's energy needs will more than double from 620 million tonnes of oil equivalent (mtoe) to 1300 mtoe. India will account for 15% of the incremental world energy demand (2007-2030). This is more than twice its contribution to the incremental world energy demand in the preceding 2 decades. Its share in world energy consumption will rise from 5% to 8%. Further as mentioned before, according to the Planning Commission, a GDP growth target of 9% p.a is constrained by meeting of the concomitant 7% p.a. increase in energy demand.

Widespread Energy Poverty: In addition to the rising future energy requirements, at present there is widespread energy poverty in the country. In 2009, over 400 million people did have access to electricity and over 850 million people relied on traditional energy sources (biomass) for cooking. In terms of the IEA's Energy Development Index (which captures three dimensions of energy development, viz. share of households with electricity access, share of households using cleaner fuels and electricity consumption per capita) India stands much below other emerging economies like South Africa, Brazil and China.

India's Limited Resource Base: India is not well endowed with conventional energy sources. While coal reserves are

relatively abundant (54 billion tones; 7.1% of world reserves), oil (800 million tones, 0.4% of world reserves) & gas (1.12 trillion cubic meter, 0.6% of world reserves) reserves are scarce and largely unexploited. Projected primary energy requirement for India by 2030 is expected to be heavily import dependent as briefly shown in the table below.

Fuel	Import (%)
Coal including lignite	11-45
Oil	90-93
Natural gas including CBM	0-49
Total Commercial primary energy	29-59

Source: Report of the Expert Group on Integrated Energy Policy, 2006

Global Energy Scenario: Scarcity & High Prices: Since the 1990s there has been a 3-fold increase in energy prices, World Bank Energy Index (base year 2000, at constant prices) rose from 79 in 1990 to 225 in 2010. It is widely believed that high energy prices are here to stay as global supply of fossil fuels lags behind the rising demand. According to IMF, "the persistent increase in oil prices over the past decade suggests that global oil markets have entered a period of increased scarcity." For a highly import dependent economy like India, the accentuating scarcity in the world energy markets makes the task of meeting energy requirements daunting.

The Challenge of Climate Change: Because anthropogenic emissions of carbon dioxide result primarily from the combustion of fossil fuels, energy sector is at the center of the climate change challenge. India's contribution to global CO_2 emissions is set to rise from 5% presently to 8% in 2030. Sectoral Break-up of CO_2 emissions is provided below.

	1994		2007		CAGR (1994-2007) %
	million tonnes of CO_2 eq	% Share	million tonnes of CO_2 eq	% Share	
Electricity	355.03	28.4	719.30	37.8	5.6
Transport	80.28	6.4	142.04	7.5	4.5
Residential	78.89	6.3	137.84	7.2	4.4
Other Energy	78.93	6.3	100.87	5.3	1.9
Cement	60.87	4.9	129.92	6.8	6.0
Iron & Steel	90.53	7.2	117.32	6.2	2.0
Other Industry	125.41	10.0	165.31	8.7	2.2
Agriculture	344.48	27.6	334.41	17.6	-0.2
Waste	23.23	1.9	57.73	3.0	7.3
Total	1251.95		1904.73		3.3

Source: Indian Network for Climate Change Assessment, Ministry of Environment & Forests, GoI

Presently, directly electricity sector along with other energy contributes the most to CO_2 emissions and emissions from this sector have grown at rates faster than the average CO_2 emissions growth for the Indian economy. Moreover, emissions from residential sector, transport sector and industry are also energy related.

Policy Approach

Given the criticality of the energy sector and a plethora of challenges present in the sector, the Planning Commission's placing of energy situation management as one of the critical sectoral challenges, is a step in the right direction. In this context, it is essential that the long due energy sector reforms be brought in during the XII Plan period and the Integrated Energy Policy (IEP), approved by the cabinet in December 2008, be implemented. The IEP outlines a large number of policy changes needed for rationalizing energy policies relating to energy pricing, energy taxation and regulatory structures.

A major policy shift called for in the XII Plan is in the area of demand side management. Given the enormity of the energy challenge facing the country and the rising environmental concerns it is pertinent that policies & initiatives to promote demand management be put in equal footing with strategies for supply augmentation.

Demand Management in XII Plan

Ahluwalia (2011), strongly advocates for demand management and proposes use of price and non-price measures.

- Energy prices in India are significantly below the international prices and fail to reflect scarcity value. This is not only true of petroleum products[1] such as diesel, kerosene, LPG but also of coal and electricity. In line with IEP's vision of competitive energy pricing in the country, rationalization of energy pricing in the country is pertinent, especially in the times of high and rising global energy prices and needs to be an important strategy in the XII Plan for tackling the energy management challenge.
- Use of non-price mechanisms would also constitute another important strategy for demand management and energy efficiency. In this context the initiatives under the National Mission on Enhanced Energy Efficiency[2] launched recently would be pivotal. Besides, policy changes to induce intersectoral shifts, especially in the transportation sector[3] would also be called for, from road to rail in case of freight and from private to public transportation in case of urban transportation

Supply Augmentation

According to the Planning Commission, 'a major supply side response' is called for in the XII Plan period. This in turn calls for enhanced investment in the energy sector. Policy changes facilitating surplus generation in the public sector energy companies and allowing and incentivizing private capital entry are seen to be critical in realizing the desired supply side response. A brief discussion of the issues, challenges and likely targets for energy subsectors, is as follows:

Power Sector:

- Likely target of 100,000 MW capacity in XII Plan (against likely achievement of 50,000 MW in Eleventh Plan). As on 30.04.2011, installed generation capacity was 174.5 GW.

	Beginning of XI Plan	XI Plan Target	As on 30.04.2011
Thermal	86	144.7	113.6
Nuclear	3.9	7.3	4.8
Hydro	34.6	51.2	37.6
RES	7.8	21.8	18.5
Total	**132.3**	**225**	**174.5**

Source: CEA & XI Plan Document

Issues

- ***Thermal Power:*** Coal availability will be a major constraint
- ***Nuclear Power:*** The Nuclear disaster in Fukushima, Japan, has come as a major setback to the global nuclear renaissance. Indian Government's stance has been to continue with its Nuclear Programme albeit with review of safety standards and practices.
- ***Financial Health:*** Long term health of power sector seriously undermined (losses Rs. 70,000 crore per year). Need for State governments to push distribution reform. Electricity tariffs need to be rationalized by the state regulators.
- ***Private Sector Participation:*** To meet capacity addition target, private sector will play a crucial role. At present, only 15.5% of grid-based generation and 12% of distribution is currently handled by the private sector, this needs to be scaled up significantly.

Coal:

- From the present level of 74 million tonnes (2009-10), the Planning Commission expects coal imports to more than triple to 250 million tonnes by the end of XII Plan. Commensurate expansion of rail and port capacity required during the plan.
- Need for Coal India to expand its role as a coal supplier over and above its present role as a mining company.
- Given the limited resources of nationalized coal companies, Ahluwalia (2011) expressed his opinion of allowing private investment in the private non-captive mining sector.
- Domestic coal pricing needs to be rationalized as it is much below international prices.

Petroleum & Natural Gas:

- Need further expansion of new NELP blocks. Stable and clearer production sharing contracts required to incentivize exploration, encourage investment and increase domestic production of oil & gas.
- Rationalization of petroleum prices is essential for surplus generation in both upstream and downstream sectors. At present the price control & the burden sharing mechanisms eat away a large chunk of their surplus and seriously constrain their investment potential in the domestic/overseas E&P sector.
- Pipelines network for transportation of natural gas and LNG is limited and needs a significant scaling up.
- Need to strengthen regulatory framework.

Other Energy Sources:

- **Solar Power:** The National Solar Mission aims deployment of 20,000 MW of solar power by 2022. Getting adequate funding is seen to be a major obstacle. Besides, per unit cost of solar generation continues to be higher than thermal generation, the sector needs nurturing through policy support so as to reap benefits of economies of scale and technology upgradation.
- **Off Grid Energy in Rural Areas:** Need for longer term energy solution for cooking in rural areas. Thrust on expanding LPG network in rural areas (with cash subsidy model). Off grid renewable energy solution should be encouraged by putting in place adequate policy incentives.

Conclusion

It is clear that a lot needs to be done on the policy front to achieve XII Plan objectives. There is an urgency to reform the present energy policies in order to meet the energy challenge the economy faces. Reliance on 'business as usual approaches' would mean losing the golden opportunity of putting India on a sustainable, inclusive and high growth trajectory.

References

- Prospects and Policy Challenges in the Twelfth Plan, Montek Singh Ahluwalia, Deputy Chairman of the Planning Commission EPW, May, 2011.
- India's Foodgrain Policy: An Economic Theory Perspective, Kaushik Basu, EPW, January 2011
- World Energy Outlook 2010, IEA
- Global Economic Prospects, June 2011, World Bank
- Report of the Expert Group on Integrated Energy Policy of India, Planning Commission, 2006.

[1] Petrol prices were deregulated in June 2010

[2] Enhanced energy efficiency in high energy consuming industry through Perform Achieve & Trade (PAT). Energy standards for electrical appliances, energy efficient buildings through the Market Transformatin for Energy Efficiency (MTTE).

[3] Share of transportation in final energy use in India is projected to double from around 10% now 20% in 2030 (IEA).

Transformation of BP's Portfolio Continues

Anthony Reinsch
Senior Director
Upstream and Gas, PFC Energy

Anthony Reinsch advises global energy companies on upstream strategy, planning, business development and competitor analysis. He completed his Doctoral studies in Economics (sans dissertation) at the University of Western Ontario, and holds a M.Sc. in Transportation Economics from the London School of Economics and Political Science, and M.A. and B.A.(Hons) degrees in Economics from the University of Calgary.

Gauri Jauhar
Senior Consultant
Upstream and Gas, PFC Energy

Gauri Jauhar works from PFC Energy's Singapore office. She has been part of teams involved in the management and delivery of consulting projects to a host of clients including both International Oil Companies and National Oil Companies. She holds an MBA (Finance) from Johns Hopkins University, a Masters in International Economics from Radford University, and a Masters in Economics from the Delhi School of Economics.

The BP-Reliance transaction brings BP a 50% share in ~1.5 bcf/d of deepwater gas production and 23 Reliance operated oil and gas blocks, the majority in the Krishna-Godavari (K-G) basin. The Reliance deal was arranged as a "sole source" transaction, outside of any formal bid process. The deal pushes BP's cumulative Upstream asset acquisitions since March 2010 above the $23.8 bn mark, versus Upstream divestitures of ~$19.7 bn over the same period. BP has further distanced itself from its Global Competitor peers in terms of depth of commitment to Russia (TNK-BP and the recent BP-Rosneft transaction) and India for longer-term growth.

Introduction

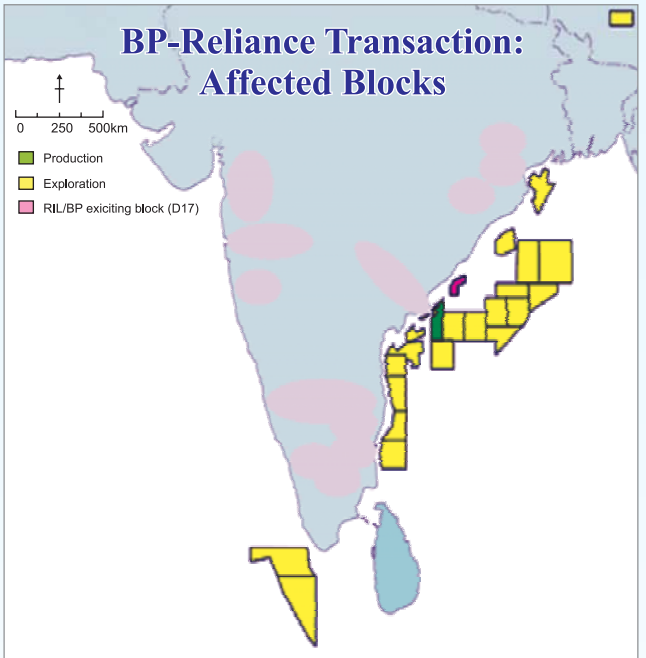
The USD 7.2 billion farm-in and joint venture deal struck between British Petroleum (BP) and Reliance brings together the worldwide deepwater expertise of BP and the India operating experience and deepwater acreage holdings of Reliance. The deal is couched in a 5-year exclusivity agreement between the two companies in the Indian upstream sector, and 10-year exclusivity in gas marketing. This transaction positions BP in the heart of one of the world's fastest growing gas markets which is projected to deliver above 6% CAGR through 2030.

Together with the recent BP-Rosneft transaction and the portfolio impacts of BP's ~$43 billion in asset transactions over the last 12 months, a larger share of BP's future is now tied to Russia – an environment where BP has succeeded while virtually all other E&P companies have failed, and where creeping resource nationalization remains a major concern and to India, an upstream operating environment that has frustrated those E&P players believed to be the most adept at managing above ground risk and uncertainty. Set against ExxonMobil's refocusing onto the North America unconventional resource plays, or Chevron's commitment to LNG development in Australia, the deepening of BP's commitment to Russia and India represents a much different risk-reward profile, and a comparative valuation challenge for both analysts and investors.

BP-Reliance Deal

On February 21, 2011 in an affirmative move for the Indian hydrocarbon sector, BP announced the formation of a gas value-chain partnership with Reliance Industries Limited, India's largest private sector company. The arrangement calls for BP to pay US$7.2 billion to acquire a 30% w.i. position in 23 oil and gas blocks operated by Reliance (all but one being offshore, and the majority located in the Krishna-Godavari (K-G) basin off the east coast of India,

home to Reliance's commercial D6 field development). The 23 blocks cover approximately 270,000 sq. kms. The two companies will also form a 50:50 joint venture to undertake investments in the gas marketing part of the value chain. Depending on commercial discoveries on the 23 blocks, BP may pay Reliance up to an additional USD 1.8 billion in performance bonuses. Combined with the upfront acquisition cost and anticipated operations capex spend, BP's total capital commitment to this deal could mount to USD 20 billion. Minority working interest partners Niko Resources and Hardy Oil & Gas have signaled their intention to file "no objection" certificates, leaving deal closure dependent on regulatory approvals by the Indian government.



(Source: BP website)

Re-Shaping Global Growth

For BP, the transaction is part of an ongoing portfolio rationalization and repositioning process initiated in March of 2010 and accelerated in the after-math of the Macondo oil spill in the US GOM. Over the past 12 months, the company has divested ~US$19.7 bn in upstream assets, while the Reliance transaction pushes upstream acquisitions above the US$23.8 bn mark. This excludes the value of incremental production from a suite of large-scale US Gulf of Mexico (GOM) deepwater development projects committed to the Macondo oil spill fund (structured as an Over-Riding Royalty interest in equity production from the Thunder Horse, Atlantis, Mad Dog, Great White, Mars, Ursa, and Na Kika field developments).

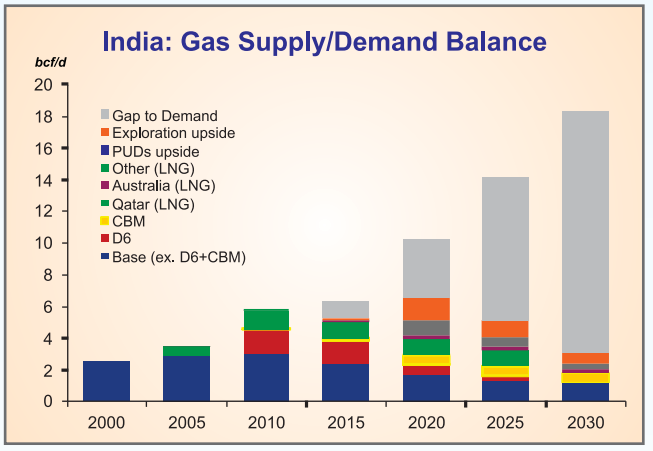
These transactions will have an important impact on the location and composition of BP's long-term growth. The company has been successful to date in shielding its portfolio of major development projects from the divestiture program, leaving medium-term growth largely intact (albeit from a somewhat smaller production base, having sold off ~335 mboe/d of production, or just under 9% of 2010 production of ~3.82 mmboe/d). Divestitures have been focused almost exclusively on mature and non-core producing areas and, for the most part, have involved the sale of entire business units, rather than selected assets. These included upstream portfolios in the Permian Basin and Canadian conventional gas in North America; Argentina, Colombia, and Venezuela in South America; and Vietnam and Pakistan in the Asia Pacific.

The acquisitions completed over this period, by contrast, illuminate and support BP's strategy for longer term production growth. The BP-Rosneft transaction extends BP's differentiating position as the leading International Oil Company (IOC) in the Russian energy sector, as well as deepening the company's commitment to Arctic resource development (complementing material resource and acreage holdings in Alaska and northern Canada). The March 2010 transaction with Devon, while preceding the Macondo spill, increased BP's position in the Azeri-Charig-Guneshli (ACG) development in Azerbaijan to 39.77%, expanded BP's already considerable US GOM deepwater portfolio, and moved BP into the rapidly emerging pre-salt play in the Brazil deepwater, deepening the company's ongoing strategic commitment to the global deepwater. Smaller positioning moves in the Canadian oil sands in 2010—bringing Devon into the Kirby *in situ* oil sands development as a full partner, and securing a 75% stake in the sanctioned Terra de Grace *in situ* development, expected onstream in 2012—complement the company's 50% w.i. in the Sunrise SAGD *in situ* development (sanctioned in 4Q:2010) and underscore BP's emerging commitment to the oil sands as a long-term, stable base to complement the more volatile production patterns of deepwater field developments.

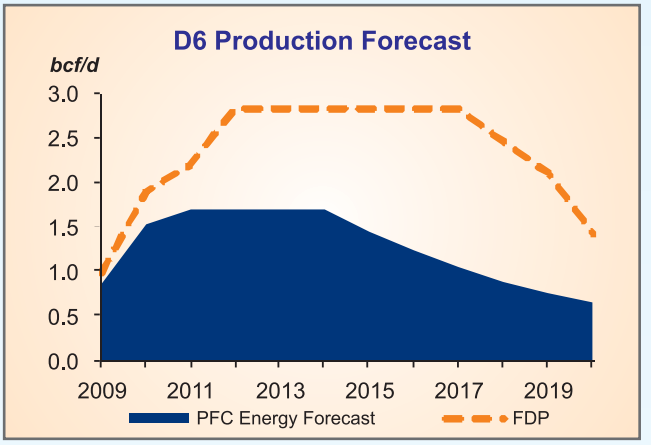
Still, one cannot escape the reality that a larger share of BP's future is now tied to Russia. BP-Reliance transaction extends BP's existing activities in the Indian energy sector

(D-17 deepwater block with Reliance, plus retail lubricants through Castrol and a solar energy JV with Tata), giving it a differentiating presence from its global competitor peers. The Reliance deal brings BP access to ~1.5 bcf/d of deepwater gas production (representing ~30% of India's total gas consumption, and ~40% of India's total gas production).

The longer-term benefits to BP from this transaction are less than secure. Presently, it is unclear how much material impact the marketing JV with Reliance will deliver to BP. While Reliance operates the East-West pipeline, all of its other pipeline initatives (especially the Southern India plan and the Kakinada-Haldia project) have met with considerable delays. If the D6 production problem is not resolved, future pipelines may not be necessary (barring substantial exploration success in the offshore basins). In LNG, BP already delivers spot LNG to the Indian market. Given its limited LNG supply portfolio, BP is unlikely to increase imports unless it is able to procure another LNG contract. BP could be interested in developing a regasification facility which would complement Reliance's off-and-on desire to develop a terminal for captive use (petrochemicals and refineries). However, greenfield regasification terminals have faced considerable political and pricing challenges in the past.



For Reliance, the partnership with BP in the Indian gas sector (similar to the company's US shale gas deals) is a strategic move linked to Chairman Mukesh Ambani's intention to grow inorganically, expressed at the Reliance annual general meeting in 2007. In the short run, this deal represents both a financial and technical boost for a company that has experienced production setbacks due to the unexpected complexity of the D6 reservoir in the K-G basin. The field has performed well below the Field Development Plan (FDP) baseline, which projected a production plateau of ~2.8 bcf/d by mid-2011.



With the majority of the 23 blocks located in the K-G basin, Reliance is clearly anticipating that leveraging of BP's offshore and deepwater exploration and development expertise will help the company to both address the challenges of D6 field development, and avoid similar pitfalls in development of additional resource discoveries in this prolific basin. In the longer run, a successful partnership in India could pave the way for additional joint venture activities outside of the country, addressing Reliance's desire to expand its international footprint.

For India, the BP move is truly transformational, constituting the largest one-time foreign direct investment into India's fast growing gas market. The deal is also timely for India's E&P sector, which has seen declining interest by the large E&P companies in recent bid rounds and mounting questions regarding fiscal burden, regulatory independence, barriers to domestic operations, and likely size of the resource base, all of which have curbed investors' interest. The deal also points to the ability to conclude a strategic alliance and positioning move "outside the bid rounds", a development which will not be lost on those upstream players increasingly frustrated with the current process for data and acreage access.

Changes in Tax Law: Impact on Oilfield Services Companies

Taranpreet Singh
Manager, Tax & Regulatory Services
Ernst & Young

Taranpreet Singh is a Chartered Accountant with 7 years' post qualification experience in handling corporate tax and regulatory matters of oil & gas service contractors. He is also involved in assisting oil & gas service contractors setting up business presence in India.

Recent amendment introduced in the provisions of section 44BB of the Act has created a sort of ambiguity with respect to nature of services that would be covered under the beneficial provisions of section 44BB of the Income Tax Act. Pursuant to this amendment, there is a challenge whether the services although proximately connected with exploration & production of oil & gas would be governed by the beneficial provisions of section 44BB or would be subject to higher tax rate as "fee for technical services"

Petroleum sector of any country is the most crucial sector, which drives the country's economic development and sustenance. Over 75% of India's hydrocarbon demands are met by imports, and with the present rate of growth in the country, this is expected to increase exponentially in the near future. In this scenario, this sector is all the more important, not only from the economic point of view but also from the energy security perspective.

Exploration & Production (E&P) companies outsource the majority of their services to oilfield service (OFS) contractors. Such services are closely connected with the overall E&P value chain, and OFS contractors play a significant role in E&P operations. Since India lacks adequate technical expertise in this area, it largely depends on global expertise. With a view to simplify the tax computation mechanism for OFS contractors, section 44BB was inserted in the Income Tax Law (ITL) in 1987. Under this regime, 10% of the gross receipts of non-resident OFS contractors, who are engaged in the business of providing services or facilities or providing equipment/machinery on hire, which are to be used in connection with exploration or production of mineral oils, are deemed as its taxable income. Accordingly, based on current tax rates, the effective tax applicable for such contractors is 4.20% of gross contract receipts. In addition, an OFS contractor is not required to maintain books of accounts in India. Based on the provisions mentioned above, non-residents providing services, including technical services, in connection with exploration and production of oil and gas, have been paying tax in India at the rate of 4.20%.

In the past, revenue authorities have contested the applicability of section 44BB on various services provided by OFS contractors, alleging that these services are in the nature of technical services, and therefore, should not get the benefit of presumptive taxation under section 44BB. However, the courts have taken a consistent view that if the services (irrespective of the nature of a service, i.e., whether they are technical in nature) relate to exploration and production of oil and gas, the income of the non-resident should be computed in accordance with the presumptive taxation provision.

Recently, an amendment was introduced in the ITL which seeks to withdraw this regime in the case of companies providing "technical services," even if the services relate to exploration or production of oil and gas.

Pursuant to this amendment, non-resident service providers providing technical services, with a permanent establishment (PE) in India, are subject to tax on a net basis (revenue less expenses) at the tax rate of 42.20%. In the event service providers do not create a PE in India, taxes are payable at the rate of 10.5% on a gross basis under the ITL or according to the tax treaty between India and the country of residence of the service provider, whichever is more beneficial.

It is believed that amendment was introduced with an attempt to negate some of the past rulings which have taken a view that presumptive taxation provision will prevail over the generic provisions. However, it is pertinent to note that recently, the Authority for Advance Ruling (AAR), has ruled against the amendment. On the issue of whether income from services pertaining to seismic data acquisition, processing and interpretation of data are taxable under the special provisions of Section 44BB of the ITL, AAR has issued a ruling that the services rendered by the service provider are "in connection with" prospecting for, or extraction or production of mineral oils, and the service provider is engaged in the business of rendering such services in India. Accordingly, income from such services rendered by the service provider will be taxable under the special provisions of Section 44BB. The AAR holds that Section 44BB is a special computation provision and it will prevail over the generic computation provision.

Given that Indian hydrocarbon reserves are largely under-developed and is largely dependent on Foreign Service contractors, the Government may consider revisiting its decision to withdraw the above amendment to nurture this sector to achieve stronger energy security.

Aviation Fuel Prices and Airline Economics

Praveen Jaiswal
Operations Manager
IndianOil Skytanking Limited

Praveen Jaiswal is a Commerce Graduate and MBA from Motilal Nehru Institute of Research & Business Administration, University of Allahabad with a Diploma in Shipping from Institute of Chartered Ship Brokers, UK. He has to his credit publications on Oil & Gas in leading magazines, journals & websites in India & abroad.

The growth in the aviation sector and capacity expansion by carriers has posed challenges to aviation industry on several fronts. These include shortage of workers and professionals, safety concerns, declining returns and the lack of accompanying capacity and infrastructure. Moreover, stiff competition and rising fuel costs are also negatively impacting the industry. To combat these challenges, airlines globally have responded by practicing innovative methods in order to reduce their operating costs and break-even. The aviation sector has also recognized the growing and urgent need for society to address the global challenge of climate change. The article describes in detail the vital role which aviation industry plays in promoting sustainable development and should remain safe, affordable and accessible in order to ensure mobility on an equitable basis to all sectors of society.

The airline industry is passing through an exceptionally demanding period. Starting with 9/11 that created highly in-conducive insurance liabilities, SARS that wreaked havoc with Asian traffic to Europe and the US, the AVIAN Bird flu which hit intra-south Asia and of course Aviation Turbine Fuel (ATF) rates, the airline industry aggressively restructured its business; re-looked at business models, streamlined processes and began cutting down on costs. While these steps initially made by airlines to keep their collective 'head-above-water' the airline industry further braced itself for the worst which led the revamp of revenue service aircraft and acquisition of brand new aircraft on long term operational lease. During the past five years airlines phased out 'high-maintenance' aircraft and embraced fifth generation passenger aircraft fitted with fuel efficient engines that lowered direct operating costs significantly. Aircraft manufacturers Boeing and Airbus during the period beginning 2003 to 2006 saw some of the highest aircraft deliveries with airlines in every corner of globe acquiring new aircrafts. ATF hedging, while was effective in softening the blow especially in sudden price rises, the main savings that airlines saw was from significantly low maintenance cost, thanks to a new aircraft fleet; low direct operating costs attributable to new efficient aircraft engines and aircraft flight performance; and wafer thin indirect operating costs due to efficient airline processes and hybrid airline business models.

To combat rising fuel prices, airlines globally have responded by seeking to improve fuel efficiency of their operations by selecting higher flight levels for operations, intentionally choosing parking bays near the runway that lowered ground taxi time, sought early decent clearance enabling the aircraft to have longer drift down on near to idle engine power settings and in some cases taxied on single engine power with the second engine remaining idle. In addition, airlines altered aircraft take-off weight significantly and a few carriers removed extra seats from the cabin, switch to an entire paperless cockpit, and removing seat back phones even down to flushing lavatories during extended delays to minimize take-off weight. While such corrections would offer marginal savings on fuel used, significant savings can mostly be made by improving airline efficiencies and reducing elements that constitute indirect operating costs.

One of the keys to lowering operating costs and drive airlines to break-even, lies in running the airline more efficiently and significantly reduce costs that feature indirectly in airline balance sheets. While ATF costs drive operating costs up, it only reflects in price hikes on routes

and can be combated by imposing fuel surcharges which may be attributable to inflation. Rise in ATF prices regionally or globally feature commonly under inflation and therefore as long as there is demand there are bound to be price hikes. Break-even gestation in any airline business occurs in between five to seven years of aircraft operation and is dependent on the business model employed, aircraft used for revenue service and indirect operations. Since a majority of India's airlines are today in their third or fourth year of running, it becomes impossible for them to break-even. While ATF costs would hurt airline operating costs, it could never be the reason for an airline to fold up. India operates one of the youngest aircraft fleet in the world and with new and more efficient engines, airlines gain from low fuel burn and improved operating efficiency. The advantage accrued from a new aircraft fleet presents immense savings which in turn leads to achieving break-even faster.

IATA realizes the impacts; fuel price fluctuation has on airlines financial stability and has implemented the best practices for fuel conservation for aircraft operators as well as ATS providers. These practices have been incorporated in IATA publication under, 'Guidance Material & Best Practices for Fuel and Environmental Management'. IATA is also working closely with airlines, air traffic controllers, Air Navigation Service Providers (ANSPs), to implement better air space design so as to try and save air time, as on average airlines spend approximately $100 per minute when in flight on operating costs i.e. labour, fuel, maintenance, etc.

Airlines around the world have also taken measures to deal with fuel price fluctuation, as well as measures to conserve energy and hence improve fuel efficiency.

How do airlines cope with the issue of fuel prices?

Airlines are trying to reduce fuel consumption by using various measures such as:

- Avoiding unnecessary tankering i.e. avoiding carrying more fuel than is required to meet safety minima on a particular sector;
- Using lighter equipment in the cabin of older aircraft's to reduce weight;
- Reducing aircraft speed during cruising periods;
- Using computerized flight planning;
- Using slower rates of climb/descent and higher cruise altitudes.

Where possible with the above measures airlines may be able to save some fuel, however the biggest saving of fuel consumption comes from switching from old fleet to newer, more fuel efficient aircraft; especially in cases where an airline is able to switch or replace a three or four engine jet to an aircraft with fewer and more advanced engines.

Improving Fuel Efficiency

In addition to some of the measures used to cope with fuel price fluctuations, airlines also are:

- Employing single engine taxi procedures on normal operations, as well as selective shutdowns when there is ground delay;
- Using airport power rather than onboard APUs (Auxiliary Power Units) when at airport gates;
- Investing in winglets to cut aircraft drag (hence reducing fuel consumption);
- Optimizing flight planning for minimum fuel-burn routes and altitudes;
- Pooling resources to purchase fuel in bulk through alliances with other airlines and so forth.

A common element in India that adds stress to airline operations is the severe congestion at airports both in the air and on the ground. While quick fixes at high speed runway exit taxiways, additional taxi ways and more efficient ground control procedures have helped to ease this slightly, there are still many changes and amendments that should be done to help improve airline efficiency. These include:

- Shorter distances between terminal and bays in order to lower transportation time;
- Augmentation of additional aerobridges enabling at least 70 percent of arrival aircraft to dock at the terminal;
- Increased use of two runway operations;
- Reducing after take-off track out distance below 5 DME (Distance Measuring Instrument);
- Strict adherence to low runway occupancy time and penalize airlines for spending excessive time on the runway during take-off or landing.

ATF cost for an airline has impact only on direct operating costs which account for 30 to 40 percent of total airline expenses leaving the rest 60 to 70 percent to be slimmed down. Financial performance of an airline predominately is dependent on airline efficiency; its market strategy and an intuitive approach to route planning that maximizes revenue. The airline business today is one of the most complex industries. Airlines operate on small margins so that any significant decline in revenue or increase in costs can cause dramatic changes. The challenge for airlines is achieving profit maximization through efficiently using their fleet, managing revenues and with cost optimization. Its profitability, revenue and yield are predominately driven by economic and external factors and this makes it most vulnerable to even the slightest variation in economic growth rates, national disasters, epidemic outbreaks, terrorism, war, currency fluctuations and most importantly volatile oil prices.

The airline industry serves not just as an economic engine for states, cities and regions, but as a cog in the essential network of transportation. Furthermore, airlines, with their familiar names and easily recognizable symbols, bring in a sense of unity to the large communities which they serve. The industry creates its impact not just by providing direct employment, but also through the creation of opportunities throughout the travel and hospitality sector of the economy. Jobs in hotels, resorts, restaurants and car rental agencies, just to mention one small part of the economy, depend to differing degrees on the health of the airline industry. Yet the industry finds itself in a very difficult period.

Air Transport can play a key role in economic development and in supporting long-term economic growth. It facilitates a country's integration into the global economy, providing direct benefits for users and wider economic benefits through its positive impact on productivity and economic performance. Global economic growth is a key driver of growth in air traffic demand. However, while air traffic demand has increased as economies have grown, air transportation itself can be a key cause and facilitator of economic growth. Not only is the aviation industry, a major industry in its own right, employing large numbers of highly skilled workers, but more importantly it is an essential input into the rapidly growing global economy. Greater connections to the global air transport network can boost the productivity and growth of economies by providing better access to markets, enhancing links within and between businesses and providing greater access to resources and to international capital markets.

Demand Elasticities

The demand for air travel is sensitive to changes in air travel prices and incomes. However, the degree of sensitivity i.e. its demand elasticity varies according to different situations. Reliable estimates for demand elasticities are essential in order to ensure that air transport policies are effective. Demand elasticities measure the change in the quantity demanded of a particular good or service as a result of changes to other economic variables, such as its own price, the price of competing or complementary goods and services, income levels and taxes. Demand elasticity for price of less than one in absolute value reflects inelastic or price insensitive demand, where the proportional change in quantity demanded is less than the proportional change in price. An elasticity of greater than one in absolute value reflects elastic or price sensitive demand. In other words, the proportional change in quantity demanded will be greater than the proportional change in price. The elasticity of air travel demand varies according to the coverage and location of the market in which prices are changed and the importance of the air travel price within the overall cost of travel. The appropriate elasticity to use will depend on the type of question being asked i.e. what the price that is being charged? What is the market that is being assessed for example demand for an individual airline or demand for total air travel?

Crude Facts of Aviation Fuel Economics

Most aviation fuels are jet fuels originating from crude oil. Crude oil must be refined to be useful and jet fuel is only one of many products that can be derived from crude oil. Jet fuel is extracted from the middle distillates fraction and competes, for example, with the production of diesel.

Crude oil is a limited natural resource subject to depletion and several reports indicate that the world's crude oil production is close to the maximum level and that it will start to decrease after reaching this maximum. A post Kyoto political agenda to reduce oil consumption will have the same effect on aviation fuel production as a natural decline in the crude oil production. On the other hand, it is predicted by the aviation industry that aviation traffic will keep on increasing.

The industry has put ambitious goals on increases in fuel efficiency for the aviation fleet. Traffic is predicted to grow

by 5% per year to 2026, fuel demand by about 3% per year. At the same time aviation fuel production is predicted to decrease by several per cent each year after the crude oil production peak is reached resulting in a substantial shortage of jet fuel by 2026. The aviation industry will have a hard time replacing this with fuel from other sources, even if air traffic remains at current levels. The size of jet fuel production is dependent on various parameters, viz.:

- The market situation at any given moment;
- The grade/quality of the crude oil processed;
- The logistic situation at the refinery.

If the refinery would like to increase jet fuel production, diesel production must decrease. This also implies that jet fuel production could be increased without large investments or time delays. During the year the proportion between diesel and jet fuel production changes and the fuel most profitable at that moment is produced. The kerosene fraction is an average of 8-10% of the crude oil, but all kerosene does not become jet fuel or diesel. Kerosene can also be used to decrease the viscosity of the heavy fractions of crude oil and is used as lamp oil in this part of the world. Simple refinery process changes could increase jet fuel production and if the hydrocrackers were optimized to produce jet fuel the share could probably increase much more. To be able to produce even more jet fuel new hydrocrackers could be developed, but that would take time. Production changes in the refinery can only change the yield of different products. If jet fuel production were to increase obviously the production of other products would decrease, such as gasoline and diesel.

Future Scenarios: Aviation Fuel Supply and Demand

Three scenarios are articulated for future aviation fuel demand. The scenarios are based on industry forecasts, both when it comes to traffic growth and goals for fuel efficiency increase. The forecast numbers for growth is used as an indicator of the growth of jet fuel consumption. All the calculations of future aviation fuel demand have been calculated based on aviation fuel production in 2006 or normalized to that value, since that was the most recent aviation fuel production number published by the IEA.

Demand Scenarios 2006-2026

a. Traffic will continue to grow according to industry forecasts and average fuel consumption for the world aviation fleet will remain as it is today. Fuel consumption will increase at the same rate as the increase in traffic;

b. Traffic will keep growing according to industry forecast but the average fuel consumption (litre/100) for the world aviation fleet will go down by 50 per cent compared to 2005 by the year 2020. A decrease of one per cent per year from 2020 to the year 2026 is assumed;

c. Traffic will keep growing according to industry forecasts and average fuel consumption for the world aviation fleet will follow a curve extrapolated from the average fuel consumption of the years 1987 to 2007.

The aviation industry outlook on future traffic does not look realistic in the light of future crude oil production, taken that the aviation fuel percentage of refinery output cannot be increased hugely. The outlook suggests that the aviation industry needs to rethink their position when it comes to future growth in air traffic since it is dependent on the availability of conventional aviation fuel originating from crude oil. Even the "business as usual scenario of crude oil production requires big efficiency increases to the aviation fleet to maintain current rates of traffic growth.

The worst-case supply scenario creates a lack of aviation fuel in all of the demand scenarios discussed. The percentage of aviation fuel of produced oil products would need to increase from 6.3% up to 30% of crude oil production in the most diverse case. Alternative fuels can play a role in increasing the amount of available fuel, but it seems unrealistic that it could provide a large contribution soon, taking into account the work still to be done in that area. The possibility of biofuels replacing conventional jet fuel is limited, considering the large amount that would be needed. However, the development of bio-jet fuel is still important for the future aviation industry.

The Indian Scenario

Aviation Industry in India is one of the fastest growing aviation industries in the world. With the liberalization of the Indian aviation sector, aviation industry in India has undergone a rapid transformation. From being primarily a government-owned industry, the Indian aviation industry is now dominated by privately owned full service airlines and low cost carriers. Private airlines account for around 75% share of the domestic aviation market. Earlier air travel was a privilege only a few could afford, but today air travel has become much cheaper and can be afforded by a large

number of people. The origin of Indian civil aviation industry can be traced back to 1912, when the first air flight between Karachi and Delhi was started by the Indian State Air Services in collaboration with the UK based Imperial Airways. It was an extension of London-Karachi flight of the Imperial Airways.

In 1932, JRD Tata founded Tata Airline, the first Indian airline. At the time of independence, nine air transport companies were carrying both air cargo and passengers. These were Tata Airlines, Indian National Airways, Air Service of India, Deccan Airways, Ambica Airways, Bharat Airways, Orient Airways and Mistry Airways. After partition Orient Airways shifted to Pakistan.

In early 1948, Government of India established a joint sector company, Air India International Ltd in collaboration with Air India (earlier Tata Airline) with a capital of Rs 2 crore and a fleet of three Lockheed constellation aircraft. The inaugural flight of Air India International Ltd took off on June 8, 1948 on the Mumbai-London air route. The Government nationalized nine airline companies vide the Air Corporations Act, 1953. Accordingly it established the Indian Airlines Corporation (IAC) to cater to domestic air travel passengers and Air India International (AI) for international air travel passengers. The assets of the existing airline companies were transferred to these two corporations. This Act ensured that IAC and AI had a monopoly over the Indian skies. A third government-owned airline, Vayudoot, which provided feeder services between smaller cities, was merged with IAC in 1994. These government-owned airlines dominated Indian aviation industry till the mid-1990s.

In April 1990, the Government adopted "open-sky policy" and allowed air taxi- operators to operate flights from any airport, both on a charter and a non charter basis and to decide their own flight schedules, cargo and passenger fares. In 1994, the Indian Government, as part of its open sky policy, ended the monopoly of IA and AI in the air transport services by repealing the Air Corporations Act of 1953 and replacing it with the Air Corporations (Transfer of Undertaking and Repeal) Act, 1994. Private operators were allowed to provide air transport services. Foreign direct investment (FDI) up to 49 percent equity stake and NRI (Non Resident Indian) investment of up to 100 percent equity stake were permitted through the automatic FDI route in the domestic air transport services sector. However, no foreign airline could directly or indirectly hold equity in a domestic airline company.

By 1995, several private airlines had ventured into the aviation business and accounted for more than 10 percent of the domestic air traffic. These included Jet Airways Sahara, NEPC Airlines, East West Airlines, Modi-Luft Airlines, Jagsons Airlines, Continental Aviation, and Aviators - Commercial Aviation Academy Damania Airways. But only Jet Airways and Sahara managed to survive the competition. Meanwhile, Indian Airlines, which had dominated the Indian air travel industry, began to lose market share to Jet Airways and Sahara. Today, Indian aviation industry is dominated by private airlines and these include low cost carriers such as Deccan Airlines, GoAir, Jetlite and SpiceJet etc, who have made air travel affordable.

Airline industry in India is plagued with several problems. These include high aviation turbine fuel (ATF) prices, rising labor costs and shortage of skilled labor, rapid fleet expansion, and intense price competition among the players. But one of the major challenges facing Indian aviation industry is infrastructure constraint. Airport infrastructure needs to be upgraded rapidly if Indian aviation industry has to continue its success story. Some steps have been taken in this direction. Two of India's largest airports-Mumbai and New Delhi-were privatized recently. Two green-field airports are coming up at Bangalore and Hyderabad in southern India. Investments are pouring into almost all aspects of the industry, including aircraft maintenance, pilot training and air cargo services. The future prospects of Indian aviation sector look bright.

Rising fuel prices affect every business either directly or indirectly but few as much as the aviation world. Airlines have such high fuel requirements that fuel is second only to labor as their single largest cost. The fuel cost has risen so much recently that it's now higher than even the cost of the aircraft for many airlines. So what are the problems with the cost of oil approaching $100 a barrel (and the price of refined jet fuel being about $15 a barrel higher)? Airlines survive or fail on their ability to do two things:

1. Fill the seats

2. Manage their fuel costs

Airlines that are already stressed financially may find it difficult to deal with higher fuel costs and yet keep the

price of their tickets competitive. Fierce competition among domestic carriers limits the ability of airlines to raise ticket prices. The result may be fewer domestic seats available and quite possibly fewer domestic flights available according to some aviation analysts who believe the airlines will be flying fewer regional locations because these routes just are no longer economical. The discount airlines have been able to keep flights full in order to cover costs and keep prices low, but are hurt in quarterly earnings every time fuel prices increase. The world's airlines consume about 205 million tons of aviation fuel each year, which represents about 20 percent of the operating costs for the airlines. Aviation is also a key contributor to greenhouse gas emissions, generating two percent of all human-caused carbon dioxide emissions and nearly all the world's emissions of nitrogen oxide, a compound that contributes to the formation of ground level ozone.

There is also a Greek chorus warning us that the age of air travel is over, undone by the twin calamities of peak oil and climate change. They point to oil prices tripling over the last decade, while noting that a flight from New York to London releases more greenhouse gases into the upper reaches of the stratosphere than the thirstiest Hummer when driven for a year. Fortunately the thinking goes that the imminent exhaustion of cheap oil will take care of the problem. Air travel's actual share of our carbon footprints is currently 3% and falling, thanks to a bounty of incremental and potentially revolutionary advances meant to slow and hopefully end its carbon contributions. The next generation of airliners, headlined by Boeing's 787 Dreamliner is lighter and more fuel efficient than last century's models, complemented by new engines that burn quietly and clean.

Within the next 5 to 10 years, different national and su-pranational emissions trading schemes will be introduced globally to reduce aviation's CO_2 emissions. The European Union's emissions trading scheme will directly limit the CO_2 emissions of virtually all flights starting from or landing at any European airport from 2012 onwards. The upcoming US cap-and-trade-system for greenhouse gases as well as the New Zealand system will very likely choose the fuel suppliers as account-table entities of their systems (upstream approach). Aviation will be covered indirectly by the price im-pact on the fuel purchased. Detailed plans for mandatory national emissions trading systems have also been worked out by Australia, Canada, Norway, Iceland, Liechtenstein and Switzerland. This foreseeable heterogeneous global framework will have impacts on competition within the aviation sector.

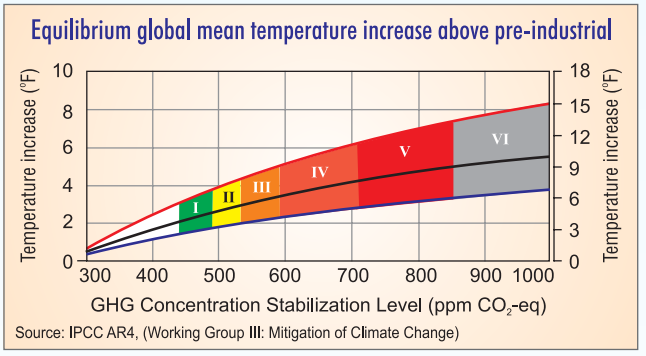
Summary of Interim Report on Low Carbon Strategies for Inclusive Growth

Rohit Raj
Officer, CP&ES
Indian Oil Corporation Limited

Rohit Raj has been working as an officer in Corporate Planning & Economic Studies (CP&ES) department of Indian Oil Corporation Limited. He is a MBA from IIM Ahmedabad and B.Tech from NIT Jaipur.

Introduction

Threat of climate change due to increased concentration of GHGs has become a topic of global concern because its adverse effects are not restricted to a single nation. As per the 2007 Fourth Assessment Report compiled by IPCC (AR4), "if emissions continue to rise at their current pace and are allowed to double from their pre-industrial level, the world will face an average temperature rise of around 3^{0}C in this century". Projections of increase in global temperature corresponding to increase in levels of GHG concentration as per IPCC are given below:



Source: IPCC AR4, (Working Group III: Mitigation of Climate Change)

In May 2011, Planning Commission published an interim report of the Expert Group on **Low Carbon Strategies for Inclusive Growth**. In order to incorporate "low carbon inclusive growth" as one of the key pillars in **Twelfth Five Year Plan,** this Expert Group was constituted under the Chairmanship of Dr. Kirit Parekh. This report provides a menu of low carbon strategies to reduce India's emission intensity over the time frame. This report meticulously examines the power, transport, industry, building and forestry sectors to determine levels of emissions and suggest a list of options to reduce the emissions under scenarios of "Determined Efforts" and "Aggressive Efforts". The options considered suggest that emission intensity of India can be brought down by 23 to 25 percent over the 2005 levels in scenario of Determined Efforts and in scenario of Aggressive Efforts emissions can be brought down by 33 to 35 percent over the levels of 2005.

Interim report on **Low Carbon Strategies for Inclusive Growth** considers two scenarios for each sector. Both of these are mentioned below:

Determined Efforts (Lower End of the Emission Reduction Range): imply policies that are already in place or considered are pursued vigorously and implemented effectively up to 2020.

Aggressive Efforts (Higher End of the Emission Reduction Range): in addition to above aggressive efforts require introduction as well as implementation of new policies.

India envisages a path of inclusive growth to achieve social, economical and environment sustainability. Considering India's past economic and social activities, on a per-capita basis, India is one of the lowest Greenhouse Gas (GHG) emitters in the world. However, current and future economic and social developments will increase its GHGs emissions; therefore, India has a strong interest in establishing a fair and equitable agreements on policies to minimize the risk of climate change. In line with this view, India has already declared that it will reduce the emission intensity of its GDP by 20-25 percent over the 2005 levels by the year 2020. This goal requires formulation of proactive policies followed by their efficient implementation.

Collective and cooperative global actions are required to restrict the temperature rise to 2^0 degrees Celsius by reducing the level of GHG emissions. It is obvious that no country can solve this problem alone and it would be of no use for one country to reduce the GHG emissions and other to increase it. This article mainly summarizes the initiatives suggested for oil & gas industry.

Carbon Footprint of India

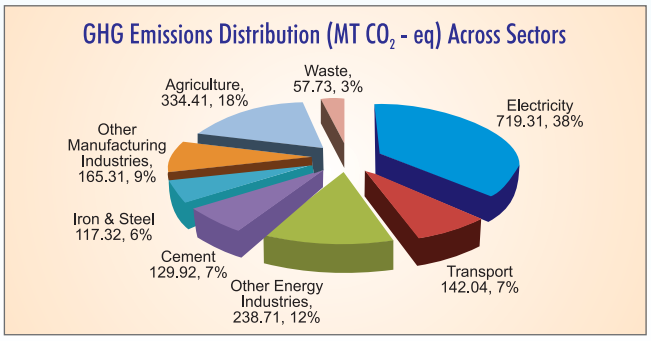
Level of GHG emissions of a county depends on its economic and social activities, demographic and physical attributes. Therefore, total emissions, per capita emissions and emissions intensity of GDP vary widely across countries. As per International Energy Agency (2009) report, 2008 emissions data of selected countries is given below:

Region Country	Population (million)	GDP (billion 2000 US$)	GPD PPP (billion 2000 US$)	Energy Cons. (MTOE)	CO_2 Emissions MT CO_2	Per Capita Energy Cons. (kgOE)	Energy Intensity KgOE/ $GDP PPP	Kg CO_2/ $GDP PPP	Per Capita Electricity Cons. (kwh)	Per Capita CO_2 Emission (tonnes)
World	6609	39493	61428	12029	28962	1.82	0.2	0.47	2752	4.38
China	1327	2623	10156	1970	6071	1.48	0.19	0.6	2346	4.58
Brazil	192	808.95	1561	235.56	347	1.23	0.15	0.22	2154	1.8
India	**1123**	**771**	**4025**	**421**	**1146**	**0.53**	**0.1**	**0.28**	**543**	**1.18**
Japan	128	5205	3620	513.5	1236	4.02	0.14	0.34	8475	9.68
S. Africa	48	178	517	134.3	346	2.82	0.26	0.67	5013	7.27
Thailand	64	173	548	104	226	1.63	0.19	0.41	2157	3.54
Turkey	74	372	821	100	265	1.35	0.12	0.32	2210	3.59
UK	61	1766	1833	211	523	3.48	0.12	0.29	6142	8.6
USA	302	11468	11468	2340	5769	7.75	0.2	0.5	13616	19.1
France	64	1506	1738	264	369	4.15	0.15	0.21	7573	5.81
Germany	82	2065	2315	331	798	4.03	0.14	0.34	7185	9.71
Russia	141.79	429.55	1651.17	786	1593.83	5.54	0.48	0.97	6443	11.24

Source: IEA, 2009

It is found that in terms of per capita of CO_2 emissions China and USA emits almost 4 and 16 times of India. Considering India's vision of achieving inclusive growth in economic and social front, demand for energy will increase profoundly and India will witness a constructive shift from traditional biomass to modern commercial energy in its energy basket. Therefore, it is very critical to implement clean energy strategies from inception to lead India towards a clean and green nation.

As per the assessment of GHG emissions made by The Indian Network for Climate Change Assessment (INCCA) in 2010 for the year 2007, distribution of GHG emission pertaining to various sectors of India is given below:



India's GHG emissions by sources and removal by sinks was 1727.71 million tons of CO_2 equivalents in 2007. This includes emissions from the energy sector, industries, agriculture and waste and removals by the Land Use Land Use change and forestry (LULUCF) sector. Excluding LULUCF, GHG emissions were 1904.73 million tons of CO_2 equivalents. Energy sector accounts for 1100.06 million tons of CO_2-eq emissions i.e 58% of total CO_2 equivalent emission in 2007. The energy sector emissions include emissions due to fuel combustion in electricity generation, solid fuel manufacturing, petroleum refining, transport, residential & commercial activities, agriculture & fisheries. It also includes the fugitive emissions due to coal mining, and handling of oil and natural gas.

However, India envigages a goal to reduce the emission intensity of its GDP by 20-25 percent over levels of 2005. Therefore, it is essential to mesure the level of emission in 2005 and in order to determine that CAGR is calculated on the basis of available data of 1994 and 2007. Using growth rates mentioned in table below, it is estimated that India emitted 1433 million tons of CO_2 equivalent emissions in 2005.

Sector	1994	2007	Change	CAGR
Electricity	355.04	719.31	364.27	5.6
Transport	80.29	142.04	61.75	4.5
Residential	78.9	137.84	58.94	4.4
Other Energy	78.92	100.87	21.96	1.9
Cement	60.87	129.92	69.05	6
Iron & steel	90.53	117.32	26.79	2
Other manufacturing Industries	101.98	165.31	63.33	3.8
Agriculture	344.49	334.41	-10.08	-0.2
Waste	23.23	57.73	34.5	7.3
Total CO_2-eq emissions excluding LULUCF	1214.25	1904.75	690.5	3.52
Total excluding LULUCF and Agriculture	869.76	1570.34	700.58	4.65
GDP (Rs. Billion)*	12,825	30,619	17,794	6.92
Emission intensity**	66.8	56.2	10.2	-1.34

*@1999-00 prices (Central Statistical Commission, India)
**in grams of CO_2 equivalents per Rs. of GDP

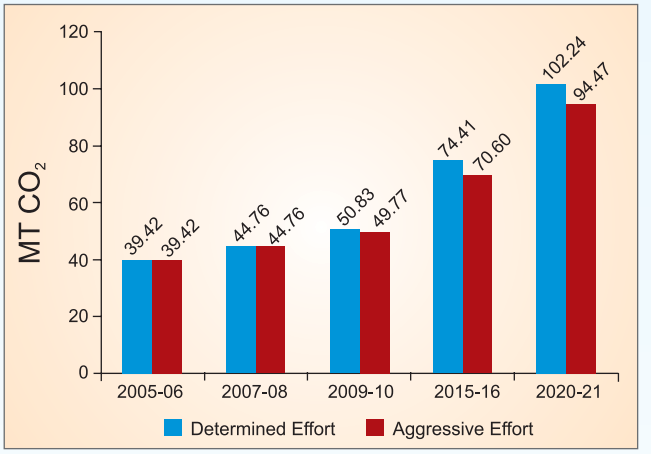
Oil & Gas Industry

The domestic consumption of petroleum products was 100.43 million tonnes and 141.75 million tonnes in 2001-02 and 2010-11 respectively, it means demand witnesed a growth rate of 3.5% (CAGR) over this period. It is expected that the demand of petroleum products will grow with a rate of about 4% in next 10-15 years. Consumption of natural gas has also been increasing in energy basket of India due to large increase in domestic gas production and import of LNG. Consumption of natural gas has increased from about 32.3 BCM in 2003-04 to about 64.2 BCM in 2010-11 with a growth rate of about 9% (CAGR) over this period. As per WEO-2010 report, currently the share of natural gas is about 6% and about 21% in energy basket of India and world respectively. Considering India's share of gas in energy basket, efforts interms of proactive policies and regulations are required to increase this share to global standard.

As per INCCA, 2007 report, oil & gas industy contributes about 3.2% of India's total GHG emissions. Majority of emissions in oil & gas industry are due to the refining activity, gas flaring, pipeline transportation of oil & gas, oil exploration, storage and its flow to the consumers.

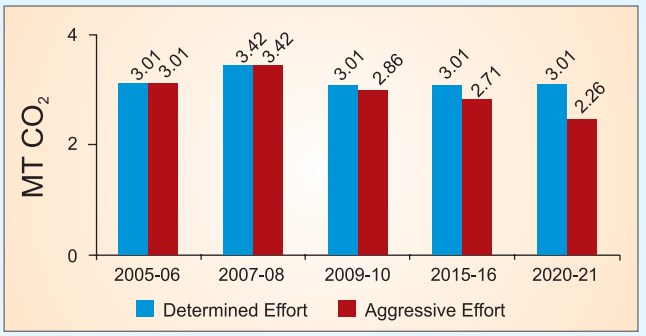
Petroleum Refining

Refining activity contributes about 80% of oil & gas industry emissions, therefore every refinery is taking several significant steps to reduce it. Refineries are adopting new advanced and efficient technologies to reduce fuel consume per tonne of crude oil processed. If refineries continue to improve their efficiencies by adopting advanced techologies, there would be significant reduction in their emissions. Reduction in emissions (assuming GDP growth at 8%) from refining activity under both scenarios is mentioned below:



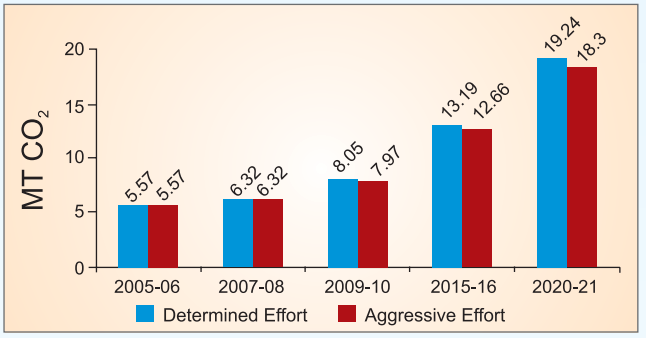
Gas Flaring

Oil companies are taking several steps to directly use the gas, due to which flaring has come down from level of 6% in 2001-02 to a level of 3% in 2008-09. It is found that about 1.09 BCM of gas is still being flared in the country. However, upstream companies are adopting various strategies to minimize the gas flaring and utilize the gas to various fuel uses through liquefaction, compression mode and transport the flared gas to locations near pipeline for pipeline injections or use it as a fuel for industrial or domestic use. Reduction in emissions (assuming GDP growth at 8%) from gas flaring under both scenarios is mentioned below:



Gas Processing and Transportation

It is estimated that about 5% energy consumption efficiencies can be achieved in the gas transportation, extraction and processing activities. Reduction in emissions (assuming GDP growth at 8%) from gas transportation, extraction and processing activities under both scenarios is mentioned below:



Oil & gas sector can impact the emissions from household sector significantly. In rural and urban household sector, if entire biomass for cooking is replaced by LPG and gas, emissions levels will come down significantly. Since, large numbers of households currently use biomass for cooking and the overall CO_2 emissions are estimated at 138 million tonnes of CO_2-eq in 2007.

Reduction in emissions of oil & gas industry under both scenarios is mentioned below:

Emissions (million tonnes) 2007	Mitigation Scenario	2020 (with 8% GDP Growth)	2020 (with 9% GDP Growth)
44.76	Refinery Emissions (million tonnes)		
	Determined Effort	102	115
	Aggressive Effort	95	105
9.75	Emissions from Gas Processing, etc. (million tonnes)		
	Determined Effort	23	25
	Aggressive Effort	20	23
54.5	Total Emissions (million tonnes)		
	Determined Effort	125	140
	Aggressive Effort	115	128

Renewable Energy at a Glance

Cumulative deployment of various renewable energy systems/devices in India

Renewable energy Programmes/systems		Cumulative achievements (as on 31 March 2011)
		IN MW
1.	**Power From Renewables**	
	A Grid-interactive renewable power	
	Wind Power	14156
	Small Hydro Power (up to 25 MW)	3042.63
	Biomass power (Agro residues and plantations)	997.1
	Biomass congeneration	1667.53
	Waste of power (Urban & Industrial)	72.53
	Solar Power	37.66
	Sub total (A)	19973.45
	B Off-Grid/Distributed Renewable Power including Captive/CHP plants	
	Biomass / Congeneration (non-bagasse)	301.61
	Biomass Gasifier	131.81
	Energy recovery from Waste	70.42
	Solar SV Power Plants	8.16
	Watermills/microhydel	6.98
	Sub total (B)	518.98
	Total (A+B)	20492.43
2.	**Decentralized Renewable Energy Systems**	
	Family Type Biogas Plants (in lakh)	44.04
	Solar Photovoltaic Systems	
	Street Lighting System (Nos.)	182200
	Home Lighting System (Nos.)	733245
	Solar Lanterns (in Nos.)	831604
	Solar Water Heating Systems - collector area (m^2)	4.47 Million m^2
3.	**Remote Village Electrification (villages/hamlets) (Nos.)**	8104

kW=kilowatt; MW=megawatt; m^2 = square metre

Source: Akshay Urja, April 2011, Volume 4, Issue 5

Revised Estimates of National Income and Expenditures on GDP, 2010-11

(At 2004-05 prices)

	Item	2008-09	2009-10 (QE)	2010-11(RE)
A	**Estimates at Aggregate Level**			
	1 National Product (Rs.Crore)			
	1.1 Gross National Income (GNI) at factor cost	4137125	4464854	4834759
			-7.9	-8.3
	1.2 Net National Income (NNI) at factor cost	3669890	3946540	4259782
			-7.5	-7.9
	2 Domestic Product (Rs.Crore)			
	2.1 Gross domestic Product (GDP) at factor cost	4162509	4493743	4877842
			-8	-8.5
	2.2 Gross domestic Product (GDP) at market prices	4462967	4869317	5298129
			-9.1	-8.8
	2.3 Net National Income (NNI) at factor cost	3695274	3975429	4302865
B	**Estimates at Per capita Level**		-7.6	-8.2
	Population (Million)	1154	1170	1186
		31801	33731	35917
			-6.1	-6.5
	Per capita (NNI) at factor cost (Rs.)	36070	38408	41129

Revised Estimates of National Income for the year 2010-11

(At current prices)

	Item	2008-09	2009-10 (QE)	2010-11(RE)
A	**Estimates at Aggregate Level**			
	1 National Product (Rs.Crore)			
	1.1 Gross National Income (GNI) at factor cost	5249163	6095230	7241026
			-16.1	-18.8
	1.2 Net National Income (NNI) at factor cost	4685873	5439557	6503394
			-16.1	-19.6
	2 Domestic Product (Rs.Crore)			
	2.1 Gross domestic Product (GDP) at factor cost	5282086	6133230	7306990
			-16.1	-19.1
	2.2 Gross domestic Product (GDP) at market prices	5582623	6550271	7875627
			-16.1	-19.1
	2.3 Net National Income (NNI) at factor cost	4718796	5477557	6569358
			-16.1	-19.9
	2.4 Gross National Disposable Income	5752909	6759384	8050341
B	**Estimates at Per capita Level**			
	Population (Million)	1154	1170	1186
		40605	46492	54835
			-14.5	-17.9
	Per capita (NNI) at factor cost (Rs.)	45772	52421	61610

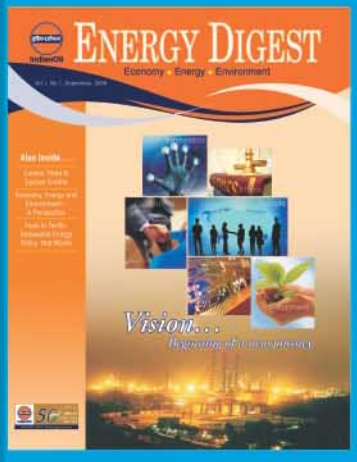
Note: The figures in parenthesis show the percentage change over previous year
QE: Quick Estimate; RE: Revised Estimate

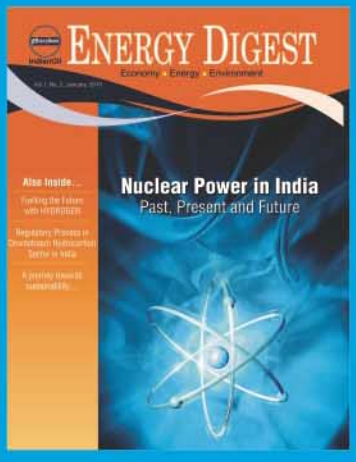
Inviting articles for Energy Digest

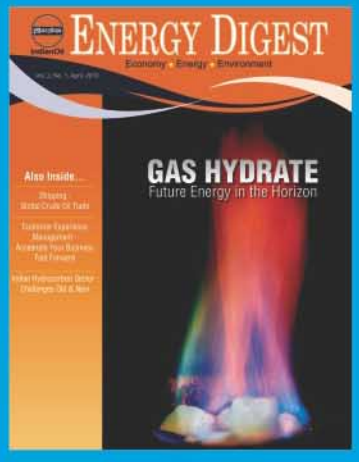
In today's energy driven world, any Nation's growth depends on its energy sector. Energy sector being a critical sector in the Nation's sustainable development requires an appropriate formulation and implementation of policies. Therefore, the need to have a sound energy sector requires the optimal utilization of existing natural reserves (fossil fuels) and advanced technological developments to exploit the untapped resources pertaining to renewable and non renewable reserves. Along with impetus on supply side an efficient system on demand side is also necessitated to improve the efficiencies of energy driven machines and using them judiciously.

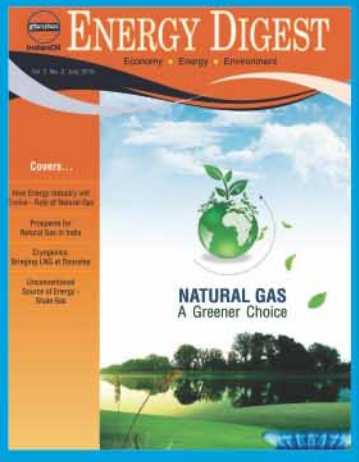
Keeping the same aim in our mind, a quarterly journal "Energy Digest" has been started in order to make professionals aware of latest economical, technical and regulatory developments pertaining to domestic and global energy sector including environmental issues. Energy Digest publishes articles, case studies, research papers and abstract of important reports. Till now seven issues have been published and circulated among experts across the country.

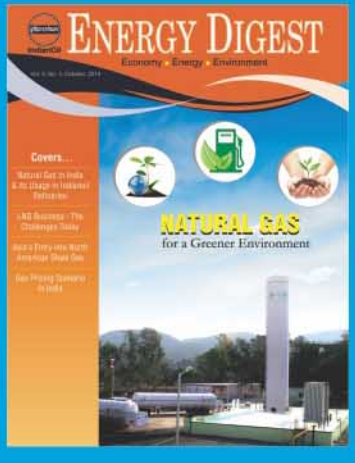
Readers are invited to contribute articles on subjects related to "Economy-Energy-Environment" of about 3000 words. The publication material in a soft copy may be sent to rajr2@iocl.co.in.

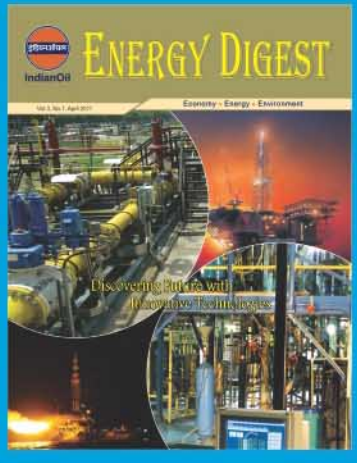












SERVO®

Hyundai Genuine Oils.
Approved for Hyundai.
By Hyundai.

- Superior performance and improved fuel efficiency
- Outstanding engine cleanliness
- Extra wear protection
- Excellent sludge control

IndianOil SERVO®
Hyundai Genuine Oils
100% PERFORMANCE. EVERYTIME.

Hyundai range of Genuine Oils:
Engine Oil • Gear Oil • Steering Oil • Brake Fluid • Coolant

Available at Hyundai Service Centers across the country