CHAPTER 5

SHALE OIL & GAS: IMPACT ON THE INDIAN ECONOMY

The question that is relevant to most Indians is how is Shale Oil & Gas likely to impact India's economy? And will it result in a reduced import bill? After all, oil and gas are the biggest import components of India's trade and impact the country on the current account front, leading to large foreign exchange outflows, impacting the Indian Rupee. A weakening rupee drives fuel led inflation and impacts everyone.

India's Import Dependence of Oil & Gas and its Economic Implications

In 2013-14, India's imports of petroleum & its products were over a third of all its imports, 34.4 % to be exact as per the Petroleum Planning & Analysis Cell. Our import dependency of Crude oil was to the tune of 77.6%, whilst import dependency of natural gas was 29.2%. The PPAC has also estimated that if crude prices increases by one $ per barrel the net import bill of the country increases by Rs. 2,169 Crores or $ 0.35 Billion, assuming the Jan-Mar 2015 Indian Crude basket at $50/ barrel and an average exchange rate of Rs. 62/US $ per barrel. Further, should the value of the Indian Rupee itself depreciate by one rupee, the additional impact to the country, is estimated the Import bill increasing by Rs. 1,749 Crores or $ 0.28 Billion (Petroleum Planning & Analysis Cell, 2014b). A double impact! In effect, nothing keeps the country more coupled with global markets, so significantly, as our oil and gas imports and growing domestic consumption does.

India's Present Energy Mix

As per EIA, India imported 38% of all its fossil fuel requirements in 2012, despite the having significant domestic fossil fuel reserves. India was ranked as the fourth-largest energy consumer in the world in 2011, following China, the United States, and Russia. India's energy demand continues to grow as a consequence as well as a requisite its growing economy and modernization. The World Bank puts India is the world's third-largest economy on a purchasing power parity basis.

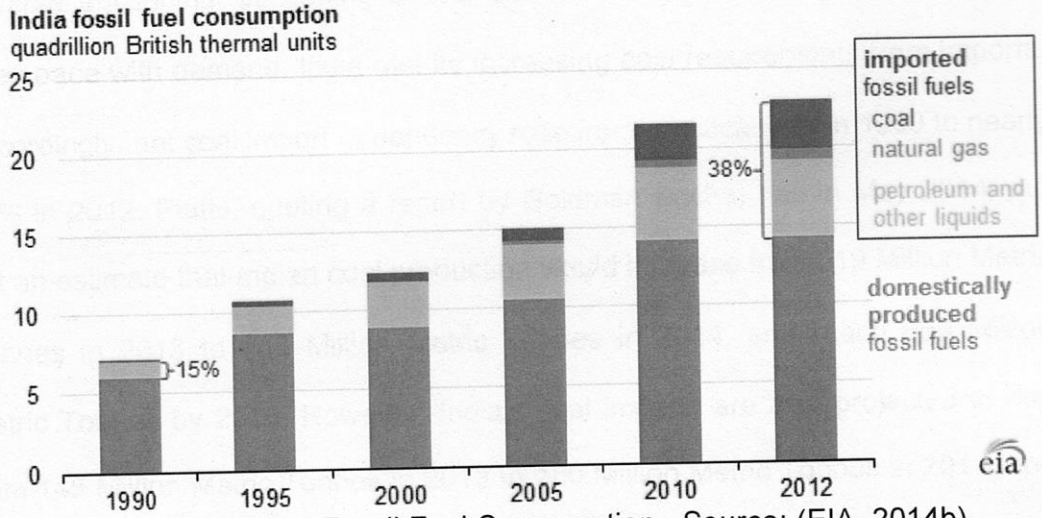


Chart 16: Indian Fossil Fuel Consumption Source: (EIA, 2014b)

Coal is India's primary fossil fuel, meeting 44% of total energy requirements. As per EIA, "India was the world's third-largest coal producer, consumer, and importer of coal in 2012" (EIA, 2014b). Despite its significant coal reserves, increase in coal production has been slow, at about 4% per annum, against a demand that continues to rise at over 7% per annum. Coal is mainly used in India for electric power generation, in addition to other uses such as inputs for steel, cement etc, which are smaller in comparison. Coal-fired plants accounted for 154,000 Mega Watts (MW) of India's total power generation

capacity of about 255,680 MW as of 31 December 2014 (Ministry of Power, Government of India, 2014).

This increase in demand for coal is a result of growing electricity requirements of a growing country, as well as a consequence of the lower than expected power generation output from natural gas based power plants. Increasing dependence on coal based power has in turn led to coal shortages, which the government is working hard to alleviate. Some issues, like that of new coal mine allotments went into a legal review, and have taken time to emerge form that phase, onto the new policy, announced by the government, that of 'reverse auctioning' auctioning of ibid coal mines. Since coal production could keep pace with demand, India met its increasing coal requirements from imports. Accordingly, net coal import dependency rose from practically nil in 1990 to nearly 23% in 2012. Platts, quoting a report by Goldman Sachs, has in May 2014, put out an estimate that Indian coal production would increase from 519 Million Metric Tonnes in 2013 to 543 Million Metric Tonnes in 2014, and reach 669 Million Metric Tonnes by 2018. However, India's coal imports are also projected to rise from 145 Million Metric Tonnes in 2013 to 160 Million Metric Tonnes in 2014, and reach close to 230 Million Metric Tonnes in 2018(Platts , 2014) . The Government of India, however has a more ambitious programme, of increasing indigenous coal production and is targeting doubling the coal production in the next five years, to reach close to a Billion Metric Tonnes, "*I see Coal India production doubling in the next five years. It makes about 500 million tonnes hopefully this year. We (will) do a billion tonnes in 2019*," said Shri Piyush Goyal, Minister of State for Power, Coal as well as New and Renewable Energy (PTI, 2014a).

Notwithstanding the attempts by the government to increase coal production, in the near term, import of coal is most likely to remain a reality.

Natural gas has so far been a substitute for coal, for power generation and as an alternate to LPG and other petroleum products for fertilizer feedstock and certain other sectors. India was self-sufficient in natural gas until 2004, when it began to import liquefied natural gas (LNG). Because of insufficient natural gas infrastructure at a national level as well as insufficient indigenous natural gas production to meet its demand, India has been importing LNG. In 2013, India was the world's fourth-largest LNG importer, following Japan, South Korea, and China, and consumed almost 6% of the global market.

Natural gas consumption has grown at an annual rate of 8% from 2000 up to 2012, although lower than expected supply from domestic gas fields, from 2011 onwards has resulted in declining consumption. In 2012-13, India consumed 242.6 Million Metric Standard Cubic Meter Per Day (MMSCMD) of natural gas. LNG imports accounted for about 29% of 2012 demand, and LNG is expected to account for an increasing portion of demand at least in the next several years as Indian energy firms attempt to reverse the country's recent domestic production declines. Increasing LNG imports will depend on the pace of expansion in regasification terminal capacity and pipeline infrastructure connecting gas to markets that currently lack access.

The majority of natural gas demand in 2012 came from the power sector (33%), the fertilizer industry (28%), and the replacement of LPG for cooking oil and other uses in the residential sector (15%), according to Ministry of Petroleum & Natural Gas.

India's Future Energy Mix

As per 'Vision 2030', a report on Natural Gas by Industry Group for The Petroleum & Natural Gas Regulatory Board, the growing demand for energy and its supply dynamic is expected to alter the primary energy mix of India on account of the substitution of oil by natural gas. The share of natural gas in the energy mix of India is projected to increase to 20% in 2025 as compared to 11% in 2011(Akhil Mehrotra; et al, 2013). However, these projections are subject to fructification of growth in gas infrastructure, to include import terminals, regasification plants and trans-national gas pipelines keeping pace.

Demand for natural gas has increased significantly due to its increased availability, development of transmission and distribution infrastructure, economies in use of natural gas in place of traditional fuels, its environment friendly characteristics and the economic advantages of supplying gas at lower prices to end consumers. As mentioned earlier, power and fertilizer feedstock sector are the two biggest contributors to natural gas demand in India and continue to account for more than 55% of gas consumption. As per the report 'Vision 2030' India's natural gas demand is all set to grow significantly at a CAGR of 6.8% from 242.6 MMSCMD in 2012-13 to 746 MMSCMD in 2029-30. Gas based power generation is expected to contribute the most, in the range of 36% to 47%, to this demand in the projected period from 2012-13 to 2029-30. Fertilizer sector's share in the overall gas consumption expected to go down from 25% in FY 2013 to 15% in FY 2030 due to higher growth in other sectors.

MMSCMD	2012-13	2016-17	2021-22	2026-27	2029-30
Power	86.50	158.88	238.88	308.88	353.88
Fertilizer	59.86	96.85	107.85	110.05	110.05
City Gas	15.30	22.32	46.25	67.96	85.61
Industrial	20.00	27.00	37.00	52.06	63.91
Petchem/Refineries/Internal Cons.	54.0	65.01	81.99	103.41	118.85
Sponge Iron/Steel	7.00	8.00	10.00	12.19	13.73
Total Realistic Demand	**242.66**	**378.06**	**516.97**	**654.55**	**746.03**

Table 3: Assessed Sector Wise Demand for Natural Gas of India
Source: (Akhil Mehrotra; et al, 2013)

Growing demand has to be met by growing supply, or demand mismatch will continue to persist. Projected supply of natural gas is expected to grow at a CAGR of 7.2% from 2012 to 2030 reaching 400 MMSCMD by 2021-22 and 474 MMSCMD by 2029-30. The supply profile for the projected period, as per the report "Vision 2013" is as under.

MMSCMD	2012-13	2016-17	2021-22	2026-27	2029-30
Domestic Sources	101.1	156.7	182	211	230
LNG Imports	44.6	143.0	188	214	214
Gas Imports (Cross border Pipelines)	0.0	0.0	30.0*	30.0	30.0
Total	**145.7**	**299.7**	**400**	**454**	**474**

Table 4: Projected Source Wise Supply of Natural Gas 2012-13 to 2029-30
Source: (Akhil Mehrotra; et al, 2013)

Availability of natural gas in India is expected to fall short of the total natural gas demand by around 94 MMSCMD in 2014-15. However, this shortfall is likely to reduce by 2017-18 if substantial addition in regasification capacity and natural gas supply from imports increases. The demand-supply gap is likely to

again increase post 2017-18 and reach about 272 MMSCMD by 2029-30 as increase in supply are projected to lag behind a steady increase in demand. The demand-supply gap that is likely to prevail over the projected period has been depicted in the chart that follows.

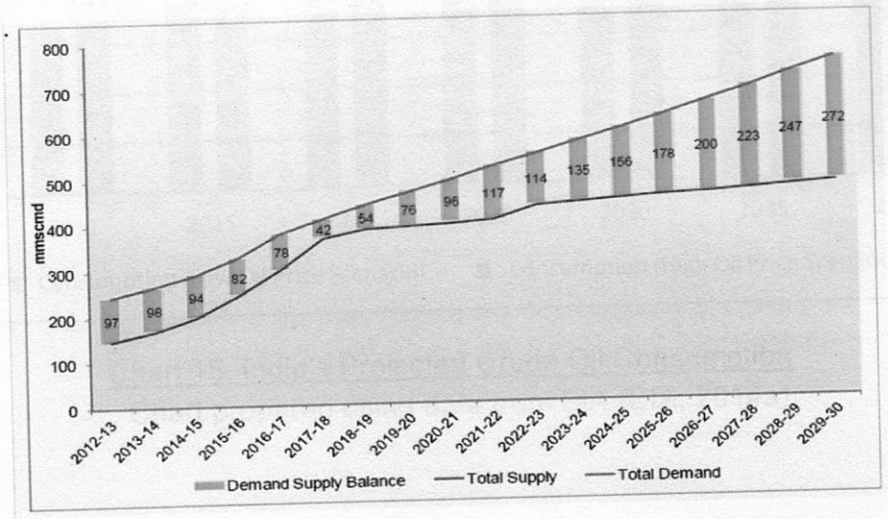


Chart 17: Natural Gas Demand Supply Gap from 2012-13 to 2029-30
Source: (Akhil Mehrotra; et al, 2013)

Oil is the next major constituent in India's energy mix. As per EIA 2014 International Energy Outlook, India's demand is likely to double, going forward in to 2040, in both cases, whether low oil prices, or high oil prices.

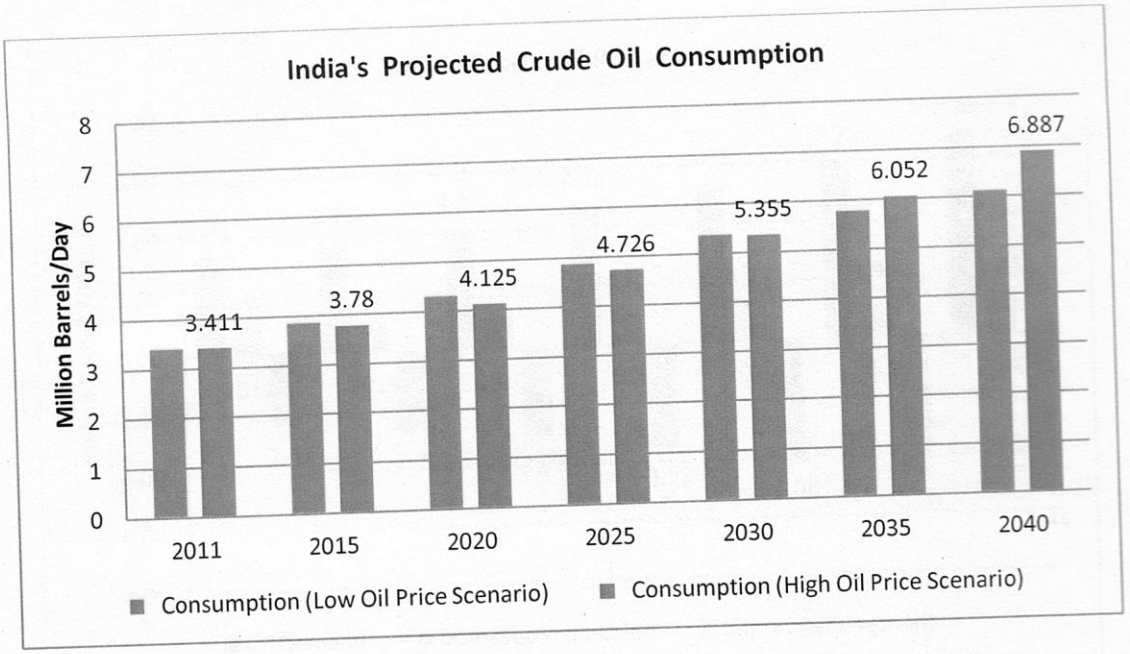


Chart 18: India's Projected Crude Oil Consumption
Chart prepared using data from EIA (EIA, 2014a).

India is not geologically endowed with large oil producing basins, and our domestic oil production remains more or less around the one million barrel per day mark. While the country has witnessed nine rounds of bidding under the 'New Exploration Licensing Policy' *or NELP*, with nine rounds complete and the tenth round in the offing, oil production is not foreseen to be increasing substantively in the future. So any growth in demand has perforce to be met with by imports. A chart, using EIA data has been prepared, to indicate the extent of likely import dependency of crude, and is as follows.

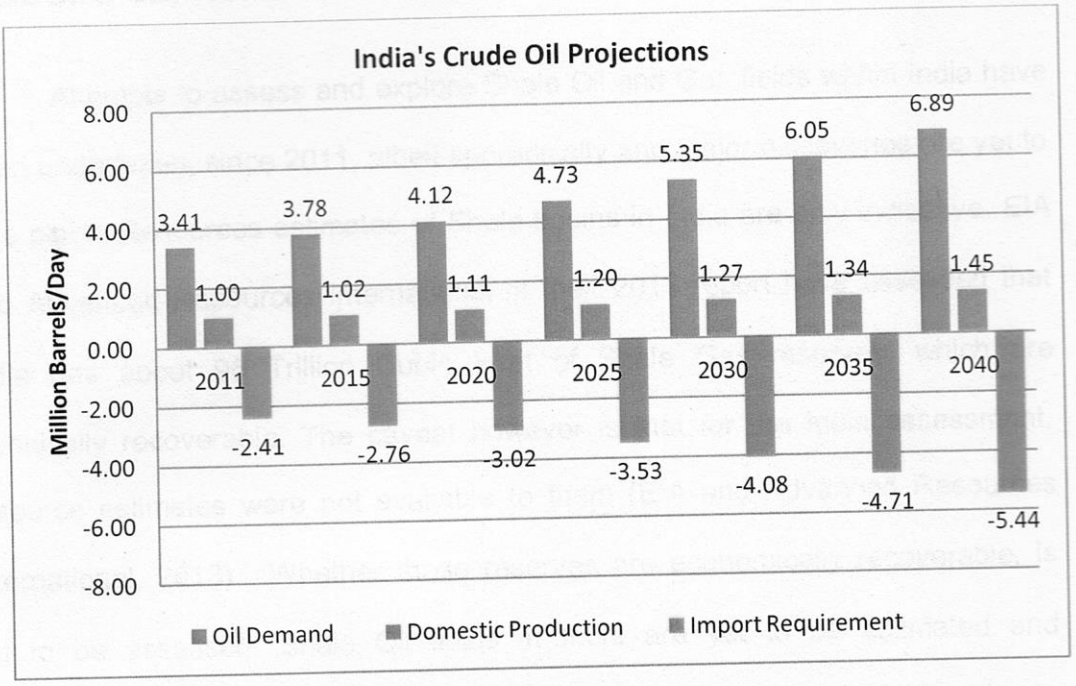


Chart 19: India's Crude Oil Projections
Chart prepared using data from EIA (EIA, 2014a).

Quite clearly, the future portends two clear indicators. The first is that India's oil & gas demands will witness substantial increase in the future. The second is that both oil & gas will have to be imported, to meet the gap. In such a context, price stability, price moderation and increased availability of crude and natural gas holds definite and significant advantages for the country. An analysis of increased availability must take precedence over other factors, since it also impacts supply-demand dynamics and in turn prices and volatility, internationally.

Increased supply of crude oil and natural gas, can theoretically result from increased production indigenously, i.e. from within India. And the country is making all efforts to do so.

Shale Oil & Gas Production in India

Attempts to assess and explore Shale Oil and Gas fields within India have been undertaken, since 2011, albeit sporadically and major discoveries are yet to take place. Resources estimates of Shale basins in India are only indicative. EIA and Advanced Resources International in their 2013 report have assessed that India has about 96 Trillion Cubic Feet of Shale Gas reserves, which are technically recoverable. The caveat however is that for the India assessment, resource estimates were not available to them (EIA and Advanced Resources International, 2013). Whether these reserves are economically recoverable, is yet to be assessed. Shale Oil fields in India are yet to be estimated and published, although the data put out by the Director General of Hydrocarbons, Ministry of Petroleum & Natural Gas, Government of India in its Tenth NELP Bidding documents, does give out the details of the geology and stratification, and herein Shale and kerogen layers are indicated (Director General of Hydrocarbons, Ministry of Petroleum & Natural Gas, Government of India, 2014).

Commercial production of Shale Oil or Shale gas, i.e. natural gas extracted from Shale deposits is yet to commence. Joshi Technologies made the first Shale Oil discovery in Cambay Basin in mid-2010 (EIA, 2014b). ONGC had dug a Shale Gas exploratory well at Jambusar, near Vadodara in October 2013. It does have plans to continue exploration, in the Cambay and the Krishna-Godavari Basins (PTI, 2014b). There have been reports of other Shale Oil and Gas field finds, sporadically, in various locations, but these have yet to become sustainable oil or gas producing wells/fields. As trends indicate, Shale Oil & gas, indigenously produced, within India is a possibility, but may take more time for

fruition. In the recent Kelkar Committee Report titled Roadmap for Reduction in Import Dependency in Hydrocarbon Sector by 2030– Part I, has stated that

"*Shale gas has been a game changer in the US energy landscape. In less than a decade, US supply has shifted from that of deficit to surplus. Many agencies have predicted huge shale gas potential in Indian basins. Shale gas may account for more than 75% of India's untapped yet-to-find potential, according to certain industry estimates. Development of shale gas could represent a significant step towards India's goal of achieving energy security*" (Kelkar Committee, 2013) .

Impact of US Shale Oil & Gas on India

Increase in availability of natural gas, globally, due to Shale gas extraction and hence availability of imported natural gas is the biggest impact. One of the biggest consumers and importers of natural gas in the world, US is likely to become self-sufficient in natural gas in the next few years, largely due to increasing production of natural gas indigenously, from Shale Gas fields, as mentioned in Chapter 2. The EIA 2014 Annual Energy Outlook prognosticates that the US is likely to turn a net gas exporting country, by 2018 (EIA, 2014a).

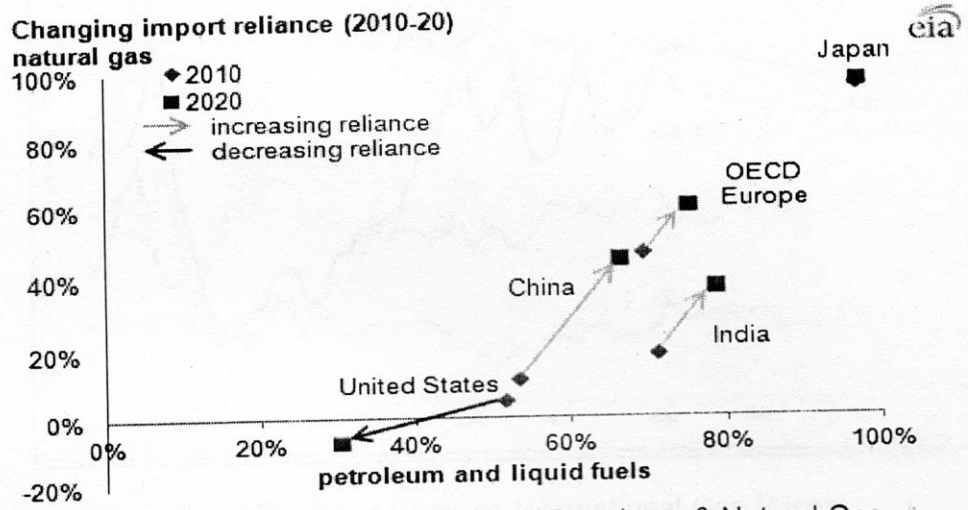


Chart 20: Changing Import Reliance of Petroleum & Natural Gas
Source: (EIA, 2014e)

These projections are based on robust growth & production output of US Shale Gas in the last decade. As a result, the price of natural gas in the US has moderated and is averaging around 3-4 US $/ MMBtu. US natural gas prices, which historically moved with other gas hub prices in the UK and Japan, have since diverged, to moderate to lower levels consistently, reflecting the increasing supply due to the Shale Gas additions within the US, as compared to demand. Elsewhere, as in Europe, which is largely dependent on Russian gas; Japan, China, South East Asia and India, which are dependent upon gas from the Middle East, continue to witness higher gas prices than those prevalent for the last few years, in the US, i.e. the Henry Hub prices. A chart below, indicating Henry Hub (HH), UK's National Balancing Point (NBP), and Asian Spot prices along with oil parity prices based on Platts and Bloomberg data, is indicative.

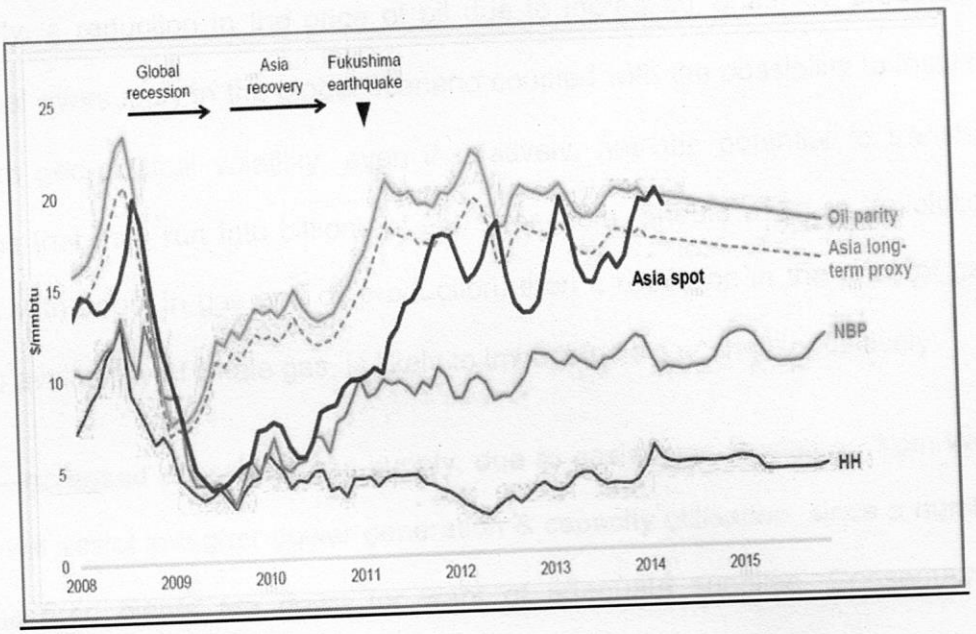


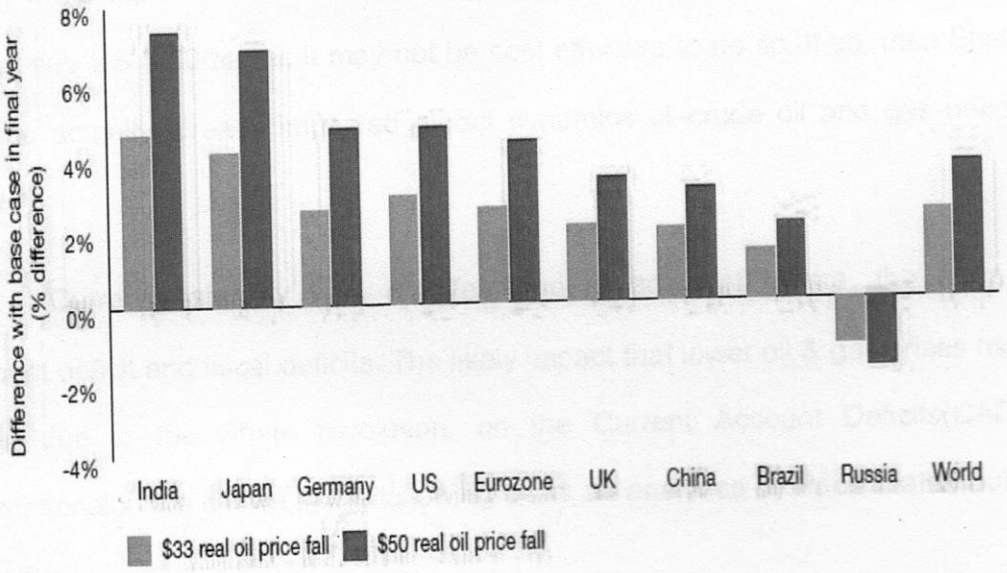
Chart 21: Chart Showing International Gas Prices
Source: (Bloomberg and Platts, 2015)

With legislative changes in the US widely foreseen and expected to assist export of oil & gas, availability of natural gas is expected to increase, driven primarily by substantial Shale Gas output. In turn this will lead to a decoupling of traditional gas suppliers from the US, to and the gas thus freed, in effect surplus and freely exportable gas, will become available to countries like India. It will also moderate of global gas prices, as marginal increase in supply is going to favourably impact the supply & demand dynamics. Apropos, availability of natural gas to India is likely to improve, and India has the option of sourcing such gas from a number of sources, at better, more competitive terms. This has the potential and likelihood of bring down the price of imported natural gas in India, and hence directly impacts the Import bill of the country. In 2013-14, we have imported 14 Million Tons of Oil Equivalent (Mtoe) of LNG gas for about US $ 8.5 Billion US $. A 15% reduction in gas price can leads to a reduction of over a billion US $ today, and going forward, it may well translate many times over. Similarly, a reduction in the price of oil due to increased Shale Oil production, marginal oversupply in the global scenario coupled with the possibility to insulate oil from geo-political volatility, even if relatively, has the potential to translate savings that may run into billions of US $ for India. Should a Shale 'revolution' occur, with boost in gas and oil production, then a reduction in the price of gas, due to availability of Shale gas, is likely to impact India's economy positively.

Increased & assured gas supply, due to easier gas availability from West Asia, will assist in higher power generation & capacity utilisation, since a number of gas fired plants are down for want of adequate supplies. Consequently, fertiliser inputs costs are estimated to come down, with pass through effects. In

turn, budget subsidies are certain to reduce if gas prices and fertilizer costs reduce.

With import cost of gas coming down, import bill is certain to reduce. Similar is the case with crude oil. Whilst oil production may not itself increase substantially, as in the case of gas, but the marginal increase in Oil in the US is likely to moderate price increases, and a low to moderate oil price regime can be expected. In such a scenario, India, largely dependent on imports of crude, will benefit tremendously on the current account deficit, budgetary support, as well from overall benefits of lower oil prices, in the form of low inflation, higher GDP growth and the consequent positive spiral. Two scenarios of oil price drop, from their recent averages of around 100 US $/barrel, that of a 33 US $ drop; or a 50 US $ drop have the potential, to impact India's GDP growth estimates by between 4 to 7% in the long term.



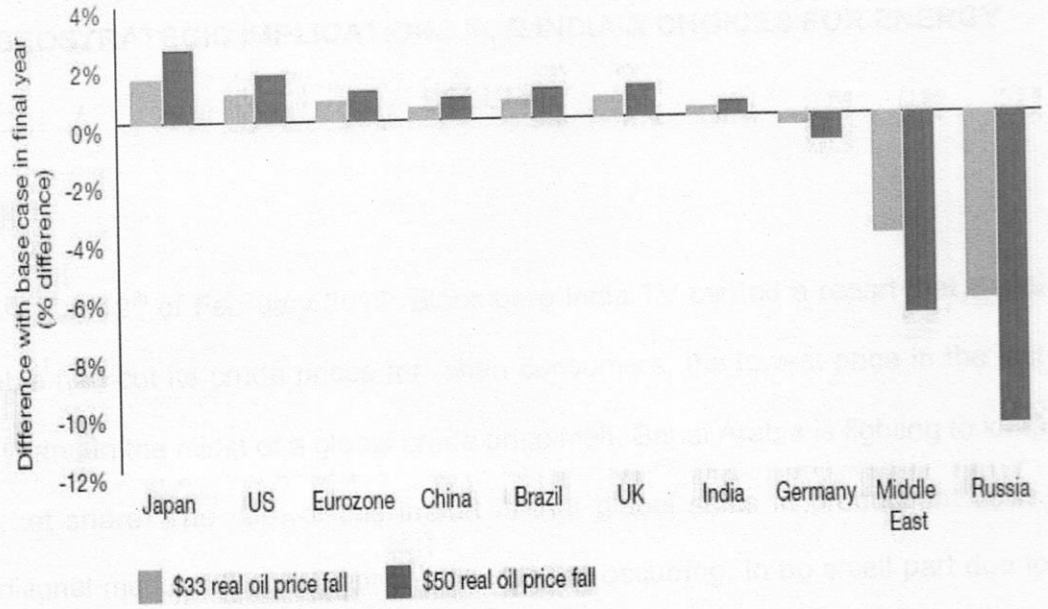
Source: PwC analysis using NiGEM

Chart 22: Change in National GDP in Oil Price Scenarios (Relative to Baseline)
Source: (Price Waterhouse Coopers, 2013)

As is being witnessed now, in spite of a volatile Middle East, with festering violence in Syria, Iraq; earlier in Israel – Palestine controlled West Bank; Lebanon; Egypt; Libya; Sudan; Tunisia; in fact the entire West Asia & North Africa, due to a surge in Shale led oil & gas production, prices have fallen considerably, due to marginal global oversupply. The Arabian states are holding production levels, as decided in the last OPEC meet on 27 October 2014, and are not reducing prices, as stated, in order to ensure that they do not lose market share. It is a foregone conclusion, that market share can only be lost in a situation of oversupply. This is a manifestation of the Shale revolution that India is benefitting from.

The other reason to allow oil prices to fall to low levels has been, ascribed by many commentators, to drive the US Shale Oil producers out of business, as Shale Oil is expensive to produce (this has been discussed earlier in Chapter II) and at sub US $ 50/barrel, it may not be cost effective to do so. If so, then Shale Oil has actually already impacted global dynamics of crude oil and gas prices already.

Currency stability is a manifestation of amongst others, the current account deficit and fiscal deficits. The likely impact that lower oil & gas prices may have, due to the Shale revolution, on the Current Account Deficits(CAD), internationally, are shown in the following chart, as analysed by Price Waterhouse Coopers.



Source: PwC analysis using NiGEM

Chart 23: Change in National Current Account Deficit in Oil Price Scenarios
Source: (Price Waterhouse Coopers, 2013)

Conclusion

In concluding this chapter, should the Shale 'revolution' truly happen, and not turn out to be a short-lived phenomenon; the impact on India is assessed to be substantially beneficial. Low oil prices, of the kind being witnessed now, i.e. in the range of 50-60 US $/ barrel, have so positively impacted the macroeconomic situation for India. However, to derive optimal benefits from unconventional oil & gas, and in order to reduce our external dependence of energy, India needs to push domestic oil & gas exploration & production efforts, in all its prospective Shale basins, and supplement its conventional oil & gas production.