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Energy Security - Emerging Trends Towards a New Reality

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Summary

"There is no power as costly as no-power" – Homi Bhabha

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.

Energy security or security of supply is becoming a major concern in developed nations. Since all economic activity requires the use of energy resources, the continuing availability of energy at a price that protects economic growth is the only way energy security can be achieved. Energy security has always been viewed through an economic lens, one that brings into focus our heavy reliance on an increasingly tight global oil market, our growing vulnerability to externally driven movements in supply and demand and our general inability to predict geopolitical changes that drive such movements.

Energy security can be ensured by focused attempts on part of governments to achieve energy efficiency. Energy security, or security of supply, is a key component of energy policy in many developed countries.

This paper highlights some of the threats faced and the options available to achieve energy efficiency, thus ensuring security of energy.

Introduction

"Energy and water demand will soon surely be a defining characteristic of people's life in the 21st Century".

Growth demands energy. It is no wonder that India— a growing giant with an economy expected to grow 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 2030 it is expected to become the third largest, overtaking Japan and Russia.

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 9%-10% over the next two decades, and in its wake will be a substantial increase in demand for oil to fuel land, sea, and air transportation.

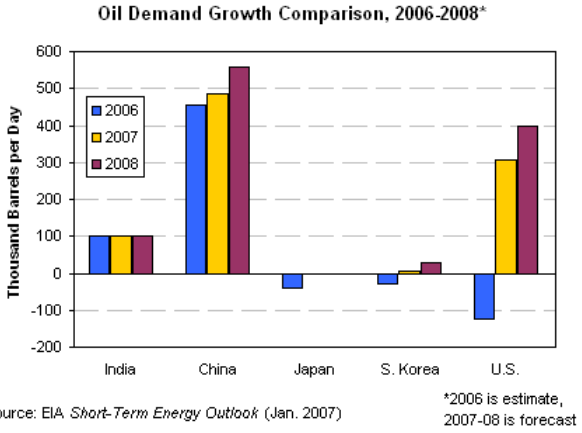
Energy is the lifeline of modern societies.

Our current energy balance is the result of industrial and consumption choices of the past. An optimal solution would free our future generations from the energy dilemma which continues to threaten our national security and prosperity. It could also lead to opportunities in many new industries that could reinvigorate our economy. Since all economic activity requires the use of energy resources, the continuing availability of energy at a price that protects economic growth should be a major concern of our government.

Dr. Kalam- "Energy efficiency, energy accessibility, and development of sustainable energy technologies are the cornerstone of energy security."

The need for energy security emanates from the growing imbalance between the demand for energy and its supply from indigenous sources resulting in increased import dependence. policies to reduce demand by improving fuel economy or to diversify supply by promoting alternatives are indeed quite sensible. By decoupling oil consumption from economic growth, these actions establish a buffer between our economy and events beyond our borders.

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 2020.



Source: EIA *Short-Term Energy Outlook* (Jan. 2007)

*2006 is estimate, 2007-08 is forecast

India Energy Security & Challenges:

All the various projections of India's energy demands say it will remain dependent on hydrocarbons. Coal will continue to fuel half of India's energy requirements – but consumption will increase fivefold by 2030 to over two billion metric tonnes annually. Oil figures will show a similar rise but, unlike coal, petroleum will be almost all imported. Natural gas, a sector long stunted by price controls and under investment, is expected to see a large expansion as market forces seep into the sector.

Dr Abdul Kalam , the ex-President of India, observed on India's 59th Independence day ," Energy Security rests on two principles. The first, to use the least amount of energy to provide services and cut down energy losses. The second, to secure access to all sources of energy including coal, oil and gas supplies worldwide, till the end of the fossil fuel era which is fast approaching. Simultaneously we should access technologies to provide a diverse supply of reliable, affordable and environmentally sustainable energy.

Energy Security, which means ensuring that our country can supply lifeline energy to all its citizens, at affordable costs at all times, is thus a very important and significant need and is an essential step forward. But it must be considered as a transition strategy, to enable us to achieve our real goal that is - Energy Independence or an economy which will function well with total freedom from oil, gas or coal imports."

Our long-term security and prosperity require sufficient, affordable, clean, reliable, and sustainable energy.

As a national security problem, energy is unique in that the risks we face from this single condition are diverse and are intensifying simultaneously. In fact, our energy dependence creates some threats that could directly or indirectly undermine our security and prosperity.

The important challenges to India's energy security are both internal and external in nature. Internally, India has a limited resource base, lacks adequate infrastructure and an integrated long-term energy policy. There is also the growing concern over environment and problems of political and bureaucratic inertia.

The external challenge lies in getting a continuous supply of energy at reasonable prices as domestic production is low but the demand is high. India's import dependence has intensified concerns that without reliable, affordable energy it will be unable to sustain high economic growth. India imports its 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 viz:

- Most of the world's oil is concentrated in places that vulnerable to political upheaval and terrorism. Major oil suppliers are in unstable regions in the Middle East and Africa. And demand for oil will increase far more rapidly than we expected just a few years ago. Within 25 years, the world will need 50 percent more energy than it does now.

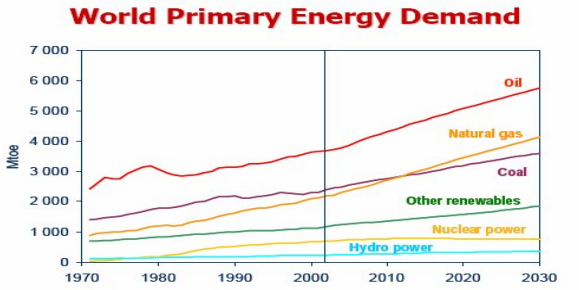
- Oil supplies are vulnerable to natural disasters, wars, and terrorist attacks that can disrupt the lifeblood of the international economy and inflict pain on our economy. Any major disruption of oil creates scarcity that drives prices up. oil prices go high, spurring higher gas prices.

- Geopolitical uncertainty stokes fears of a possible supply disruption and volatility in oil prices In addition to securing supplies at the most competitive prices, India is becoming increasingly aware of the fact that its economy is highly vulnerable to supply disruptions.

Worldwide reserves are diminishing. We will face the prospect that the world's supply of oil may not be abundant and accessible enough to support continued economic

growth in both the industrialized West and in this is occurring within the context of explosive economic growth in large rapidly growing economies like China, India, Brazil, and many other nations. The demand for energy from these industrializing giants is creating unprecedented competition for oil and natural gas creating panic among developed nations.

As we approach the point where the world's economies are competing for insufficient energy, oil will become an even stronger conflict and threats of military action, than it al



Fossil fuels will continue to dominate the global energy mix, while oil remains the leading fuel

Source: IEA World Energy Outlook, 2004

- Slow market reform has limited investment.

- The threat of climate change has been made worse by inefficient and unclean use of non-renewable energy. In the long run this could bring drought, famine, disease, and mass migration, all of which could lead to conflict and instability. Attempt to achieve global solutions to the problem of greenhouse gases is required. If limits on carbon dioxide emissions are designed effectively to avoid dangerous climate outcomes, these measures will automatically curb global oil consumption, because there is simply no way to achieve such reductions without confronting the oil that currently accounts for 40 percent of global emissions.

India is moving towards a de facto market-based energy security policy similar to that practiced by the United States and most Western states. This assumes that so long as overall oil and gas supply exceeds overall oil and gas demand the market will ensure all customers are satisfied. The policy focus on ensuring that there are no supply disruptions. the Indian government has begun to take a far greater interest in the prospects for ***nuclear power*** in its future energy matrix. The best near term option for increasing our energy security is increasing our energy efficiency.

"In general, the perspective of a country on nuclear energy – and degree of public acceptance – could depend on where you are on these curves, on the availability of fossil and hydro resources, and on technological development capacity." - R. Chidambaram, 2003

Steps to be taken for increasing energy security:

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** : This would require construction of LNG terminals which pose security risks and are attractive targets for terrorists. But Indian govt. still talking to Oman to supply additional LNG for upcoming projects and upbeat the security challenges on energy.

- **Increased domestic production:** The Ministry of Petroleum and Natural Gas crafted the New Exploration License Policy (NELP) in 2000, which for the first time permits foreign companies to hold 100 percent equity ownership in oil and natural gas projects. Concerned about India's growing demand of energy for next decade, the government has taken steps in recent years to deregulate the hydrocarbons industry and encourage greater foreign involvement. But as a part of this effort, however, to date, only a handful of oil fields are being operated by foreign firms. Between 2000 and 2005, the government awarded 110 oil and natural gas concessions in five separate licensing rounds. The sixth bidding round (known as NELP-VI) recently concluded, with 52 exploration blocks awarded. As in previous rounds, ONGC and other Indian national oil companies (NOCs) fared very well. ONGC secured a total of 25 exploration blocks, notably absent on the list of bidders for the NELP-VI are international oil majors. The Indian government has also taken the major steps to attract oil majors including ONGC and to utilize their vast deepwater experience and other technical expertise. This improved business climate could improve India's energy security.

  - **Increased utilization of clean coal technology**: The country 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 fueled 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 energy plantations 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 America Wind Energy Association India currently ranks fifth in the global wind energy production.

- **1-2-3 Indo-US Nuclear cooperation :** Under the agreement, which is part of a broad sweep of foreign policy being enacted to bring India closer into the embrace of the United States, it would become much easier for India to obtain technology, equipment and nuclear fuel (which may fulfill the growing energy demand) that have all remained elusive for several decades now, following the nuclear tests that India conducted in 1974 and 1998. With this deal, America is reversing the sanctions it imposed on India, greatly limiting nuclear cooperation between the two countries. The deal with India it is bringing India into the non-proliferation regime as more of India's nuclear facilities will now be subjected to IAEA safeguard. U.S.A specifically targets India for enhanced cooperation on alternative energy sources, such as clean coal technology and bio-fuels.

The only two energy sources with the potential to structurally change India's energy profile are natural gas and nuclear power. For these shifts to happen, however, major domestic energy reforms and external political decisions are required.

To minimize the impact of global fluctuations, improving energy infrastructure, which includes establishment of new refineries, urban gas transmission and distribution networks, a unified national grid and improved transportation facility can go a long way in establishing energy security in India. A first component of energy security is to ensure sufficient supplies. Expanded programs to enhance energy efficiency in appliances, building construction, and industry are all necessary to keep our energy intensity declining.

Affordability of energy supplies also remains a key goal for energy security. High energy prices increase inflation and inhibit future economic growth. The government's energy review notes that "in terms of purchasing power parity, power tariffs in India for industry, commerce and large households are among the highest in the world."

Another critical component of reliability is protection of the physical infrastructure and transit of our energy supplies. Real diversity can only be achieved by an energy portfolio dominated by sustainable energy, the final component of energy security.

Strategic energy partnerships with other major consuming countries are crucial for our national security. Strategic partnership for energy security with the world's largest consumers will increase leverage in relation to petro-states.

Developing an energy security policy for India –

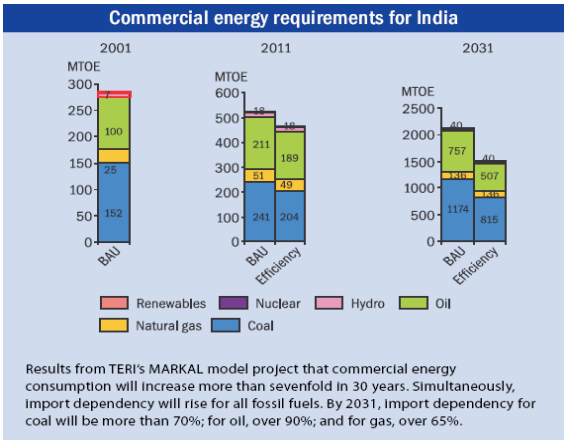
Efforts are in progress for highlighting the energy requirement vis a vis the economic impact. Energy and Resources Institutes, New Delhi has taken up a project which would delineate a comprehensive energy security policy for India. The main activities would include:

(1) Detailing concerns in energy security for India. This would consist of preparing an energy profile for India that would cover all energy resources (coal, gas oil, hydropower, nuclear, and renewable).

(2) Study the micro approach to energy security with a focus on local energy access and energy delivery mechanisms using case studies for two regions.

(3) Review of energy policies of other countries and the lessons that can be drawn for India.

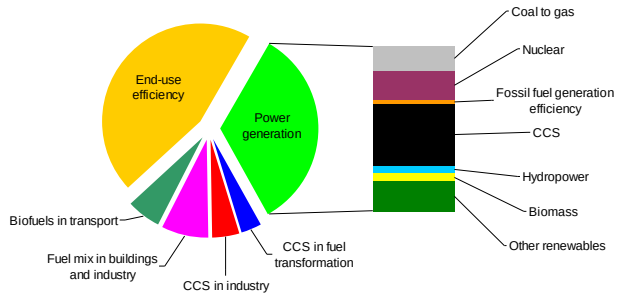
(4) Identification of strategies for alternative mitigation.



Using the MARKAL (a dynamic bottom-up linear programming optimization model) framework, a study was undertaken by the Division for the Office of the Principal Scientific Advisor to the Government of India in 2005. The main thrust of the study was to examine the status and future potential of technologies (resource supply, conversion, and endues) in India's energy sector under

various scenarios against the backdrop of rising energy demand and import dependence. Another study for the Ministry of Environment and Forests, Government of India, aims to determine the set of policies and strategies that would steer the economy towards sustainable, efficient, and optimal use of energy resources while meeting environmental and developmental objectives.

Energy security is a concern we should hold in high priority to ensure that the future of our nation can venture into a new era of economic growth.



Source: IEA Energy Technology Perspectives 2006

As Dr. Kalam says," ... Energy security leading to Energy independence is certainly possible and is within the capability of the nation. India has knowledge, natural resources; what we need is planned integrated missions to achieve the target in a time bound manner. Let us all work for self-sufficient environment friendly energy independence for the nation. "

We can control many greenhouse gases with proactive, pro-growth solutions, not just draconian limitations on economic activity. Industry and government alike recognize that progress on climate change can go hand in hand with progress on energy security, air pollution, and technology development.

We can also use coal to reduce our oil dependence. The coal-based transportation fuels. One of the technologies that will be encouraged by this program, the Fischer-Tropsch process, yields a diesel fuel that is compatible with existing vehicle technology. It is superior to oil-derived fuel with respect to performance and emissions.

We should strive to consume fewer hydrocarbons than we can produce domestically. This means more clean coal and renewable fuels of all types must seek energy partnerships abroad. Partnerships with foreign governments can help speed our conversion to real energy security and open new markets for fuel technologies.

Conclusion

India should consider promoting and strengthening its oil diplomacy on a regular basis. Elevated oil and natural gas prices do have the benefit of making alternative fuels more competitive. As alternative fuels become more competitive, oil and gas producers have strong incentive to drop prices to kill the competition. Long-term energy security also requires the use of clean energy. As long as we continue to consume fuels that do not burn cleanly or cannot have their damaging gases sequestered, we will continue to pay environmental costs and will remain vulnerable to a climate change induced disaster. To usher into a new era of prosperity, it is important that the government should seriously rethink the policies controlling the energy and infrastructure.

Throughout the centuries there were men who took first steps, down new roads, armed with nothing but their own vision. - Ayn Rand

Reference

Theodoros Zachariadis Economics Research Centre, University of Cyprus , On the exploration of causal relationships between energy and the economy**.**

Economics of Petroleum Production - A Compendium Volume 1: Profit & Risk • Volume 2: Value & Worth by Ian Lerche & Sheila Noeth.

Theodoros Zachariadis - On the exploration of casual relationship between energy and economy.

An Oil Reserve Right at Hand By Gal Luft

Sunday, February 18, 2007; B07

Ex-President Dr Abdul Kalam's address to the nation on 59th Independence day eve

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