

Energy Security and Clean Use

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ABSTRACT

As global demand for energy continues to rise especially in rapidly industrializing and developing economies, energy security concerns become even more important. India's economic growth stands around 8 percent in the past decade, leading to 6.5 percent growth in the demand for energy. Given the projected economic growth levels, energy demand is expected to continue to rise; rising energy needs, in turn have drawn attention to the importance of energy security. To provide solid economic growth and to maintain levels of economic performance, energy must be readily available, affordable and be able to provide a reliable source of power without vulnerability to long- or short-term disruptions. Energy security issue can be encounter by accelerated development of energy infrastructure; human development index and technological up-gradation are key areas for action. There are many drivers governing the secure supply of energy such as Diversification of generation capacity, Prices, Levels of investment required, Ease of transport, Concentration of suppliers, availability of skilled labor, Interconnection of energy systems, Fuel substitution and Political threats. Now as we talk about the clean use of energy Renewable energy provides reliable power supplies, fuel diversification, which enhances energy security and lower risk of fuel spills while reducing the need for imported fuel and conserve the nation's natural resources. These resources can be used to produce electricity without producing carbon dioxide (CO₂), the leading cause of global climate change. In this paper the challenges in achieving energy security and suggestions were carried out on undertaking decentralized distribution inputs to achieve sustainability of programs. The findings and recommendations in this paper are based on independent thinking of the author and do not necessarily reflect views of commission or authority or any governing public or private body.

1. INTRODUCTION

As global demand for energy continues to rise especially in rapidly industrializing and developing economies, energy security concerns become even more important. Currently, India is one of the world's fastest-growing economies. India's real economic growth stands around 8 per cent in the past decade, leading to 6.5 per cent growth in the demand for energy. Given the projected economic growth levels energy demand is expected to continue to rise, rising energy needs, in turn

have drawn attention to the importance of energy security. Energy security is ensured by guaranteeing three factors – availability, accessibility and affordability of energy resources.

“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”

The rapid increase in economic activity has been accompanied by rising energy consumption. Today, India is the fifth largest energy consumer in the world. While the world consumes 12000 million tonnes of oil equivalent (mtoe) of energy resources, India consumes 4.4% of the world total (524.2 mtoe). Global consumption of primary commercial energy (coal, oil & natural gas, nuclear and major hydro) has grown at a rate of 2.6% over the last decade. In India, the growth rate of demand is around 6.8%, while the supply is expected to increase at a compounded annual growth rate (CAGR) of only 1%. Coal, oil and natural gas are the most important sources of primary energy in India, accounting for 52.9%, 29.6% and 10.6% respectively of the primary energy consumption. Inadequate domestic supplies of these hydrocarbons are forcing the country to increase its import bill. While the country remains highly dependent on oil imports, it is saddening to note that supply of natural gas, which was expected to alleviate our energy security from the new domestic fields remain well below projection. Of late, driven by accelerated capacity addition in power generation and decline in domestic coal production, India's imports of coal have risen for the country having the world's fourth-largest coal reserves. On the global front demand for hydrocarbons is rising consequently, India faces a challenge in its effort to ensure energy security.

Energy security issue can be encounter by accelerated development of energy infrastructure, reduced dependency on Import, human development index and technological up-gradation are key areas for action. Beside that a diverse mix of energy sources, each with different advantages, provides security to an energy system by allowing flexibility in meeting each country's needs. Using clean, renewable energy is one of the most important actions you can take to reduce your impact on the environment. Renewable energy provides reliable power supplies and fuel diversification, which enhance energy security, lower risk of fuel spills, and reduce the need for imported fuels. Renewable energy also helps conserve the nation's natural resources.

2. ISSUES IN ENERGY SECURITY

India's fragile energy security is under severe pressure from its rising dependence on imported oil, regulatory uncertainty, small pool of skilled manpower and poorly developed upstream infrastructure and dependence on fossil fuels as the dominant source of energy in the near future.

To meet the growing energy demand over the next few years, India will have to enhance its energy security by procuring energy supplies at affordable prices. While the country has surplus refining capacity and is an exporter of petroleum products, major investments will have to be made in the domestic upstream industry and to acquire hydrocarbon reserves abroad.

In India currently, a move towards a diversified fuel basket, together with a focus on efficient exploration and consumption of energy resources, is needed. Additionally, key areas of action are:

- a. Accelerated development of energy infrastructure
- b. Human resource development
- c. Technological upgrade

A. Rising dependence on imported oil

Over the past few years country dependence on imported oil has steadily increased as a result of stagnant domestic production and rising demand. This high dependence on imported crude oil has significant implication on energy security and the overall financial health of the country domestic production remained flat, hampered by limited prospectively delays in the commissioning of new projects and declining production from existing maturing fields. Disruption in crude oil supplies has always been a cause for concern for India. The Middle East and North Africa, which supplies 60% of India's oil requirements, have witnessed high degree of geopolitical volatility in recent times. The recent upheaval in the Middle East, especially in Libya and Egypt triggered a drop in crude oil production in the region, resulting in increased crude oil prices driving up inflation in India. According to Goldman Sachs, the increase in oil price by US\$10 per barrel could potentially slow India's GDP growth by 0.2% and may inflate the current account deficit by 0.4%. in addition, the increase in oil price could result in foreign exchange reserve. The recent depreciation of the rupee raised the bill of the crude oil import for India, which in turn has led to increase in inflammatory pressure in the economy. Further, increase in oil import impact our trade deficit.

India's requirements of fossil fuels for the year 2030 are projected to be 337 to 462 Mt of oil, 99 to 184 Mtoe of gas and 602 to 954 Mtoe of coal. If the global fossil fuel supply increases by only 1.7%, as projected by IEA, then India's share in 2030 would range from 5.8% to 8.0% for oil, 2.4% to 4.5% for natural gas and 16.7% to 26.5% for coal.

B. Inadequate upstream Infrastructure:

The upstream oil and gas infrastructure in India is inadequate due to underinvestment in the past. As a result, the production of oil and gas remained stagnant and has not been able to keep up with

the rise in demand. The sector has limited participation from foreign and private players as is visible from their declining participation in New Exploration Licensing Policy (NELP) rounds. For instance, a total of 21 foreign companies participated in NELP-VII, ten foreign countries took part in NELP-VIII, while only eight companies took part in NELP-IX (2011). Further, companies have spent just US\$7.2 billion, out of their investment commitment of US\$20.7 billion until NELP VII. Although the unexplored sedimentary area in the country decreased from 41% in FY99 to 12% in FY10, the level of exploration will have to be further raised to increase hydrocarbon production.

C. Underdeveloped natural gas infrastructure:

The natural gas infrastructure in the country needs an overhaul. The infrastructure is currently underdeveloped due to limited availability of natural gas and inadequate transmission and distribution pipelines. India's gas pipeline density (pipelines spread per square km) is one of the lowest in the world. As a result, the share of natural gas in the overall energy mix is only 10% as against the global average of 24%.

Comparison of pipeline density — 2010

Country	Estimated pipeline density (km/sq. km.)
India	0.003
UK	0.05
US	0.05
Pakistan	0.01
China	0.004

In India, most of the gas production and liquefied natural gas (LNG) terminals were located in the western part of the country. As a result, the pipeline infrastructure was concentrated only in the western India, which has adversely impacted the availability of gas in the rest of the country. The low availability of gas and limited infrastructure has curtailed development of gas market in the country. Over the next few years, the availability of gas is likely to increase on the back of incremental supplies of KG-D6 block, as well as from the new gas fields of ONGC, CBM and new LNG facilities.

C. Acute shortage of skilled human resources:

The oil and gas industry in India is facing a shortage of skilled manpower due to attrition, retirement and the inability to attract the young force. The industry is unable to attract talent from universities due to lack of awareness of the available career opportunity within the industry and difficult working conditions, especially in the upstream segment. Other, industry provide attractive

carrier opportunities. Around 11% of the workforce may retire over the next few years, resulting in significant loss of experienced personnel. Over the next few years, the shortage of talent is likely to increase, which may impact operation across the value chain. There will be around 25,000 additional professionals over the next few years due to attrition, retirement and increasing activities in the industry. The upstream segment is likely to have the highest shortfall of skilled manpower of around 7,600 employees.

D. Technical risk

Even when the country has adequate energy resources, technical failures may disrupt the supply of energy to some people. Generators may fail, transmission lines could trip or oil pipelines may spring leaks. There may be many such accidents that disrupt the supply of energy. One needs to provide security against such technical risks.

Further, any disruption in access to energy can be very expensive in welfare terms as energy is critical not only for economic growth but also for human survival and well-being. For example, if an increase in the price of oil, a disruption of oil supply or erratic power supply forces farmers to reduce the use of their pumps and tractors, the consequent reduction in agricultural output and employment can have a serious and adverse impact on the poor. Thus, a government may choose not to immediately transmit a sudden large increase in the international price of imported energy to consumers. To be able to insulate consumers against such sudden price increase, governments may have to bear the burden of this price rise for some time.

On the other side, market risk of a sudden increase in oil price also plays an important role in energy security. While we may be able to pay for imports, a high oil price can cause inflation, slow down the economy and impose hardship on our people. Given that world oil prices have fluctuated substantially over the years, the adverse impact on the economy of sudden and large increases in oil price is perhaps a more likely risk than supply disruption.

3. IMPROVE ENERGY SECURITY

Actions to improve energy security can be classified broadly into two groups, one that reduces risks and another that deals with the risks after they occur. The major policy options are:

A. Reducing Risks

1. Reduce the requirement of energy by increasing efficiency in production and use of energy;
2. Reduce import dependence by substituting imported fuels by domestic fuels;
3. Diversify fuel choices and supply sources;
4. Expand domestic energy resource base.

B. Dealing with Risks

1. Increase ability to withstand supply shocks;
2. Increase ability to import energy and face market risk;
3. Increase redundancy to deal with technical risk

A.1. Reduce Energy Requirement

Energy efficiency and demand side management also have a large scope to reduce energy requirement. These include the use of energy efficient appliances and automobiles, hybrid cars, energy efficient buildings, efficient lighting, cogeneration, distributed generation with Combined Heat and Power (CHP) use, energy efficient and well-maintained irrigation pumps, smokeless improved woodstoves, etc.

In the long-term, promotion of public transport in urban areas can significantly reduce energy consumption particularly the need for imported oil and gas. Some advance actions that can be taken over such as to develop effective and attractive mass transport such as underground, elevated trains, light rail, monorail or dedicated bus lanes in existing metros. For medium size cities, make plans for efficient public transport corridors to serve future population and acquire the right of way. Congestion charges and parking fees should be levied in city centers to discourage the use of private cars.

A.2. Substitute imported energy by domestic alternative

Energy security can be increased by reducing the need for imported energy by substituting it with other forms of energy. Though this does not reduce the need for total energy, it reduces import dependence. If the domestic substitutes increase dependence on one particular fuel, however, it can increase domestic supply risk. Conversely, if substitutes diversify the domestic energy mix, they can also reduce supply risk particularly if the substitutes are local renewables. Decentralized distributed generation (DDG) is one of the innovative approaches adopted by many countries like Cambodia, Nepal and Philippines and is proving effective in India too. DDG is promoted by GoI through Rajiv Gandhi Grameen Vidyutikaran Yojana which enables electricity generation at local level by utilizing local resources and wastes and is usually implemented in remote villages where connectivity to grid is not possible or not cost effective. It had ensured those villages with continuous power supply, reduced dependence on external sources and promoted renewables such as wind, water and biomass.

A.3. Diversify Supply Sources

The forecast growth in energy demand means that we will need many sources of energy now and into the future. A diverse mix of energy sources, each with different advantages, provides security to an energy system by allowing flexibility in meeting each country's needs.

The impact of a short-term disruption in the normal source of supply will depend on how important that source is in our total import mix. Thus the first measure for increasing security is to diversify our sources of supply both domestically as well as for the import of oil or gas. India currently imports oil from many different countries (from 25 different countries) nearly two-thirds of our imports are from four countries, i.e. Saudi Arabia, Nigeria, Kuwait and Iran.

Energy security can be increased not only by diversifying sources of import of a particular fuel but also by diversifying the energy mix by using different types of fuels. An economy that uses coal, oil, gas, nuclear, hydro and renewables of various kinds is naturally less dependent on one particular fuel, and hence less vulnerable to supply disruptions of either domestic or imported energy sources. The security provided by such diversification is enhanced when the ability of the users to switch among fuels increases.

4. GOVERNMENT POLICIES

Bridge the rising demand supply gap, reduce import dependency and make ourselves resilient to the external factors economic and political disruptions in the sourcing nations, international crude oil prices the government has initiated several policy and regulatory measures:

New Exploration License Policy (NELP): To increase domestic exploration and production, the government introduced NELP. During the ninth round of bidding under NELP, there was an investment commitment of more than USD 827.44 million.

By 2012, the government plans to move towards an Open Acreage Licensing Policy (OALP), wherein oil and gas acreage will be available round the year instead of cyclical bidding rounds launched under NELP.

Coal Bed Methane Policy: To stimulate the exploration and production of coal bed methane in the country, the government introduced the Coal Bed Methane Policy. Till date 33 blocks have been offered in four rounds of bidding.

Underground Coal Gasification: The pilot production of underground coal gasification would commence by the end of 2015. ONGC has signed an agreement with Skochinsky Institute of Mining, Russia to harness world class technology to tap this energy source.

Gas Hydrate is at the research and development stage (during the year 2008, India signed an agreement with Russia under the Integrated long term programme of cooperation to jointly conduct research and development for technology required to harness gas hydrates).

Shale gas policy: By the year 2012, the government plans to announce the Shale gas policy. The government has been encouraging acquisition of overseas E&P assets. 100% FDI is permitted in exploration, refining, pipelines and marketing.

5. CLEAN ENERGY

Climate change and energy security are key drivers for future energy policy. While energy security has been a pillar of energy policy for about a century, concern about climate change is more recent and is bound to radically change the landscape of energy policy. Policy makers are now under increasing pressure to address these twin challenges: to develop cost-effective policies that will both ensure the security of our energy system and reduce greenhouse gas emissions. Therefore, we need new tools to assess objectively the interactions between the implementation of these multiple policies and to maximize their impact across these two important goals.

The world is on the cusp of a clean energy revolution. Some new technologies can help provide clean energy by harnessing the power of the sun, wind, and other renewable resources. Other technologies can enable more efficient use of energy in buildings, industry, and vehicles. These technologies, when coupled with supportive policies, can significantly reduce carbon pollution from traditional fossil fuels, improve local air quality, create jobs, enhance energy security, and provide improved access to energy around the world. Yet barriers to the adoption of clean energy technologies abound, and the cost of some technologies remains high. By working together, governments and other stakeholders can overcome barriers and advance the adoption of clean energy technologies.

6. IMPORTANCE OF CLEAN ENERGY

Using clean, renewable energy is one of the most important actions you can take to reduce your impact on the environment. Electricity generation is the leading cause of industrial air pollution. Most of our electricity comes from coal, nuclear, and other non-renewable power plants. Producing energy from these resources takes a severe toll on our environment, polluting our air, land, and water. Renewable energy sources can be used to produce electricity with fewer environmental impacts. It is possible to make electricity from renewable energy sources without producing carbon dioxide (CO₂), the leading cause of global climate change. But replacing our fossil-fuel infrastructure will take time and strong, consistent support from both state and federal mandates to build renewable energy generation and demand for clean energy from consumers and businesses.

Renewables Benefit the Economy- Renewable energy provides reliable power supplies and fuel diversification, which enhance energy security, lower risk of fuel spills, and reduce the need for imported fuels. Renewable energy also helps conserve the nation's natural resources.

Price Stability- Renewable energy sources such as wind, solar, hydro and geothermal do not entail fuel costs or requires transportation and therefore offer greater price stability.

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