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GAS HYDRATE

Future Energy in the Horizon





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From the Editor's Pen

The third edition of the Energy Digest comes out in the new financial year. In the preceding fiscal, 2009-10, as the world economy started showing signs of recovery, the Indian economy exhibited an impressive recovery. As per the advance estimates of GDP for 2009-10, released by the Central Statistical Organisation (CSO), the economy is expected to grow at 7.2% in 2009-10. The renewed momentum witnessed in the manufacturing sector, where growth has more than doubled from 3.2% in 2008-09 to 8.9% in 2009-10 augurs well for India's future growth prospects. However, the flaring up of inflation in the recent months, poor agricultural performance, and high fiscal deficit could adversely affect the health of the economy. On the energy front, international crude oil prices continue to be at historically elevated levels in real terms and are projected to rise further. According to U.S. Energy Information Administration, WTI prices will rise to an average of about \$82 per barrel by the end of the year and to \$85 per barrel by the end of 2011. On the environment front, while some of the projections of the United Nation's Inter-Governmental Panel on Climate Change on impact of climate change were shrouded by controversy, it remains a fact that climate change is big threat to the survival of humanity.

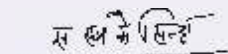
The quest for energy to meet the growth aspirations of the economy & to meet the basic energy needs of the masses requires looking beyond the conventional sources and technologies for extracting the same. In this context Gas Hydrates present immense opportunity. The article '*Gas Hydrate-Future Energy in the Horizon*' discusses the potential of this resource and efforts taking place globally & in India in developing it.

Efficient logistics are crucial to catering to energy services demand. In the context of oil, owing to the non-uniform distribution of oil reserves, large scale movements of oil take place across the globe through shipping. The article '*Shipping: Global Crude Oil Trade*' discusses the various factors & issues affecting the shipping industry, especially in the context of India's growing demand for imported crude oil.

Customers justify the existence of a business. The article '*Customer Experience Management – Accelerate your business fast forward*' discusses the concept of Customer Experience Management in contrast to Customer Relationship Management and its applications in the downstream petroleum industry in India.

Development of hydrocarbon sector is critical to the energy security of the Indian economy. The article '*Indian Hydrocarbon Sector: Challenges Old & New*' discusses the key challenges the sector faces, special focus on emerging and new challenges.

We will be looking forward to your comments, suggestions and feedback.


(A.M.K Sinha)

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Gas Hydrate – Future Energy in the Horizon

Pramod Narang

The Earth's natural gas hydrate deposits potentially offer a vast new source of low-polluting, carbon-based energy that could provide a comfortable and much needed bridge to an eventual carbon-free energy future. Not enough is known about gas hydrates, especially towards its exploitation for the benefit of society, so they are neither presently included as a source of methane in technically recoverable natural gas resource base, nor are they included in the existing energy models and forecasts. A degree of increased knowledge of the deposits, coupled with a few breakthroughs regarding its production could alter the energy scenario dramatically.

For about two decades now, the term “**sustainable development**” has characterized the discussions about distributing prosperity in a fair manner throughout the world, enabling more humane living conditions for all the people and about conserving our environment. Energy plays a crucial role in sustainable development. The nature of its availability influences practically all fields of social, economical and political activities, and also influences the state of environment and climate. Accordingly, **“the use of energy is only sustainable if the sufficient and permanent availability of suitable energy resources at affordable price is assured, while at the same time limiting the detrimental effects of supplying, transporting and using the energy.”**

Fossil fuels – the motor of today's economy

Today, over 80% of world's primary energy supply is based on finite fossil energy carriers of coal, mineral oil and natural gas. Thus it is clear that, even with the very rapid changes in the energy supply, fossil-based energy will still be needed for decades to come and possibly to an even greater extent than today. However, the question of which resources are still available, and for how long, is of central importance. Should the present-

day rate of consumption continue, the static ranges of these resources, representing the time remaining until these reserves are completely exhausted, are:

Conventional mineral oil	42 years
Natural gas	61 years
Coal	122 years

At first, these time periods might not seem to be alarming. However, such considerations do not include a very important factor – increasing prices and the resulting economic disturbances. These are anticipated long before the fossil energy supplies run out, that is, when the supply cannot continuously meet the demand. Experts are of the opinion that this point in time will occur shortly after passing the global production maximum. For technical and physical reasons, this point will happen near the so-called “**mid-depletion point**” for mineral oil, a point in time when half of the total assumed mineral oil reservoirs have been consumed. The mid-depletion point for mineral oil will be reached in the next 5 to 20 years if the consumption continues at the current or higher rates. By that time, considerable price increases for crude oil are expected. Natural gas alone cannot meet the supply deficit. Furthermore, the reserves of mineral oil and natural gas are distributed

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very unequally over the globe. More than 70% of the mineral oil reserves and more than 65% of the natural gas reserves are located within the “eclipse” of countries extending from Saudi Arabia in the south, over Iraq and Iran, up to Russia. Considering these two facts together, it becomes very apparent as to how explosive the supply situation may become in the foreseeable future.

Climate unbalance

Several hundred million years of photosynthesis were necessary to synthesize the energy-rich carbon compounds. Within just a few centuries, the human race has consumed these valuable resources. During the combustion of fossil energy carriers, pollutants like sulfur dioxide and oxides of nitrogen are formed which contribute to the formation of acid rain. An incomplete combustion causes emissions of carbon monoxide, unburnt hydrocarbons and soot particles.

Besides these emissions, carbon dioxide is always emitted during the combustion of fossil fuels. This gas has the detrimental effect of boosting the greenhouse effect and thereby increasing global temperatures. The concentration of carbon dioxide in the atmosphere has already risen by a fourth since the beginning of industrialization, thereby causing the mean temperature near the ground to increase by 0.6 ± 0.2 °C. If adequate countermeasures are not undertaken to reduce the emission of this and other greenhouse gases, scenarios calculated by eminent agencies indicate a further increase in the mean temperature in the near future. Along with the temperature increase, changes in the distribution of precipitation, an increase in the frequency of extreme weather conditions, a shift in climate and vegetation zones, and a degradation of soil quality are expected.

Search for cleaner fuels

Currently, natural gas represents 21% of the energy consumed globally. The International Energy Agency (IEA) in its *2009 World Energy Outlook* projects that this figure would rise by an average of 1.5% per year globally. IEA forecasts much higher growth in developing countries such as India and China. Together, they

accounted for only 35% of Asian gas use in 2007 but are projected to account for about 50% of the total in 2030.

These increases are expected because emissions of greenhouse gases are much lower with the consumption of natural gas compared to that with other fossil fuels. For instance:

- Natural gas, when burnt, emits lower quantities of greenhouse gases and other pollutants per unit of energy produced than do other fossil fuels. This occurs because of the fact that natural gas is more easily fully combusted, has lower carbon to hydrogen ratio and contains fewer impurities than any other fossil fuel.
- The amount of carbon dioxide produced for an equivalent amount of heat production varies substantially among the fossil fuels, with natural gas producing the least. For major fossil fuels, the amounts of carbon dioxide produced for each billion British thermal unit (Btu) of heat energy extracted are 2,08,000 pounds for coal, 1,64,000 pounds for petroleum products, and 1,17,000 pounds for natural gas.

Natural gas - the most preferred choice

Natural gas is, therefore, seen as one of the most important and benign fuels to address the environmental and energy security concerns.

Need for non-conventional sources of natural gas

Conventional world natural gas resources are estimated to be about 16,500 trillion cubic feet (U.S. Geological Survey 2008 World Petroleum Assessment). The ability of this conventional resource base to meet the world's growing gas supply needs is limited by the fact that a substantial portion of it is not located close to major and developing gas markets and would therefore require enormous investments in pipelines and other facilities to move the gas to market. For that reason, much of the current conventional resource may not be viable for commercial production. As reported by IEA, proved gas reserves are estimated at 6,500 trillion cubic feet as of 1st

January 2009. (Proved reserves are estimated quantities that can be recovered under present technology and prices).

Therefore, development of new, unconventional and cost effective resources such as shale gas, coal-bed methane and methane hydrates (or natural gas hydrates) can play a major role in ensuring adequate future supplies of natural gas and moderating price increases.

What are natural gas hydrates?

Natural gas hydrates are members of highly varied class of substances known as **clathrates**. They are ice-like substances composed of a host lattice of water molecules (H₂O) and one or more of potential suites of



Courtesy - Schlumberger, U.S Department of Energy (DOE)

guest molecules which at normal temperatures and pressures occur in the gaseous phase and are capable of physically fitting into the interstices of the water-ice lattice.

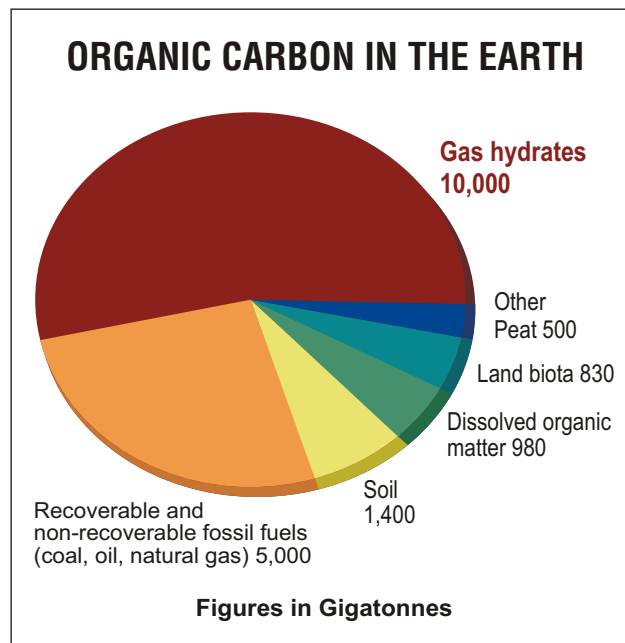
Therefore, as the name suggests, methane hydrate is a compound made up of methane and ice and is often described as methane gas trapped inside cage-like crystal structures made up of water molecules.

Why study methane hydrates?

Earth's vast deposits of natural gas hydrates hold the promise of meeting the world's natural gas needs far into the 21st century – if they can be tapped.

By most estimates, gas hydrates are the largest global reservoir of organic carbon, greater than all conventional sources of hydrocarbons put together. The estimated amount of natural gas contained in the gas

hydrates is enormous, but is speculative over a vast range from about 2 million trillion cubic feet (Tcf) to 400 million trillion cubic feet. Even on the conservative side, there may be twice as much energy in gas hydrates than in all other fossil fuels combined.



Source – Geological Survey of Canada

U.S. Geological Survey (USGS) estimates that in US alone, the gas hydrates deposits contain 2,00,000 Tcf of natural gas. Comparing this with a known recoverable natural gas resource of approximately 2400 Tcf; if a little over 1% of gas hydrate resource could be rendered producible, US natural gas resource base would nearly double.

Presently, they are at best a sub-economic source, but realization of even a small part of their potential would provide a very significant source of natural gas to meet future energy and environmental requirements. Gas hydrate, is thus an important topic of study.

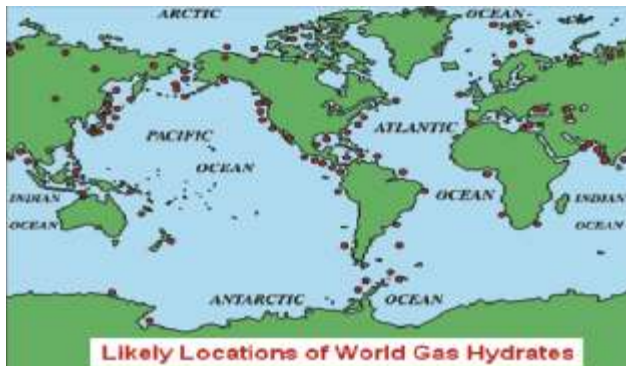
The greatest interest in energy from hydrates comes from countries that have limited domestic reserves of conventional hydrocarbons such as Japan, USA, Korea and India. Even high-cost domestic energy is attractive to these countries if there is security of supply. The question for economic development is, therefore, can a commercially viable recovery system be developed?

Where does it occur? How is it formed?

Gas hydrate deposits exist beneath certain parts of ocean, and under many regions of permafrost. Methane hydrates get formed in these places because it is stable only at high pressures or low temperatures.

The deep waters of almost all the world's oceans are cold enough and have enough pressure to stabilize hydrates in the sea floor at depths greater than about 500 metres. Most hydrates seem to be confined to the edges of the continents, where water is sufficiently deep and where nutrient-rich waters unload partially decayed organic material for bacteria to convert to methane. With the right temperature and pressure combination, these methane molecules are eventually trapped in ice crystalline cages, forming undersea deposits of gas hydrates.

Gas hydrates are also found close to land surface in permafrost regions because of the low prevailing temperatures. Various calculations have established that methane hydrates will only be found up to 280 m below the sea floor in areas where the water is 1,000 m deep, and up to 570 m below the sea floor in areas where the water is 4,000 m deep.



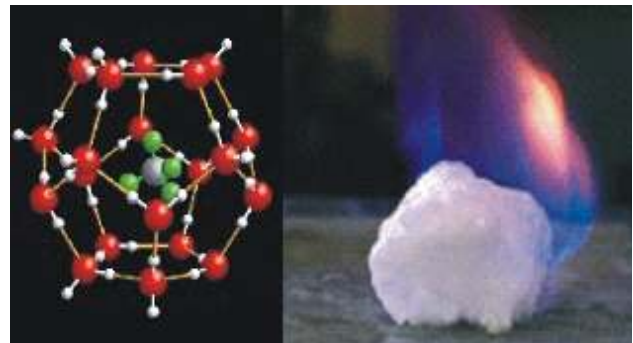
Source – USGS

The map below shows the land and sea areas around the world where the presence of natural methane hydrate has been confirmed, or where it is thought to exist.

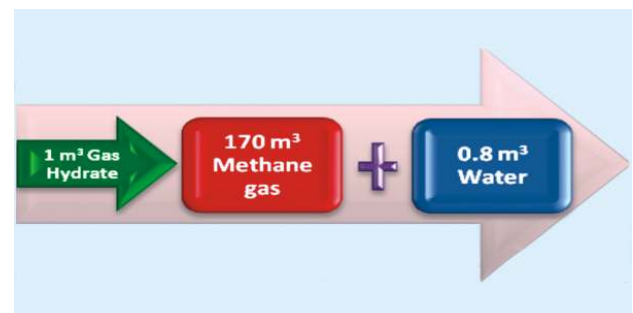
Structure of gas hydrate – how much gas does it contain?

This kind of information has been gathered by conducting experiments using synthetic methane

hydrate, providing fundamental data that will be extremely valuable in developing natural methane hydrate as an energy source



As already defined, a methane hydrate consists of methane gas trapped inside cage-like crystal structures made up of water molecules. If all the cages would be occupied by methane, one cubic metre of solid hydrate



could contain 170.7 m³ of methane at standard conditions of temperature and pressure. In nature, one cubic metre of hydrate turns out to contain up to 164 m³ of methane.

What impact does methane hydrate have on environment?

To produce methane gas from methane hydrate safely and without harming the environment, many wide-ranging environmental issues need to be addressed. While large volumes of oceanic natural gas hydrates have decomposed in the past, information on their role in the global carbon cycle and global climate change is limited. Some of the issues that will have to be thoroughly investigated to fully understand the environmental impact of methane production from gas hydrates are given below.

Emission of methane into sea and atmosphere

It is clear that the release of methane into the atmosphere, for whatever reason, would substantially increase the greenhouse effect since methane is about 20 times more potent a greenhouse gas than carbon dioxide is. Therefore, it is undesirable for methane to leak into the sea or atmosphere during the production process. Research agencies have to investigate production methods that will help ensure the absolute minimum of leaks during development and production.

Other environmental considerations

Drilling wells as part of the development of methane hydrate produces debris referred to as 'cuttings'. In addition, it is anticipated that the process would also produce large quantities of water with high salt content as a byproduct. The research agencies are investigating the impact these actions may have on the environment.

Potential hazard to sea-floor

Methane hydrate act as a binding agent, which holds together the sand and mud that makes up the strata under the sea-floor. It has been suggested that the production may lead to land subsidence or landslides on the sea-floor, as the strata becomes unstable following removal of this binding agent. Methods will have to be developed that will prevent destabilizing the strata as a result of the development and production of gas from methane hydrates.

Impact on marine life

Even though this is a critical issue, very little research has been conducted on the impact of methane emissions on marine life.

Potential hazard to sea-floor structures

From 350 kms to 500 kms seaward of the shoreline, the continental shelves, slopes and rises are replete with many types of man-made structures – drilling platforms, subsea well completions, pipelines, instrument housings, communication cables, etc. Their number and distance from shore increases every year. Decomposition of natural gas hydrates, either gradual or

rapid and either on-site or nearby, can place those structures at a risk of damage or destruction. If a hydrate formed in the past has since decomposed, leaving behind poorly consolidated water filled sediment, significant damage could occur if a heavy structure is placed at that location.

Potential hazards to vessels and other floating structures

Conceptually, the sudden release of large volumes of either methane or methane hydrates at the sea-floor owing to mechanical disruptions of hydrated sediments (whether or not caused by rapid decomposition of gas

*For this reason, it has been proposed that hydrate-sourced methane plumes are responsible for what is popularly characterized as a high incidence of 'mysterious disappearance without trace' in the so-called **Bermuda Triangle**. In actuality, such events are no more common in the Bermuda Triangle than anywhere else.*

Source – EIA Natural Gas 1998: Issues and Trends

hydrate itself) could launch a mass of methane bubbles towards the surface – a methane plume. To the extent that the water column is occupied by bubbles, its bulk density is reduced. It follows that whatever is afloat above such a plume is at the risk of quickly sinking.

Natural gas hydrate research

Phase I – Hydrate as a laboratory curiosity

Clathrates were first discovered in 1810 when two scientists, Humphrey Davy and Michael Faraday, were experimenting with chlorine-water mixtures. As the mixture cooled, the scientists noticed a solid material forming at temperatures above the normal freezing point of water. However, because natural occurrences were not known, the subject remained largely an academic curiosity.

Phase II – Hydrate as an industrial nuisance

Hydrate research entered its second phase in 1930s when it was determined that hydrate was responsible for

plugging natural gas pipelines, particularly those located in cold environments. Subsequently, the physics of various clathrates was investigated including the construction of the first predictive models of their formation. A prime focus of this work was the development of chemical additives and other methods to inhibit hydrate formation.

Phase III – Hydrate as a naturally occurring substance

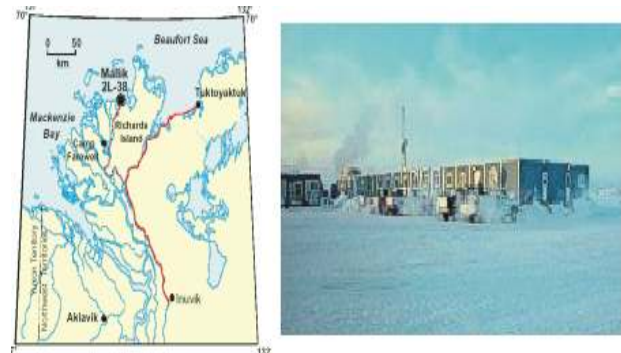
By the mid 1970, many scientists began to speculate that the low temperature/high pressure conditions necessary for the hydrate formation should exist extensively around the globe, not only in permafrost regions, but also under deep oceans. The global hunt for methane hydrate was on. However, because hydrate quickly dissociates when removed from its natural environment, no one actually saw methane hydrate until 1974 when Soviet scientists recovered large hydrate molecules from the floor of the Black Sea. Subsequently, in 1980s, the research vessel *Glomar Challenger* traveled the globe collecting cores of ocean bottom sediments as a part of deep sea drilling project tests. Many of the samples found chemical evidence for hydrate. However, one sample taken off the coast of Guatemala included a one-meter core composed almost entirely of methane hydrate.

These samples were studied by USGS and U.S. Department of Energy (DoE)'s National Energy Technology Laboratory (NETL) and formed the impetus for the first R&D programme in the US. As a result, first systematic appraisals of the hydrate deposits began to emerge.

Phase IV – International R&D efforts to test the production potential of natural methane hydrate

In the mid-1990s Japan and India, two countries with large energy needs but limited domestic energy resources, began aggressive, well-funded hydrate programmes in preparation for commercial production of methane. Continued environmental concerns rapidly escalated the demand for natural gas, giving rise to concerns of the long-term sustainability of gas supplies. In 1998 and 1999, international efforts resulted in drilling of the first two wells designed specifically to

investigate methane hydrate-bearing strata. The first well (Mallik 3L-18C) was drilled below permafrost on the Mackenzie River delta in the Northwest Territories of Canada.



Location of Arctic Mallik gas hydrate research site and a photograph of Mallik camp

The second location was drilled by a consortium of Japanese government agencies and commercial organizations in 945 metres of water off the southeastern Japanese coast adjacent to a deep ocean trench known as Nankai Trough.

Both wells showed the presence of highly concentrated methane hydrate. The Japanese discovery was particularly significant, as the well showed hydrate concentrations of up to 80% in specific confined reservoirs.

Phase V – A coordinated and balanced international methane hydrate research programme

By now, the growing recognition of the size and extent of the global methane hydrate resource gave rise to a number of critical scientific and public policy issues. The success of field programmes at both Nankai and Mallik led to a second research programme at Mallik in 2002. One of the prime goals of the programme was the investigation of hydrate formation producibility. A series of field experiments were conducted to test the reservoir's response to both thermal stimulation and depressurization methods. Both methods resulted in hydrate dissociation and release of gas, thereby confirming the technical feasibility of methane production. Mallik 2002 has the distinction of being the first site that carried intentional flaring of gas hydrate.

In early 2004, Japan Oil, Gas and Metals National Corporation (JOGMEC) returned to Nankai Trough

drilling 15 additional wells, including one horizontal well, into hydrate bearing units in water depths ranging from 700 meters to 2000 metres. Well results from this drilling programme continue to be analyzed.

Advances in India

Government of India formulated a National Gas Hydrate Programme (NGHP) in 1997 for exploration and development of gas hydrates resources of the country. Directorate General of Hydrocarbons (DGH), under the Ministry of Petroleum & Natural Gas (MoP&NG) has done pioneering work for initiating gas hydrate expedition in the country. Reconnaissance surveys carried out by DGH in the East Coast and Andaman Deepwater areas in 1997 deciphered the most promising areas for gas hydrates and indicated the presence of several gas hydrate leads/prospects. ***The total prognosticated gas reserves from the gas hydrates in the country is placed at 1900 TCM.*** Following reconstitution of the NGHP in the year 2000 by MoP&NG, a new sense of urgency was imparted to the programme and it was put on a fast track implementation.

National Gas Hydrate Programme Expedition 01 (NGHP Expedition 01)

One of the most comprehensive gas hydrate field ventures conducted so far, the expedition was



completed in 113 days, from 28.4.2006 to 19.8.2006. Scientists conducted ocean drilling, coring, logging and analytical activities to assess the geologic occurrence, regional context, and characteristics of gas hydrate deposits along India's oceans.

Objectives

Based on the analysis of geological and geophysical data, the Expedition was planned to visit ten sites in four areas: the Kerala-Konkan Basin in the Arabian Sea – western continental shelf of India; the petroliferous Krishna-Godavari Basin and Mahanadi Basin in the Bay of Bengal – eastern continental shelf of India; and the previously unexplored Andaman Islands. The goals of the cruise were to conduct scientific drilling, well logging, coring, and shipboard scientific analyses of samples recovered from each site to provide further insight into:

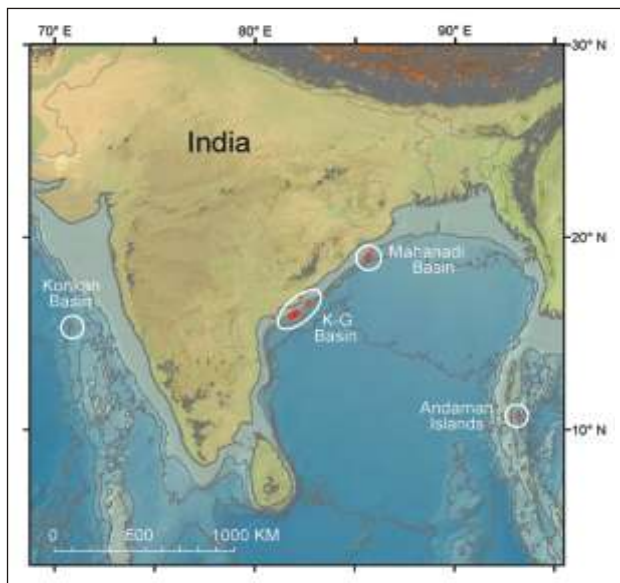
- the distribution and nature of gas hydrate in marine sediments;
- the geologic controls on the formation and occurrence of gas hydrate in nature;
- the processes that transport gas from source to reservoir;
- the effect of gas hydrate on the physical properties of the host sediments;
- the microbiology and geochemistry of gas hydrate formation and dissociation; and
- the calibration of geophysical and other predictive tools to the observed presence and concentration of gas hydrates.

Scientific findings and impact

NGHP Expedition 01 was among the most complex and comprehensive methane hydrates field ventures yet conducted. The science team utilized extensive on-board lab facilities to examine and prepare preliminary reports on the physical properties, geochemistry, and sedimentology of all the data collected prior to the end of the Expedition. Although the data will continue to inform gas hydrates science for years to come, the following are the key scientific highlights of the expedition to date are as follows.

- Gas hydrates were discovered in numerous complex geologic settings and an unprecedented number of 494 gas hydrate cores (2,850 m) were recovered.

- One of the richest marine gas hydrate accumulations ever discovered has been delineated and sampled at Site 10 in Krishna-Godavari Basin.
- One of the thickest and deepest gas hydrate occurrences yet known has been discovered offshore of the Andaman Islands and has revealed gas hydrate-bearing volcanic ash layers as deep as 600 metres below the sea-floor.
- A fully developed gas hydrate system has been established in the Mahanadi Basin of the Bay of Bengal (Site 19) for the first time.



Courtesy-DGH

The NGHP Expedition 01 has marked a monumental step forward in the realization of gas hydrates to becoming a viable energy source.

Buoyed by the results of NGHP I, the MoP&NG is working on a program to accelerate the Gas Hydrate research in India. While the current structure involves officials of different organizations guided by a steering committee of the petroleum ministry, it is proposed in the new system to bring them together under the roof of one organization —the National Research and Development Centre for Gas Hydrates - to improve efficiency. The centre is expected to be set up in Navi Mumbai due to its proximity to the port.

The board of directors of the new gas hydrate agency will comprise members of firms and institutes who will sponsor the program along with eminent scientists. Besides, an operational wing, it will have a geology & geophysics lab, a research and development wing, engineering lab and an environment impact assessment lab. The centre will conduct field implementation of R&D finds, geo-scientific surveys and address safety and environment issues. The petroleum ministry is likely to nominate a full-time gas hydrate program manager as part of the initiative.

Epilogue

Will gas ultimately be produced from gas hydrates? If so, then how will it be produced in a cost effective manner? Who will succeed in unlocking this ice cage?

Although there are no clear answers today, it is worth remembering that many years were required to develop technology of economic recovery of oil and gas resources; tar sands and shale gas are recent examples. Sometimes the answers come very quickly, sometimes only after many years. Yet, an undisputed fact remains that gas hydrate is a very large potential source and it just needs some bright ideas to unlock this puzzle and help quench the never-ending energy thirst of the world.

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Shipping: Global Crude Oil Trade

Ravindra Kumar Meena & Rohit Raj

The non-uniformly distributed crude oil reserves necessitate movement of tonnes of oil across the seas. Uninterrupted oil supplies are critical in keeping the engine of the Indian economy running. Timely and uninterrupted imported crude oil supply requires long term crude oil supply contracts and efficient/economical shipping arrangements. This article discusses the various factors & issues affecting the shipping industry, especially in the context of India's growing demand for imported crude oil.

Growing energy needs of nations and depleting natural reserves have started a race among nations to tie up long term crude oil supply contracts in order to satisfy future energy demands. This scenario would result in several new shipping routes and increase the existing shipping capacity to fulfill the demand of overseas movement of crude oil among nations.

Crude Oil - Global Scenario

Energy is required to attain and sustain sound economic and social growth; therefore, if a nation has reliable, efficient and economic supply of energy, it would make its economy to grow, create jobs and improve the living conditions of citizens. Currently, majority of primary

Levels (mtoe)	Growth (% p.a.)	Fuel Shares (%)			
		2007-30	2007	2010	2020
Oil	0.8	36.4	35.1	33.1	31
Coal	1.5	28.2	28.5	28.8	28.1
Gas	1.9	22.3	22.6	23.2	24.1
Nuclear	1.6	6.6	6.7	6.5	6.7
Hydro	2.3	2.4	2.6	2.7	2.8
Biomass	3.4	3.5	3.9	4.6	5.3
Other Renewable	7.4	0.5	0.6	1.1	1.9
Total	1.5	100	100	100	100

Source: World Oil Outlook, 2009 Report

energy demand of world is being satisfied by non-renewable energy resources. Although, renewables are growing at fast rates (due to their lower base) their share continues to be small. As per the projection of OPEC's World Oil Outlook-2009, fossil fuels will continue to satisfy more than 80% of the world's energy needs over the period of next 20 years and oil will continue to play the leading role.

Due to huge requirement of nations to have uninterrupted supply of oil coupled with non-uniformly distributed crude oil reserves, crude oil is the largest single commodity in international trade. Shipping is the most common means of overseas crude oil trade and with the two industries being inextricably linked.

Table 2, shows that oil export has been witnessing increasing trend for several years except for the last year

	2005	2006	2007	2008
Oil Prod. (OP) (Mn.Tonne)	3897	3914	3906	3929
Oil Export (OE) (Mn.Tonne)	1885	1933	1984	1970
OE/OP (%)	48.37	49.39	50.79	50.14

Source : Data of MOP&NG

because of global economic meltdown. It is likely that with the revival of global economy and surging

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economic growth among Asia Pacific economies, crude oil import would show further increase.

With most advanced economies typically having tighter fuel economy standards; requiring a re-structuring their industries to be more fuel efficient; and are more likely

Table 3: World Oil Demand (Mbpd)

	2006	2010	2015	2020	2025	2006-2025 AAGR
OECD	54.5	56.5	58.4	59.3	58.9	0.4%
FSU	3.9	4.1	4.5	4.7	4.8	1.3%
Developing Countries	26.2	30.1	34.8	39.1	42.6	3.3%
China	6.7	8.5	10.5	12.2	13.3	5.2%
India	2.8	3.3	4.0	4.6	5.2	4.4%
TOTAL	84.6	90.7	97.6	103.1	106.3	1.4%

Source: Petroleum Economist Limited, 2006

to substitute gas-for-oil. However, this would be counterbalanced by the economic growth in emerging economies which would be more oil intensive in coming times. Today, it is well recognized that the demand of oil in developing countries is set to increase exponentially. It has been estimated that their demand would rise to about 42.6 Million barrels per day (Mbpd) by 2025, from the present levels of 26.2 Mbpd. Amongst the developing countries, the increase in demand of oil in China and India would be highest. China and India's demand is growing at a rate of 5.2% and 4.4% respectively which is much higher than the World Average of 1.4% (Table 3). Therefore, the quest for oil by both India and China will also mean competition for ships to import that oil.

Global Oil Shipping

The demand of crude tankers is invariably related to the oil demand and production levels across the world. While pipelines are a more secure and economical means of oil transportation across the world. However, many a times any major possible development in this field is bogged down by the differences between countries involved and international politics. Any oil pipeline between the countries would require high initial investment and mutual consensus in terms of security, investment and pricing among all the involved countries.

Crude Tankers
Categorization on basis of Physical Parameters

Table 4: Types of Tankers

Class	Length M	Beam M	Draft M	Typical max DWT	Typical Min DWT
Seaway Max	226	24	7.9	10,000	60,000
Panamax	294	32	12	60,000	80,000
Aframax	246	42	15	80,000	120,000
Suezmax	274	46	16	120,000	160,000
Very Large Crude Carrier (VLCC)	330	60	20	200,000	350,000
Ultra Large Crude Carrier (ULCC)	470	70	24	320,000	550,000

Categorization on basis of Usage:

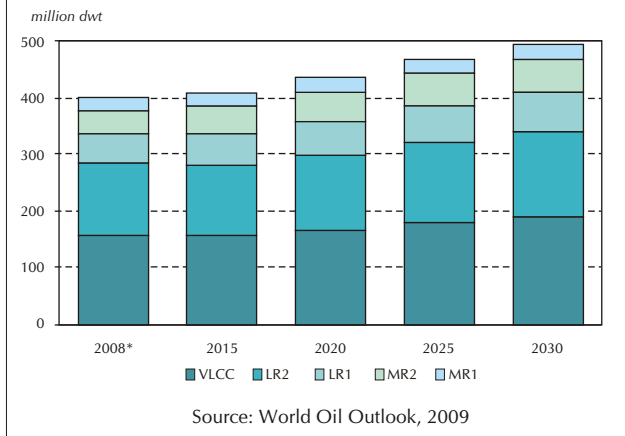
- **Clean tankers** utilized for carrying white oil products.
- **Dirty tankers** utilized for carrying crude oil as well as black oil products.
- **Special tankers** utilized for carrying special products like lube oils, gases

Similar to E&P and refining sector, tanker market had been also badly affected by the recent global economic turmoil and stagnant demand of crude oil.

A grim scenario was witnessed last year for the oil demand especially in the OECD countries which resulted a fall in VLCC tanker hire rates. According to Energy Information Administration (EIA), in 2009 oil demand in advanced economies (OECD) is estimated to have fallen anywhere between 1.9 to 2.3 million barrels/day while that of north America by around 1 million barrels/day and European markets by around 0.8 million barrels/day.

However, considering the long term prospects of inter country crude oil and refined products trade, global tanker capacity will increase. The latest WOO report projects that the capacity of the global tanker fleet is expected to expand by almost 100 million deadweight tonnes (dwt) by 2030, reaching the level of 496 million dwt, from a global capacity of 398 million dwt at the end of 2008 (Figure 1: Outlook for tanker capacity requirements by category, 2008-2030). In view of the growing scale of crude movements in the future, in the context of future capacity additions, emphasis will be on more usage of VLCCs to achieve economies of scale and also bring down the cost of ocean freight. It is projected

Figure 1: Outlook for tanker capacity requirements by category, 2008-2030



that percentage increase in no. of VLCCs will be more as compared to any other vessel by 2030.

Major Risks involved in Shipping

Volatility in Freight Rates: Freight markets are highly unpredictable and volatile which exposes the traders (exporters/importers) to high price risk. Figure 2 captures the movement of TD 3 – an index published by the Baltic

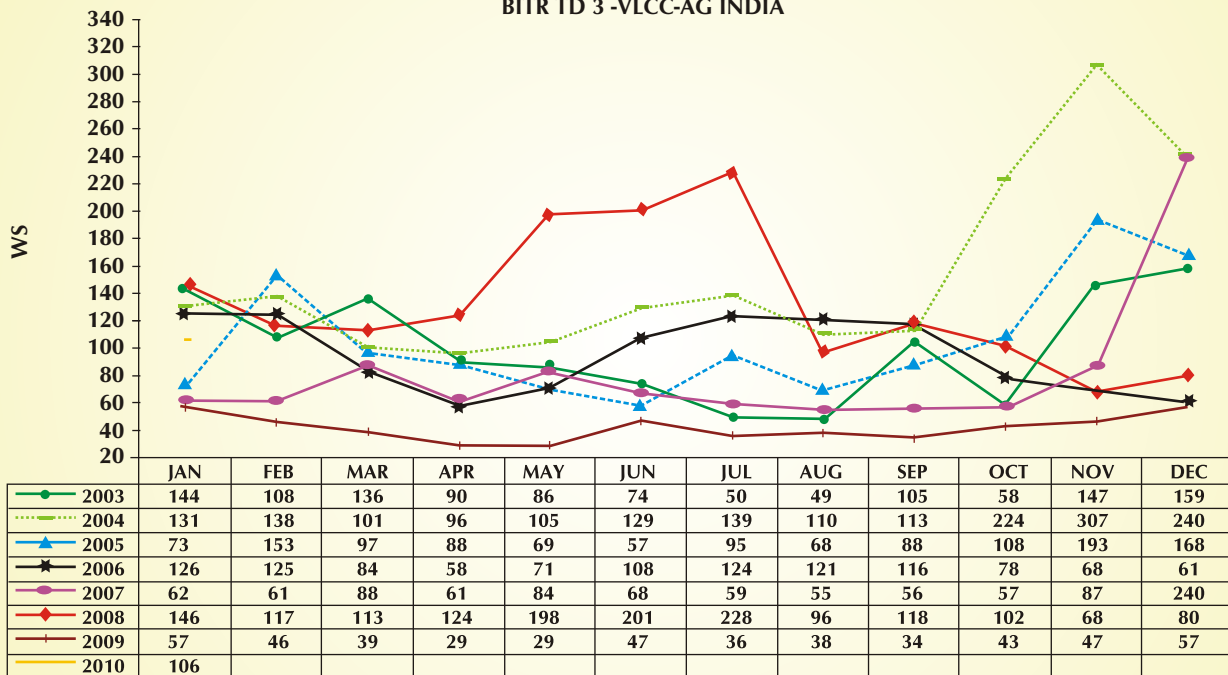
Exchange for VLCC for AG -Japan route. It can be seen from Figure 2, that markets do not always follow a fixed pattern. For example, it looks that the market has a tendency to rise in winter months (Oct -Dec), however, the market did not follow the same pattern in 2006 and in fact it fell significantly in the winter months.

Again, during April to June the markets were showing a rising trend in 2004 and 2006 but the same did not happen in the year 2005 during the same period. Therefore, freight rate risk requires extensive analysis considering macro/micro and seasonal parameters while chartering up a ship for a long time.

Changes in controlling policies: International shipping is heavily regulated. In the shipping industry, the principal regulator is the International Maritime Organization (IMO)¹, which is the United Nations Agency responsible for safety of life at sea and the protection of environment. As per the Regulation 13 G of MARPOL (International Convention for Prevention of Pollution from Ships), single hull vessels are to be completely phased out by the year 2010. Double-hull

Figure 2: Volatility in Tanker Spot Rates

BITR TD 3 -VLCC-AG INDIA



Source: Baltic Exchange

tankers have been mandated by IMO in an attempt to make carriage of liquids such as oil safer; in the event of an accident, a double-hull will prevent spillage and the consequent expensive and hazardous clean-ups.

This policy change would possibly bring out a significant change in the global shipping scenario and is likely to have an impact on freight rates. Therefore, there is a need to look at this aspect little more closely while drawing up the shipping strategy.

However, a few maritime nations, including India, have framed their own rules on single-hull tankers plying along their coast purely for carrying domestic cargo even after the global phase-out date. India has around 70 single-hull tankers and such ships can ply along the country's coast till 2015 or till they reach 25 years, whichever is earlier, based on their structural condition and operational areas, according to a circular issued by DGS (Directorate General of Shipping) in 2009.

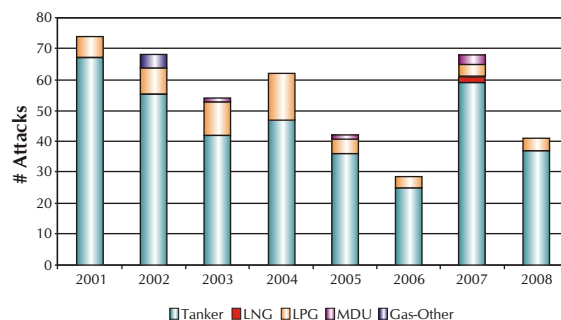
Piracy: This is an innate risk to shipping industry. Of late, this risk has reached to a very high level in terms of number of attacks (Figure 3) and economic losses due to these attacks. As per an estimate of IMO, maritime piracy, costs transport vessels \$13 to \$15 billion a year as losses in the waters between the Pacific and Indian Ocean alone. It is interesting to note that vast majority of pirate attacks against energy vessels occur against oil tankers, with attacks on LPG vessels being a distant second (Figure 4). Attacks on oil vessels are disproportionately high, since out of about 120,000 ocean-going vessels in the world, only about 4,000 (just over three percent) are oil tankers. Since, shipping being

Figure 3: Global Maritime Pirate Attacks: Jan 1997-Sept 2008 (N = 3566)



Source: International Maritime Organization

Figure 4: Energy Attack by Vessel Type: 2001-2008



Source: International Maritime Organization

a global industry is not restricted to any particular nation; therefore joint efforts of all marine nations in terms of supportive political and economical policies are required to overcome this risk. Nowadays, marine insurance is being considered as an important measure to overcome piracy risk; however, insurance is only shifting risk from one party to another instead of eradicating it.

Hedging against Freight Rate Risk

Considering the high volatility in freight markets, managing freight rate is a significant issue for players associated with shipping industry. Therefore, to hedge/manage this risk, Forward Freight Agreements (FFA) were introduced in 1990. Presently, FFAs are being used by ship-owners and operators, oil companies, trading companies and grain houses as a tool for managing freight rate risk. Underlying asset for a FFA is freight rate of dry bulk carriers and tankers for a specific physical trade route. These contracts are cash settled against various freight rate indices published by the Baltic Exchange² (for Dry and most Wet contracts) & Platt's (Asian Wet contracts). FFAs are often traded over-the-counter (OTC) through broker members of the Forward Freight Agreement Brokers Association FFABA. However, screen-based trading is gaining popularity. Trades can be given up for clearing by the broker to one of the clearing houses that support such trades. There are four clearing houses for freight: NOS Clearing (Oslo, Norway), LCH.Clearnet (London), NYMEX (NY Mercantile Exchange) and Singapore Stock Exchange (Singapore).

In India, FFAs were introduced in 2009 and it is considered as a significant development for the Indian shipping industry, commodity traders, importers and exporters. Now, Domestic oil refining companies and shipping companies are permitted to use OTC and exchange-traded freight derivatives in international markets for hedging their exposures to freight risk as per the norms laid down by RBI

India's Crude Oil Scenario

Growing demands, limited domestic reserves and high dependence on imports are some of the key characteristics of Indian oil & gas industry. With the advent of liberalized policies across all sectors, high spending on infrastructure and emphasis on inclusive growth across all masses and geographies of the nation have caused increase in demand of energy. India is not blessed with rich oil and gas reserves which are required to sustain long-term energy needs and it is most likely that domestic oil reserves would get depleted in next five to six years if used at the present consumption rates (Table 5). Therefore, India is highly depended on other oil rich nations to bridge this supply/demand gap and shipping is the most easily available and feasible way to transport bulk quantities of crude from one nation to another. India is emerging as the global hub for oil refining with capital costs lower by 25 to 50 per cent over other Asian countries and as per the World Oil Outlook, 2009 report, by 2015 almost 50% of additional refining capacity (i.e. 2.8 mb/d) would come from Asia,

	2005-06	2006-07	2007-08	2008-09
Oil Reserves	786	756	725	760
Oil Prod. (Mn.Tonne)	32.2	34	34.1	33.5
Oil Cons. (Mn.Tonne)	130.1	146.6	156.1	160.8

Source: MoP&NG

mainly china and India. Currently, Indian refinery capacity is 178 MMTPA which is expected to reach to a level of 241 MMTPA and 302 MMTPA by the end of XI plan and XII plan respectively. However, India does not have enough indigenous crude oil to satisfy this refining

capacity; therefore, bulk of this requirement will be met through crude oil imports.

Indian Shipping Industry

Shipping industry being a global industry is fundamentally associated with global economy and industrial activities. In last few years, India Government has formulated and implemented several proactive policies to make Indian players more competent against global players. With effect of these policies, today India holds 17th and 15th rank among the world maritime nations in terms of Gross Register Tonnage (GRT)³ and Deadweight (DWT)⁴. In last two years, Indian shipping industry has witnessed a dramatic upward shift in Gross tonnage and DWT tonnage. Today Indian shipping companies collectively own about 704 vessels with 8.3 million gross tonnage (GT) or around 13.75 million deadweight tonnages. Indian shipping industry contributes approximately 0.3% to the country's GDP.

The industry is governed by 3 separate Acts viz. The Merchant Shipping Act, 1958, The Inland Vessels Act, 1917 and The Coasting Vessels Act, 1838. While most of the vessels are registered under Merchant Shipping Act and dealt within the sector, smaller barges and coastal vessels are governed by the latter two Acts, and lighterage or barging industry comes under port sector.

In 1957, Indian Shipping Policy was formulated and *Transchart* was formed by the Government in tune with its policy. According to this policy, all Government owned/controlled cargoes should be imported on Freight on Board (FoB) basis to support Indian Shipping Industry and exported on Cost & Freight (C&F) basis to save FOREX reserves, with all centralized shipping arrangements to be made through *Transchart*. *Transchart*, which was given the responsibility of ensuring compliance of the Government policy of FOB imports, has been supporting growth of Indian shipping, besides obtaining competitive freight rates for the importers, including the oil PSUs.

In tandem with policy to de-regulate Indian Oil sector, in April 2005, Indian Oil Corporation (IOC) was given the autonomy to make its own shipping arrangements for

crude oil imports, circumventing Transchart. After this initiative, IOC became responsible for its own shipping cost (Largest input cost after crude oil cost) and could optimize it more efficiently by controlling the entire supply chain management.

Crude Oil Procurement in IOC

IOC procures crude oil from indigenous and overseas oil fields. Procurement of crude oil requires an efficient co-ordination among different departments of IOC, shipping companies, port authorities and oil suppliers to have optimum logistics and scheduling operations. After the taking over of ship chartering from Transchart in June 2005, Scheduling and Logistics department of IOC under the purview of IOC Shipping ensures timely lifting of crude oil, timely input of crude oil to refineries, optimize cargo parcel sizes to reduce freight cost and minimize dead freight, promote maximum usage of VLCCs for economics of scale, optimum utilization of time chartered vessels, minimization of demurrage⁵ and coastal monthly crude planning.

In a company like IOC, where most of the crude oil requirement is being satisfied through imports have a very high component of ocean freight in overall cost structure. Crude oil is about 95% of IOC's total cost, however, of the remaining cost; ocean freight is about 40%, which is almost equivalent to the total operating cost of all the refineries of IOC put together (Table 6). Therefore, proper scheduling and supply chain management is a critical issue in effecting the bottom-line of a company.

	% share
Crude Oil	94.4
Ocean Freight	2.2
Operating Cost	2.3
Depreciation	1.1
Total	100

In IOC, tanker scheduling can be broadly classified into categories:

Indigenous Crude Oil Lifting: IOC procures indigenous crude oil from Bombay high platform, Jawahar Island

Chartering

Chartering is the process of hiring a ship to deliver the cargo for a client from the load port to discharge port at a certain price called "freight rate". In simple words it is a contract between the "Owner" of the ship/vessel and the "charterer" to deliver the cargo.

TYPES OF CHARTERING

	Voyage Charter	Contract of Affreightment (COA)	Time Charter
Characteristics			
Voyage	Single Voyage	Multiple Voyages	Ship hired for Fixed period
Freight	Per voyage	Per voyage	Charter hire per day
Payment	After completion of voyage	After completion of voyage	Monthly in advance
Crew	Ship owner	Ship owner	Ship Owner
Bunker Cost	Ship owner	Ship owner	Charterer
Port charges	Ship owner	Ship owner	Charterer
Demurrage	Charterer	Charterer	No demurrage

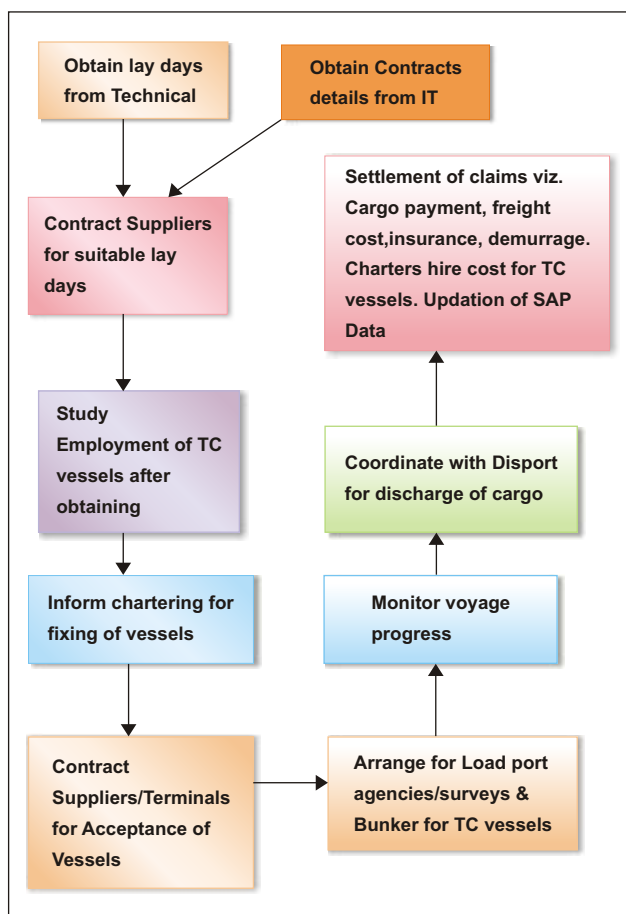
A voyage charter party is for a single voyage whereas a time charter party governs hiring of a ship for a specific period of time.

In a time charter party there is no transfer of ownership of vessel, however charterer is free to use the vessel for a specific period of time at a per day hire rate called Charter hire rate. Since, time charter vessels are at charterer's disposal at all times, it guarantees the much needed tonnage security. However, since there is always a cost involved in hiring the vessel on time charter "Utilization of the vessel" is the key factor.

CoA involves hiring the vessel for fixed number of voyages or time.

Bombay, Panna - Mukta, KG Basin, Ravva and PY-3 crude oil for CPCL, Chennai and its refineries. Shipping is as per Charter party terms. The allocation and laydays for Bombay High crude oil is finalized in Industry working group (IWG) meeting, which is normally held in the last week of every month. IWG consists of members from all the PSU oil companies and Shipping Corporation of India.

Imported Crude Oil Lifting: Procurement of imported crude oil is finalized by International Trade department of IOC with respective suppliers through TERM and SPOT contracts. An optimum balance is being maintained to ensure uninterrupted supply of crude oil to refineries at lowest possible cost. Procurement of imported crude oil is being done under the guidance and approvals of Empowered Standing Committee (ESC). Once the contracts details from IT and laydays⁶ from technical department are obtained by IOC shipping, it contacts suppliers for suitable days for loading and inform chartering cell for fixing of a vessel as per the cargo size and also ensures that top priority should be given to time charter vessels. Once the vessel is fixed after getting approval from the supplier and terminal authorities, several arrangements are done at load port with respective agencies as per the charter party. After the loading of a vessel, voyage details are monitored, proper arrangements at disport for unloading with concerned parties is done by IOC-Shipping.



Presently, majority of crude oil is being imported from Middle East Gulf (MEG) and West Africa by IOC (Table 7). Given the expected increase in future demand of crude oil and to achieve energy security, new crude oil sources are being considered by IOC. This would result in new shipping routes like North Africa (Algeria and

Table 7: IOC's Crude oil import basket

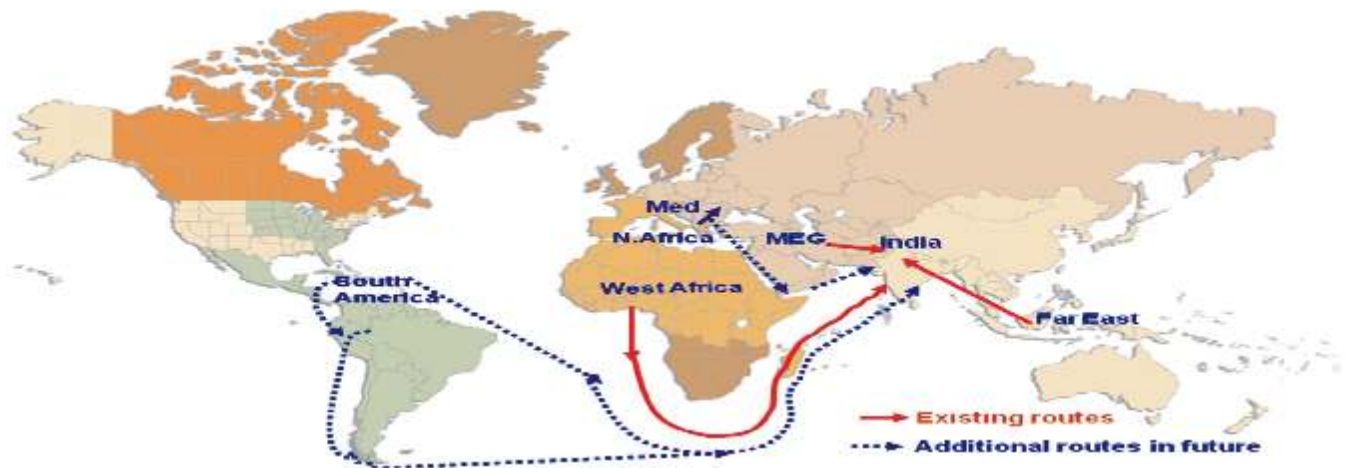
Loading Region	2008-09	
	Qty (MMT)	%
MEG / New Regions	32.7	68.4
W.Africa/ S America	13.0	27.2
Far East	2.1	4.4
Total	47.8	100.0

Libya), Mediterranean (Ceyhan), & Black Sea (Georgia) through Suez Canal and S. America (Columbia, Mexico, Ecuador) to India.

End Notes:

- The International Maritime Organization (IMO),** formerly known as the Inter-Governmental Maritime Consultative Organization (IMCO), was established in Geneva in 1948, and came into force ten years later, meeting for the first time in 1959. The IMCO name was changed to IMO in 1982. The IMO is a specialized agency of the United Nations with 168 Member States and three Associate Members. The IMO's primary purpose is to develop and maintain a comprehensive regulatory framework for shipping and its gamut today includes safety, environmental concerns, legal matters, technical co-operation, maritime security and the efficiency of shipping.
- The Baltic Exchange** is the world's only independent source of maritime market information for the trading and settlement of physical and derivative contracts. Its international community of over 550 members encompasses the majority of world shipping interests and commits to a code of business conduct overseen by the Baltic. The exchange provides daily freight market prices and maritime shipping cost indices which are used to settle freight futures.

Principal Shipping Routes of IOC



- 3: **Gross Register Tonnage (GRT):** represents the total internal volume of a vessel, with some exemptions for non-productive spaces such as crew quarters; 1 gross register ton is equal to a volume of 100 cubic feet (2.83 m³), which volume, if filled with water, would weigh around 2,800 kg or 2.8 tonnes.
- 4: **Deadweight (DWT):** is the displacement (actual total weight of a vessel) at loaded condition minus the lightship weight (measure the actual weight of the ship with no fuel, passengers, cargo, water, etc. on board).
- 5: **Demurrage:** It is the agreed amount payable to the owner by the Charterer (IOC) in respect of delay to

the vessel beyond the agreed time (Laytime), for which the owner is not responsible. It is applicable to Voyage Charter and COA vessels. Demurrage cost depends on various factors such as demand/supply scenario, age, condition, size, type, etc of a tanker/vessel. Demurrage for a Suezmax vessel and VLCC is about USD 24,000 and USD 45-50,000 Per Day Prorata Basis (PDPR) respectively.

- 6: **Lay time:** The period of time agreed between the parties during which the owner will keep the ship available for loading / discharging without payment additional to the freight.

Customer Experience Management - Accelerate Your Business Fast Forward

A.M.K. Sinha & Rohit Dawar

Customer experience is the customer's perception of interactions with a brand. Customer Experience Management (CEM), therefore, is simply managing customer experiences. CEM helps the enterprise see the customer with the "right brain"- concerned with perceptions, feelings and interactions that are harder to quantify but so valuable nonetheless. Instead of just looking at how valuable the customer is to the enterprise, CEM requires an inspection of the enterprise's value to the customer. Rather than recording such transactional information as leads, opportunities and average handle times, the way many CRM systems do, CEM maps the experience from the customer point of view. CEM leaders don't focus on the customer just to feel good they see it as a successful business strategy.

I've learned that people will forget what you said, people will forget what you did, but people will never forget how you made them feel.- Maya Angelou

We see our customers as invited guests to our party, and we are the hosts. It's our job everyday to make every important aspect of customer experience a little bit better. Jeff Bezos

A business is in existence only if it has customers. A company may have developed very good products, have the best of manufacturing facilities and state of the art retail chains, but if there are no customers, then it would close shortly. However, if the business is to grow, then its existing customers have to purchase more and also more people would have to become its customers. The growth of the business is dependent on how customers perceive the company and in turn how they carry out their purchase from this company.

Businesses start by offering a product or service which they think would satisfy the needs of people. A lot of focus is initially given on the product (both physical and service product) so that it is appealing to the prospective customer and he is attracted to buy it. Most of the time the companies get so much involved in developing better and better products, that they lose focus on the

customer. Companies start believing that if they can offer the best product in the market, then customers would automatically come to them. It may be true for very high technology products, where the customer wants to derive the benefits of better products. However, in most of the businesses where there is an option available to the customer, then the customer follows his own decision making process, which is a very complex one. Most businesses have no idea why customers behave as they do. They do not know what makes customers tick.

Unless you have the only business in the world that offers your product, customer service will absolutely make or break your business. When a customer buys a product, they expect it to work the first time. When it comes to products, expectations are pretty clear. They expect a good quality product based on the price they are willing to pay for it, but when it comes to service, expectations can be a little fuzzy. When a customer begins a relationship with a company, they have a specific set of expectations based on the perceptions of the company and the industry in which the company operates. These expectations are formed through personal past experience and experience of others with whom the customer interacts.

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Companies have the opportunity to *Satisfy, Dissatisfy or Impress* their customers. Delivering below expectations is obviously bad and dissatisfies the customers, but in the context of creating loyalty, so is simply satisfying customers, because they are getting nothing more or less than they expect. Creating customer value and loyalty comes from consistently exceeding expectations and impressing customers. Customer loyalty is the degree to which customers will patronize a specific company alone, because this company has developed and created an emotional bond with them. This company has gone beyond their expectations and addressed something more innate - their emotional needs as a consumer.

As customers are expensive to acquire, keeping them loyal allows companies to amortize their costs. Loyal customers are often willing to pay premium prices and they can become the company's effective marketing weapons, evangelizing its products on its behalf. Many companies have tried to garner customer loyalty by using a combination of approaches like:

- developing a brand that resonates with its audience,
- improve levels of customer service,
- spending more on marketing, strengthening quality control processes or
- investing in customer relationship management software.

But, initiatives like the above don't build customer loyalty. Customers become loyal because of the experiences they have as a result of these types of initiatives. A resonant brand creates an emotional connection, successful customer service delivers an experience that makes the customer important, marketing initiatives reaches out to customers even as they help the organizations better identify the customers, quality control processes minimize the risk that the customer will experience product failure and customer relationship management systems ensure a consistent experience across all the customer's interactions with the business. The common thread here is the experience the customer ultimately has with the business, because positive experiences create the emotional bond that leads to customer loyalty. Customers always get more than they bargain for,

because a product or service always comes with an experience.

So, we come to the question what is Customer Experience? **Experiences are "Takeaway" impression formed by people's encounters with products, services and businesses a perception produced when humans consolidate sensory information.**

Alternately, customer experience is the internal and subjective response customers have to any direct or indirect with a company. Direct contact generally occurs in the course of purchase, use and service and is usually initiated by the customer. Indirect contact most often involves unplanned encounters with representation's of a company's products, services or brands and takes the form of word-of-mouth recommendations or criticisms, advertising, news reports, reviews and so forth.

Humans constantly filter a barrage of clues, organizing them into a set of impressions some of them more rational or calculative and others more emotional. These emotions can be very subtle even subliminal or even extremely obvious. They may occur due to happenstance or by purposeful design. They may exist as isolated episodes or managed suites. Collectively, they become an experience.

The manifestation of some of the experiences what customers feel about organizations could be voiced as: *"They actually offered to deliver that shirt to me at the airport," "They insisted me on giving me a refund, even though I had worn the shirt for four months," "My hotel room had my favourite box of chocolates," "Their maintenance people wear ties and carry briefcases," "They have special parking places for expectant mother."* Such seeds, if cultivated over a long enough periods, can propagate meaningful preferences.

A customer experience can be viewed as a collection of clues, with each clue carrying a message that suggests something to the customer. The clues that form customer experience fall into two major categories.

The first category of clue concerns the actual functioning of the product or service and is primarily interpreted by the rational part of the brain. These clues relate to the delivery of a particular outcome.

The second category of clue concerns the emotions. These clues relate to the five senses of sight, smell, sound, tastes and textures of the product or service as well as the context or environment in which it is offered. This category includes both '*mechanics*' (clues emitted by things) and '*humanics*' (clues emitted by people). Customers perceive the experiences delivered at various customer touch-points, like product advertisement, in store, call centres, web site, quality of customer care, service features, etc. **The aggregate experience (net result of the good ones minus the bad ones) across all touch-points becomes how customers feel about the company and its brand.**

Emotional clues, the mechanics and humanics, are just as important as functional clues. Indeed, to design a superior customer experience, organizations must manage the emotional component of the experience with the same vigour they bring to the functional delivery of the product and service. Their ultimate goal is to make customers feel good so that they buy more, more often and over a longer time from them only and also recommend them to others.

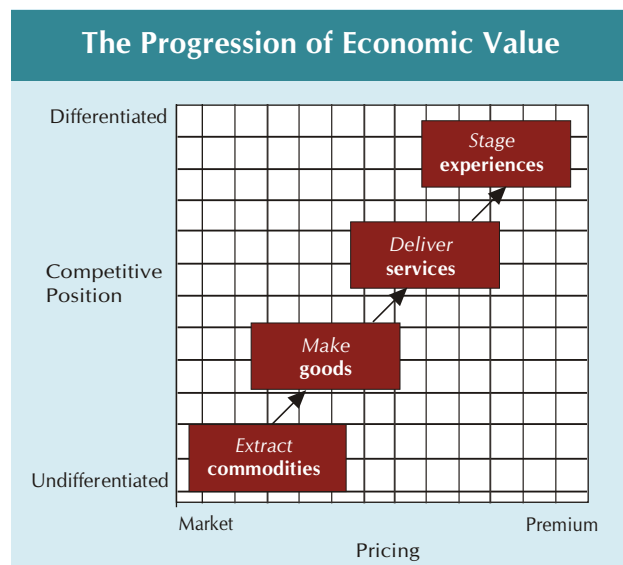
Behavioural sciences research shows that affect or mood influences how people think and act. Research shows that positive mood seems to help people recall positive material from memory. This is because, when people are in a positive mood, they try to maintain that state, whereas people try to improve a negative mood by avoiding recall of negative memories. Mood or affective states also influence the information processing strategy individuals are likely to adopt. People in a good mood are more likely to use quicker mental short-cuts in decision making, whereas people in a sad mood are more likely to use a thorough decision making process. Positive moods increase the likelihood of many positive behaviours.

The distinction among functional, mechanic and humanic clues can be subtle. For example, a retail salesperson who answers a customer's question about when an out-of-stock item will be available is producing both functional and humanic clues. The accuracy of the information is a functional clue while the salesperson's choice of words and body language are humanic clues. One salesperson may answer the question disinterestedly,

and another may answer enthusiastically. A customer's emotional response to the two differing humanic clues is likely to be quite different even if the information is accurate in both cases.

An experience is not effective unless it is remembered, branded and contrasted. Nobel prize-winning psychologist, Daniel Kahneman pointed that people remember only two things during an experience: how they feel at the peak and at the end. These peak-end feelings summarize the whole experience process and are stored in the brain at the subconscious level. A branded customer experience works to amplify the brand through intentional and consistent delivery of on-brand experiences across all touch points. People are comparison animals and we feel good or bad largely as a result of comparing our experiences, which cause us to set our anchors differently. People need pain to contrast with pleasure. Therefore, an effective experience causes positive emotions and memories, delivers differentiated brand values to target customers and optimizes resource allocation.

Figure : 1



This leads us to the concept of **Customer Experience Management (CEM)**.

Customer Experience Management is a unified approach to marketing and customer service, using Customer Relationship Management (CRM) data and acquired knowledge to "target" an improved customer

experience; achieving greater loyalty, leading to reduced churn and higher revenue. The concept of CEM was first introduced by Joseph Pine and James Gilmore in their 1998 Harvard Business Review article on "Welcome to the Experience Economy". According to them the progression of economic value in a business is as shown in figure-1.

Many companies wrap experiences around their traditional offering (product and service) to sell their products better. To realize the full benefit of staging experiences, however, businesses must deliberately design engaging experiences that command a fee. Unless companies want to be in a commoditized business, however, they will be compelled to upgrade their offerings to the next stage of economic value.

According to Pine and Gilmore, an experience occurs when a company intentionally uses services as a stage, and goods as props, to engage individual customers in a way that creates a memorable event. In figure-1, commodities are fungible, goods are tangible, services are intangible and experiences memorable. While commodities, goods and services are external to the buyer, experiences are inherently personal, existing only in the mind of an individual who has been engaged at an emotional, physical, intellectual or even spiritual level.

The product commoditization is accelerating fast and consumers are becoming impatient as there are low switching barriers due to abundance of choices. There are several compelling reasons for improving the customer experience for forward looking organisations, like:

Strategic : Particularly in rapidly commoditising markets, customer experience may be the only way to differentiate its brand and create lasting competitive advantage.

Marketing : Word-of-mouth is most effective and inexpensive form of marketing. If a company can create 'raving fans' or 'apostles', they can actually reduce expenditures on marketing.

Customer Retention: Delighted customers are repeat buyers and may spend more with each new spend. The lifetime value of a loyal customer can be huge, especially when referrals are added and repeat purchases of related products.

Experiences, like goods and services, have to meet customer needs; they have to work; and they have to be deliverable. Just as goods and services result from interactive process of research, design and development, experiences derive from an interactive process of exploration, scripting and staging capabilities.

Designing Memorable Experiences

As per Pine and Gilmore, the five key experience-design principles are:

Theme the experience: An effective theme is concise and compelling and it is not a corporate mission statement or a marketing tag line. It needn't be publicly articulated in writing, but the theme must derive all the design elements and staged events of the experience toward a unified story line that wholly captivates the customer.

Harmonize impressions with positive cues : While a theme forms the foundations, experience must be rendered with indelible impressions. Impressions are the 'takeaways' of the experience; they fulfil the theme. To create the desired impressions, companies must introduce cues that affirm the nature of the experience to the customer. Each cue must support the theme, and none should be inconsistent with it. It's the cues that make the impressions that create the experience in the customer's mind.

Eliminate negative cues: Ensuring the integrity of the customer experience required more than the layering on of positive cues. Experience stagers also must eliminate anything that diminishes contradicts or distracts from the theme. Eliminating negative cues creates a more pleasurable customer experience.

Mix in memorabilia: Certain goods have always been purchased primarily for the memories they convey. These goods generally sell at price points far above commanded by similar items that don't represent an experience. If businesses offered themed experiences layered with positive cues and devoid of negative cues, customers would want and would pay for memorabilia to commemorate their experience.

Engage all five senses: The sensory stimulants that accompany an experience should support and enhance its theme. The more senses an experience engages, the more effective and memorable it can be.

Challenges to designing and implementing Customer Experience Management

Companies seeking to improve their customer service, should consider the following:

People: Companies look for employees that are highly motivated, competitive, committed and hardworking. However, many employees lack a passion for dealing with customers and for delivering high quality products and services. These are unique characteristics and skills, and organizations would do well to seek during the hiring process prospective employees who possess them.

Process & Policies: Existing processes and policies often prevent employees from providing the type of solutions that their customers seek. Processes and policies should empower all employees so that they can consistently deliver high quality solutions and speedy service to customers.

Tools and information: Employees often lack proper and up-to-date tools to service customers efficiently and effectively. Providing customers with consistently rapid service and high quality solutions necessitates making the appropriate investment to improve tools and information access.

Customization & Personalization: Organizations offering a "one shoe fits all" consumer approach to its solutions will rarely succeed in building emotional customer engagement. Successful organizations offer collaborative models where customers can determine what they want and how they would like it delivered. The utilization of collaborative models can lead to the elevation of the brand familiarity, quality, overall relevance, distinctiveness and purchase consideration.

Adaptation and Change: What excites customers today will be taken for granted tomorrow. Due to heavy competition and accelerated commoditizing, there is abundance of similar product and services which lower their value perception, driving prices and customer commitment lower. Successful companies consistently innovate their solutions to maintain their competitive differentiation and ensure customer preference for their products and services.

Some companies choose to address a few of these elements while ignoring others - **ensuring the inconsistency of the customer experience across all organization touch points.** Only complete commitment to the development and utilization of right now business strategies will yield ongoing customer engagement with all of its associated financial benefits. Compromising on either speed of service or solution quality will ultimately drive customers to compromise on their loyalty and commitment to their organization.

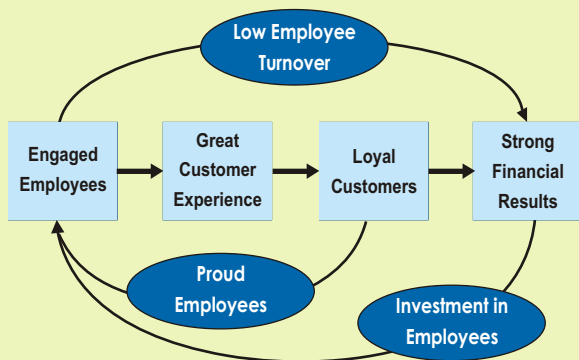
Implementation of CEM in Downstream Petroleum organization in India

The products of a downstream marketing company reach almost the entire population in the geographical area it operates in some way or the other as it satisfies their energy needs. Every person somewhere or other is a customer of a downstream petroleum marketing company. As there is a large potential customer base, there is tough competition within the industry. Based on the location of the refineries, the products from one company's refinery are marketed by all the oil marketing companies in that region. The petroleum products are already commoditized and as such basic product does not offer much differentiation. The key to gain

Figure : 2

By focusing on employees, companies can establish the Employee Experience Virtuous Cycle where they end up with more loyal customers, stronger financials, and more engaged employees.

Employee Experience Virtuous Cycle



Source: Customer Experience Matters (experiencematters.wordpress.com)

competitive advantage lies in the ability of a company to create value for the customer through structured Customer Experience Management techniques.

A company in the downstream petroleum industry has varied types of customers. Some of the products in downstream marketing are controlled by the Government, as it decides how much and at what price some of the products would be marketed. It includes deciding retail selling price of some of the products (such as MS, HSD, PDS-SKO and LPG-Domestic) and the channel through which it would reach the ultimate customer (PDS-SKO).

There is immense diversity in the customer base, it covers large scale industries (Power plants, fertilizer units, etc. for naphtha, lubes, etc.), large service providers (Defence, Railways, Airlines, etc. for fuel, lubes, etc.), Government agencies (PWD, NHAI, etc. for fuel, bitumen, lubes, etc.), Petrochemical units (for naphtha, SKO, lubes, etc), large transport fleet owners (for fuel, lubes, etc.) on one hand and on the other hand, there are small/ individual customers like small factories (for fuel, lubes, etc.), re-processors (for speciality products, coke, wax, etc.), individual transport vehicles (for fuels and lubes), households (for LPG and SKO), etc.

To meet the demand of all types of customers, the companies have various marketing channels and distribution networks wherein there are a multitude of 'touch points' across which customer experience clues are generated. It poses immense challenge to these companies to firstly, map all these touch points and secondly, develop a system that ensures high levels of customer experience at each one of them.

Some of the touch points for few of the customers can as follows:

1. **Industrial Customers, Government Agencies and Small Industries:** Field Officers, service offering, supply location, transporter, tank truck and stake truck crew, etc.
2. **Large fleet owners:** Field officers, Loyalty Group, retail outlets, lubricant resellers, etc.
3. **Individual transport owners:** Retail outlets, Loyalty Group, and lubricant resellers.
4. **Households:** Field Officer and LPG Distributors.

In order to provide a positive and exhilarating experience to the end customers, apart from taking advantage of the customer friendly technology, the personnel at all the touch points have to be highly motivated, trained, empowered and have a customer centric attitude. Keeping in view the limitation of scope in this article, we would like to address in brief how an effective CEM can be implemented for one segment of the customers.

For example, to deliver a highly positive experience to the individual customer at the **retail outlet**, the CEM is to be implemented across the entire chain, starting from the supply location. When a tank truck comes to collect product, the truck crew would have a positive experience when they are able to load the product (quality & quantity) without any hassles, within the stipulated time and with correct and timely paperwork. It would also include the behaviour of the personnel of the supply location and the amenities available for them. The tank truck would then reach the retail outlet and based on much time they have taken to reach, how they deliver the product and how they behave with the retail outlet staff, the positive experience would be transferred to the retail outlet personnel.

The retail outlet personnel would have an overall positive experience if their interaction with the supply location, the company officials and the tank truck crew were positive and this would enable them to deliver positive experience to the individual customer who comes to their outlet for filling up their vehicle. Most of the times, the customer has interaction with the pump attendant only and on his experience with the attendant, he experiences the offering of the company and evaluates the performance of the company. The company may have installed the best of facilities, latest technology equipments, have world class logistics, etc. but if the pump attendant is not able to give the effective positive experience to the customer, all the above would go in vain.

It is therefore, important for organizations to study all touch points across the value/supply chain scientifically and create enabling factors (both technology and human resources) for deliverance of consistent positive experience.

Indian Hydrocarbon Sector: Challenges Old & New

Jessica Singh & Ravindra Kumar Meena

Hydrocarbon business across the globe has always faced a plethora of challenges. While some challenges have been characteristic of this sector such as exhaustible resource and skewed resource distribution. Today, newer challenges, especially in the form of high and volatile crude oil price and climate change concerns have come to the fore. In India, in addition to country's low resource base, the paucity of gas transportation infrastructure and the policies of price subsidization, amongst others are the key challenges to the development of the sector

Today, Indian economy is the second fastest growing large economy in the world. India's economy is expected to grow in the range of 8-9% p.a. in the coming years. The country is facing formidable challenges in providing adequate and efficient supply of energy at affordable price. India is world's fifth largest energy consumer, accounting for about 3.45% of the world's total annual energy consumption. However, in per capita terms, at 455 kgoe in 2005, India ranks extremely low and way below the developed countries & only 26% of the world average. Moreover, in terms of the International Energy Agency IEA's Energy Development Index (which captures three dimensions of energy development, viz. share of households with electricity access, share of households using cleaner fuels and electricity consumption per capita) India stands much below other emerging economies like South Africa, Brazil and China.

Role of Hydrocarbons in Indian Energy Sector

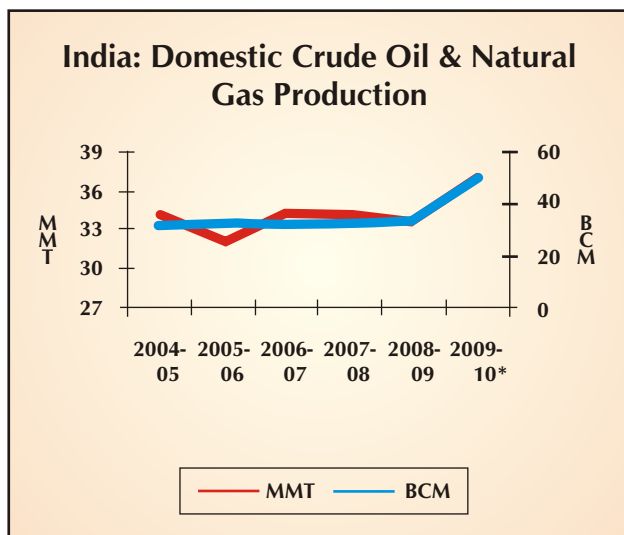
The role of hydrocarbon sector in fuelling the growth of the Indian economy has considerably enlarged in the last few decades. The share of oil in

the Indian energy mix has risen from around 18% in early 1960s to around 33% now. However, India's per capita consumption of petroleum products is about

1/5th of world's average per capita consumption. As regards to gas, with little or no role as an energy source in pre-independent India, today its share has risen to around 9%.

India is not very well endowed with oil & gas reserves. Moreover, a large percentage of its available reserves still remain unexploited. As per BP Statistical Review of the World 2009, India accounts for 0.5% of the world proven oil reserves and 0.6% of gas reserves of the world. Until recently, production of crude oil & natural gas had remained more or less stagnant. However, with the initiation of the supply from Krishna Godavari (KG) Basin in April 2009, gas supply scenario in the country has improved. The production of crude oil from Cairn's Mangala field in Rajasthan and RIL's KG deepwater has also contributed in improving the oil supply scenario. As per Ministry of Petroleum & Natural Gas (MoP&NG), during 2009-10 the projected production of crude oil is 36.708 Million Metric Tonnes(MMT) against previous year production of 33.508 MMT. The increase of about 3.2 MT in crude oil production is because of new crude from Rajasthan (2.4MMT) and KG deepwater (0.8MMT). The projected production for natural gas (including Coal Bed Methane) for 2009-10 is 50.211 billion cubic metre (BCM) a major leap from 32.847 BCM produced in 2008-09.

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Source: MoP&NG

Refining capacity in the country has increased by 55% from 114.6 MMTA in 2001 to 178.0 in 2009. The share of private sector has increased significantly during this period, with most of the additions coming in the private sector.

In the context of sluggish increase in crude oil production and the rising refining capacity & growing demand for Petroleum products (in 2008-09 consumption of petroleum products rose by 3.5% to 133 MMT), the imports of crude oil have grown steadily and stood at 146.4 MMT in 2008-09 with a foreign exchange outgo of USD 89.2 bn.

Challenges in the Hydrocarbon Sector

Traditional Challenges:

Exhaustible Resource Base: With oil & gas being an exhaustible resource, maintaining long term supplies, has always been a difficult task. For the world as a whole the Reserve to Production Ratio for Oil is 42 years & for gas is 60.4 years.

Skewed Resource Distribution: Middle East accounts for 60% of proved oil reserves & 41% of proved gas reserves (Table 1). Skewed geographical spread of oil & gas resource endowment has added constraints, which have assumed stark dimensions from time to time with the spurt of geo-political tensions.

REGION	Share in Proved Oil Reserves (%)	Share in Proved Gas Reserves (%)
North America	5.6	4.8
South & Central America	9.8	4
Europe & Eurasia	11.3	34
Middle East	59.9	41
Africa	10.0	7.9
Asia Pacific	3.3	8.3

Source: BP Stats 2009

Operational Challenges: Due to its very nature, operational challenges have always been integral to the oil & gas business. Operational challenges are enormous, especially in the context of logistics & safety.

Finding Capital: Hydrocarbons sector is a highly capital intensive sector, the investment requirements in this sector are huge. The capital intensity will rise further as the world moves away from the era of cheap oil sources.

New & Emerging Challenges

Today, extra dimensions have emerged, which make this sector more complex than ever. New challenges are in the form of:

Extreme oil price volatility: Volatility & uncertainty in the crude oil market make investment decisions riskier. This is a big challenge given that most of the investments in

The Enigma of Crude Oil Price Volatility

There are two lines of thought/ views:

Speculative View: Theoretically, financial instruments such as futures & options in commodity markets enable price discovery and hence smoother operations of the market and reduce volatility.

Hedgers are typically producers & consumers of physical commodity who use futures market to offset price risk. By contrast, noncommercial traders seek profits by taking market positions to gain from changes in the commodity price, but are not involved in the physical receipt/ delivery of the commodity. These financial players are referred to as 'speculators' & have increased their footprint in the market

place dramatically since the late 1990s. According to a study by the Baker Institute, Rice University, noncommercial players now constitute about 50% of those holding outstanding positions in the US oil futures market, compared to about 20% prior to 2002.

According to IEA, considering the drive up in prices in 2008, no direct correlation between speculation and drive up of prices can be established. Moreover, even if a correlation could be established, the direction of causality remains uncertain:

Does money in crude futures drive up crude prices?
Or Rise in crude prices leads to flow of money in the crude futures market?

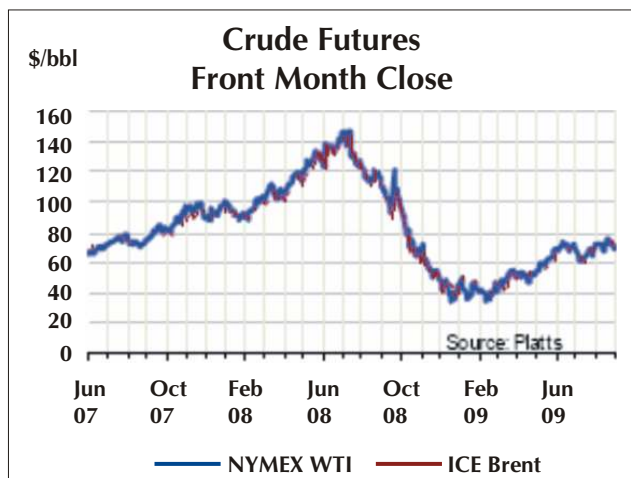
Fundamental View: Nature of the demand and supply of oil is such that it exacerbates volatility. Both supply and demand are price inelastic.

Inelastic supply emanates from:

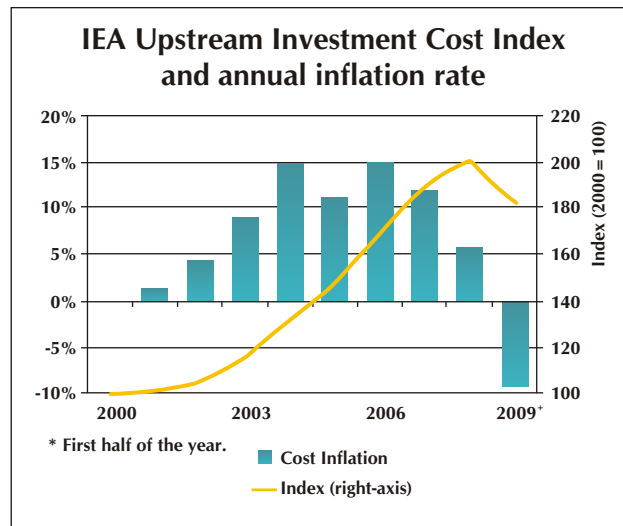
- ▶ Access Restrictions
- ▶ Resource Nationalism
- ▶ Project Bottlenecks
- ▶ More Difficult Oil increases the lead time for new supply
- ▶ "Peak Oil" plays a role in the perception of oils a store of value for the future
- ▶ Lack of complex refining capacity

Consumer subsidies & taxes, which are widespread in the case of hydrocarbons contribute to making demand inelastic.

the hydrocarbon sector have a long gestation periods. While it is clear that in the long term demand for hydrocarbons is set to increase, the volatility in crude prices by making investment decisions tougher jeopardizes investments and exacerbates demand supply imbalances and leads to further volatility in the future.



A multitude of factors affect the dynamics of crude oil prices and no sole factor can be held responsible for its dynamics. Commodity markets are by definition volatile. They follow a cyclical pattern emanating from periods of over & under investment. However, the volatility witnessed in the crude oil prices, of late is extraordinary and cannot be merely regarded to be a result of the cyclical nature of the market.



Source : IEA, World Energy Outlook 2009

Sharp rise in oil & gas infrastructure costs: There had been a persistent rise in upstream capital & operating costs since the year 2000. Annual inflation rate for capital costs in terms of IEA Upstream Investment Cost Index reached a peak of about 15% in 2006. Only with the onset of global economic recession did the costs fall but are still high in relation to historical costs.

Climate change has had a multiplicative effect on the intensity of the challenges for this sector. Although, the oil and natural gas industry is directly responsible for just 6% of global CO2 emissions, but when you add the CO2 emitted in the end uses (transportation, power and heat generation), the petroleum and gas sectors account for almost half of all global emissions. It is therefore that the debate over how to reduce the global greenhouse gases (GHG) focuses primarily on oil and natural gas companies. This sector is under constant regulatory and reputational pressure to reduce both upstream and downstream CO2 emissions, and in the coming years will increasingly be expected to provide solutions and make investments. In this context, emphasis is on additional investments in

carbon capture sequestration (especially in developed countries), energy efficiency, demand side management, development of bio-fuels and R&D.

Low R&D Investments: This is a neglected area, globally and particularly in India. As per World Development Report 2010, only 0.5% of revenues of private energy companies are spent annually on energy RD&D, which dwarfs in comparison to investments at the rates of 15% & 8% seen in telecom & pharmaceutical sectors respectively. The state of public investment in energy RD&D is even worse, globally this has hovered around USD 10bn annually for many decades while global subsidies on petroleum products alone amount to USD 150 bn annually. India is spending around Rs. 200 - 250 crore per annum on R&D efforts in the hydrocarbon sector, which dwarfs in comparison to the subsidy & under-recoveries on petroleum products in India running into thousands of crores.

Challenges Specific to India

India's High Import Dependency: Over the years, with rising demand and stagnating domestic supply India's dependency on imported oil has enlarged considerably to more than 80% today. As per the expert group on Integrated Energy Policy of India, by 2031-32 India would be importing 90-93 % of its crude requirements.

Although in the present era of globalization dependency on imported products/ commodities may not, in general, be a worrisome feature, the case of oil is unique despite it being a highly globalized industry from the very beginning. In addition to the risk of supply disruption due to geo-political reasons, the extreme volatility in the international crude oil witnessed in the last few years added to the general run up in crude prices, place large importers like India in a disadvantaged spot. Not only does this make the country highly vulnerable, it makes operations of refiners & marketing companies very challenging. Added to this is the extant pricing & subsidization policies, which cushions the consumers from price volatility, but compounds the difficulties of oil refining and marketing companies.

As regards to gas, until the last 6-7 years, India was severely constrained to cater to its gas demand through

domestic production. It was only with the advent of LNG, that we can today supplement our domestic supplies. Gas imports through transnational pipelines, despite years of diplomacy, have not materialized. Given scope and benefits of gas as a fuel, the enhancement of gas security for the country is pertinent.

In the context of oil & gas security *thrust on domestic exploration & production* is seen as an important strategy. The New Exploration & Licensing Policy (NELP) of the government has been the main agent of the bringing about improvement in domestic supply scenario. After seven rounds of NELP, the area under exploration has increased more than four times to 48% of Indian Sedimentary Basin area from 11% before implementation of NELP. Hydrocarbon reserves accretion has been more than 600 Million Metric Tonne of oil equivalent (MMTOE). According to the Directorate General of Hydrocarbons, in the next four years, under the NELP, it is planned to increase coverage to 80% of total Indian sedimentary basins. The recent oil & gas discoveries in the east coast Krishna-Godavari Basin & in Rajasthan represent the success of these policies.

However, the risk of *policy instability* in regard to production sharing agreements and price fixation could act as a major deterrent in attracting investment in this sector.

In addition to the challenge of attracting investments, the dearth of skilled E&P professionals is major challenge both globally and for India as well.

In addition to the accelerated exploration programs, schemes to *enhance oil production* from the existing reservoirs have been put in place. Here thrust is on technological breakthroughs and better reservoir management practices.

Getting equity oil & gas abroad is also another strategy to meet this challenge. Indian companies have succeeded in getting a significant foothold and are currently operating in 14 countries. However, the size of India's overseas oil & gas assets is quite small.

Another thrust area has been *development of alternative fuels* such as Coal Bed Methane, Gas Hydrates, Coal Liquefaction & shale.

Development of Gas Market & Infrastructure in India:

In India, the share of gas in energy mix is 9%, while globally it is 24%. This is mainly attributed to the limited availability and infrastructure. However, now with the large scale discoveries the challenge before the sector is to develop the required transport and distribution infrastructure. Development of a national gas pipelines grid is pertinent in this context. In addition to interstate networks, development of city gas distribution network is also receiving a boost. Proper regulatory framework will be pivotal in attracting investments and developing an efficient market. It clearly requires transition from old system and building new systems based on principles of competitiveness & efficiency.

Rationalization of Subsidy & Pricing Policies in India:

Market competition as envisaged with the dismantling of APM regime has not been fully achieved mainly because of Government's continuing with the control of retail prices of MS and HSD and at the same time declining to phase out subsidy in SKO (PDS) and LPG (Domestic). The mechanism presently adopted by the Government has resulted in distortion in market structure in hydrocarbon sector as private players have chosen to stay away from the retail market and at the same time PSU downstream oil companies have been at times made to absorb a part of the under-recoveries in their respective balance sheets. Even when under-recoveries are fully compensated, the mechanism of doing so through oil bonds has its own limitations and costs. This has hurt the financial health of the Oil Marketing Companies & the fiscal health of the Government. Recently, the Expert Group on A Viable and Sustainable System of Pricing of Petroleum Products Chaired by Dr. Kirith Parikh, estimated that the under recoveries on these four products at crude oil price of \$80/bbl, to balloon to Rs.1,57,000 crore by 2020-21. If oil prices rise by 25% to \$100/bbl, the under-recoveries will rise higher by 77%. Likewise if oil prices rise to \$120/bbl (50% increase) the under-recoveries will rise by 155%. The committee has been categorical in stating the present pricing policy will be unsustainable in the long run.

Creating conditions for competitive markets of petroleum products proper regulation & rationalization

of pricing & subsidy mechanism are the major challenges to ensure competition, financial efficiency and protection of consumer interests.

Meeting the Investment Requirements: According to IEA estimates, India needs to invest \$233 billion in its oil & gas sector over the period 2006-2030. Of this \$169 billion is required for the oil sector. Three quarters of the investment will be absorbed by the refining sector and rest by upstream sector. As regards the gas sector, the investment requirement has been estimated at \$63 billion. More than 90% of the investment in this sector would be oriented towards developing upstream capacities as well as transport and distribution infrastructure. Investment in LNG regasification plants is estimated to amount to \$6 billion.

Subsidizing oil prices policy has lead to erosion of the capacity of PSU oil marketing companies to generate internal resources for funding investments required for growth. The higher borrowings have further affected the financial health of these companies. It is in this context that the investments for infrastructure development become major challenge.

Refining investments will need to address the growing requirement of diesel compared to other transportation fuels, the need for product quality upgradation, capacity expansion for developing India as a refining hub to take advantage of its relatively low capital costs and geographical proximity to the supply centres (Middle East) and growing demand centres (South Wat Asia).

Refining industry in India is facing a unique challenge in the form choice of crude basket. On one hand, to circumvent the growing pressure on refining margins, sour and heavier crudes are being refined, but this leads to higher sulphur emissions and hence environmental degradation.

Today, India's *oil pipeline (both crude & product)* network has expanded to 24,000 km. However, still there are miles to go in view of increasing demand and the fact that the role of pipelines as a means of transportation in India still lags behind the levels prevalent in developed countries.

Today, India has 184 MMTPA POL handling capacity at its major ports, which is 1/3rd of the country's total port capacity. In the future with India's import dependency set to rise it planning to develop it self as an export hub for refined petroleum products, to facilitate this scale of throughput, ramping up *port infrastructure* is a critical challenge.

In developing countries like India, millions suffer from *energy poverty*. Providing access to hydrocarbon fuels to the rural population, through innovative business models is a huge challenge as well as an opportunity. Necessary initiatives need been put in place in this direction through the Rural Format Retail Outlets. "Rajeev Gandhi Grameen Vitrak Yojana", a new scheme

for increasing the reach of LPG is a step in the right direction.

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- ▶ Report of Expert Group on A Viable and Sustainable System of Pricing of Petroleum Products, February 2010
- ▶ World Development Report 2010: Development & Climate Change, World Bank

Summary of Kirit Parikh Committee Report

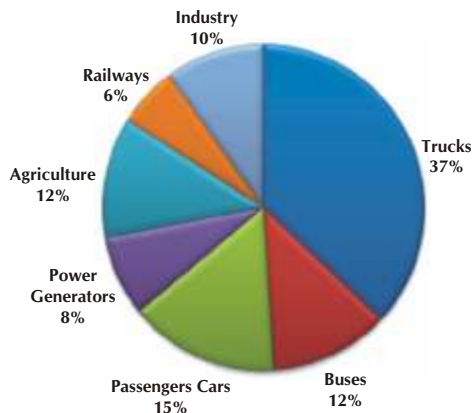
Corporate Planning & Economic Studies, IOCL

The Expert Group on 'A Viable and Sustainable System of Pricing of Petroleum Products' under the Chairmanship of Dr. Kirit Parikh, submitted its report on 2nd February 2010. The report defines a viable long-term strategy for pricing major petroleum products (MS, HSD, SKO and LPG) as one which is workable over a wide range of international oil prices and has to meet the various objectives of the government. It should limit the fiscal burden on government and keep the domestic oil industry financially healthy and competitive.

Key Observations & Inferences of the Report

Under-recoveries: At current levels of prices of MS, HSD, PDS SKO and domestic LPG, the financial burdens on the companies as well as on the government will be unsustainable. The committee's projections based on projected demand and current domestic prices at different crude prices indicate that under-recoveries will shoot up to Rs.157,000 cr by 2021 at \$80/bbl and at \$120/bbl will be around Rs.401,000 cr.

MS: The report observed that MS being a **Final Consumption Product**, has very limited indirect impact on inflation. MS is used by personal vehicles (2 & 4 wheelers) & 3 wheelers owners. The report states that "There is no reason to subsidize this class of consumers."



HSD: HSD has diverse uses across sectors. Around 40% of HSD consumption is accounted for by LCV & trucks for road transportation, Passenger cars (15%), Agriculture (12%), Industry (10%) are the other significant consumers. The report states in the context of the effect of HSD price rise on goods transportation by diesel using vehicles, that "Increase in price would improve efficiency & substitution by cheaper mode of transport like Railways."

As regards to the rising trend of diesel cars, according to the report, inter alia the higher excise duty on petrol (Rs. 13.35/litre) compared to diesel (Rs. 3.6/litre) encourages use of diesel cars.

SKO: PDS SKO price has remained unchanged at Rs. 9/ litre since 2002. Based on National Sample Survey 2004-05, the report puts forth the following observations about SKO consumption pattern:

- ▶ **Rural Households:** Only 1.3% use SKO for cooking. Bulk of SKO is used to meet lighting requirements, with 44.4% using it for lighting. Poorest 10% of rural population spends only 2% of its expenditure on SKO & 13% on discretionary items. Implying that the impact of a hike in SKO price on the poorest section of rural population would not be much and could be met by cutting expenditure on discretionary items such as entertainment, sundry articles etc.
- ▶ **Urban Households:** Less than 20% use SKO (10.2% use SKO for cooking & 7.1% for lighting).

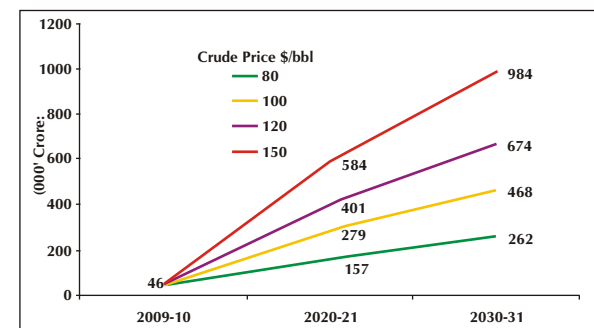
As regards to PDS SKO allocation by MoP&NG, the report finds out that during 1999-00 & 2005-06, the percentage decline in households using PDS SKO was 32.6%, while the reduction in SKO allocation by MoP&NG was only 12.8%.

The report states that due to considerable price gap between PDS SKO & HSD, "35% or more of PDS kerosene is diverted for unauthorized purposes including adulteration." This diversion would negate the effect of "more than Rs.20000 crore of investment in producing Euro III and Euro IV diesel."

Domestic LPG: According to the report "a subsidized product ought to be given in limited amounts. However, domestic LPG is both heavily subsidized and available in unlimited quantity." According to the report, less than 10% of rural households use

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Total under recoveries of oil marketing companies at different levels of Crude Price, 2009-10 to 2030-31



LPG, while urban households get the bulk of LPG subsidy. Top 30% of urban households use 40% of LPG & spend less than 5% of their total expenditure. The impact of hike in LPG price would be low due to its low rural penetration and significant purchasing power of urban consumers.

Recommendations:

Deregulation of MS & HSD: Market determined prices @ both refinery gate & retail levels.

Imposition of additional excise duty on diesel cars: Corresponding to the differential tax on MS & HSD, it is estimated Rs. 81,000 per diesel car.

PDS SKO Allocation reduced by 20%:

1. 5 ltr per household per month for BPL without electricity & 2 ltr per month for households with electricity
2. Allocation be reduced inline with increase in access to electricity.

Increase SKO price by Rs. 6/ litre

1. The above is a short term measure
2. In the long term with Unique Identification project of Government (UID) fully operational:
 - There be a SINGLE PRICE of SKO which is close to HSD price
 - PDS SKO be provided to BPL households through SMART CARD SYSTEM
 - Every Year Price of SKO be raised in accordance growth in *Per capita GDP in Agriculture* which the report recommends to be used as a measure of the increase in purchasing power of rural poor. SKO & LPG pricing not linked international crude oil prices
 - Pricing not linked to international prices

Price of LPG to be raised by Rs. 100/- per Cylinder

1. The above is a short term measure
2. With UID fully operational
 - ▶ There be a SINGLE PRICE of LPG
 - ▶ LPG be provided through SMART CARD SYSTEM in fixed quantity
 - ▶ Subsidy to be provided only to the BPL card holders
 - ▶ Market Price to be periodically revised based on growth in per capita Income
 - ▶ Pricing not linked to international prices

Incremental revenue accruing to ONGC/OIL to part finance SKO/LPG under -recoveries (UR)

1. Different rates of tax on incremental price for different price bands. Higher rates at higher prices.

Remaining SKO / LPG UR to be financed by cash subsidy & not by oil bonds

Assessment of Likely Impact on Oil Marketing Companies:

Moderation in growth rates of MS & HSD consumption with price hike

- ▶ Since 2007-08 despite deceleration in GDP growth HSD & MS growth rates have accelerated. This has been mainly due to their prices remaining more or less unchanged and even declining in real terms.

Entry of Private Sector in MS & HSD

- ▶ Loss in Market Share of PSU OMCs

Easing of financial constraints on OMCs & strengthening of their balance sheets

- ▶ Under Recoveries (UR) on MS & HSD will be nil
- ▶ Under Recoveries on SKO & LPG will remain but will come down and will be financed in cash

Decrease in adulteration of HSD

- ▶ SKO-HSD Price Gap Reduced
- ▶ Increased Sales of HSD & decrease in SKO Sales

General Criticisms of the Report as Appearing in Media:

- ▶ Virtually dismisses the impact of price rise due to increased price of HSD
- ▶ Puts the consumers at the disadvantage and is meant only to benefit the Oil Companies & ultimately the Govt.
- ▶ Has not provided anything to improve the efficiency or increasing access to cleaner fuels

STATISTICS

INDIA: POL IMPORT-EXPORT VALUE & VOLUMES

	2006-07		2007-08		2008-09	
	QTY TMT	VALUE Rs. Crore	QTY TMT	VALUE Rs. Crore	QTY TMT	VALUE Rs. Crore
IMPORTS						
CRUDE	111502	219029	121672	272699	128155	341887
PRODUCT						
NAPHTHA	5307	14277	5983	18470	4988	17349
OTHERS	3244	4286	2931	4219	2564	5350
FUEL OIL	2983	5174	3659	7485	2602	7892
LPG	2278	5766	2833	8700	2347	7832
KEROSENE	1424	4250	2489	8324	1449	6459
LUBES	1021	3392	1253	3402	1145	4721
DIESEL	968	2670	2951	9212	2734	9656
PETROL	421	1326	328	1137	397	1530
BITUMEN	14	19	35	50	59	105
TOTAL	17660	41160	22462	61000	18285	60893
TOTAL IMPORTS	129162	260189	144134	333699	146440	402781
EXPORTS						
DIESEL	11369	29198	14308	40871	13769	47520
NAPHTHA	8411	21431	9297	27365	7284	24028
FUEL OIL	3759	4988	4718	6811	5932	11795
AVIATION TURBINE FUEL	3652	10254	4486	13555	3490	13012
PETROL	3615	10191	4258	13614	5330	17500
OTHERS	1980.1	2865.3	3122	6938	807.4	2240.3
LUBES	509	1207	311	691	93	478
KEROSENE	150	541	137	492	77	362
LPG	112	342	99	401	109	455
BITUMEN	66	77	43	51	40	67
TOTAL EXPORT	33624	81094	40779	110789	36931	117458
NET IMPORT	95538	179095	103355	222911	109510	285323
Net Product Export	15964	39934	18318	49788	18646	56565

Source: Petroleum Policy and Analysis Cell, MoP&NG

INDIA: TRAFFIC AT MAJOR PORTS (million tonnes)

Commodity	2006-07	2007-08	2008-09	Growth% over 2007-08
Pol	154.3	168.7	176.1	4.4
Iron Ore	80.6	91.8	94	2.4
Fert. & raw mts	14.1	16.6	18.2	9.6
Foodgrains	5	2.2	1.8	-18.2
Coal	60	64.9	70.4	8.5
Vegetable Oil	3.6	3.8	4.8	26.3
Other Liquids	10.9	12.8	11.9	-7
Containerized Cargo	73.4	92.3	93.1	0.9
Others	61.9	66.2	60.2	-9.1
Total	463.8	519.3	530.5	2.1

Source : Department of Shipping, Government of India

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