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India's energy security: Challenge and resolution

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Abstract
In twenty-first century, global realities have altered the concept of national security. While national security is a holistic concept, energy security is one of its major components. The latter essentially involves ensuring uninterrupted supply of energy to support the economic and commercial activities necessary for sustained economic growth. As far as India is concerned, energy security emanates from the growing imbalance between the demand for energy and its supply from indigenous sources resulting in increased import dependence.

Keywords: energy security, IEA, BHP, GPFA, GASPA, LNG, NELP, GSPC, IAEA, 123 agreement, CBM, ONGC

Introduction

Economy and energy are deeply inter-related. Energy availability is the key to economic growth and higher economic growth in driven by increasing energy consumption. At present, fossil fuel, viz. oil, gas and coal, meet around four-fifth of the total energy demand in the world, which will continue to command a predominant share in the next two decades or so [1]. Securing energy resources is of strategic importance. Majority of the established by dry carbon resources in the world are confined to and controlled by few countries, whereas the demand is worldwide. The concern related to assured supply are threats of supply disruptions, terrorism, instability in exporting nations, nationalist backlash, geopolitical rivalries, speculative trading and business cartels. Recent global developments like economic downturn of 2008-09 and the geo-political unrests in Middle-East countries have once again demonstrated the vulnerability of world's crude oil prices and the resultant on economic growth of countries.

The Indian economy which registered a high and robust growth of over 9% per annum during 2005-06 and 2007-08, and withstood the global financial crisis and economic slowdown during 2008-09 and 2009-10 has made a quick recovery. The future outlook for the Indian economy looks as robust and sanguine. According to International Energy Agency, India is projected to achieve highest average real GDP growth of 6.4% during 2008-2035, as against 5.7% by China. In line with GDP growth, India is also projected to reach the highest primary energy demand growth in the world during the reference period 3.1% p.a. against 2.1 by China [3].

Growth demands energy. It is no wonder that India – with an economy expected to growth at over 5 percent a year for the next twenty-five years – has developed a ravenous appetite for energy. India is the world's fifth largest consumer of energy, and by 2025 it is expected to become the third largest, overtaking Japan and Russia.

India's demand for oil alone is expected to increase at an average rate of 2.9 percent annually over the next quarter century. Yet India has only 0.4 percent of the world's proven oil reserves, and domestic production is expected to remain constant, if not decline. Absent the discovery of major reserves – which most analyst view as unrealistic – it is clear that India will remain a net importer of oil. If consumption follows the current trajectory, India is also projected to run out of coal, its primary source of energy, in forty years. Its domestic natural gas reserves are limited as well [4].

Energy security consideration for India will therefore require:

1. Ensuring availability of energy sources through domestic efforts or through long term supply agreements or through buying assets abroad'
2. An elaborate distribution network for domestic supplies'
3. Development of infrastructure to cope with the growing demand in terms of storage, import terminals etc.'
4. Energy conservation;
5. Alternate and diverse sources of energy and the needed R & D;
6. To grow our energy supply in an environmentally responsible manner;
7. Above all, institutional and policy mechanisms to ensure an equitable supply of energy backward sections of the Indian society;

India's import dependence has intensified concerns that without reliable, affordable energy it will be unable to sustain high economic growth. India imports its three major sources of energy, and its dependence on imported oil is expected to increase even further. The situation is complicated by a number of factors:

1. Major oil suppliers are in unstable regions in the Middle East and Africa;
2. Oil prices are high, spurring higher gas prices;
3. Geopolitical uncertainty stokes fears of a possible supply disruption and volatility in oil prices;
4. Slow market reform has limited investment, and
5. Few or no viable energy alternatives currently exist.

The Present Scenario

According to the statistics of the US Energy Information Administration; the Indian energy mix is comprised of combustible and waste (38.2%), oil (22.4%), gas (4.2%), Hydro (1.2%), nuclear (0.8%), geothermal, solar and wind (0.1%). This reflects India's relatively low level of economic development (although it may also have to do with differences in reporting). If its current economic growth continues, India will see 'Chinese developments' with a reduction in the role of combustible renewable and waste, and a rapid increase in the consumption of coal and oil, as well as the promotion of renewable energy sources such as geothermal, solar and wind. If India's current energy policy is vigorously pursued, we are also likely to see a further boost to the importance of natural gas and nuclear power.

By production source, India's electricity generation is derived from: coal (68.3%), hydro (11.9%), gas (11.5%), oil (4.6%), nuclear (2.8%), and solar PV, biomass and other sources (0.9%). Compared with the situation in China, gas plays a surprisingly prominent role in Indian electricity production [5].

Since 2002 several major gas finds have been made that have the potential to supplement the India's dwindling oil reserves. Despite this, Indian domestic gas production is not sufficient to cover a significantly increasing demand, and India began importing gas in 2004 [6]. As of 2005 India produced about 90 million standard cubic meters of natural gas per day. IEA projects a demand of natural gas at the level of 400 million standard cubic meters a day in 2020. Compressed natural gas consumption for vehicles is expected to reach 5% of total consumption already in 2010 and India has ambitious plans for city gas projects.

The share of gas in India's energy mix is expected to increase sharply, and grow to 20% by 2015 [7]. Despite its major gas finds; India is likely to import 30-40% of the gas it uses. The key challenge for rapid development of the gas sector is the capacity of Indian power generators to pay market-based gas prices, which in turn depends on vigorous implementation of power sector reform [8].

A. Coal

The major consumer of coat in India is the power sector which consumes more than the two-third of the production. The other industries that depend on coal are steel, cement, fertilizers, chemicals, paper etc. India is comfortable with the reserves of the economy even today. Three quarters of the total coal reserves in India are concentrated in the states of Bihar, Madhya Pradesh, and West Bengal. The report on the Group of Indian Hydrocarbon Vision 2025 predicts the share of coal is projected to increase from 53% to 50% during 2025.

B. Oil & Gas

India is the fourth largest oil consumer in the world after USA. China and Japan and more than 75% of crude oil requirement is met through imports. The growing mismatch between rinsing oil consumption and slower growth rate of production has resulted in increased import dependence to meet its energy demands. India's total import bill for crude oil and natural gas during 2010-11 was approximately US$ 85 billion [9]. In the near and medium terms, gap between domestic production and demand is projected to increase further. Most of the demand of the Oil and Gas emerged from the transportation sector. The industries and agriculture also are the major consumers. Production from overseas oil gas blocks presently contributes about 10.5% of domestic production of India [10]. The import dependency reached 73.3% in the recent past. However, the effects of global slowdown were reflected in the Indian economy too and were manifested as postponement of several planned refinery capacity additions/pipelines, and work-in-progress of grassroots refineries.

As per the BP Statistics the gas consumption in India constitutes 11% of its energy mix. The report of the Group of Indian Hydrocarbon Vision 2025 predicts the share of natural gas in to increase to around 20% by 2025. As per Integrated Energy (2008), it is projected that the total consumption of natural gas in India will reach beyond 600 MMSMCMD by 2030. It was expected that by 2015, Indian gas market is likely to be as large as that of Japan [11].

The recent success of the discovery of the Godavari basin in the Andhra Pradesh region has not only improved the India's energy security by boosting possible gas production by 50%, but also raised the prospects of Indian sedimentary basins in the international arena.

C. Power

The power sector reforms need to strengthened and made deeper for meeting the rising domestic needs. The increasing demand supply gap, the obsolescence of the installed plants, frequent failures of the grids, rising losses faced by the electricity boards, loss in the distribution, relatively high cost of production are some of the major concerns in this sector. Too much reliance on the non-renewable sources to generate power is also unviable in the long run.

India at present has an installed generating capacity of around 107 GW, which is classified further into 70% thermal, 25% hydro, 3% nuclear; and 2% wind & power. A major portion of this installed capacity is still under the government control and only a small portion is owned by private sector. However, the situation was quite reverse before independence where the power sector was dominated by private sector presence. Later due to its strategic nature, all the segments of the power sector were nationalized. It is paradoxical that today again we would be seeking the help of private players to meet the demand supply gap. This model is already being followed in certain states of India such as Maharashtra, AP and Orissa.

Like China, India is a growing giant facing the critical challenge of meeting a rapidly increasing demand for energy. With over a billion people, a fifth of the world population, India ranks sixth in the world in terms of energy demand. Its economy is projected to grow 7%-8% over the next two decades, and in its wake will be a substantial increase in demand for oils to fuel land, sea, and air transportation.

While India has significant reserves of coal, it is relatively poor in oil gas resources. Its oil reserves amount to 5.9 billion barrels, (0.5% of global reserves) with total proven, probable, and possible reserves of close to 11 billion barrels. The majority of India's oil reserves are located infield's offshore Bombay and onshore in Assam. Due to stagnating domestic crude production, India imports approximately 70% of its oil, much of it from the Middle East. Its dependence is growing rapidly. The World Energy Outlook, published by the International Energy Agency (IEA), projects that India's dependence on oil imports will grow to 91.6% by the year 2025.

Overseas Oil fields

Concerned about its growing reliance on oil from the Persian Gulf- 65% of its energy is imported from the region – India is following in the footsteps of other major oil importing economies, and seeking oil outside the Gulf. Indian firms' investment in overseas oilfields is projected to reach $3 billion within a few years. Of particular interest is Africa, especially Sudan, where India has invested $750 million in oil, and Nigeria, with which India reached a deal last November enabling it to purchase about 44 million barrels of crude oil per year on a long term basis. Additionally, India recently finalized a contract in Syria for the exploration, development and production of petroleum with a Syrian company. Sakhalin, in Russia, and Vietnam and Myanmar in Southeast Asia are also potential suppliers to the Indian market.

But the most attractive oil domain outside the Persian Gulf is the Caspian Basin where India is trying to befriend the region's leaders and, if possible, gain a foothold. To support energy security interests in Central Asia, India has already stationed troops in Tajikistan, provided it with $40 million aid package and understood to refurbish an air base near the Tajik capital Dushanbe India is also pursuing relations with Kazakhstan, Azerbaijan and Iran.

India policy of source diversification has problematic implications. First, many of the countries with which India is dealing are known for severe violations of human rights, sponsorship of terrorist activities, and general misuse of oil revenues. Further enrichment of oil supplying countries like Sudan, Syria and Iran is the interest of India, a country which itself is a prime target of Islamist terrorism. Second, the exploration of overseas oilfields, especially in the area of the South China Sea, could bring India in direct competition with fellow Asian countries like China and Malaysia. Most importantly, this policy contributes to accelerating global depletion of non-Middle East oil reserves, and will lead India and the rest of the world to a point in which dependence on the region would be far stronger.

In addition to its struggle to secure supply, India is becoming increasingly aware of the fact that its economy is highly vulnerable to supply disruptions. Till recently, India did not have energy security policy or contingency plans to fall back on in case of crisis. Nor is it a member of any organization like the International Energy, which was born in the aftermath of the 1973 oil crisis to protect members from any future disruptions in the energy market. To minimize the impact of global fluctuations, India is building a strategic crude oil reserve facility on its southern and eastern coasts.

Bilateral Energy Cooperation

Bilateral energy cooperation with neighbouring nations to facilitate plans for regional natural gas and oil pipelines, included from Burma, Bangladesh, Iran and Turkmenistan. The lowering of India-Pakistan tensions due to the start of a dialogue process has raised expectations that New Delhi would yield to the Pakistan and Iranian desire for a $3 billion India-Iran gas pipeline via Pakistan. Such an overland pipeline, which is also being promoted by Australia's Broken Hill Proprietary (BHP) Company, would be a major foreign exchange earner for Pakistan. Islamabad could earn up to $735 million a year in transit fees and other charges. This, however, is not the only option for India to import natural gas by pipeline from Iran's huge South Pars field. Two offshore routes bypassing Pakistan have also been technically analyzed by international firms at the behest of the Indian and Iranian governments.

- **Turkmenistan-Afghanistan – Pakistan-India (TAPI) Gas Pipeline**

To settle various issues related to the Gas Purchase Agreement (GASPA), bilateral and multilateral energy cooperation meetings have been held among the four countries and their gas companies participating in the Turkmenistan-Afghanistan-Pakistan-India (TAPI) Gas Pipeline Project and signed the Gas Pipeline Framework Agreement (GPFA) in December 2010 [12]. Its initial capacity will be 27 billion cubic meters (950 billion cubic feet) of natural gas per year of which 2 billion cubic meters (71 billion cubic feet) will be provided to Afghanistan and 12.5 billion cubic meters (440 billion cubic feet) to each Pakistan and India. Later the capacity will increase to 33 billion cubic meters (1.2 trillion cubic feet) [13]. The pipeline was expected to be operational by 2014 [14].

- **Iran-Pakistan-India (IPI) Gas Pipeline**

Under the Iran-Pakistan-India Gas (IPI) Pipeline 60 MMSCMD of gas is proposed to be supplied in Phase-I, to be shared equally between India and Pakistan and 90 MMSCMD of gas is envisaged to be supplied in Phase-II. Several critical issues, viz, the delivery point of Iranian gas, the project structure, guarantees related to safety of the pipeline and security of supply, besides pricing of gas are yet to be resolved [15]. On 1 May 2012 it was reported that Pakistan's foreign minister, Hina Rabbani Khar and said that Islamabad will not give in to US pressures to mothball the project and will finish the huge pipeline project "at any cost" and that the project was in line with the India's national interest [16]. On 4 September 2012 the project was announced to commence before October 2012 and be completed by December 2014 [17]. On 29 January 2013 US Consul General Michael Dodman threatened Pakistan with economic sanctions if it does not abandon the project [18].

- **Indo-US Civil-Nuclear Agreement**

The 123 Agreement signed between the United States and India is known as the U.S.-India Civil Nuclear Agreement or Indo-US nuclear deal [19]. The framework for this agreement was a July 18, 2005, joint statement by Indian Prime Minister Dr. Manmohan Singh and then U.S. President George W. Bush, under which India agreed to separate its civil and military nuclear facilities and to place all its civil nuclear facilities under International Atomic Energy Agency (IAEA) safeguards and, in exchange, the United States agreed to work toward *full* civil nuclear cooperation with India [20]. In this agreement US agreed to sell both nuclear reactors and technology to India. This is big business industry – roughly $150 billion [21] worth, accordingly to estimates from the US-

India Business Council (USIBC). The numbers are extrapolated from the Indian nuclear industry's plans to increase nuclear power output from around 4,780 MW now to 20,000 MW over the next three decades. The Atomic Energy Commission has doubled its target for 2025 from 20,000 MW to 40,000 MW. Nuclear energy today accounts for barely 2.5 percent of India's total generation of 137,000 MW [22].

Policies Implemented by Indian Government

- Increased fuel efficiency through a cut in state subsidies on all petroleum products, except some household necessities such as kerosene and cooking gas which receive the up to 40% subsidy to benefit the poor.
- Shift to natural gas and LNG: India will be a major importer of natural gas and LNG over the next few decades. The cheapest way to supply India with gas would be through pipelines from Central Asia and the Middle East, through Pakistan, but due to tense relations with Pakistan the two countries have not been cooperating on energy schemes and such pipelines are politically infeasible. On the eastern coast, imports of small amount of natural gas from Bangladesh may be feasible. However, Bangladesh's internal party politics does not allow taking a decision in favour of New Delhi. Consequently, India is focusing on costlier LNG imports especially from Oman and Qatar. This would require construction of LNG terminals which pose security risks and are attractive targets for terrorists.
- Increased domestic production: In the past few years the government introduced a new exploration licensing policy aimed to promote investment in the exploration and production of domestic oil and gas. It is premature to determine how much oil can be generated domestically and for how long, but privatization of the oil sector, removal of bureaucratic obstacles and improved business climate could improve India's energy security.
- Increased utilization of clean coal technology: India is the third largest coal producer and holder of 7% of global reserves of coal. Coal provides 56% of India's commercial energy supply. Application of the coal gasification combined cycle process is an emerging technology for clean and efficient coal fuelled generation.
- Shift to next generation fuels and increased use of renewable sources of energy. India is probably the only country in the world with a full-fledged ministry dedicated to the production of energy from renewable energy sources. The Indian government is promoting the use of ethanol made from sugar cane and bio-diesel extracted from trees that are common in many parts of India, such as the Jetropha, Karanja and Mahua. Additionally, India is emerging as a growing market for solar, wind and hydroelectric power. According to a report by the American Wind Energy Association India currently ranks fifth in the global wind energy production.

India's Strategies for Energy Security

The various strategies to achieve our energy security objectives are as follows:

- As India still remains a vastly under explored country. Domestic acreages and frontier basins are now being increasingly brought under exploration and production under the New Exploration licensing Policy (NELP). In this regard, some of the recent discoveries by Reliance and GSPC, offshore in the East coast and by Cairn in Rajasthan have opened entirely new vistas in the exploration of oil and gas in India.
- Simultaneously, we have also taken up Methane extraction from Coal. This year we have launched the 3rd round of CBM blocks.
- In addition to the accelerated exploration programs, schemes to enhance oil production from the existing reservoirs have been put in place. Out national oil company ONGC has taken up US$2.7 billion investment plan in these schemes in 15 fields to enhance oil production by elevating its recovery factor for oil to 40%.
- In refining and marketing, India has already introduced liberal policies. Investments in millions in the domestic oil and gas sector are also given rights to market petroleum products in India.
- The policy on pricing of petroleum products has been dovetailed with the objective of equitable access to the economically weak sections of the society.
- Another important component of our oil and gas security is to acquire equity oil and gas assets outside India. Indian companies have succeeded in getting a significant foothold and are currently operating on 14 countries with a production of about 100,000 Barrels per day of oil and oil equivalent gas in Sakhalin I, Sudan and Vietnam.
- In addition to accelerating efforts at home and through international participation, India sees enhancement in its energy security through energy corridors for supply of oil and gas across and within its borders.
- To develop alternate fuels. In this regard, considerable efforts are underway for production of Biodiesel.
- To develop alternate fuels. In this regard, considerable efforts are underway for production of Biodiesel.

Therefore, the Major Solutions that can be summarized are as follows:

1. Development of renewable sources as quickly as possible.
2. Finding substitutes for the energy sources and uses.
3. Development of new technology, which will preserve the existing energy and also makes its usage efficient.
4. Try and find ways and means to impart awareness among the people towards effective consumption.
5. Allowing Domestic firms to explore opportunities abroad in exploration and refining so as to earn foreign exchange.
6. Allowing the Foreign Direct Investment in these sectors on a priority basis to enhance the capacity and share the burden of creating productive infrastructure.
7. Increase the utilization of the domestic energy resources to give a boost to output.
8. Create new capacities to improve the energy infrastructure.
9. Allow more and more private sector participation and reduce the control of government in pricing.
10. Bring about more competition and competitiveness in these sectors.

Give the global trend towards greater deregulation and privatization in the energy sector, India would also do well to adapt its energy security strategy to the emerging market conditions in which governmental intervention is not easy. At the same time, India needs to more coherent policy to promote domestic energy use in a more efficient, environmentally sustainable fashion. The new governmental push to turn to renewable energy is a necessary first step in that direction. Organized protests over the displacement of local people by large hydroelectric projects, however, have acted as a damper to the promotion of hydroelectricity. Commercial nuclear power remains an appealing but more costly energy option for India. As an energy-poor nation that wishes to harness the atom for electricity generation, India is set to develop a self-sustaining plutonium economy for its planned breeder reactors. Nuclear power, however, is likely to account for a small share in the mix of energy resources that India wants to use in the future.

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