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From the Editor's Desk

Increasing commodity prices coupled with significant volatility are posing a major challenge for policy makers to sustain domestic growth amid recent economic slowdown in Europe and United States. In India, effects of escalating commodity prices due to supply & demand sides pressures are clearly evident in latest inflation figures and resulting contractionary monetary measures. In the background of high inflation, monetary tightening and economic slowdown in developed countries, reduction in investment and private consumption growth is expected. India's GDP growth rate of 7.7 percent in April-June, 2011-12 as compared to growth rate of 8.8 percent a year earlier is clearly showing a noticeable reduction in private & Government consumption and fixed investment.

The focus of global economic developments is shifting from the west to east in particular to China and India. They would continue to lead world economic growth and energy demand in coming years. They accounted for 10 percent of total world energy consumption in 1990 which increased to 21 percent in 2008. It is projected that their share in total world energy may reach to 31 percent by 2035. In India where large sections of population are still without adequate access to commercial energy, it is being considered that energy demand will have to grow at around 6.5 percent per year to support targeted 9 percent GDP growth rate per year in XII five year plan. In order to meet this energy demand, efforts are required to expand domestic production and secure import supplies in coal, oil and gas; and bring efficiencies in operations by introducing & implementing rationalised energy prices and non-price initiatives like National Mission on Enhanced Energy Efficiency. Considering existing socio-economic conditions of our country and our aim towards bringing in inclusive economic growth, energy related policy initiatives need to be pursued swiftly to bring in faster developments.

The article "Gasification - Value Addition in a Refinery" discusses the opportunity of developing a clean fuel and other useful products like ammonia from any fossil based carbonaceous materials by using innovative technology interventions. Besides this, article on "Unconventional Hydrocarbons: Development & Issues" discusses about the criticality of unconventional energy sources in present era. It also considers the initiatives implemented, challenges faced and means to encourage the development of unconventional energy sources in India.

Mutual understanding and co-operation among countries is a success mantra in this globalized and liberalized world. The article "WTO & Energy: Reciprocity or Conditionality?" discusses about the role of WTO in energy sector and its implications on India's energy sector policies and infrastructure. It also discusses about the crucial parameters defining the role of WTO in this energy driven world.

In last two decades, India has taken several proactive steps by framing and implementing encouraging economic and regulatory policies for attracting private investment to make India as a global hub in petroleum products and petrochemicals. The article "Petroleum, Chemicals, and Petrochemical Investment Regions (PCPIR) - India's Systematic Investment Plans (SIP)" discusses about one of the important policy developments of GOI to promote investments in energy and chemical sector. It also discusses the status of major PCPIR projects in detail. In addition to this a summary of "Summary of Interim Report on Direct Transfer of Subsidies on Kerosene, LPG & Fertilizer", an interim report issued by the finance ministry, has also been included.

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

19 September, 2011

(A.K. ROY)

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Gasification - Value Addition in a Refinery

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One of the most compelling challenges of the 21st century is finding a way to meet the growing energy needs while minimizing the impact on environment. While various efforts have been initiated to achieve the said objective, a general global consensus has emerged to produce clean energy, both from conventional as well as alternative fuels using a variety of technologies and an energy source that is environmentally sound as well as commercially viable. Recently, gasification is emerging as one of the processes that can help to meet these challenges by generating synthesis gas from any fossil based carbonaceous materials.

Gasification

Gasification is an environmentally effective technology that converts any carbon containing material (including refinery byproducts like petroleum coke, vacuum residue, etc., biomass and municipal solid waste) into clean synthesis gas. Carbon reacts with water in the form of steam and oxygen at relatively high pressure typically greater than 30 bar and at temperatures typically reaching 1200° C to produce raw synthesis gas or syngas. Syngas is a mixture composed primarily of carbon monoxide, hydrogen and some minor by-products (Refer to Figure 1).

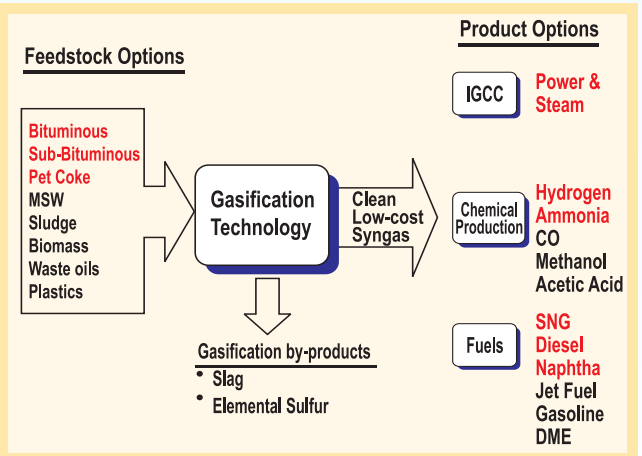


Figure: 1

The by-products are removed to produce a clean syngas which can be used for the following purposes:

- Generate power & steam
- Produce hydrogen
- Produce ammonia for urea to use as fertiliser
- Produce CO for Acetic acid
- Produce Petrochemicals
- Substitute Natural Gas
- Transportation fuels

Feed Stocks

Gasification facilities consume a variety of carbon-based feedstocks, including natural gas, coal, petroleum, petcoke, biomass, and industrial wastes. In the existing gasification plants, coal remains in leading position as the predominant gasifier feedstock (51%). Petroleum provides 25% of feedstocks and natural gas contributes about 22%. All the 11 under construction plants of about 10,000 MW_{TH} are coal-fired. It is pertinent to mention here that petcoke contributes to only about 1% of the total feedstock as on today. However, of the total capacity that is in the planning stages for the period 2011-2016, petcoke is envisaged to account for almost 30% capacity growth with remaining 70% expected to be coal fed (Refer to Figure 2).

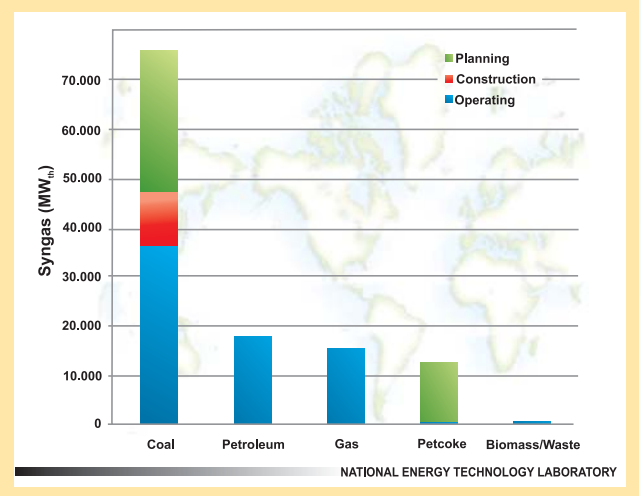


Figure: 2

Gasification Technologies

Different technology suppliers worldwide have developed the gasifiers which are either air- blown or oxygen-blown and either of the moving bed, fludised bed or entrained flow. The gasifier technology selection is influenced by number of factors such as:

- Nature of feedstock
  - Calorific value
  - Composition including sulphuur content
  - Physical properties (hardness, grindability, hard groove index)
  - Ash content and properties (fusion temperature)
- Downstream requirements
  - Syngas quantity & composition
  - Pressure
  - Steam requirements
  - Water availability
  - Scale of operation

Entrained flow gasifiers have been commonly used in recent years for gasification and currently there are two technologies available:

- Wet slurry feeds e.g. GE, ConocoPhillips, ECUST
- Dry feed systems e.g. Siemens, Shell

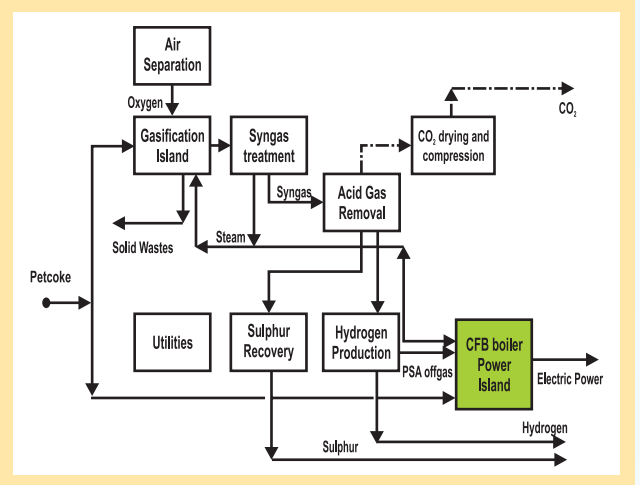


Figure: 3

Wet slurry feed offers significant capital and operating expenditure advantage over dry feed technologies; however, oxygen demand as well as CO_2 produced is higher in wet slurry feed as compared to the dry feed system.

Syngas Capacity by Technology

According to National Energy Technology Laboratory (NETL) USDOE database, at least 15 different gasification technologies are now in operation in plants around the world. However, three commercial technologies are currently dominant and hold 89% of the 2010 world market. Shell leads the way with 45 plants, accounting

for about 41% of world gasification capacity, Lurgi gasifiers are used at nine plants representing about 25% of the total and GE gasifiers are used at 67 plants representing about 23% of total syngas output. The remaining 11% is spread among a dozen other gasification technologies (Refer to Figure 4).

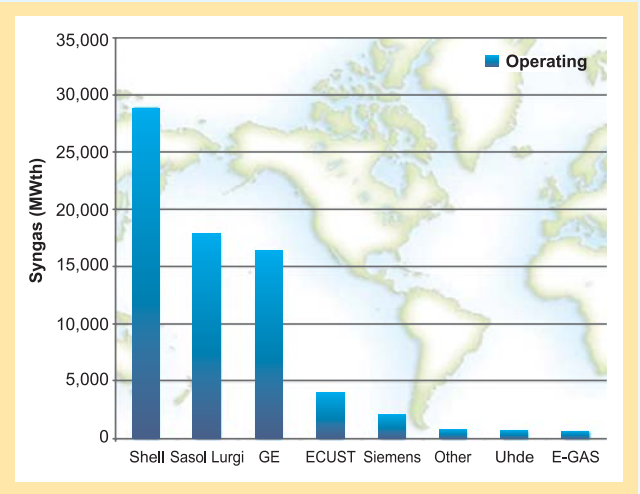


***Figure: 4**; Source: NETL, 2010*

Product Distribution

The flexibility and versatility of gasification plants enable them to offer a wide range of products, including liquid transportation fuels, chemicals, fertilizers, power, steam, gaseous fuels, and various other products (e.g., ammonia and hydrogen). According to NETL 2010 database, out of total 144 plants in operation, chemicals and liquid transportation fuels represent the leading products with 45% and 38% share respectively, of the world gasification capacity. Other products are power (11%) and gaseous fuels (6%).

Integrated Gasification Combined Cycle (IGCC) Power Plant

The IGCC based power plants came up on coal/ residue gasification, mostly in USA followed by Spain and Italy. The cost of a coal gasifier comprises about 40-45% in the total cost of IGCC plant. Therefore, to ensure coal to continue to serve US energy interests and enhance opportunities for economic growth and employment, US Department of Energy (USDOE) funded three IGCC demonstration projects under Clean Coal Technology demonstration program (known as CCT program). Although these plants took long time and high investment to enter into commercial operation but they adequately demonstrated IGCC technology.

Over the years, IGCC plants were set up based on coal, petcoke and heavy residue gasification but could not compete with conventional pulverized coal fired (PC) power plants due to higher capex and higher cost of power generation and lower plant availability. Based on Coal/ petcoke admixture as a feed stock, there are only 5 plants out of a total of 15 IGCC plants presently working worldwide. List of working IGCC plants is given below:

S. No.	Plant Name	Location	Technology Provider	Year	Output (MW)	Feed
1.	Nuon	Buggenum, Netherlands	Shell	1994	250	Coal/ Biomass
2.	Wabash	Terre Haute, IN, USA	E-Gas (ConocoPhillips)	1995	260	Coal/ Petcoke
3.	Tampa Electric	Polk County, FL, USA	GE	1996	250	Coal/ Petcoke
4.	Vresova	Vresova, Czech Republic	Sasol Lurgi	1996	350	Coal/ Petcoke
5.	Schwarze Pumpe	Lausitz, Germany		1996	40	Coal/ Biomass
6.	Pernis Refinery	Rotterdam, Netherlands	Shell (IGCC)	1997	120	Visbreaker/ Tar
7.	Elcogas	Puertollano, Spain	Uhde PRENFLO	1998	300	Coal/ Petcoke
8.	ISAB Energy	Sicily, Italy	GE	2000	520	Asphalt
9.	Sarlux	Sardinia, Italy	GE	2001	545	Visbreaker/ Tar
10.	Chawan IGCC	Jurong Island, Singapore	GE	2001	160	Tar
11.	Api Energia	Falconara, Italy	GE	2002	280	Visbreaker/ Tar
12.	Valero	Delaware City, DE, USA		2003	160	Petcoke
13.	Negishi IGCC	Negishi, Japan	MHI	2003	342	Asphalt
14.	Eni Sannazzaro	Sannazzaro, Italy	Shell (IGCC)	2006	250	Oil Residues
15.	Fujian Petrochemical	Quanzhou, China	Shell	2009	280	Oil Residues
	Total Capacity				**4,107**	

Source: World Gasification Database; Gasification Technologies Council, NETL

Drivers in the Gasification Industry

Some of the recent issues and trends that are likely to have a significant impact on the future direction and growth of the gasification industry are as under

Influence of volatile oil and natural gas prices

Lower and stable gas prices encouraged rapid use of gas in producing power till 2002. However, factors such as increase in the gas prices and increasing volatility have contributed in shifting the focus towards coal or petcoke based gasification plants.

Increased demand

The expanded economy in Asia, particularly China and India, has generated an increased interest in gasification as a viable energy option. The first gasification plant was commissioned in 1983 and presently (as of 2010) there are 50 operating plants in China. Out of these 50 plants, the feed stock for 13 plants is petroleum based (vis-breaker residue/ vac. residue), producing ammonia in seven plants and oxo-chemicals in three plants; Methanol, chemicals and gasses in one plant each.

Power (Electricity), steam and hydrogen from environmental wastes

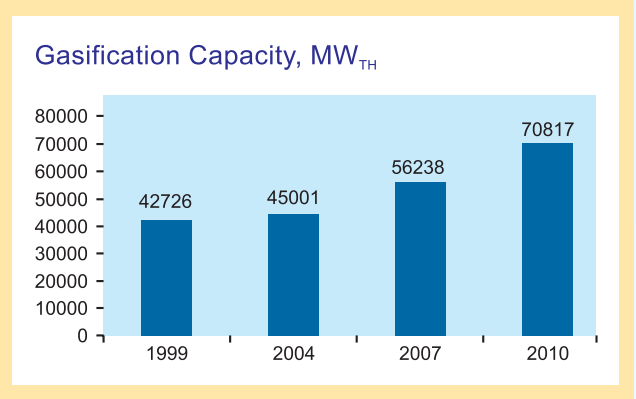
During the last 20 years, petroleum refineries have attempted to more completely use the wastes from refineries in order to avoid environmental issues associated with outdoor storage, runoff, discharges as well as cost of disposal. Gasification can facilitate useful conversion of these wastes to produce power, syngas and hydrogen for use in refinery or for export from the plant. These were the prime reasons for increased interest in gasification plants, particularly in Europe (Italy, Poland and Netherlands) and the US.

Environmental regulations

Finally, there is a growing consensus that carbon dioxide management will be required in power generation and energy production, in the years to come. The strategic choices for generation capacity are increasingly getting influenced by the potential to adapt to these environmental and carbon policies. By virtue of lesser emission footprints, gasification provides a versatile option that will be able to comply with more stringent environmental regulations. Moreover, since the gasification process allows carbon dioxide to be captured in a cost effective and efficient manner, it will be an increasingly attractive choice for the continued use of fossil fuels.

Market Trend

The world gasification capacity in 2010 has shown a significant increase of 26% over that of 2007 as depicted in the below mentioned chart (Figure 5):



2010 - 144 operating plants, 412 gasifiers

Figure: 5; *Source: Gasification Database, 2010, NETL*

Globally, there are 53 schemes either under construction, under planning or developmental stage, out of which six plants have proposed to use Petcoke as their feedstock. Upon commissioning of all these schemes, the syngas production capacity is likely to go up to 120000 MW_{TH} by 2016 from the present 70817 $MW_{TH.}$

Out of the above mentioned 53 schemes, 25 plants have opted for chemicals route, 17 plants will have their primary product as electricity, 6 will produce liquid fuels, while 5 will produce gaseous fuels. California based Chevron Corporation and Houston based ConocoPhillips (E-Gas) have developed technology to gasify petcoke for use in fertilizer plants. China Petroleum and Chemical Corporation (Sinopec) have replaced its naphtha feedstock with low cost pet coke and coal for its Jinling plant.

It is also pertinent to mention here that after 2003, no gasification capacity was added using petcoke as a feedstock. However, as indicated in figure 1, the trend is

undergoing a change with 6 plants in US are proposing the use of petcoke as a feedstock. The salient features of these plants, all located in the U.S. are given as under:

S. No.	Plant Name	Technology	Stage	Year	Syngas Capacity, MW_{TH}	Output
1.	Hydrogen Energy California	GE	Development	2012	1150	Power
2.	Lima Energy IGCC Plant	E-Gas	Planned	2013	2560	Power
3.	Port Arthur Refinery, Valero Energy Corporation	ECUST	Development	2014	2451	Gaseous fuels
4.	Lake Charles Gasification Project, Leucadia Energy	GE	Design	2014	2230	Chemicals
5.	Mississippi Gasification	E-Gas	Front End Design	2015	1720	Gaseous fuels
6.	Sweeny Gasification Project, ConocoPhillips	E-Gas	Front End Design	2016	1916	Power

Source: Gasification Database, 2010, NETL

In view of the environmental benefits like CO_2 capture, the above-mentioned projects are likely to obtain financial assistance under the Clean Coal Power Initiative (CCPI) program of DOE.

In India, it has recently been reported that one of the major domestic refiner has annouced to build a petcoke gasification plant to produce 1 million tonnes of Acetic Acid. It will further invest in this chain to make several value added products like Vinyl Acetate Monomer and Poly Vinyl Acetate.

Petcoke Disposal in Refineries

In the present context, there are issues related to disposal of petcoke in the developed economies. U.S. exported 164 million barrels of petcoke to 63 countries in 2010, which is about 80% of its High-Sulphur (S) production. Significant importers are Japan, Mexico, China, Brazil, Spain, Italy, Turkey, etc.

Whereas refineries in India are able to sell high-'S' petcoke, mostly to cement plants with a reasonable price realization. A small quantity is also sold to brick & lime industry and boilers in thermal power stations. The burning of such high 'S' petcoke in cement kiln, CFBC boilers, etc. results in SOx and CO_2 emission, to some extent affecting the ambient air quality, if not otherwise captured through some processes. But the question remains unanswered: With the increased production of high sulphur petcoke how long the evacuation would be possible for us through cement plants/power plants.

Environmental Obligations

In September 2010, the U.S. Environmental Protection Agency (EPA) announced regulations for air protections for more than 100 portland cement plants across the country. These rules limit particle pollution from new and existing kilns, and also set new-kiln limits for particle and smog-forming nitrogen oxides and sulfur dioxide. The EPA maintains that when fully implemented by 2013, the sulfur dioxide and Nitrogen Oxides level shall reduce by 78% and 5%, respectively.

In India, the National Action plan on Climate Change unveiled by Government of India in June 2008 outlines mission in specific areas such as solar energy, enhanced energy efficiency, sustainable habitat, water sustaining Himalayan ecosystem, sustainable agriculture & strategic knowledge for climate change. Prime Minister's council on climate change has already ratified 'in principle' the National Mission on Enhanced Energy Efficiency. The mission's objectives include around 5% reduction in annual energy consumption and in turn save nearly 100 million tonnes of CO_2 every year. This brings Energy Management into focus for efficient use of energy through

optimization & conservation measures without sacrificing production levels as well as quality and ensuring safety and adherence to environmental regulation and standards.

The rise in atmospheric CO_2 levels is primarily due to expanding use of fossil fuels for energy. Apart from CO_2, SOx and NOx are the other pollutants affecting our environment. In Indian context, total CO_2 emissions from oil & gas sector are about 450 Mt for 2008 (WEO, 2010). Indian refineries, through production of environmental-friendly fuels i.e. Euro III/ IV have contributed in reduction of not only SOx but also in emission of CO, HCs, NOx and particulate matter by investing huge amounts for new processing and treating units. There lies a further challenge as well as opportunity for proper planning, implementing energy efficient and innovative cutting edge technologies for further improving bottom line of refinery operation and, to produce quality products while meeting environmental obligations. This assumes more importance in future for upcoming refineries to manufacture products with tightened specification from cheaper, high 'S' and heavy crudes.

As far as the Indian cement industry is concerned (which is the largest user of 'High-S' petcoke), present emission standards generally relate to particulate matters. However, in line with the development in the western economies particularly the U.S., it is expected that more stringent regulations are bound to follow rendering the disposal of 'High-S' petcoke difficult in the years to come.

Economics of a Gasifier Plant; Pricing of Petcoke

Apart from the benefits of gasification plants, they are associated with high capital costs and large gestation periods. Besides, there are only a few technology providers that dominate the scene. The higher capital cost of IGCC plant results in higher fixed cost of power. Therefore, to be able to produce the outputs (Electricity, chemicals, hydrogen, etc), the variable component of the cost need to be kept lower. As there are issues linked to disposal of petcoke in the U.S. and European countries, the feedstock (petcoke) to gasification plants associated with refineries is valued at a nominal or a bare minimum price.

In one such indicative calculation by ConocoPhillips (2004) for a gasification plant using petcoke as feedstock, and producing power and hydrogen in USA the RTP for petcoke was considered in the range of USD 6-12/ Tonne, depending on the handling costs. Accordingly a post-tax IRR was worked out as 15%. The indicative calculation is reproduced below:

Refinery Capacity	200,000 BPD
'High – S' petcoke production	4700 TPD
Hydrogen demand	60 MMSCFD
Refinery power demand	100 MW
Steam requirement	1800 Mlb/ Hr at 600 psig
Capex	$ 900 million
Air Separation Unit	$ 110 million
Gasification Island	$ 345 million
Hydrogen plant	$ 50 million
Power block	$ 265 million
Soft costs	$ 130 million
Opex, per year	$ 55 - $ 65 million
Net Savings per year	$ 180 - $ 190 million
Post-tax IRR (100% Equity)	15%

Source: Petcoke Gasification Synergies for Refineries, ConocoPhillips, 2005

In India, High-'S' petcoke is presently being sold, particularly for burning in cement kiln and boiler at an appropriate market price which bring a good business sense and is therefore, considered as a product with considerable value. However, with environmental norms getting more and more stringent in the country, it is unlikely that this trend may continue in the years to come. Therefore, at that point of time, the disposal of petcoke may take precedence over the commercial aspect. The situation may compel refining companies to dispose the petcoke through environment friendly gasification process at a nominal value.

Petroleum Coke Scenario in India – A Case Study

In India, even though the petcoke production and consumption figures have shown a decline in 2010-11 as compared to 2008-09, yet it is observed that a quantity of about 2.7 MMTPA has been imported during the

period. These imports are mainly from those countries where the usage of high 'S' coke is already being discouraged due to the environment concerns.

Need for Petcoke Gasification

Advanced countries like the US are exporting the high sulphur petcoke along with coal to other countries. With increasing awareness on environment and commitment of countries to cut down the release of pollutants, it may not be the same to burn high sulphur petcoke in the cement kiln and boilers of power plants. Hence, as a proactive measure, it is worth-considering environment-friendly methods of utilizing the petcoke on a long-term basis. One such utilization could be the gasification route, converting petcoke to synthesis gas and produce hydrogen/ chemicals, power, steam, etc. In the process, it will enable value-addition to low or negative-value feed stocks by converting them to environment-friendly marketable fuels and products.

Future Options

In the coming years, production of high-sulphur petcoke from oil refineries of India is envisaged to be rising due to increasing use of high-sulphur crude. As a proactive initiative, it is worth to explore various alternatives for petcoke disposal; gasification being one of the probable answers. It would be therefore, prudent to select a gasification route for maximizing value addition to coke and also ensure its disposal on long term basis in environmental-friendly manner. Since standalone IGCC power plant may not be viable option; integration with chemicals, petrochemicals and/ or Hydrogen may be found economically feasible with improvement in technology and costs.

However, gasification technology requires huge investment and is restricted to few technology suppliers across the globe. The technology risk varies with type of gasifier which is purely dependent upon fuel characteristics. The experience of petcoke gasification is very limited so for as compared to coal and liquid fuel gasification. Also, there are issues pertaining to Reliability, Availability and Maintainability (RAM) of the plants in operation which are now getting resolved with performance of plants reaching an acceptable industry threshold. It is therefore, pertinent for the industry to explore various technological options and its pros and cons to prepare itself for journey towards gasification of high 'S' petcoke available in its refineries in future.

Conclusion

Gasification technology has a vast potential for synergy with refinery, if its integration with chemicals, petrochemicals and hydrogen is explored. In the Indian context, the readily available petcoke market may shrink in the future due to environmental regulations. These compulsions are expected to pull down the petcoke demand and adversely affect refinery operations as well as economics.

The gasification technology so far is not at a very mature stage in India, with little experience in petcoke gasification. Incidentally, also very few gasification plants based on high 'S' petcoke feed are in commercial operation worldwide. Therefore, issues relating to technology partner selection, formulation of the project, customization of the project etc. are likely to take considerable amount of time. In addition to these pre-project activities, the project itself is likely to have a high gestation period. A reasonable time-frame from conceptualization to commissioning could therefore, run into 8-10 years. It is also expected that by such time, the environmental regulation may also become stringent and will have a significant influence on the business decisions.

Unconventional Hydrocarbons: Development & Issues

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The Shale Gas Revolution in the US has raised interest worldwide in the development of unconventional oil & gas. Technological breakthroughs coupled with rising prices of hydrocarbons, especially oil have turned the cost economics of unconventional oil and gas attractive. For Indian energy sector development of unconventional oil and gas should be a priority area. Initiatives for development of unconventional oil & gas are not new in India. However, expect for CBM major breakthroughs are awaited in other areas.

World Energy Scenario: Demand Outrunning Supply

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. Overall the conventional oil & gas reserves of the world are limited while the demand is ever increasing. Further, 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" (World Economic Outlook 2011, April). This has been the driving factor for exploring newer sources of hydrocarbons i.e. the unconventional oil & gas.

Unconventional Oil & Gas: Definition and Types

In geological terms, a hydrocarbon is considered conventional if the reservoir sits above a water bearing sediment and if it is relatively localized. If neither is the case, the hydrocarbon is defined as unconventional. Any source of oil/ gas is described as unconventional if it requires production technologies significantly different from those used in the mainstream reservoirs/ fields exploited today. The difference in technology manifests in terms of differences in energy input, cost and environmental impact.

The unconventional oil sources include:

- Extra heavy oil (oil with high viscosity and API gravity of less than 10°);
- Oil sand (sand containing bitumen);
- Oil shale(sedimentary rock containing kerogen);

The unconventional gas sources include:

- Tight gas (natural gas with low permeability);
- Coal bed methane (CBM, natural gas associated with coal);
- Shale gas (nat. gas associated with shale oil);
- Natural gas hydrates (structures of water ice trapping natural gas)

Unconventional Hydrocarbons: Dynamics of Technology & Prices

The dynamics of technology of the unconventional sources and the prices & supply-demand equation of conventional sources are crucial in making what was unconventional yesterday into conventional/ mainstream source tomorrow. In fact a few decades ago, all offshore oil was considered an unconventional resource. However, this portion of global supply has since grown to account for 30% of the total. Further, over the last couple of decades, deepwater has rapidly become an important part ofthe world's oil supply. Drilling in deepwater and ultra-deepwater (depths of five thousand feet or more) just started becoming economically profitable and technically feasible on a large scale in the last decade, in part due to significantly higher oil prices. Globally, oil supplies from deepwater have risen from 1.5 mb/d in 2000 to 5 mb/d by 2009, around 5% of total world oil production.

Unconventional Hydrocarbons: Shale Gas Revolution and the New Era

Technical breakthroughs made in hydraulic fracturing and horizontal drilling in the United States in the last few years for shale gas production have raised unconventional gas output in the US by almost 40% over the 2007-2010 period (IEA, Medium Term Oil & Gas Market Report 2011). This remarkable success story of shale gas in the United States in many ways has augured a new era in the hydrocarbon sector powered by realization of the potential and scope of unconventional oil & gas.

Many countries across the globe are exploring the potential of are looking for shale gas. In addition, CBM is also attracting attention in a number of countries, particularly Australia. According to IEA, the share of unconventional gas in global production is expected to increase from 12% in 2008 to 24% in 2035. Unconventional gas would supply more than 40% of the increase in demand to 2035, when it is projected to reach 1.2 tcm.

Turning to unconventional oil, according IEA (World Energy Outlook 2010), the reserve base of unconventional oil is assessed to be several times larger than conventional oil resources. The main sources of unconventional oil today are Canadian oil sands and Venezuelan extra-heavy oil. The Orinoco belt in Venezuela has a production capacity of 570 kb/d of extra heavy oil. Canada is the only country with commercial extraction of oil sand. Oil shale is currently exploited in Brazil, China, Germany and Israel. According to IEA, by 2035 around 10% of global oil demand will be met by unconventional oil, production of unconventional oil is expected to increase from present 1.7 mb/d to 6.9 mb/d by 2035.

Unconventional Hydrocarbons: Challenges & Policy Issues

High Development Cost & Long Payback Period: Production of unconventional hydrocarbons entails high costs, complex operations and long gestation periods. Moreover, the economic viability of these depends on the prices of conventional oil & gas.

Human Resource: Newer technologies require newer skill sets, acquiring & training the required manpower resources constitutes a major challenge in advancements in unconventional oil & gas. This is especially true as the oil &gas sector even in its conventional businesses has been facing a manpower crunch.

Environmental Impact: Carbon emissions for extracting oil and upgrading oil from unconventional sources are presently higher than those from most conventional sources. Production of unconventional oil is an energy intensive process that requires significant amounts of heat and hence more emissions. The energy used as a percentage of the energy produced is about 20 -25 % for extra heavy oil, 30 % for oil sand and 30 % for oil shale, as compared to 6 % for conventional oil and gas.

Besides, a large fraction of world's unconventional resources are located in environmentally sensitive areas, where water and land use could constrain new developments. Of late the concerns of contamination of fresh water by the chemicals used for hydraulic fracturing in shale gas production have come to the fore. A current study (expected to be issued in 2012) by the Environmental Protection Agency (EPA), USA on effects of shale gas production on water is likely to create uncertainty and add to the opposition to shale gas.

Fiscal & Regulatory Structures: Once fiscal and regulatory structures need to be tailored specifically to unconventional sources for facilitating development. Frameworks used for conventional oil & gas might not be suitable in the case of unconventional.

Prices: Prices can support development unconventional hydrocarbons, but this is never a straightforward proposition in markets like India's where government has a heavy hand in setting prices and subsidies are widespread. Often, countries want diversification or

energy security but are not willing to pay for it; such market risks also delay unconventional gas development.

End-use Integration & Logistics: Unconventional hydrocarbon programs are more intensive and require different infrastructure – both physical as well as technical – to succeed. In countries without gathering and processing systems, pipelines, and sufficient qualified personnel, the pace of unconventional gas development can be slow.

India's Energy Management Challenge: Role of Unconventional oil & gas

India's rise in the global arena as a major economic power has been coupled with a significant scale up in its energy demand. In the coming decades the economic growth aspirations would entail putting forth a major supply side response to meet the growing energy requirements. According to IEA, India's share in world energy consumption will rise from 5% to 8%. During the XII Plan period management of the energy situation is understood to be a major a challenge. How well India tackles its energy challenge will be crucial in enabling India to meet its growth and development aspirations.

Hydrocarbons constitute a major energy source in India, with a share over 45% in the primary commercial energy. However, India is not well endowed with conventional hydrocarbons. India's conventional oil reserves stand at 800 million tones, which is 0.4% of world reserves & while conventional gas reserves stand at 1.12 trillion cubic meters, which is 0.6% of world reserves. On the other hand, India presently, accounts for 2.7% of global hydrocarbon demand and this number is projected by IEA to rise 5.9% in 2035 (WEO 2010).

A major component of the supply response for meeting India's energy requirements would be through the imports route. According to the Integrated Energy Policy (Planning Commission 2006), it is projected that by 2030, 30-60% of India's energy requirements would have to be met through imports. With oil & gas accounting for the bulk of the imports, over 90% of oil would be imported and gas imports could be as high as 50%. High dependency on imports in the context of rising global energy prices and geopolitics raises a number of concerns about the stability of energy supplies to the economy.

In the backdrop of positive developments in the area of unconventional hydrocarbons across the world and the necessity of meeting India's energy challenge for realizing its growth aspirations, a major thrust in this area is called for. Initiatives for development of unconventional oil &gas are not new in India. However, expect for CBM major breakthroughs are awaited in other areas.

Oil Shale: In India, shale formation is exposed to the surface in the region of Belt of Schuppen falling in Assam, Arunachal Pradesh and Nagaland. The oil shale reserves are estimated at about 100 billions barrels (Directorate General of Hydrocarbons). World reserves are estimated to be more than 5 trillion barrels of oil, of which 1 trillion barrels are recoverable (IEA, WEO 2010). However, the production of shale oil requires large amount of energy and water. Environment and monetary cost have so far made production of oil from oil shale uneconomical.

Coal to Liquid: Driven by the need for energy security and concerns over higher price volatility, the world's major oil importers—especially China, India, and the US—have sought domestic alternatives like coal-to-liquids (CTL). China has a large and rapidly growing coal-to-methanol industry, and began production at its first CTL plant in 2009. CTL liquids consist of mainly diesel for vehicles and naphtha for chemicals. In India, OIL has carried out pre-feasibility studies on Catalytic Two Stage Liquification Technology and Direct Liquification Technologies in order to select the best suitable technology for the North East coal for liquefaction. A joint task force between the Oil India Limited and Coal India Limited has been constructed by MOP&NG to confirm availability and assured supply of coal in Assam, Arunachal Pradesh and Meghalaya for a commercial plant. By 2035, India is projected to produce around 0.1 mb/d of oil from CTL (IEA, WEO 2010).

Gas Hydrate: It is estimated that India has vast gas hydrate resources, with the total prognosticated gas resource from the gas hydrates in the country placed at 1894 TCM. Much of the work being done world over is in research stage. Indian scientists have been working in close association with that of US & Japan, the two other countries besides India who have contributed largely in this field, jointly undertaking R&D studies for knowledge sharing and information exchange.

CBM: Having the 3rd largest proven coal reserves and being the 4th largest coal producer in the world, India holds significant prospects for commercial recovery of CBM. Prognosticated CBM resource has been estimated to be around 4.6 TCM. India started CBM production

from the Raniganj Block in West Bengal in 2007. Since 2001, India has awarded 26 blocks in three bid rounds, with more than 250 CBM wells drilled. The government offered another 10 blocks in its fourth CBM bid round under NELP-VIII. Government incentives for CBM production include no participating interest from the government, the ability to sell gas at market rates, no singature bonuses, no custom duties for equipment required for CBM exploration and other provisions. The projected production of CBM is of the order of 7 MMSCMD by the year 2011-12.

Shale Gas: Recently EIA released a major study estimating potential of shale gas across the globe. India emerged amongst the top 15 countries in the study (including the United States and Canada) that have technically recoverable shale gas resources of over 60 tcf. In each of these 15 countries, the estimate of technically recoverable shale gas resource is greater than the country's currently proved gas reserves, and in many cases a great deal larger. For India, expressed in terms of a country level Reserves to Production ratio (R/P), even 20% of the estimated technically recoverable shale gas identified would add 9 years of reserves at 2010 production levels. Further, Schlumberger & ONGC Shale gas pilot made an initial gas in place estimate of 300-1200 TCF in Indian Shale Gas Basins (Damodar, Cambay, Krishna Godavari and Cauvery). In comparison, this is 300 times RIL's KG D6 proven reserves (78 TCF). Recently an MoU between US & India was signed for technical cooperation in Shale gas.

Way Forward

Development of unconventional hydrocarbons has been slow in India with no significant breakthrough as yet. Policy framework in the form of fiscal policies, licensing or leasing costs, costs due to environmental regulations needs to be developed.

While country specific factors are seen to be quite important, lessons can be drawn from other countries. Moreover, while replication of policies for conventional hydrocarbon exploration & production is uncalled for, lessons can be learnt. The existing policy framework for exploration and production of conventional oil & gas in the form of the New Exploration & Licensing Policy (NELP) despite the success of KG Basin has a number of limitations. A large proportion of India's conventional oil & gas reserves remain largely unexplored. Of the 26 sedimentary basins identified in India, so far, only 20% of the total area has been well explored. Policy hurdles are main reason for the lack of enthusiastic response to NELP. For instance, among others, unstable policies in regard to production sharing agreements & price fixation and lack of clear M&A Rules are seen to be major policy limitations.

Further, much needs to be done in improving the data on the unconventional resources. Obtaining reliable geological data is critical and in fact the first building block for development of unconventional oil & gas. In this context, the DGH has a crucial role to play.

Energy Diplomacy will also have a role to play in facilitating the process of acquiring technologies especially those for shale gas. In this context, the MoU signed with the Government of India & the United States for technical cooperation in shale gas is a step in the right direction.

Besides this initiatives by Indian E&P companies will go a long way in development of this sector. On such is the recent stake acquisitions by Reliance in the 2 shale gas firms in the US (Atlas Energy & Pioneer Natural Resources) with the objective of acquiring technical expertise. The joint pilot project of ONGC with Schlumberger (a global leader in oil field services) for assessing shale gas reserves in India is another encouraging initiative.

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WTO & Energy: Reciprocity or Conditionality?

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Coherence between WTO & Energy Policy though has achieved some minor goals but has been expensive in terms of direct costs and inefficiencies in policy making and policy debate. WTO & Energy has always been and is a chameleon of coherence. With liberalization and privatization, energy services are now an important component of international trade and trade agreements. Energy plays a vital role in the development of any economy and given its unequal distribution trade in energy, especially fossil fuels, is an important component of international trade. India has the capability of exporting high-skilled manpower at competitive prices but is facing various market accesses, discriminatory and regulatory barriers in markets of export interest. India needs foreign investment, technical know-how and international best practices in energy. The country has progressively liberalized this sector and there are no major entry barriers. However, India has not been successful in attracting large foreign investment and technology. This is due to various domestic barriers which make it difficult to set up a competitive operation.

Introduction

Energy security is essential for both daily operations, as well as long-term investments. The contemporary era has witnessed increasing concentration and awareness being paid to the issue. There are large number of apprehensions and fears, such as oil and fossil fuel depletion, dependence on foreign resources of energy, solidity of nations which are energy suppliers, energy demands of developing countries and escalating competing demands from advanced developing countries, economic efficiencies and environmental issues. Globally, there have been several energy crises which have drawn attention towards energy security. Policies related to the promotion of energy efficiency, enhanced variety of supply, market reforms, etc are important tools for promoting energy security. Dependable and reliable legal frameworks are essential components that encourage investment and technology transfer that contribute towards the energy security. At the moment, regulation of international energy trade is highly fragmented with multiple instruments involved. It is noted that the bulk of regulation are governed by domestic laws, and the role of regional and global laws in addressing energy and secure production and supplies has remained unclear and unsettled. Doctrines of multilayered governance hardly have been applied to the sector.

World Trade Organization

The World Trade Organization, created in 1995 is a binding contract between its 149 Member Nations in which they agree to reduce government controls on international commerce. Operating outside of the United Nations system, the WTO governs vast areas of public policy through its own legislative, judiciary, and executive bodies that respectively write, adjudicate, and enforce its world trade rules. Among the more than thirty multilateral trade agreements WTO administers is the General Agreement on Trade in Services (GATS), which is increasingly important to developed nations as their economies become based more on services while manufacturing and agricultural production move to lower cost developing nations.

The aim of current GATS negotiations is to remove barriers to the trade in services, the scope of which includes every sector from architecture to banking to tourism. There are no service sectors excluded from the current negotiations. There are requests in even the most

sensitive sectors: health, education, culture, and water. The WTO is already somewhat in the oil services arena because the list of sectors in the current GATS includes commitments made by various countries for individual activities such as transport and information that sometimes intersect with the energy business. It should also be noted that other areas of the current negotiations, such as talks on Non-Agricultural Market Access (NAMA), could also impact energy policies by reducing government's measures on everything from tariffs on imported equipment to quotas on energy products.

Oil and gas services include a wide range of services, such as: drilling services; derrick erection; repair and dismantling services; services necessary for oil or gas extraction such as well casing; cementing, pumping and plugging wells; as well as specialized fire extinguishing services.

WTO's competition agenda focuses on to eliminate government practices that protects national monopolies, both state owned and private; to promote competition, disciplines on what governments can and cannot do, including with state-owned businesses and are intended to break up national industries that restrict competition.

Energy in WTO: Governing Agreements & their impact

WTO agreements that are directly relevant to cross-border energy trade include the General Agreement on Tariffs and Trade (GATT); the General Agreement on Trade in Services (GATS); the Technical Barriers to Trade (TBT) Agreement; the Trade Related Investment Measures (TRIMs) Agreement; the Subsidies and Countervailing Measures (SCM) Agreement; and the Agreement on Government Procurement. The GATT and WTO principles that govern international trade are fully applicable to trade in energy and energy products. These include the most favored nation (MFN) principle and the national treatment principle. During the Tokyo (September, 1973) and Uruguay (September, 1986) Rounds, WTO Members discussed issues related to dual-pricing practices and resulting subsidies, reverse dumping; export restrictions and export taxes; and problems of natural resource product displacement. The resistance of resource-endowed countries made it impossible to reach an agreement regarding specific rules on these issues, and de facto, the general GATT/WTO rules are currently being applied to energy issues. There are, however, specific features of the energy sector which give rise to questions over whether existing GATT/WTO rules and agreements can adequately address relevant energy issues. These aspects are related to security of supply, public service obligations, the existence of quantitative restrictions, requirements of trade in energy services (transportation and access to markets and networks), and environmental implications of different forms of energy. In the context of growing interests in the development of new sources of energy, a debate has emerged as to whether, in the trade system, a different set of rules and disciplines should apply to renewable energies such as solar, wind and bio-energy.

Energy issues around the world today are dealt with in a fragmented manner and some energy specific agreements and institutions are described below:

- Organization for Economic Cooperation and Development (OECD)
- International Energy Agency (IEA)
- International Energy Forum (IEF)
- The Energy Charter Treaty (ECT)
- Organization of the Petroleum Exporting Countries (OPEC)
- Multilateral Environmental Agreements
- Regional Level: European Union (EU) and North American Free Trade Agreement (NAFTA)
- The United Nations Framework Convention on Climate Change (UNFCCC)
- The European Single Energy Market
- Asia Pacific Economic Cooperation (APEC)
- Gulf Cooperation Council (GCC)
- Bilateral & Regional Trade Agreements (like North American Free Trade Agreement (NAFTA); Association of South East Asian Nations (ASEAN) & United Nations Conference on Trade & Development (UNCTAD).

Typical obstacles to trade in energy services include restrictions for the entry and stay of energy services managers, professionals and experts; restrictions for the entry of the equipment and tools needed to provide the services; arbitrary business and licensing requirements; and absence of transparence of regulatory framework as energy was not specifically addressed by international

agreements for a long time, and was mostly treated in a political context as a special case. *It is now commonly accepted that the existing*

WTO rules apply equally to energy products. These rules are not, however, well designed to address some trade-related issues in the energy sector. The WTO addresses import barriers to a larger extent than export barriers. In the energy sector, the trade restrictions are more pertinent to export barriers.

Energy in WTO: Role over the years

Sixty years ago, when the rules of the GATT were negotiated, world energy demand was a fraction of todays and so were energy prices. While energy has always been a crucial factor in geopolitics, at that time liberalizing energy trade was not a political priority. The industry was largely dominated by state run monopolies and thus governed by strict territorial allocation. International trade in energy resources and products was heavily concentrated, cartelized and controlled by a few multinational companies. This explains why the rules of GATT, and now the WTO, do not deal with energy as a distinct sector.

There has long been a misconception that energy is not governed by international trade rules in the same way that other products are. Such a misunderstanding may have been caused by the fact that energy products and materials do not usually encounter market access problems in their export markets. International trade rules have generally dealt with import barriers more than export barriers. In the energy sector, trade restrictions are more pertinent to export barriers, and as a result, market access discussions have not focused as heavily on energy. The seemingly limited focus on energy can also be attributed to the fact that until recently, large energy exporting countries including Saudi Arabia (December, 2005), Russia and central Asian nations, were not Members of the WTO. The accession of Saudi Arabia and the likely accession of Russia and other oil exporting countries is seen as a major development that will affect the profile of energy in the trade system.

In current scenario, energy and energy products are a central element of world trade. Further advancements in renewable technologies are expected to produce new dimensions in energy trade at the multilateral level. Such developments, when coupled with predicted growth in oil and gas trade, will have a substantial and escalating impact on the international trade regime.

Rich nations are trying to use the WTO to create a new global policy framework for "energy security" that would fundamentally redefine, under the logic of "free trade in services," who will access energy resources, which ones are used and how, and who will benefit most from their exploitation. Finalizing such a deal could establish the WTO as a powerful international instrument to enforce new energy architecture, shifting control over the global economy's most strategic resource oil to global corporations. Facing deadline in the Doha Round of negotiations (Commenced in November 2001, about eight Round of negotiations has been held without any concrete conclusions), a group of governments including the United States, the European Union, and the Kingdom of Saudi Arabia have submitted via the WTO a "collective request" to a group of developing countries (including many OPEC nations) to "offer" specific commitments to liberalize their energy sectors under expanded world trade rules. Developing nations are under great pressure in current WTO negotiations to make generous offers to open their domestic markets to a range of services and goods in exchange for developed nations' opening their markets to more agriculture imports.

While the thrust of rich countries' demands aims to dismantle state-owned oil companies in the major energy-exporting nations and large emerging economies, expanded WTO rules could also restrain energy policymaking in the rich countries themselves, especially current priorities like reducing reliance on imported energy and/or shifting to sustainable sources. If left unchallenged, current WTO negotiations could reduce governments' right to regulate at a time when democratic control over energy policy has become a global imperative for addressing unparalleled security, economic, social, and ecological threats. Energy experts believe the world is entering a period of historic transition, where energy security has become the new lens through which governments view international relations. In the context of today's political moment of "energy anxiety," all governments, whether hoping to maximize the benefits of their energy exports or reduce their reliance on energy imports, must maintain full flexibility to decide their own energy future and not become subordinate to onerous

new disciplines under the WTO. If current proposals are approved, foreign energy services companies could win WTO rights to unilaterally decide which energy resources, energy workers, and energy technologies to use, extending even to the protection of their rights to perform monitoring services that enable remote control over pumping.

For energy-exporting nations, WTO's expansion into energy policy could reduce governments' ability to set conditions on foreign investors and foreign service providers; to develop domestic employment and local service providers; acquire technological expertise and strengthen national capacity; conserve natural resources and minimize environmental impacts; and to meet development goals that maintain political stability. Similarly for energy-importing nations, WTO's expansion into energy policy could deepen over-dependence on fossil fuels; restrict measures that reduce reliance on imported energy; increase political instability in nations that supply energy; and might undermine efforts to shift to a safe, secure, and sustainable energy future.

A major policy issue in the petroleum sector is of "dual pricing" (or "two-tier pricing") for natural resources, whereby governments keep domestic prices lower (or export prices higher). This is of fundamental interest to petroleum producing countries as it enables them to use their natural resources to promote industrialization, through attracting investment and supporting the competitiveness of their industrial sector. The issue of dual-pricing, together with the related issue of export restrictions on the part of some major trading nations, was raised at the 1982 GATT Ministerial Meeting, and again in the course of the Uruguay Round negotiations, with a view to elaborating new rules to govern these practices. While dual-pricing as such is not inconsistent with WTO rules, problems arise in finding acceptable mechanisms to keep domestic prices lower than world prices and in controlling access to the lower-price energy; such mechanisms include (a) export restrictions, (b) export duties or taxes, and (c) the provision by the government of low-cost energy inputs. During the Uruguay Round negotiations, some participants sought to elaborate GATT Articles in such a way as to restrict policy options in the petroleum sector. The proposals were related mainly to "dual-pricing" and export restrictions. However, the only relevant new obligations were those included in the Agreement on Subsidies and Countervailing Duties.

The developing countries under the new WTO regime are faced with a considerable increase in their obligations particularly in respect of government procurements, subsidies, anti-dumping, customs valuation and import licensing procedures. Again, the new obligations that they have accepted in the area of services and intellectual property rights could have adverse economic impact on their development. The developing world, which consists of two-third majority of the total WTO membership, has not reaped plausible benefits under WTO regime. They also have a strong feeling that their voice is not being heard, and the issues raised by them are not being addressed. However, some noticeable change of strategy at the WTO seems to have taken place in recent years.

Subsidies: A Concern

Subsidies are one of many policy instruments used by governments to attain economic, social and environmental objectives. Worldwide, subsidies exist in several economic sectors, including agriculture, fisheries and energy. Governments can subsidize consumption and production by transferring funds to recipients directly, by assuming part of their risk, by selectively reducing or increasing the taxes they would otherwise have to pay, and by imposing mandates and barriers to trade.

Energy subsidies, in particular, are often used to alleviate energy poverty and promote economic development by enabling access to affordable modern energy services. Given the critical role that energy plays in economic and social development; the reform of inefficient energy subsidies should be analyzed in a context, including their links to the three pillars of sustainable development, including economic growth, poverty reduction and environmental dimensions. Taking into account the sovereign rights of countries to develop economic and social policies, subsidies are fundamentally country-specific, and should be based on national circumstances. There is no systematic reporting of energy subsidies at the international level. There are also gaps and limitations in the measurement and estimation currently available for energy subsidies at the global level.

Using the price-gap methodology, the IEA estimates that fossil-fuel-related consumption subsidies amounted to US$ 557 billion in 2008 (IEA, 2010). Based on IEA analysis, if these subsidies were phased out by 2020 it would result

in a reduction in primary energy demand at the global level of 5.8% and a fall in energy-related carbon-dioxide emissions of 6.9%, compared with a baseline in which subsidy rates remain unchanged. However, it is worth noting that the price-gap methodology has shortcomings. OPEC is of the opinion that the benchmark price to be used in the case of energy resource well-endowed countries should be the cost of production. Consequently, OPEC could not associate itself with the above estimation of fossil-fuel-related consumption subsidies.

Furthermore, subsidies provided to producers of fossil fuels may be on the order of US$ 100 billion per year (GSI, 2009). The total order of magnitude of subsidies to consumers and producers – almost US$ 700 billion a year - is roughly equivalent to 1% of world GDP (World Bank, 2009; OECD, 2008). Energy subsidies also imply significant fiscal and quasi-fiscal costs (Ebinger, 2006; Briceno *et al.*, 2009).

OECD countries have been raising taxes (negative subsidies) on energy, mainly fossil transport fuels, in amounts exceeding US$ 400 billion (excluding Goods and Services Tax and Value Added Tax) in each of the years between 2003 and 2008; these taxes significantly affect relative end-use prices for fuels. Subsidies to other non-fossil-fuel energy are considerable and have been increasing over time. A rough estimate by the Global Subsidies Initiative (GSI) indicates around US$ 100 billion per year are spent to subsidize alternatives to fossil fuels. Based on this, OPEC estimates that renewable energy sources and biofuels are subsidized at a much higher rate than fossil fuels. The per unit basis subsidies to renewables and biofuels are equal to US cents 5.0 per kWh, compared with US cents 1.7 per kWh for nuclear power, and US cents 0.8 per kWh for fossil fuels.

To put these estimates into perspective, estimated agriculture subsidies in OECD countries were close to US$ 400 billion in 2008 (OECD, 2009a). Government financial transfers to marine capture fisheries provided by OECD countries are estimated to be US $6 billion a year (OECD, 2006a). The value of petroleum subsidies to consumers increased dramatically in recent years, largely as a result of rising oil prices, but has been projected to decline to US$ 240 billion in 2010 (Coady et al., 2010). The increase in petroleum subsidies from 2003 to mid 2008 was particularly strong and consistent over time (IMF, 2008; Coady et al., 2010). From end-2008 to mid-2009, global subsidies are projected to increase from the lowest annual rate of US$ 50 billion to almost US$140 billion, reflecting the high volatility of oil prices.

Poorly implemented energy subsidies are economically costly to taxpayers and can damage the environment through increased emissions of greenhouse gas and other air pollutants. Recent OECD and IEA analyses indicate that phasing-out fossil fuel subsidies could lead to a 10% reduction in global greenhouse-gas emissions in 2050 compared with business-as-usual (OECD, 2009b; OECD 2010a). Several studies reviewed by the Independent Evaluation Group (IEG) of the World Bank (IEG, 2009) found that subsidies to fossil fuel use tend to benefit high-income households more than the poor, due to the former's higher consumption levels. According to the same study, the bottom 40% of the population in terms of income distribution received only 15-20% of the fuel subsidies in developing countries. Nonetheless, some subsidies related to fossil fuels can improve the environment or the welfare of the poor if they encourage reduced reliance on biomass in areas at risk of deforestation, and fund research into ways to sequester carbon emissions from combustion.

To justify the subsidy phase-out on the grounds of climate change mitigation objectives, it is required that the provisions of the United Nations Framework Convention on Climate Change (UNFCCC) should apply, in particular the principles of equity, and common but differentiated responsibilities and respective capabilities, as well as the provision that economic and social development and poverty eradication are the first and overriding priorities of the developing country Parties.

A particular road map to guide policy makers is required to phase out subsidies and special attention is to be devoted to address implementation challenges, including overcoming political obstacles and affordability constraints and to facilitate the reform process through the use of targeted assistance, safety-nets and industrial restructuring packages.

Since it may take time to put in place effective social safety nets, governments may want to consider options for assisting the transition of the poor, including temporarily maintaining universal subsidies on those fuels that are better targeted to the poor and are more important in their household budgets and introducing

short-term measures to alleviate the impact of tariff increases on the poor, using where possible volume differentiated tariffs or connection charge subsidies.

India in WTO

As India engages more deeply with the global economy, its policy makers face the challenge of devising trade policies that take into account the stunning diversity of its economy and people. While taking advantage of opportunities offered by increased economic integration, they must manage the challenges that a more open economy will pose for the majority of Indian workforce. The country's current commitments on trade policy through institutions such as the World Trade Organization (WTO) are modest and leave broad policy discretion over tariffs and other trade measures in the hands of national policy makers. As India pursues a new multilateral trade agreement and numerous bilateral and regional trade pacts, it is moving into uncharted territory, where the decisions it makes will constrain its existing policy space and have a significant impact on the evolution of its economy. However, there are several problems with these Multilateral Trade Agreements:

- Predominance of developed nations in negotiations extracting more benefits from developing and least developed countries;
- Resource and skill limitations of smaller countries to understand and negotiate under rules of various agreements under WTO;
- Incompatibility of developed and developing countries resource sizes thereby causing distortions in implementing various decisions;
- Questionable effectiveness in implementation of agreements reached in past and sincerity;
- Non-tariff barriers being created by developed nations;
- Regional cooperation groups posing threat to utility of WTO agreement itself, which is multilateral encompassing all member countries;
- Poor implementation of Doha Development Agenda;

India has both export and import interests in energy services. India needs foreign investment, technical know-how and international management best practices. Given the availability of high-skilled manpower at competitive prices, India has the potential of providing energy-related consultancy services both through cross-border supply and movement of persons. Since the domestic availability of fossil fuel is limited, Indian companies are exploring the possibilities of investing abroad. Indian companies are facing various market accesses, discriminatory and regulatory barriers in countries of export interest. India, on the other hand, has substantially liberalized this sector. Since the unilateral regime is liberal, it would not be difficult for India to make further improvements in the revised offer at WTO. However, any improvement in commitments should be in return for greater market access. India should offensively push for liberalization commitments in this sector, both in the WTO and in its bilateral/regional agreements. It would be difficult for India to undertake commitments in certain subsectors, such as pipeline transportation and retailing, since the domestic regime is evolving and due to security concerns and sensitivity. In sensitive sectors such as energy, unilateral liberalization should precede multilateral commitments.

Although there are no major entry barriers, India has not been successful in attracting foreign investment in this sector. It is not important to merely change ownership from public to private. The purpose of the reforms is to ensure a regulatory framework which will allow the private sector to operate in a competitive environment, protecting the interests of consumers and meeting the energy needs of society. New models of private-public partnership, greater inter-ministerial coordination and centre-state and state-state coordination will improve productivity and efficiency. Across the world, governments play an active role in development and trade in energy.

Government to government collaborations would ease the process of entry of Indian companies into international markets. The Indian government and private sector should together identify countries of trade interest, and the government should enhance collaboration with these countries. This will not only diversify the energy supply base but also improve energy security. India has trade complementarities with other South Asian countries and cooperation in energy is important for the development of this region as a whole.

Conclusion

- Official encouragement of price-fixing practices;
- Dual-pricing practices and resulting subsidies, and/or reverse dumping;
- Pricing policies in transactions with affiliated, versus non-affiliated, enterprises;
- Effects of restrictive business practices (whether or not government-condoned);
- Government ownership and management of natural resource product production or trade;
- Natural resource development policies and practices;
- Discriminatory procurement;
- Export restrictions and export taxes; and
- Problems of the displacement of natural resource products by substitutes.

Although WTO rules apply to energy trade, they are not designed specifically to tackle many problems that arise in cross-border trade in energy products and materials. For instance, issues related to restrictive practices of the energy-exporting countries, practices of energy enterprises that occupy a monopoly position and often are granted exclusive rights and privileges, and transit problems are not addressed to a substantial degree by the existing multilateral trade rules. Moreover, there is lack of comprehensive investment framework. The WTO Membership of energy-exporting countries also poses questions with respect to the policies on renewable energy. These countries might find it disadvantageous if multilateral rules permitted certain policies envisaged by energy importing countries. This problem might concern permission of certain types of subsidies directed at development of alternative energy sources, permission to distinguish between products on the basis of the production methods, etc. Multilateral rules addressing the above issues are desirable because they would create a transparent and predictable framework. Energy is a complex industry that requires technical knowledge and a customized approach. The uniform rules would provide a more balanced and efficient framework for international cooperation than is offered by bilateral and regional agreements. Although WTO Members have tried to address the issues related to energy during negotiations in the past, the positions of energy exporting and importing countries are polarized, and agreement was not possible. Creation of these rules thus does not seem feasible in the near future. Considering that energy is generally covered by current WTO provisions, the application of existing principles to the energy sector, relying on decisions of the dispute settlement panels addressing acute issues on an adhoc basis, appears to be the likely outcome in the near future.

Petroleum, Chemicals, and Petrochemical Investment Regions (PCPIR)–India's Systematic Investment Plans (SIP)

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Economic reforms initiated in 1991 brought significant changes in the structure of the domestic Petroleum and Petrochemical Industry. Delicensing and deregulation allowed the market forces to determine investment and growth .The Petroleum and Petrochemical sector is the significant contributor to Gross Domestic Product (GDP). The Ethylene consumption has strong correlation with GDP for last two decades across the globe. Hence this sector needs to be encouraged in order to achieve increased GDP growth, global competitiveness, world scale operations and sustainable development. To promote investments in this domain Government of India (GOI) conceived the Concept of Petroleum, Chemicals, and Petrochemical Investment Regions (PCPIRs).

Introduction

In April 2007, GOI launched an integrated PCPIRs policy aimed to promote investment in this sector to make the country an important hub for both domestic and international markets. The GOI decided to attract major investment from domestic and foreign industry partners by providing them transparent and investment friendly policies and facility regime. Main idea behind the introduction of PCPIRs policy is that PCPIRs would reap the benefits of co-sitting, networking and greater efficiency through the use of common infrastructure and support services. The PCPIRs would have world class infrastructure to provide a competitive environment conducive for doing business in order to boost manufacturing, augmentation of exports and generation of employment.

Concept of PCPIR

A PCPIR would be a specially delineated investment region with an area of around 250 square kilometers planned for establishment of manufacturing facilities and export led production in petroleum products, chemicals and petrochemicals along with the associated services and infrastructure. A PCPIR comprises of production units, public utilities, logistics facilities, environmental protection mechanisms, residential areas and administrative services. It would be having a processing area, where the manufacturing facilities along with associated logistics services and required infrastructure. It would also have a non processing area to include residential, commercial and other social and institutional infrastructures. The minimum processing area for the PCPIR will be about 40% of the total designated area.

The PCPIR may include one or more Special Economic Zones (SEZs), Industry Parks, Free Trade & Warehousing Zones, Export Oriented Units or Growth Centres, duly notified under the relevant Central and State Legislations or policies.

The benefits available under the relevant legislations or policies will continue to remain available to SEZs, parks, etc. which are integral parts of a PCPIR. A PCPIR could cover existing facilities or industries or services to benefit from and complimentary to the investment region. The concerned state government will notify the acquired area under the relevant act for proper planning and zoning to ensure coordinated developments. Each PCPIR would have a refinery or a petrochemical feedstock company

as an Anchor Tenant. The internal infrastructure of the PCPIR will be developed by a developer or a group of co-developers.

Role of Central Government

The GOI designated the Department of Chemicals & Petrochemical (DoC&PC) as a nodal agency of GOI for PCPIRs. The nodal agency in consultation with the concerned State Governments and Central Ministries as per the relevant policies and refer the applications received for setting up of PCPIRs to the High Empowered Committee and forward the High Empowered Committee's recommendations to the Cabinet Committee on Economic Affairs (CCEA) for final approval. The committees shall evaluate the proposals considering potential investments from domestic and foreign resources, generation of additional economic activities and employment in the proposed region, logistic support to evacuate the production in the investment region to domestic and global markets and the ecological balance and conformity to prevailing policy of Ministry of Environment and Forests. After the approval of CCEA, the department of C&PC will notify the PCPIR and enter into a Memorandum of Agreement with the concerned State Government. The GOI through budgetary resources or through Public Private Partnership will develop or upgrade the infrastructure viz. rail, road, ports, airports and telecom services. The Government will provide the necessary Viability Gap Fund (VGF) as per prevailing norms to promote the investments in the region.

Role of State Governments

The State Government plays the lead role in the venture of PCPIRs starting from identification of suitable land and preparation of Master Plan to identification of processing and non processing areas within the delineated area with appropriate rehabilitation to the concerned as per norms. The State Government is responsible:

- Constituting a management board for development and management of PCPIRs
- Reliable power connectivity for the units in the PCPIR
- Provision of bulk water requirement
- Sewerage and effluent treatment linkages for disposal
- Other infrastructure facilities under the jurisdiction of State Government

As of now, GOI has accorded approval to four PCPIRs located in the states of Andhra Pradesh, Gujarat, Orissa, and Tamil Nadu. Detailed description of the PCPIRs in respective states are elaborated below:

Andhra Pradesh

Andhra Pradesh is the first state to sign Memorandum of Agreement with the GOI on 1st October 2009. The PCPIR is being developed by Andhra Pradesh Industrial Infrastructure Corporation (APIIC) Limited across 138 KM of coastal corridor between Visakhapatnam and Kakinada (VK-PCPIR) with a notified area of 603 sq.km. Major attributes of VK-PCPIR are given below:

- Anchor Tenants: Hindustan Petroleum Corporation Limited (HPCL) and GMR led consortium.
- HPCL to upgrade the Visakha Refinery from 7.5 to 15 MMTPA with about Rs. 10,000 crore and proposed a new 15 MMTPA Refinery cum Petrochemical complex with an investment of about Rs. 32,000 crore.
- GMR to setup 15 MMTPA refinery with about Rs. 31,000 crore and a polypropylene unit.
- Major investors include ONGC, Reliance Industries, Air Liquide India, Baker Hughes, NTPC, etc.
- Committed investments till date is about Rs. 1,74,654 crore in anchor projects of infrastructure and petroleum sector.
- Projected potential investment in next 5-7 years is about Rs. 3, 43,000 crore.
- Viability Gap Fund: about Rs. 1,275 crore.

Andhra Pradesh - Advantage

Visakhapatnam has emerged into an industrial hub with the presence of HPCL refinery, Vizag Steel, Hindustan Ship Yard and NTPC Simhadri as major units. A pharmaceutical city is also being developed in the Vishakhapatnam district. The coastal corridor under PCPIR houses three ports i.e. Vishakhapatnam, Kakinada

deepwater sea port and Gangavaram port. VK-PCPIR provides excellent port, airport, rail and road connectivity. Apart from this proximity of the PCPIR region to the Krishna Godavari (KG) basin is a value addition. Considering all these advantages this corridor has huge potentials to be a strategically located hub for domestic and global market players.

VK-PCPIR location and Global Markets

Port to Port Distance of Key Markets from Proposed Site in No of Days	
Colombo	3
Singapore	5
Shanghai	14
Tokyo	16
Dubai	9
Rotterdam	27
Hamburg	27
Boston	32
Houston	37

Courtesy: Andhra Pradesh Industrial Infrastructure Corporation (APIIC)

Andhra Pradesh - Infrastructure Development

- Committed Investment about Rs. 19,031 crore through funding from Public Private Partnership, State Government and GOI.
- Up gradation of Visakhapatnam and Kakinada Deepwater ports with about Rs. 3,600 crore.
- Up gradation of NH-5 Golden Triangle from 4-lane to 6-lane and state highways.
- Up gradation of existing airports and proposed new international airport at Visakhapatnam in the costal corridor.

Gujarat

The PCPIR is being developed by Gujarat Industrial Development Board Corporation at Dahej in Bharuch district with a notified area of 453 sq.km under the Special Investment Region Act. Major attributes of Gujarat-PCPIR are given below:

- Anchor Tenant: ONGC Petro Additions Limited (OPaL) a joint venture promoted by ONGC, GAIL (India) and Gujarat State Petroleum Corporation Limited (GSPC).
- The OPaL is investing about Rs. 19,530 crore for 1.1 MMTPA multi feedcracker.
- Existing Major Units in PCPIR: Reliance Petrochemical Complex, Petronet LNG, Hindalco and ABG Shipyard.
- Direct and Indirect employment opportunities stand at about 30,000 and 90,000 respectively.
- Viability Gap Fund: about Rs. 80.5 crore.

Gujarat - Advantage

- Existing chemical, petrochemical industrial estates around PCPIR.
- Feedstock advantage of Gujarat, it accounts 48% of country's refining capacity.
- The proposed PCPIR's proximity to Delhi-Mumbai Industrial Corridor (DMIC).
- Diversified Chemical Industries: Gujrat contributes 15% of country's chemical exports.
- Existing LNG terminal at Dahej.

Courtesy: Gujarat State Industrial Development Board (GIDB)

Gujarat - Infrastructure development

- Proposed a 40 MMTPA solid, liquid cargo and container port at cost of about Rs. 1,500 crore.
- About Rs. 450 crore investments for better road connectivity.
- Rail link to Delhi –Mumbai Dedicated Freight Corridor (DMFC).
- Proposed greenfield airport at PCPIR site by GOI thorough Public Private Partnership for external infrastructure support.

Orissa

The Government of Orissa proposed to set up Orissa PCPIR at Paradip by Industrial Infrastructure Development Corporation of Orissa with delineated area of 284.15 sq.km spread across Jagatsinghpur to Kendrapada. Major attributes of Orissa - PCPIR are given below:

- Anchor Tenant: IOCL (setting up 15 MMTPA grassroot refinery cum petroleum complex at Paradip) has already committed about Rs. 30,000 crore.
- Projected potential investment are of worth about Rs. 74,000 crore and out of which petroleum/ petrochemical sector would contribute about Rs. 30,000 crore, external infrastructure would contribute about Rs. 13,634 crore, allied infrastructure would contribute about Rs. 23,500 crore and about Rs. 3,500 crore would come from chemical and fertilizers sectors.
- India highest Foreign Direct Investment (FDI) proposal from POSCO to build up 12 MT steel plant at a cost of about Rs. 51,000 crore at Paradip.
- Major investments are from Hydrate Pellats Limited of about Rs. 10,724 crore and Essar Steel Orissa Limited of about Rs. 10,721 crore.
- Viability Gap Fund: about Rs. 716 crore.

Orissa - Advantage

- Paradip port: one of the major ports in India handles significant traffic.
- Existing industrial hub at Paradip.

Orissa - Infrastructure Development

- 140 km Greenfield coastal corridor at a cost of about Rs. 410 crore.
- Paradip to Haridaspur rail connectivity with about Rs. 580 crore.
- Paradip Port up gradation, construction of arterial roads and captive power plant by GOI thorough Public Private Partnerahip for external infrastructure support
- Six laning of NH-5(A).

Tamil Nadu

Tamil Nadu PCPIR recently got approved by the Cabinet Committee on Economic Affairs and it is being developed in a delineated area of 318 sq.km along coastal belt from Cuddalore to Nagapatnnam. The PCPIR is estimated to attract an investment worth Rs. 99,750 crore. Total estimated investment in external infrastructure of about Rs.13,800 crore includes support of about Rs. 5,120 crore from GOI through VGF.

PCPIR: Sustainable Development

Sustainable development is an integration of three basic premises .viz. Economic growth, Ecological balance and Social progress. Environment Impact Achievement (EIA) is a process of identifying, predicting, evaluating and mitigating the biophysical, social and other relevant effects of industrial activities proposals to ensure sustainable development.

EIA has emerged as a successful policy across the globe and in India and the EIA process has been become mandatory as per the Environmental Protection Act, 1986 for 29 categories of developmental activities involving investments of Rs. 50 crore and above. To achieve the sustainable development as per prevailing laws of the land, the concerned PCPIR authorities emphasized the EIA process. AP-PCPIR awarded the EIA studies, environment management activities to L&T Ramboll and GTZ-Germany respectively. Gujarat PCPIR under PCPIR welfare society is providing water supply scheme to nearby villages at the PCPIR site. Dahej Health and Welfare Society is registered to provide modern hospital at Dahej at a cost of Rs. 18 crore.

Challenges in PCPIR

Since the development of PCPIR requires acquisition of large area of land as per the norms of Environment Protection Act and Coastal Regulatory Zone and this poses toughest challenge in front of concerned players and the upcoming Land Acquisition and Rehabilitation & Resettlement Bill (drafted on 29 July 2011 by Ministry of Rural development) would make the land acquisition further challenging. In line with acts, GOI has already rejected the proposal of Karnataka PCPIR on account of concerns over Marine life and Ecological balance due to the strong protest from people of Southern Karnataka.

Feedstock availability is the crucial for PCPIRs, as India's over dependence on crude imports, geopolitical disturbances in crude supply and pricing would adversely affect the operational and financial parameters. Though 100% FDI is permitted in the petrochemical sector, however the tax implications are relatively higher compared to other developing countries. The anomalies in the duty structure need to be addressed considering macro economic conditions to promote the investments.

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Summary of Interim Report on Direct Transfer of Subsidies on Kerosene, LPG & Fertilizer

The interim report of the task force on Direct Transfer of Subsidies on Kerosene, LPG & Fertilizer in line with its terms of reference has come up with a proposal of a direct subsidy system for Kerosene, LPG & Fertilizers by leveraging on the Unique Identification (UID) programme. In particular for LPG the proposed system, entails Capping (Rationing), Direct Transfer & Targeting and for Kerosene the proposed system, entails a move to market determined price, and transfer of direct subsidy from Central Government to the State Governments/UTs followed by transfer to the targeted beneficiaries based on their purchase of Kerosene at the market price from the Fair Price Shops.

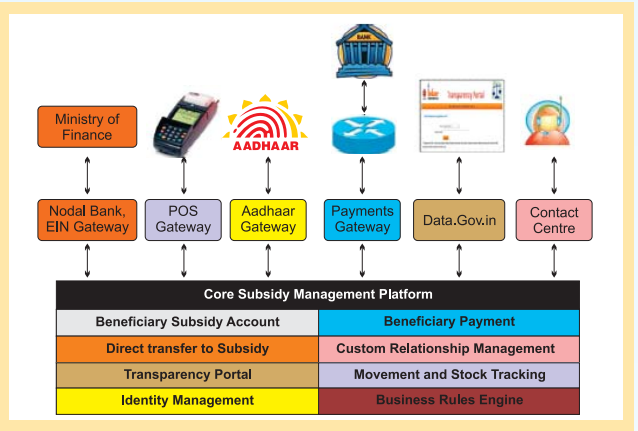
The basic approach of the Government is to move from the present system of price based indirect subsidies to direct transfers by leveraging technology solutions and in particular the 'AADHAAR' i.e., the Unique Identification (UID) programme (The UIDAI's mandate is to issue every resident a unique identification number linked to the resident's demographic and biometric information, which they can use to identify themselves anywhere in India, and to access a host of benefits and services. The number (referred to until now as the 'UID') has been named Aadhaar). Recently, the mentioned Task Force headed by Nandan Nilekani (Chairperson of UID Authority) came out with its Interim Report.

Proposed Solution Architecture: Core Subsidy Management System (CSMS) Platform

According to the Task Force (TF), the goal of the solution architecture is to achieve a fully electronic back-office process for direct transfer of subsidy. CSMS is the proposed architecture, which would be the umbrella/platform under which the entire direct subsidy transfer system would work. The concept is similar to the Core Banking Systems implemented in large banks. The CSMS would automate all business processes related to direct subsidy transfer and can be customized according to the business rules. At the very core CSMS will have:

- *Aadhaar Integration* i.e. beneficiary and family identification module,
- *ERP Integration* i.e. product movement and stock tracking module and
- *Integration with nodal bank and payments gateway*: Direct subsidy transfer module

In addition to these there would be a transparency module; contact centre module; training, education, and outreach module; logistics module; MIS module and module to integrate with other subsidy management systems. A pictorial presentation of the entire system is given below:



Existing LPG Subsidy System

In the post Administered Pricing Mechanism (APM) era subsidized LPG is being provided in cylinders via the Government run Oil Marketing Companies (OMCs), through their distribution network across the country. Subsidized LPG is available in two different size cylinders of 14.2kg and 5kg. Normally, a subsidized product ought to be given in limited amounts. However, under the extant system, domestic LPG is both heavily subsidized and available in unlimited quantity.

Domestic consumption of LPG has increased from 9.3 MMT in 2003-04 to 14.3 MMT in 2010-11. Sale of subsidized domestic LPG cylinders constitutes around 90% of the total LPG consumption. With growing LPG consumption in the country and rising global price the subsidy burden has been growing over the years.

New Proposed LPG Subsidy System:

The defining elements of the proposed system are *Rationing, Direct Transfer & Targeting.* In line with this 3 phases are conceptualized:

Phase I 'Cap on Subsidized Consumption':

Cap on consumption of LPG cylinders per household as per the policy of MoP&NG. The phase will have to be rolled out country wide simultaneously as geographical disparities are not acceptable.

The phase will require OMCs to install authentication procedure and software for distributorship operations and Enterprise Resource Planning (ERP) across the country.

Phase II 'Aadhar Linkage, Authentication for Direct Transfer of Subsidy':

It involves having market determined price for LPG.

OMC customer data base would be appended with Aadhaars and Aadhar Enabled Bank Account (AEBA) details to be used to transfer subsidy.

The customers will buy all cylinders at market price while the Government will fix the subsidy per cylinder. OMCs will sell LPG at the market price and the subsidy amount will be directly transferred from the Government to the customers. The delivery to customers will be confirmed by an authentication service and the requisite amount will be transferred, on the successful completion and confirmation of delivery by the OMCs, to the residents.

It needs to be appreciated that Phase I & II is independent of each other.

Phase III 'Segmentation & Targeting':

The LPG subsidy shall be given to specific categories and for the remainder of customers, it will be discontinued. Subsidy amount will be transferred to targeted customers directly as envisaged in Phase-II. Phase-III can be implemented only after successfully completing Phase-II.

Benefits

- Reduced Subsidy Burden for the Government
- Elimination of under recovery for OMCs
- With market determined price for domestic LPG, incentives for illegal diversion will be removed
- Market determined price would bring about entry of more players and increase competition

Existing Kerosene Subsidy System

MoP&NG makes allocations of Public Distribution System (PDS) kerosene to the States/UTs on a quarterly basis. It is then supplied by the OMCs to the wholesale dealers who sell it to Fair Price Shop (FPS) dealers at a subsidized rate, fixed by the Government of India. It is the State Governments/UT Administrations that control the scale of distribution, decide on the category of beneficiaries and the quantity to be allocated to the beneficiaries through the FPS.

Challenges of the Present System:

- Under Recoveries for OMCs
- Adulteration & Black Marketing
- Poor Targeting

New Proposed SKO Subsidy System:

Phase I: Direct Transfer of Subsidy through State Governments/UT Administration

- States to purchase kerosene from OMCs at market price from 1st April, 2012. OMCs will supply the product ex-depot at the full retail price, PDS SKO to move at full retail price from the depot to the wholesaler, retailer and customer.
- The Central Government will bear the subsidy on kerosene and transfer the differential between the RSP at retail level and the customer price as declared by it directly to the State Governments/UT Administrations. The amount of kerosene subsidy released will be only to the extent of kerosene uplifted (by the customers after authentication at the FPS) from the oil company depots in a State/UT. States reform kerosene distribution through their PDS network. This reform would have to be based on the core subsidy management system that is proposed by the TF .

Phase II: Subsidy Transfer to Beneficiaries

Phase II comprises the transfer of the cash equivalent of subsidy directly to beneficiaries through their bank accounts by linking transactions to Aadhaar. Implementation of this phase will include the following:

- Opening of a 'kerosene' account for beneficiaries with Aadhaars to regulate issue against entitlement.
- Kerosene purchase will be based on successful authentication of the beneficiary. The system will involve identification of kerosene customers through Aadhaar at the point of sale and direct transfer of cash subsidy to the account of the beneficiaries once his/her identity has been established.
- The cash subsidy to customers will be proportional to the actual quantity of kerosene lifted by the customer.
- Providing a common subsidy platform for real-time transfer of cash equivalent of subsidy from the State to the beneficiary.

Conclusion

Moving from the existing subsidy disbursal system to another mechanism, where funds will be disbursed to millions of residents instead of a handful of companies will be an enormous task with many challenges. In particular for OMCs, the new system entails a lot of ground work, inter alia these are:

- Revision in Marketing Discipline Guideline (MDG) provisions to incorporate irregularities which could arise due to a changed scenario.
- Upgradation of OMCs call centres.
- Setting up of a transparency portal that would show details of all customers of LPG who are receiving subsidized cylinders, distributer wise.
- This new system would entail fundamental reforms in the PDS of the State Government through which Kerosene is distributed today. This would require extensive consultation, collaboration and involvement of State Governments in the endeavour. The success of this scheme is critically dependent on how state governments take up the reforms that are required.

Besides, fundamental issues like the basis of targeting, definition of Poverty line & identification of intended beneficiaries, which are critical for success of the new system are pivoted on how Government defines, which are not in the scope of the TF.

India's GDP Growth (quarterly & projections) & Components

	GDP	Agriculture	Industry	Services
2009-10	8.0	0.4	8.3	9.7
2010-11	8.5	6.6	8.2	9.4
Q1 2011-12	7.7	4.0	6.7	8.9
2011-12 (forecast)	7.9	3.5	7.4	9.0

Source: MOSPI & RBI

Index of Industrial Production (IIP) Growth (%)

	July 2010	May 2011	June 2011	July 2011	April-July FY11	April-July FY12
General	9.9	5.9	8.8	3.3	9.7	5.8
Manufacturing	10.8	6.1	10.3	2.3	10.5	6
Mining	8.7	1.3	-1	2.8	8.2	1.1
Electricity	3.7	10.3	7.9	13.1	5	9.4
Basic	4.4	7.3	7.5	10.1	5.2	7.9
Capital	40.7	6.1	38.2	-15.2	23.1	7.6
Intermediates	8.5	0.3	0.6	-1.1	10.1	0.8
Consumer Goods	5.8	6.6	2.3	6.2	10	4.6
Durables	14.8	5.2	1.5	8.6	18.4	4.2
Non Durables	-0.9	7.9	3	4.1	3.8	4.9

Source: MOSPI

Inflation (WPI)

(Inflation in %)

(2004-05 base)	Weight (%)	May 2011	June 2011	July 2011	August 2011	April -July FY11	April -July FY12
General	100	9.6	9.5	9.2	9.8	10.1	9.6
Primary	20.1	12.9	11.3	11.3	12.6	19.4	12.6
Food Articles	14.3	8.3	8.4	8.2	9.6	19.2	9
Non-Food Articles	4.3	21.4	18.6	15.5	17.8	15.9	20
Minerals	1.5	29.6	27	25	23.4	27.3	25.7
Fuel Group (Coal+Electricity+POL)	14.9	12.3	12.8	12	12.8	13.5	12.6
Petrol	1.1	27.3	30.6	23.2	23.2	17.2	25.2
Diesel	4.7	5.5	6.6	9.3	9.3	15.6	7.3
Manufacturing	64.9	7.4	7.9	7.5	7.8	5.8	7.5
Food	9.9	7.9	8.5	7.6	8	6.8	7.6
Non Food	55	7.3	7.2	7.5	7.7	5.6	7.4

Source: MOSPI

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 eight 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.