ENERGY SECURITY IN INDIA

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Overview

Energy is the prime mover of a country's economic growth. Availability of energy with required quality of supply is not only key to sustainable development, but the commercial energy also have a parallel impact and influence on the quality of service in the fields of education, health and, in fact, even food security. In the last decade India has been one of the most developing countries of the world with an average GDP growth of around 6% and around 8% in last couple of years. With the growing GDP of 8%, India is moving parallel to China in terms of development, but the energy consumption is catching up as well. But the country is finding it increasingly difficult to source all the oil, natural gas, and electricity it needs to run its booming factories, fuel its cars, and light up its homes. According to a report by IEA (International Energy Agency), India needs to invest a total of 800 billion dollars in various stages by 2030 to meet its energy demand. India accounts to around 2.4% of the annual world energy production, but on the other hand consumes 3.3% of the annual world energy supply. And this imbalance is estimated to surpass Japan and Russia by 2030 placing India into the third position in terms of annual energy consumption. Therefore, after summing up all the energy issues, energy security has been identified as the only tool to overcome the energy concerns.

Energy Security

According to the Integrated Energy Policy 2006, energy security of India is quoted as below:

"We are energy secure when we can supply lifeline energy to all our citizens irrespective of their ability to pay for it as well as meet their effective demand for safe and convenient energy to satisfy their various needs at competitive prices, at all times and with a prescribed confidence level considering shocks and disruptions that can be reasonably expected".

Issues of Energy Security

a) Import of Fossil Fuels

The energy requirements of Indian economy are estimated to increase substantially in the .next two decades. According to Integrated Energy Policy, for a 9% growth over a sustained period, imports of crude oil in 2031-32 may be between 362-520 million tonnes with import dependence of 91%-94%. For natural gas, it may be 25-135 (Mtoe), which means an import dependence of 20%-57% of supply. Coal imports may be between 300- 736 (Mtoe), which may be an import dependence of 34%-57%. Total import dependence may be 58%-67%, as against the current level of 25%, with imports estimated at the higher end at 1,382 (Mtoe) and total energy consumption at 2,077 (Mtoe). Clearly, the two major fuels - oil and coal – may require large imports in the next two decades.

b) Lack of Exploration and Production

In India, there was hardly any investments in the activities of exploration and production in past two decades. There are small oil fields that are been explored which can barely fulfil our oil demand. The Cairn-Vedanta case is a live example leading to the barrier in the oil field exploration and production. The pending case has directly affected the production of the company and its exploration activities. In the coal sector, there has been 208 coal blocks been awarded to various companies, but activities are yet to start in around 100 blocks. Natural Gas is nowadays the measure issue as around a dozen gas-based plants are coming up in India. The KG- Basin case is the only significant achievement showing the success of the E&P activities.

c) Shortage in the Storage Facilities

To ensure energy security various risks are to be handled. The threat of energy security not only arises from the lack of supply, but also due to the uncertainty of availability of imported energy. Domestic production may also harm energy security. Supply risks from domestic production like a strike in CIL or other coal producing company or in that case even railways may create a dent in the energy security of India. As the major sources of energy are imported, there is a threat due to lack of storage facilities in India. The major part of crude oil is been imported and there are hardly any steps taken for its storage. During the economic crisis, India may suffer from shortfall of crude oil for refining and will eventually purchase it at higher prices leading to decline in country's economy.

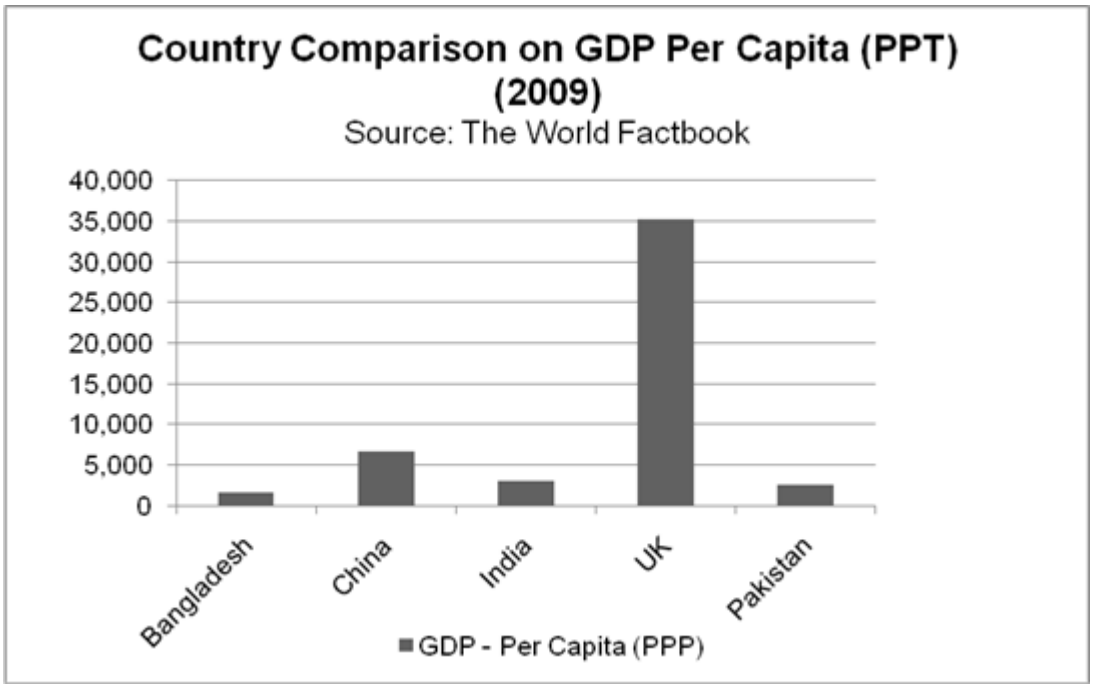
d) Rural Electrification

India has a major part of the population in the rural areas. Out of these, there are around 125000 villages that have no mark of electricity. Transmission lines are already been laid but not been used as there is lack of interest in providing electricity to the rural population. India is suffering from a deficit of around 12% on an average in terms of electricity and major share of this deficit is due to the lack of electricity in rural areas. The per capita energy consumption in India is around 750 KW which is far more less than China which is our competitor. Due to lack of capability to pay high tariffs, private players in the power sector have ignored setting up a power plant near the rural areas. REC Ltd. (Rural Electrification Corporation Ltd.), the only PSU in India, was set up for rural electrification. Village electrification level India as on 2008 was 85.2%

e) Transmission and Distribution Losses

Our country is already suffering from electricity deficit and fuelling this concern is the hurdle of T & D losses. India has an installed capacity of 167200 MW (Data from Ministry of Power, as on 31 Oct 2010), but during transmission it suffers around 30% of the losses. This has also laid to higher tariffs that are to be faced by the local consumers. There is a loss of power in the agricultural sector as no defined schedule is been planned. Reduction in the

T&D losses will help India in supporting the energy efficiency and energy security of the nation.



(Source: Ernest & Young Energy Report, 2009)

f) Unutilised renewable resources

India is been gifted with diversified renewable potential, but it has not been successful in utilising its resources at the optimum levels. The nation has a potential of around 45000 MW from Wind Power, close to 15000 MW from Small Hydro, 16000 MW from Biomass and can produce 20 MW/sq km of Solar Power. But out of the above numbers, only 30% of the renewable potential have been utilised. The electricity generation mix in India comprise of around 10% of the renewable. There is lack of awareness among the people about the benefits of renewable sources.

g) Energy Efficiency and Energy Conservation

Importance of energy efficiency and energy conservation has clearly come out from the various supply scenarios and is again supported by rising energy tariffs. The concept of efficiency can be applied in energy extraction, transportation, conversion, as well as in consumption. Further, the same level of service can be provided by alternate means that require less energy. The major areas where it can make a substantial impact are mining, electricity generation, electricity transmission, electricity distribution, transport equipment pumping water, industrial production and processes, mass transport, building design, construction, lighting and household appliances, heating ventilation and air conditioning. It should also be noted that a unit of energy saved by a user is greater than a unit produced as it saves on production, transport, transmission and distribution losses. A “Negawatt” (a

negative Megawatt) produced by reducing the use of energy need, saves more than a Megawatt generated (Source: IEP 2006). According to the recent statistics by TERI, there is a wastage of 30% of the power that is been supplied. There are lack of energy auditors and energy managers. Only 500 energy managers are certified by BEE (Bureau of Energy Efficiency) annually.

These were the major challenges that are obstructing India to deal with energy security. So, in order to improve India's chances to achieve the goal of energy security the major policy options are been classified into two categories:

A) Reducing risks.
B) Dealing with risks.

Policies for meeting India's Energy Security

Acquiring Assets

(i) Oil and Gas Sector

The important policy for' assured availability of energy, is investing in energy assets abroad and developing domestic infrastructure for receiving LNG. Further, a well-structured arrangement exists in the oil sector in India. OVL has been leading this initiative. As a result of this, it has invested $ 11 billion abroad. In addition, a number of other investors, both public sector undertakings and private players, have also invested in 50 other projects in 19 countries. The total production from these is 9.36 million tonnes of oil and gas, of which OVL's share is 8.78 million tonnes. To get natural gas, LNG terminals have been set up at Dahej and Ratnagiri and a new one is under implementation at Kochi. Imports of 7.5 million tonnes of LNG on a long-term supply basis for 25 years have been planned by Petro net LNG at Dahej under an agreement with Qatar. Another 1.5 million tonnes has been tied up with Exxon Mobil for 20 years from Gorgan LNG project in Australia. In addition, they are also importing spot cargos of LNG. Shell LNG terminal has imported several of these. As part of the investment policy, a joint venture has been set up in Oman for producing fertilizers for 1.9 million tonnes per year. It will be useful to set up similar projects in Qatar, Australia, Egypt, Kazakhstan, Turkmenistan and Mozambique or other countries, if gas is available. These initiatives need further expansion. The OVL oil equity so far accounts for only 9% of India's current oil import requirements. If these assets were to meet only 10% of the requirements in 2031-32, the investments will have to be multiplied six times, if the success rate continues to be as at present.

(ii) Coal Sector

The import requirements of coal at this juncture are limited but are slated to expand rapidly. Both US and China have large domestic coal reserves. India, however, will have to import in the coming years large quantities of coal as mentioned earlier. Though Coal Videsh under the Ministry of Coal has been formed, it has done very little business so far. A number

of private players have invested in mines in Indonesia and Australia. There is a need to give a very strong push to the mining investments abroad. India's power requirements by 2031-32 are expected at more than 950,000 MW. Around 70% of this will be from coal. It will be, therefore, most crucial to step up investments and develop coal mining resources abroad in the next two decades. The initiatives in coal are, so far, limited and have given rise to serious concerns in view of large import requirements in next two decades.

(iii) Nuclear Energy

Similar arrangements for investments can be worked out for uranium mining. France and Japan have 60%-70% of their power from uranium. They have developed mining sources from different countries like Kazakhstan, South Africa, Australia and Niger. The investment in these provides security for uninterrupted operations.

There is another dimension to these investments. The price of energy is rising as the two economies of India and China are developing rapidly at 9%-10% per annum. The cost of acquisition, therefore, has to take into account the price of energy over the next two decades. For example, cost of oil extraction may be $ 20 per barrel but assets where such acquisitions can be done at $ 40 per barrel also need to be looked at. These decisions have to be taken in the context of expected energy prices. While this takes us in the realm of speculation, the assessment is that of acquisitions which are profitable at this juncture at about $ 50 are likely to remain so. The average cost of oil for a country can be reduced by having profitable energy assets. The cost of energy security, therefore, can pay for itself in direct price terms, apart from its overall benefits to the economy in helping economic activities. Acquisition of energy has to be seen in a wider perspective of price scenarios in the next two decades rather than the conservative $ 18-20 per barrel price assumptions.

Diversifying Sources

To strengthen energy security of imports, the second policy initiative required is diversification of energy import sources. In respect of oil, for example, we can tap markets in Venezuela, Columbia, Brazil, Africa, countries of the Middle East and South America. Since the types of oil available from these may not suit our refineries, we will have to develop adequate capabilities to process various types of oil. This will enable flexibility in acquisition. Similarly, sourcing of natural gas and LNG needs to be from a host of sources. This may include Qatar, Australia, Middle East, Iran, Kazakhstan and Turkmenistan. Some of the pipelines from Iran and Turkmenistan may pass via Afghanistan and Pakistan. We will have to find innovative ways to meet our security concerns. These could be in the form of energy pipelines being owned by large international conglomerates backed by major world economies or funded by international financial organizations. In some of the other oil-rich countries, like Iran, US has imposed sanctions. We will have to negotiate with them to work out appropriate arrangements. A spread of supply resource to different regions will help improve the energy security further.

The activities in the exploration of shale gas in India also needs to undertaken as it is turning out to be a vital source of energy. Shale gas blocks acquisition have already been

started by the large PSU's like IOC, BPCL and OVL. Reliance is the only private in India that has acquired the shale gas blocks in US and in Australia.

Improving Storage Facilities

(i) Crude Oil

The third policy initiative is the development of crude oil/gas storage capacities for meeting exigencies. OECD countries have developed oil storages of 90 days of import requirements. In India, we are developing 5 million tonnes of oil storage, which is equivalent to 15 days of current import requirements. This is being developed in the form of storage tanks Visakhapatnam (1 MT), Mangalore (1.5 MT) and Padur (2.5MT). Work on this is expected to be completed by March, 2012. In addition, oil companies have, as inventory, crude oil products of around 85 days of import requirements. This generally includes only 15 days of crude reserves. Similarly, GAIL and other gas companies have gas in their pipelines. These inventories kept by the oil and gas companies cannot be treated as strategic reserves but as operating stocks. The carrying cost of proposed reserve is high and may go up if oil prices increase. The cost of inventory itself may be around $3 billion with carrying costs being around 1,500-2,000 crore per annum. In case of 90 days of the inventory, the carrying cost may be still higher (10,000-12,000 crore). Further, the cost of construction will have to be separately accounted for. There is clearly a need to think of innovative methods to develop these storages. It is possible to discuss with oil companies for creation of an inventory within the country in collaboration with international players. This could be available to us when we require it in the event of a supply disruption. Some of this storage could be outside the country too.

An important issue in this context is the funding of these inventories. Since this is a part of overall government policy, the cost of it will have to be borne by the government. To raise funds for the carrying costs and the management of these inventories, it may be necessary to impose a cess of 1.5%-2% on crude oil imported by us. An alternative could be slightly lower cess but imposed on the downstream products. It appears more appropriate to tax the crude oil itself, as it will be easier to collect. Also given the different nature of products and nature of government control on pricing of various oil products, the possibility of cess and its realization in the overall costs may raise problems. Cess of this magnitude should be adequate to meet the inventory costs of the oil for 90 days.

(ii) Nuclear Fuel

There is clearly a need for such reserves of nuclear fuel at Atomic Power plants, too. It may be possible to develop extra stocks of uranium in the power plants to meet the eventuality of disruption in supplies. This will add very marginally to the costs but will ensure continuity and uninterrupted power in generation. While setting up new atomic power plants, this must be strategic part of our operation.

Maximizing Domestic Reserves

(i) Oil & Gas Sector

In the oil sector, India has adopted an aggressive policy to expand domestic production by developing a transparent regime for award of oil blocks. So far, 234 blocks have been awarded after 8 rounds of NELP. Exploration of oil and gas are long term investments. So far there have been major finds by Reliance, ONGC, Gujarat State Petroleum Corporation and Cairn Energy. The availability of oil, of nearly 6 million tonnes per annum, which is 20% of country's domestic production by Cairn Energy is a very interesting story and should give encouragement to oil exploration. In the 1960s, exploration was done by ONGC and it was found that there was no possibility of oil in these blocks in Rajasthan. Subsequently; the block was with the international company Shell. They could not find any oil in the area. For nearly 30 years, this block continued to be unexplored, the general impression was that Rajasthan does not have oil. The block was taken up by a small group from Scotland. A geologist, after considering the data, felt that it may be possible to find oil in the area. Subsequently, in a period of 4 – 5 years, the comparatively new player developed a number of oil fields.

(ii) Coal Sector

To augment coal production, 203 coal blocks were awarded to private players, with more than 50 billion tonnes of coal reserves. There is, however, lethargy on the part of some of the private players. Most of them have been moving slowly in getting these blocks explored expeditiously. There have also been problems with environmental clearances. These issues will need to be addressed. Most countries of the world exploit their coal reserves and the coal fields are thereafter developed and re- forested. We have taken a very restrictive policy in the recent time. No country can afford to let its mineral resources go unused and hope to grow economically. A policy permitting exploration and re- forestation of the areas already mined would be necessary. This is an area of very serious concern.

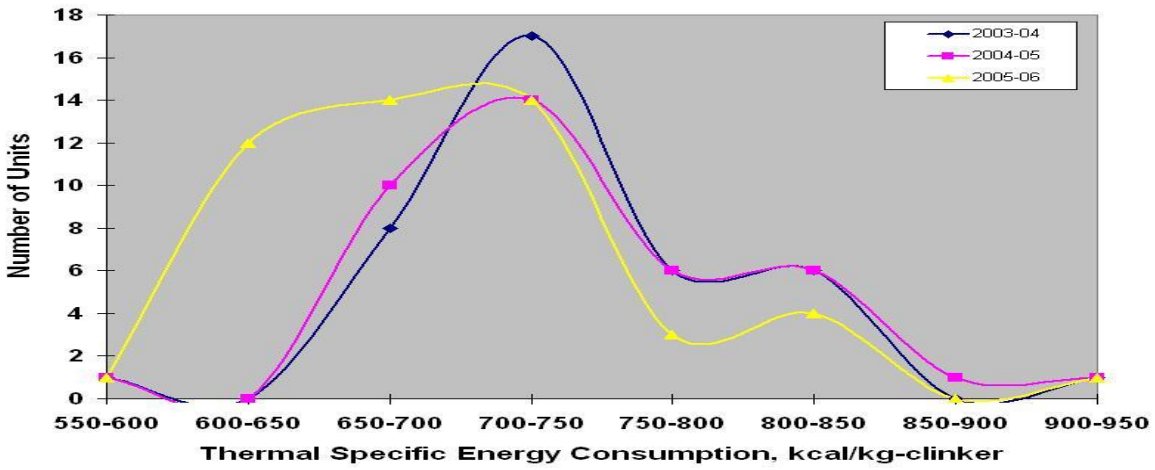
(iii) Nuclear Energy

The domestic exploration of uranium mines has been confined, so far, primarily to Jharkhand and Andhra Pradesh. The quality of uranium has been poor and the domestic production has not picked up significantly. Exploration on this so far has not led to discovery of any major deposits. While deposits were discovered in Meghalaya, there have been other issues which have clouded the development of mines. A more aggressive policy for discovering more uranium and mining it will be necessary to augment our resources. India has the second largest reserves of thorium in the world. Part of the requirements of energy may be met by developing these. The present approach for development of atomic energy is a 3-stage development. In the first stage, we are developing the present atomic power plants. As part of the second stage, we will have to develop the fast breeder reactors. After a large number of fast breeder reactors have been set up and nearly 40,000 MW capacities are created, the thorium, along with spent fuel will be used to further develop and sustain the nuclear plants.

Domestic Demand and its Management

(i) Energy Intensity

The primary concern of management of domestic demand is to develop an energy efficient economy so that the energy intensity of the GDP goes down. In the context of climate change, so far this has assumed major importance. Most countries of the world are undertaking measures to achieve this objective. According to Integrated Energy Policy, India's energy intensity was 0.16 kg of oil equivalent (kgoe) per dollar of GDP expressed in purchasing power parity terms. This is significantly lower than 0.23 kgoe of China, 0.22 kgoe of US and the world average of 0.21 kgoe. However, Japan had 0.15 kgoe and European countries, like Germany and the UK are better off. Several measures have been taken recently to promote energy efficiency. A National Mission on Enhanced Energy Efficiency has been approved by the Prime Minister and is being implemented from April, 2010. It envisages setting up of specific energy consumption goals for specific plants and performance, achievement and trade (PAT) mechanism so that those who fail to achieve the target can compensate their failure by buying the permits from those who do so. The figure below clearly highlights India's reducing energy intensities.



(*Source: Bureau of Energy Efficiency in 2008*)

(ii) Empowering Energy Efficiency

The next category of initiatives as proposed includes programme for energy efficiency in domestic lighting, municipal, agricultural and commercial building sectors. It is also proposed to make energy efficiency standards mandatory for equipment and appliances used in domestic sector, hotel equipment, office equipment, transport equipment, industrial products etc. It also mandates technology improvement programme, energy conservation building code and disseminating measures for generally creating a climate of energy efficiency. This is clearly a step in the right direction. One of the major components of the programme is introduction of super critical boilers in power plants and promoting energy

efficiency in existing plants. The average energy efficiency of coal in the Indian power plants is around 30%-33%. With the introduction of super critical technology, it is possible to increase this to 40% or more. Around 80% of the coal is consumed in the power sector. If energy efficiency in this sector can be improved substantially, the requirement of coal imports can be reduced drastically, thereby reducing domestic demand. Similarly, IGCC (Integrated Gasification Combined Cycle) technology and promoting energy efficiency in existing plants, many of which are quite old, is important. Introduction of advanced super critical boilers, which have energy efficiency higher than above, is another important step.

Reducing Transmission and Distribution Losses

A major initiative for improving energy efficiency can come from reduction in Transmission and Distribution (T&D) losses. According to estimates of the Finance Commission, by the end of 2011-12, the Aggregate Technical and Commercial (AT&C) losses will be more than Rs. 60,000 crore and may cross Rs. 1,00,000 crore in the next 5 years. Technical losses are equivalent to loss of generation. Efforts are being made to reduce losses through APDRP-II and activities by National Electricity Fund. Several states are also undertaking privatization of distribution utilities or giving these utilities to a franchisee. Privatization has helped in reducing losses to some extent but it needs more encouragement and incentives. Measures in this regard, however, are still quite inadequate and have made a small impact. This is an area, which is primarily in the domain of the State Governments. It needs enormous attention and commitment. Management of energy demand from this area is weak.

R&D in Hybrid Vehicles

The major consumers of transport fuel are the cars, trucks and railway engines. Development of energy efficiency in this sector has so far been left to the market forces. There have been some R&D initiatives like the use of hydrogen and electric cars. There is, however, no specific road map for promoting investments in the motorised transport sector to reach targeted fuel efficiency standards. There is a need to develop this. Unless energy efficiency in this sector, which consumes about 30% of the total requirement, is improved, it will be difficult to manage the domestic demand. This must be supplemented by a strong Public Transport System and fewer private cars per thousand of population. This is another area where a strong policy intervention is required.

Social Equity

Energy security has another dimension which is more in the nature of equity of the governance system. Today, we have nearly 40% of the population below the poverty line based on estimates of the World Bank. Large numbers of them do not have access to minimum energy. One of the guidelines in this regard has been the government policy to provide minimum of 30 KWH of energy to every citizen. In addition, a certain minimum

facility for cooking of 6 kg LPG has also been suggested. According to the NSSO (National Sample Survey Organization) (2004-05), only 45% of the population uses electricity and had access to electricity for lighting purposes. Since then with the launch of RGGVY (Rajiv Gandhi Gramin Vidyut Yojna) programme, around 80,000 villages have been further electrified. It is estimated that around 40,000 villages still remain. Further, there are a large number of habitations which have not been covered. Even in the villages electrified the number of people having electric connections is limited. Further, the network for providing RGGVY connections needs to be further strengthened so that it can take the load of the various activities in the village. In a number of cases, where connections have been given electricity has not been provided and only the network has been developed. It is necessary that while the villages get connected, electricity also reaches all sections of population.

It is estimated that about one crore BPL families have been provided connections under RGGVY. There are many more in the waiting. There is also need to provide, in the meanwhile, non-grid power in forest areas and other distant areas where grid connectivity is not available. To develop non-conventional sources of energy, one can provide solar lanterns or develop decentralized distribution generation. Biogas and other community assets could also be developed. The broad approach should be to cover all the villages with fuel for cooking and lighting. In addition, one has to plan for periods when there are shortages. Safeguards for these vulnerable sections have to be provided.

Energy is critical to economic growth for all countries. It is more critical to India. The per capita availability and consumption of energy in the country is way below the world average. As we grow and become the world's third largest economy after US and China, our energy requirements will multiply several folds. Our domestic resources are, however, limited. Our success in maximizing these resources and achieving a very high level of energy efficiency will help us meet our energy requirements and enable continued economic growth.
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Conclusion

Energy Security in India is the dream of the 21st century for the nation. And after implementing, the above policies will definitely move India an inch closer to achieve the dream. Huge financial investment especially in the energy sector is the need of the hour. CDM activities are equally important to sustain the concept of energy security. The new era of renewable sources will play a vital role in the nation’s target to be energy secured.

References

Websites

http://knowledge.allianz.com/en/globalissues/safety_security/energy_security/energy_security_oil_electricity_gas_coal_india.html

http://www.hindustandainik.in/news/7849_1920044,001601090001.htm

http://www.iea.org/

http://www.fas.org/ota/reports/9323.pdf

http://www.powermin.nic.in/

http://www.iags.org/n0121043.htm

http://www.petrotech.in/

Books

World Energy Outlook 2009 by IEA

Indian Energy Sector: Challenges and Opportunities

Powerline – Monthly Issues

Governing Power by S.L.Rao