

TERI-KAS International Energy Dialogue 2009 on

ENERGY RESOURCES AND INDIA'S SECURITY

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Policy Paper



The Energy and Resources Institute

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About the Conference

The politics of energy security and national energy strategies have emerged as key concerns worldwide. Energy security and the issues pertaining to energy resources are commonly treated as part of the traditional security agenda. The global demand for energy will grow dramatically over the next 20 years—with the most rapid increases emerging from Asia, particularly China and India. All governments will need to develop comprehensive policies to meet the challenges posed by the growing demand for energy.

Significant threats to energy security are: the political instability in several energy producing countries, the manipulation of energy supplies, competition for scarce energy sources, attacks on supply infrastructure as well as accidents and natural disasters. Energy security is therefore an important component of foreign and security policy agendas around the world. As the strategic importance of energy resources increases, both globally and nationally, it is more likely to be the subject of public and political debate.

It was with the objective of discussing some of the key challenges and concerns emerging from the inter-linkages between energy resources and security, particularly in the context of India, that the 4th The Energy and Resources Institute (TERI) - Konrad-Adenauer-Stiftung (KAS) Conference was held in Goa on October 1-2, 2009. The rationale behind the conference was to analyse India's energy security strategy and whether it has engaged sufficiently with the myriad security implications energy resources pose for the country. The conference looked not only at fossil fuels, but turned its attention to non-fossil fuels, specifically nuclear, renewables such as wind, solar and hydropower. At the conference, issues concerning governance that are necessary to address the security concerns surrounding energy resources were also discussed.

Key Issues and Concerns

Energy Resources and Security: Setting the Context

Energy security is embedded in the larger relationships between nations and how they interact with each other. Ensuring energy supplies is a critical component of any country's foreign security policy. Some of the main issues that were raised at the conference under this thematic were as follows:

Energy Security and Security of Energy

Energy security implies ensuring requisite quantities and types of energy to a nation against any kind of disruption, be it physical or economic. The degree of energy security possessed by a nation is the excess of actual or assured availability over demand at an acceptable price. Energy security is a function of many interactive factors such as energy requirement based on present consumption levels and expected economic growth, the availability of energy resources at competitive prices and so on.

India's Energy Concerns

- High import dependence for fossil fuels
- A quadrupling of energy demand by 2030
- Increasing energy and peak deficits in the power sector
- 400 hundred million people without access to energy
- Few indigenous resource endowments

A distinction between energy security and the security of energy needs to be highlighted. The security of energy encompasses the military and quasi-military means adopted to address the vulnerabilities of energy supply. This emphasises the safety and security of transport routes, particularly for

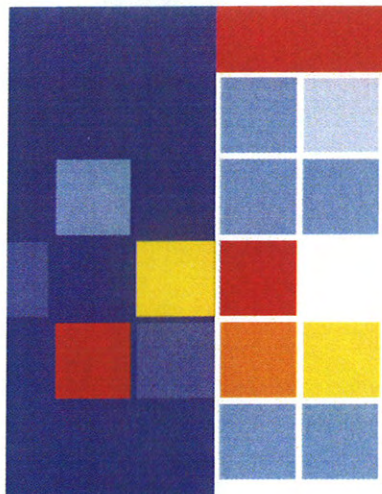
imported resources, as well as indigenously produced sources of energy, as also of its storage and distribution networks. The continuous and assured supply of energy in various forms, particularly oil, natural gas and coal, is of critical importance for a growing economy like India's.

In the next few decades, India's import dependency will increase. With it, energy security for India will increasingly imply the ability to ensure adequate supplies, which in turn will be dependent on India being able to deliver these resources on Indian ships. Therefore, adequate infra-

structure to ensure the reliable supply of energy to India is an important way in reducing the country's energy security vulnerabilities.

Energy security is not only a concern for energy importing countries, but also energy producing and exporting countries. Energy producers for instance are even more worried about the security of demand and their markets. Energy security for developing countries as well as developed countries poses different challenges. For example, in India, there are still nearly 400 million people who do not have access to energy.





Even where there is access to energy, there are severe power shortages. Particularly in areas which are in the border regions of India, power shortages can translate into security threats by fuelling divisive feelings amongst disaffected people.

Fossil Fuels

Economic growth is constrained without access to oil, whether it is in the context of an interdependent globalised economy or the agricultural revolution which fed a huge labour force. However, the geopolitics of oil arises from the fact that most of the world's principal oil producers are not its principal consumers. In the coming decades, competition for oil and gas between countries is likely to emerge in three areas: the oceans (the Arctic sea), the Antarctic region and the outer space.

For both oil and gas, the largest increases in production over 2006-2030 are expected to come from West Asia, which will continue to be the largest producer. Though the overall supply situation of fossil fuels to 2030 does not evoke concerns, it is important to point out that several factors can dampen supply prospects for coal, oil and gas. For example, the future of coal is ambiguous given the uncertainties surrounding the climate change debate, exportable surplus for coal originates largely from just three countries: Australia, Indonesia and South Africa. Also, China's increased supply of coal will increasingly be used domestically. Oil price volatility remains a big concern; whereas for piped natural gas, there are uncertainties regarding transportation and infrastructure.

India-China Competition

There is resource competition not only in terms of access to the world's dwindling resources due to rising demand, but also for capital. Resources to be used need to be extracted, refined and

transported for example. India and China will constitute a large share of incremental energy demand. For oil in particular, a global scramble is quite likely, whereas for coal, India and China, as the single largest consumers, will need to scout for resources in a geographically concentrated market. Much of China's coal demand can be met indigenously as is evident from the large incremental domestic coal supply. China's share in global demand for oil will grow from 9% to 16% and its share in global oil supply will remain constant at 4%. Similarly, for gas too, China is expected to explore the global market. Therefore, India with its growing demand for energy and a large and growing dependence on imports for oil, gas as well as for coal, will have to contend with China in the global energy market. In the case of oil, competition between India and China will cause particularly pronounced concerns.

Security of Supply

For India, energy security and the security of supply pertains not only to oil, but also coal. However, unlike oil, most of India's imported coal (for example from Australia) does not need to traverse congested routes or choke-points. However, concerns regarding resource nationalism and climate change concerns might in the future impinge on India's coal imports. India's oil and gas supplies are likely to come largely from West Asia, a region that is not considered to be geopolitically safe. Moreover, the routes through which they can come are also congested. Furthermore, India is not directly geographically linked with its major sources of oil and gas and its relations with its neighbours are not too comfortable, therefore strategies and plans to build pipelines have not fructified yet. However, natural gas is increasingly becoming important for India, given its importance as being a bridge to a less carbonised energy future.

Security Challenges: Uranium and Nuclear Energy

The understanding that emerged at the conference around nuclear energy was that it offers an important alternative for generating electricity. However, speakers cautioned that there are major costs attached to nuclear energy vis-à-vis other sources, which need to be factored in.

"Even in the presence of a satisfactory nuclear waste-management solution and adequate regulatory protocols, a large-scale expansion of the civil nuclear sector will present significant security

Nuclear non-proliferation

Non proliferation was emphasised as a grave concern, given the fact that nuclear energy is being pushed for in a far bigger way around the world. In this context, the closed versus open fuel cycle was discussed. The adaptation of the fuel cycle to incorporate reprocessed spent nuclear-fuel presents perhaps the most serious concern owing to the inherent relationship between reprocessing and nuclear proliferation. Despite exhortations to the contrary, there is still no such thing as a "proliferation-proof" fuel cycle, particularly in a geopolitical climate in which small diversions of fissile material to non-state actors represents a growing threat. However, it was also emphasised that the closed fuel cycle makes economical sense vis-à-vis the open fuel cycle. Speakers highlighted the importance of the review conference of the Nuclear Non-proliferation Treaty in 2010.

Cost and Financial Implications of Going Nuclear

The capital cost of nuclear power plants, as reported for American and European nuclear new builds, is 4 to 5 times that of thermal UMPPs in India. Even if we consider possible cost

reduction due to large scale localization, power from the imported reactors would still be several times costlier than that from thermal plants in India. Large capital costs along with relatively large gestation periods will mean higher financing costs and will further increase the completed capital costs of these plants.

Security Implications of Uranium Trade

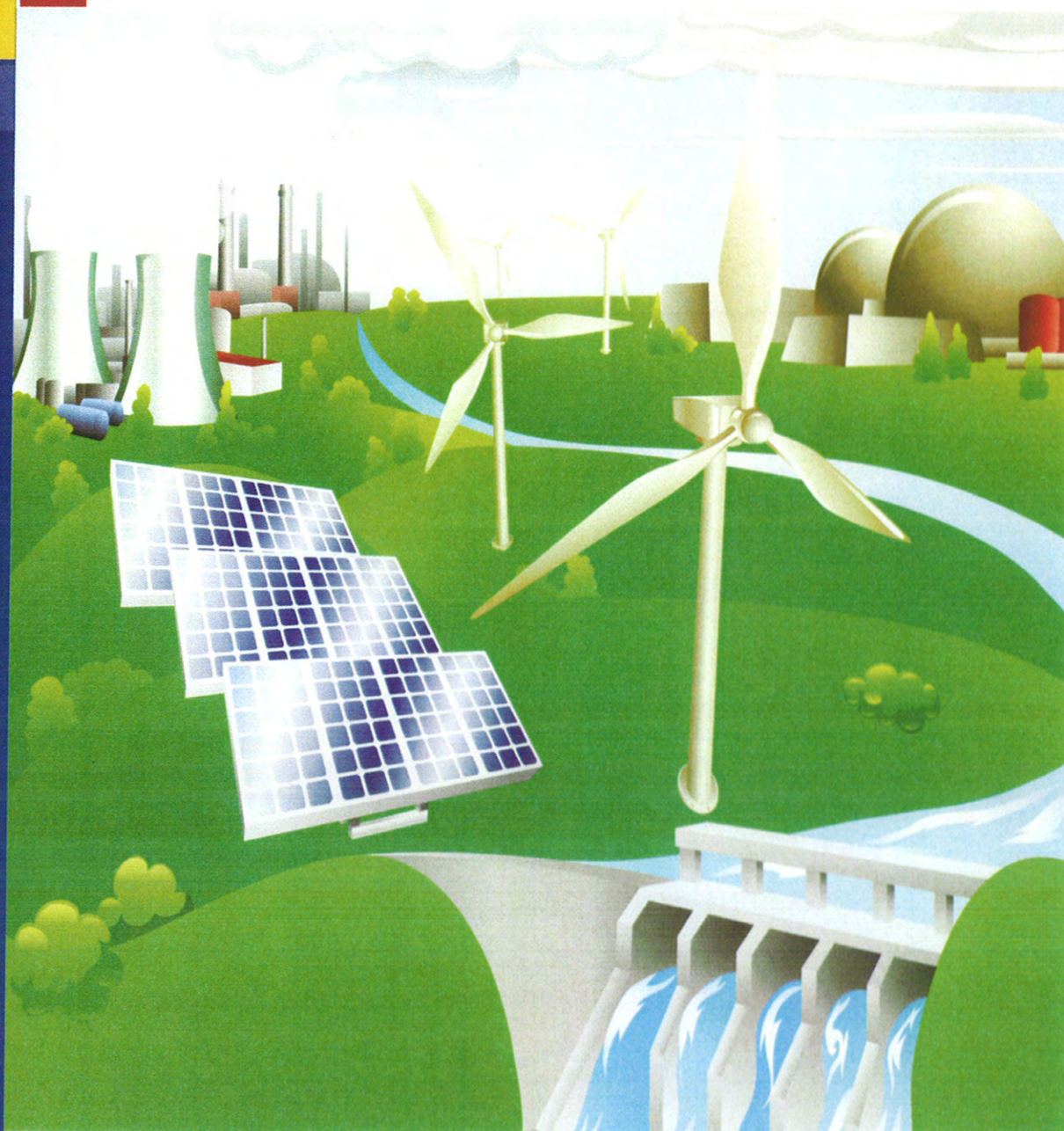
In the short to medium term, uranium trade is going to pose constraints for India. As the discussions pointed out, uranium is controlled by even smaller and more politicised cartel than oil. Given the fact that India's three-stage programme requires India to import uranium for the first stage, this will mean greater import dependencies and potentially the security concerns that imported energy resources entail.

Land Issues

Site selection for a nuclear installation is a very important and political process, which needs detailed investigations carried out over several years. Additionally, land acquisition, particularly for nuclear power plants, has become a tough problem in India, due to protests on environmental and health grounds.

Regulatory and Legal Issues

There is a need to bring about the required legislative, regulatory and policy changes to ensure private sector participation in the nuclear sector. This will ensure access to foreign technology, price discovery for the technology and so on. As legislative changes will take time, it was suggested that attempts to this end should be made right away. Also, it was pointed out that there is inadequate legislation and lacunae in the Atomic Energy Act.



Security Challenges: Hydropower

Conflicts in the future are likely to be around water. Already one-third of the world is water stressed and ensuring adequate availability of water is inextricably linked to food and hence human security. Given that hydropower has the capability of providing energy that is not dirty, it is an integral aspect of a low carbon development pathway.

Intra-state conflict and security concerns

Most speakers at the conference highlighted the anticipated negative impacts of associated dam and reservoir construction on the people in terms of water, food, and livelihood concerns. They also emphasised the related socio-economic concerns due to the uncertainties involved regarding the possible geo-environmental impacts of the projects in a highly

sensitive terrain such as the Northeast of India.

Centre-state Relations and Water Policy

In India, water is a contentious issue and has been the cause of difference between the centre and the state. Although there is a National Water Policy, the policy is largely on paper and India's water resources are not getting the required attention within a national perspective. Much of the data related to India's water resources

"Building more dams is potentially a zero sum game in several Indian basins."

remains classified thus precluding independent scientific verification.

Environmental Implications

Given the Himalayan geology, the hard truth is that about 1.1% of the storage capacity that is being monitored for the past 15 years is being lost annually due to silting. Furthermore, the environmental damage caused by large dams, both upstream and downstream are well documented, such as flooding of upstream areas, loss of forests, loss of livelihoods due to changes in patterns of natural flows and fertilization, loss of native knowledge and practices.

True Cost and Benefits of Hydropower

While evaluating feasibility of hydro projects, irrigation and flood control benefits are not monetised and all costs/benefits are loaded on electricity generation. There is a need to include the costs and benefits attached to these in order to know the right cost of hydropower. This would increase feasibility of the hydro projects and would also be a more comprehensive assessment of its impact. Within India, there are costs attached to developing hydropower in regions such as Uttarakhand and Himachal Pradesh and India's northeast, as these are

otherwise inaccessible regions, characterised by poor data and infrastructure. Given the sensitivity of these regions, it is difficult to come by high resolution topographical maps to facilitate hydropower development. Thus, at times the impact analysis of hydro projects is not as comprehensive as it should be.

Role of the Private Sector

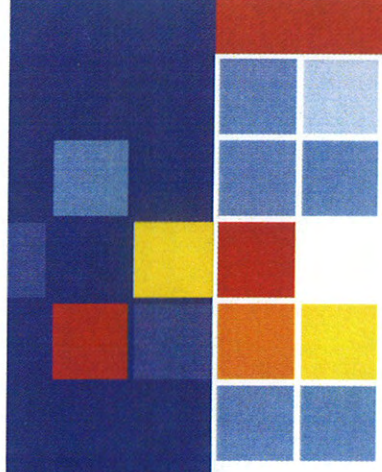
To expand the role of hydropower within India, there is a need to bring in the private sector in a bigger way (from 12% to at least 25%), particularly for investments. However, increased private sector participation should not impede an integrated basic approach to developing hydropower. Also, there are several regulatory and policy issues that need to be dealt with before private players can expand their role in this sector, for example the lack of hydrological data and topographical maps in the public domain, and long, convoluted processes to obtain environmental clearances for certain projects. Also, state level governments in India have to become more involved in hydropower development.

Infrastructure Constraints

There are serious questions over how electricity from hydropower in India's northeast and its transmission to demand centres will be addressed. With the expansion of hydropower in India, there will be also a greater need to expand the manufacturing capacity for equipment and trained skilled manpower.

Inter-state security concerns

Hydropower is a concern particularly in the context of Sino-Indian and India-Nepal relations. The question that needs to be asked is whether Tibet and its fragile ecosystem can sustain the level of economic and human activity that is currently



underway and is being envisaged by the Chinese government. Vis-à-vis hydro-power relations between India and Nepal, it was suggested that India needs to pay the right amount for hydropower from Nepal. Nepal would be unwilling to sell hydropower to India if India pays less for it than the amount Nepal has to pay to buy electricity.

Security Challenges: Renewable Energy

The aim around the world is to enhance the role of renewable energy in the fuel mix, not only to address climate change concerns, but also energy security. In the European Union for

“Security concerns do not go away by moving away from fossil fuels”

instance, the objective is to meet 20% of the energy needs from renewables by 2020. The hope is to make renewable energy competitive with fossil fuel power generation in another 5-10 years. In Germany, the share of renewables in gross electricity consumption is 15.1%, as per 2008 statistics.

Renewable energies are locally available. As such they are less vulnerable to technical failures, influences through extreme weather conditions and terrorist attacks. Where used for electricity production, they can reduce loads on electricity grids; but the variability issue needs to be addressed appropriately. When used for the production of low temperature heat, they can serve as significant fuel savers.

In India, renewables constitute about 8% of the power generation. If large hydro capacity is also taken into account, the share of installed capacity would work out to around 33% of the total capacity. There is great scope for enhancing the role of renewable energy

in India given that more than a lakh of the villages do not have electricity. Even those which have been electrified do not have guaranteed current flowing through transmission and distribution lines. Distributed power generation from solar is particularly important for far-flung areas of India and because

Renewable energy is capable of occupying a crucial space in the Indian context. However, the dream of shifting entirely to renewable sources appears to be a distant one - particularly when taking into consideration current technologies, efficiencies, and costs.

it requires lower levels of initial investments vis-à-vis extending the grid to these remote areas. The role of solar energy in India is not limited to utility-scale electricity generation alone. It extends to a variety of decentralised applications in residential, commercial, and industrial sectors. Solar energy can also help to ensure village energy security by providing the local population access to clean energy and livelihood generation opportunities.

Centre-State relations in India and Renewable Energy

There is a lack of dialogue between the state and central government and non-involvement of the state governments. Because power is a concurrent subject, state governments feel that the process of facilitation, financing and all other related issues need to be taken care of by the Centre. Capacity in India has come up largely as a result of the private sector, and hence the growth of renewable energy differs widely from state to state.

Wind power

Wind power in India is seasonal and intermittent as wind energy is good only during 6-7 months a year (monsoon months), depending on the location. The capacity utilisation factor is around 20% to 25%. Lack of predictability and inability to schedule

the power that is to be fed into the grid appear to major points of resistance from the transmission companies and distribution utilities. Investors in power generation – popularly known as Independent Power Producers – have been few and far between.

Biomass-based Power Generation

Despite the hopes and hype about India's potential for biomass-based power generation, capacity addition has not been significant. While bagasse based generation has reached 1200MW exclusive biomass based capacity has barely touched 180MW.

Big Hydropower Projects

Absence of a transparent system of allocation of potential hydropower project (of under 25 MW) sites by the states has meant a big discrepancy from state to state in terms of small hydro growth. Though it has reached a capacity of 2500MW, the progress has been extremely slow in the recent past due to lack of incentives.

Solar energy

- Against a lifeline supply of 1 KWh of power per family per day, the solar systems facilitate only a few hours of lighting alone. There is no power that can be used for education, productive purposes or entertainment by these poor villagers. The batteries that are to be installed with the systems to store the power that is generated through the day are costly and require replacement after every few years. The cost of replacement is totally ignored thus making the systems redundant altogether after a few years.
- The “charity approach” to solar power is skewed and is therefore unappreciated by the so called ‘beneficiaries’. The subsidy pattern does not allow prices to come down. Achievements in solar energy have been small and insignificant so far, largely limited by the vision of

targeting the same for the poor alone to the exclusion of grid-connected solar power.

- Large-capacity solar power plants would require a land area of about 7 acre /MW—most likely in the arid regions of Rajasthan and Gujarat. However, it is unlikely to lead to displacement of people or the diversion of agricultural land.
- Water is an important component, particularly for steam generation, cooling, and mirror-cleaning. Therefore, it will be crucial to balance drinking water requirements and irrigation needs with solar power plants.
- Security is a concern given the fact that some of the proposed sites for solar power plants are in the border regions.

Key Policy Recommendations

Fuel-specific Recommendations

Nuclear Policy

- There is a need to harmonise our narratives on nuclear non-proliferation and develop a framework that is equitable, harmonious and sustainable. At present, the international regime to deal with civilian-nuclear related issues is inadequate, particularly concerning issues of non-proliferation enforcement, fuel provision, and accident liability. To this end, it is important to identify nuclear free zones in the world.
- There is a need to open the market to private players, foreign companies, and to have joint ventures with foreign utilities. Opening the field to the private sector will necessitate a lot of legislative and policy changes.

- There is a need to understand public perceptions on nuclear energy, which should be considered integral to nuclear power development.

Hydropower

- Intensive and comprehensive Environmental and Social Impact Assessments (ESIA) studies prior to dam construction are essential. A committee of intellectuals along with some key representatives from other stakeholder groups must be formed, and only after gaining acceptance from such a committee should the construction of a dam be initiated. Public hearings must become an effective and meaningful exercise. The ESIA studies should give equal weightage to social and environmental aspects along with the

The need now is for a realistic vision, pragmatic approach, aggressive policies and creation of an enabling framework to promote renewable energy in India.

economic and financial aspects. Most dams in the northeastern region are mainly opposed because of the poor ESIA studies done and also because the downstream impacts are not adequately taken into account. It is thus imperative to give due importance to these issues prior to the construction of the proposed dams in the region.

- Compensation packages for those displaced and affected should be such that the people after relocation can live a better life. Laws to safeguard the security of these displaced people needs to be enacted and made mandatory for the decision makers and planners of large dams. To this end, there is a greater need to involve local stakeholders in the decision-making processes.
- Due to high seismicity of the eastern Himalayan region, downstream communities are subject to a greater

risk than elsewhere. This must be recognised and accounted for in working out compensation package for Project Affected People (PAP).

- A comprehensive re-assessment of the real needs of the northeastern region must be made based upon appropriate regional-scale scientific investigation considering the cumulative risk of all projects considered together and evaluating the carrying capacity of the entire region.
- There is a need to go in for smaller dams than large scale dams in these areas.
- Treaties are the best way to deal with disputes and differences over interstate hydropower projects. Particularly in the region, it is necessary to continue dialogue and discussion between governments on issues concerning hydropower development. Particularly where the Tibetan water system is concerned, it is recommendable to push for a strategic dialogue on the issue between India and China. There is an urgent need, for a greater coordination between riparian neighbouring countries

Renewable Energy

- The government in India needs to encourage generation facilities based on biomass with captive plantations since this is the only renewable resource as of now that can generate power on a 24/7 basis.
- An aggressive policy to absorb the solar power as it is generated needs to be put in place. This would obviate the need for storage and reduce costs significantly. In India, solar power is seen only from the point of view of solar panels and modules. Other aspects of solar energy related to balance of systems (BOS), energy storage technologies, grid integration at appropriate voltage and so on are often ignored. With two different established technologies of Solar Photovoltaic and Solar

Thermal having immense potential in India, all that is called for is an innovative approach to renewable energy.

- Government support for lowering the cost of loans to start up solar power projects.
- There is a need to revisit the institutional arrangements, business models, role of government as well as the private sector in developing the market for biomass.
- There is no doubt that renewable energy sector would need incentives to develop. However, there is a need to periodically review the incentive mechanisms and these need to be adjusted as the market develops. Incentives that were introduced when the market was at a nascent stage may focus on encouraging capacity addition, but as the market progresses there may be a need to move to generation based incentives.
- Subsidies to support the renewable energy sector should not last forever. This is required to ensure that renewable energy becomes a commercially viable sector. What is required is to develop innovative financing mechanisms for making renewable energy sustainable and commercially viable.

General Recommendations

Timely Investments

The problem today is not as much about the availability of oil in the future but of timely investments. Even if there is not enough conventional oil, there is enough unconventional oil, which requires timely investments by both producers as well as consumers.

Technology innovation for less carbon intensity

While the world has to move away from a more carbon-intensive future, the fact is that fossil fuels will remain the

main source of energy for countries like China and India. Therefore, the real option lies in adopting certain technologies that would help cut down emissions from the use of fossil fuels. Producers and consumers have to collectively develop innovative energy technology options.

Policy and Regulatory Issues

- Moving towards a more carbon-constrained future will require a policy framework that will have to incorporate structural reforms, both internationally as well as within countries.
- The Indian constitution gives the people of the state of Nagaland a direct stake in their natural resources. Such mechanisms are important in states such as those in India's northeast that are vital for its energy security, as it is important for the people of the region to develop stakes in the mining and commercialisation of their natural resources.

Research and Analysis

- Need for optimisation studies for individual river basins in India
- Need for a formal study to document the actual impact of relocation and rehabilitation on the lives of those displaced by huge dams

De-Hyphenate India-China

The need to de-hyphenate India and China was emphasised time and again at the conference. Given that the energy reality of both countries is quite distinct, as is their impact on climate change, it is important to emphasise this and not compare the two, particularly in terms of their impact on the global energy system.