Chapter 11

Energy Security

India's Energy Mix

India today is the world's fifth largest consumer of energy despite the fact that its current per capita consumption of energy is very low—490 kg of oil equivalent per capita annually—compared to the world average of 1780 kg. India's incremental energy demand is among the highest in the world. If India's economy continues to grow at 8 per cent per annum, India will become the third largest consumer of energy by 2030, but even a more modest 5 to 6 per cent annual growth rate will lead to a sharp increase in India's energy requirements over the next two or three decades. The Integrated Energy Policy report of the Indian Planning Commission, released in 2006, estimates that by 2031–32 India's primary energy demand will at least triple, and that for electricity increase by five to six times, from 2003–04 levels.

Efficient and reliable energy supplies are a precondition for sustaining India's economic growth. As India develops, its population will become more urbanized, more mobile and more prosperous, making India a voracious consumer of energy. The current high share—more than 60 per cent—of traditional fuels—fuel wood, dung cake, and so on—in the energy consumption of rural households is likely to come down as an increasingly prosperous population shifts towards use of commercial energy such as coal, liquefied petroleum gas (LPG) and kerosene oil. Such a shift will also bring health and

environmental benefits. India's commercial energy requirements are expected to increase by an average of over 6 per cent per annum in the coming quarter century.

Currently, India's primary energy mix is dominated by coal (51 per cent), followed by oil (36 per cent), natural gas (10 per cent), hydropower (2 per cent), and nuclear energy (1 per cent). Under any scenario the overall energy mix will continue to be dominated by coal, oil and gas for the next quarter century. Hydropower, nuclear energy, and renewable sources of energy like wind, solar, bio-fuels and hydrogen can contribute marginally, but are not critical, to India's energy security. The Integrated Energy Policy realistically concludes that even with a concerted push and a 40-fold increase in their contribution to primary energy, renewable sources of energy may account for only 5 to 6 per cent of India's energy mix by 2031–32.

Hydropower Potential

Among renewable sources of energy, hydropower is perhaps the most significant source, at least at present levels of technology. The Integrated Energy Policy of the government, however, makes the point that even if India succeeds in exploiting its full hydro potential of 150,000 MW, the contribution of hydro energy to the energy mix will only be around 1.9–2.2 per cent. However, hydropower has its advantages that make its real share in electricity generation higher. A hydropower plant is more efficient since it converts a unit of primary energy in the form of potential energy to almost one unit of electricity whereas fossil and nuclear fuels need almost three units of a primary energy source to produce one unit of electricity. Hydropower output is flexible and suited to meet peak demand. The share of hydropower in India's energy mix could significantly increase if, in addition to India's own hydropower potential, the hydropower potential of Nepal, Bhutan and Myanmar, perhaps even of Tajikistan and Kyrgyzstan, could also be tapped. India should continue

to actively work with its neighbours in this regard, the more so as such cooperation carries non-energy benefits too. While hydropower from projects in neighbouring countries may not contribute much to India's overall energy security, the income these countries would earn by selling energy to India could make a significant contribution to their overall development. Bhutan is a good example of this. Such arrangements would also hardwire the economies of neighbouring countries with India's, and thereby serve the cause of better overall bilateral relations. Political will is the key to the success of such regional projects, though environmental concerns and the problem of resettlement and rehabilitation of affected people will also have to be satisfactorily addressed.

Role of Nuclear Energy

In the context of the controversial India–US nuclear deal, an impression has been created that nuclear energy is the panacea for India's energy problems. Such hype is unjustified. Nuclear energy will always remain marginal for meeting India's energy demand unless India can take advantage of its indigenous thorium reserves. The Integrated Energy Policy puts it very clearly:

> Even if a 20–fold increase takes place in India's nuclear power capacity by 2031–32, the contribution of nuclear energy to India's energy mix is also, at best, expected to be 4.0–6.4%. If the recent agreement with the US translates into a removal of sanctions by the Nuclear Suppliers' Group, possibilities of imports of nuclear fuels as well as power plants should be actively considered so that nuclear development takes place at a faster pace. Nuclear energy *theoretically* (emphasis added) offers India the most potent means to long--term energy security. India has to succeed in realizing the three-stage development process... and thereby tap its vast thorium resource to become truly energy independent beyond 2050. Continuing support to the three-stage development of India's nuclear potential is essential.

The three-stage development of nuclear energy programme consists of setting up of Pressurized Heavy Water Reactors (PHWRs) using natural uranium in the first stage. India selected PHWR technology for the first stage, as PHWR reactors are efficient users of natural uranium for producing, as a result of reprocessing the spent nuclear fuel, the plutonium that is required for the second stage Fast Breeder Reactor (FBR) programme. The FBRs will be fuelled by plutonium and will also recycle spent uranium fuel from the PHWR to breed more plutonium for electricity generation. At present, FBR technology, which is critical to developing the second stage of India's nuclear power programme, is at a nascent stage globally. In India the first Prototype Fast Breeder Reactor (PFBR) is currently under construction at Kalpakkam. India can move on to the third stage of its nuclear programme of utilizing thorium to generate nuclear energy only when there is a successful and extensive FBR programme that produces sufficiently large quantities of plutonium. That is why it is important that India must retain the right to reprocess spent fuel from its nuclear reactors. In the third stage, Thorium–232, which is a fertile material, is used as a blanket material in the FBRs to produce fissionable Uranium–233 that will be the fuel for setting in motion a chain reaction that can produce very large quantities of hydropower, estimated by the Integrated Energy Policy Report at between 208,000 MW and 275,000 MW, the higher figure being in case India can import 8,000 MW of Light Water Reactors (LWRs) with fuel over the next 10 years. However, the Integrated Energy Policy Report makes the following significant caveats:

> These estimates assume that the FBR technology is successfully demonstrated by the 500 MW PFBR currently under construction, new Uranium mines are opened for providing fuel for setting up additional PHWRs, India succeeds in assimilating the LWR technology through import and develops the Advanced Heavy Water Reactor for utilising Thorium by 2020.

India's first experience of LWR technology is the nuclear plants being set up with Russian assistance at Kudankulam. LWRs are

the kind of reactors that will be imported into India pursuant to the recent approval of the Nuclear Suppliers Group, though the LWR technology itself may not be transferred.

There is also widespread justifiable scepticism about at least four sets of critical issues on which there is insufficient clarity. The first set of issues relate to the availability of fuel. India must have guaranteed availability of uranium at economical prices. The problem is that production and export of uranium is controlled by a very small suppliers' cartel whose decisions will be influenced by overwhelmingly political considerations. In case nuclear supplies from abroad are halted—either as a pressure point against India or as a response to a nuclear weapon test conducted by India to ensure its security at any time in the future—India's industry which is dependent on nuclear power would suffer huge losses.

The second set of issues relates to safety, environmental and security measures. After the experience of the gas leak at the Union Carbide plant in Bhopal in 1984, there can be no compromise on this point. People living around nuclear power plants will need to be reassured that nuclear power plants and the storage facilities for spent fuel will not affect the health of the population or livestock, nor pollute the environment. Nuclear power plants will have to be secured against terrorist or aerial attacks.

The third set of issues relate to the cost of nuclear power. Under the best-case scenario, the cost of nuclear power would be at least three times that of power from coal-fired plants. The capital cost of setting up a nuclear power plant is three times that of a coal-fired power plant. Experience around the world shows that there are invariably cost and time overruns. Safety, security and environmental measures will drive up costs. Since investors, whether foreign or Indian, would presumably want to cover themselves against any mishaps, the cost of product liability insurance would be paid by the end-user. There will be costs related to storage and disposal of spent fuel, for which expensive holding ponds would have to be constructed till the fuel is reprocessed, if at all. The government has not made available to the public any detailed study, assessment or even policy statement to establish whether, with the same quantum

of investment, India is better off giving priority to nuclear power over renewable sources of energy like hydropower, wind and solar energy.

Finally, there is continuing ambiguity about India's right to reprocess fuel, the importance of which has been outlined above. The India–US 123 Agreement gives India the right to reprocess spent fuel, but explicitly says that 'to bring these rights into effect, India will establish a new national reprocessing facility dedicated to reprocessing safeguarded nuclear material under IAEA safeguards and the Parties will agree on arrangements and procedures under which reprocessing or other alteration in form or content will take place in this new facility'. In other words, the US and other countries could withhold, delay or add conditions to reprocessing permission, in which case India will not have enough plutonium for its three-stage nuclear programme. Thus it would hardly be prudent for India to rely unduly on nuclear power for its energy security.

Critical Importance of Fossil Fuels

Coal

India will have to continue to rely heavily on fossil fuels for its energy security. Coal will remain India's principal source of commercial energy, estimated at about 45–50 per cent but under no circumstances less than 40 per cent, for the next few decades. Although India does have large deposits of coal, these are insufficient for India's growing needs. Neither is Indian coal always cost-effective. As Indian coal deposits are concentrated in one region, namely eastern India, Indian coal is relatively expensive compared to imported fuels along the western and southern coasts of India. Moreover, the quality of Indian coal is poor—it has high ash content, and is therefore unsuitable for manufacturing steel. India has to import about 65 per cent of its coal requirements for the steel industry. It is also currently slightly deficit in coal for power generation. For all these reasons, India will be compelled to import coal in

increasingly larger quantities in the coming years. The Indian Government has set up a new organization, International Coal Ventures Ltd. (ICVL), along the lines of ONGC Videsh Ltd. (OVL) to pursue opportunities for investments in coal mining projects abroad. However, there are infrastructure constraints in going in for very large-scale coal imports. In the long run, keeping environmental concerns in mind, India will have to reduce its reliance on coal as an energy source. If India can tie up long-term arrangements for its imports of gas, gas-fired power plants will increasingly supplant thermal power stations.

Oil

Over the next quarter century, the share of oil and gas in total energy consumption is expected to be at least 45 per cent in the overall energy mix. India's problem is that it has only 0.5 per cent and 0.6 per cent respectively of global proven oil and gas reserves, against a current share of 3.1 per cent and 1.4 per cent respectively in global oil and gas consumption. Growing urbanization and rapid development of the transport sector will drive the demand for oil. Gas will be used primarily by the power and fertilizer sectors (80 per cent) and to a lesser degree the transport and household sectors. Natural gas-fed power plants are less expensive per kilowatt of electricity generated with higher thermal efficiency; they also have a shorter construction period than oil or coal-based power plants. Unfortunately, India's indigenous oil and gas production has reached a plateau. Despite the recent discovery of new gas fields in the Krishna–Godavari basin in the Bay of Bengal, the additional output from these sources will contribute only marginally to bridging the supply–demand gap in the coming years. Hence India's continued heavy dependence on imported oil and gas is inescapable. Currently about 70 per cent, this dependence is likely to increase to more than 90 per cent by 2030. This makes the oil and gas sector crucial for India's energy security.

At present, two-thirds of India's imported oil comes from the Persian Gulf region and another 15 per cent from Nigeria. In the foreseeable future, India will have to continue to rely

heavily on Gulf oil. India is understandably concerned that instability or disorder in the Gulf could lead to disruptions in supplies. India's decision to establish a strategic oil reserve can mitigate the adverse consequences of short-term oil disruptions, not of prolonged disruptions or permanent denial of supplies. However, India does have an advantage in that the Gulf region is on India's western doorstep, which makes India's energy supply routes much shorter than for other major countries.

India has agreed in principle with the major oil-producing Gulf countries like Saudi Arabia, Kuwait and UAE to develop long-term strategic relationships in the energy sector involving supply of crude oil and petroleum products, upstream and downstream joint ventures and marketing. Such strategic relationships can enhance India's energy security. If the oil-producing countries develop stakes in India's downstream sector, this will provide some assurance that India would continue to receive from them adequate oil supplies. India should also try to get some guarantees of uninterrupted oil supplies in the Free Trade Agreement that it is currently negotiating with the GCC countries, namely Saudi Arabia, Kuwait, Qatar, Bahrain, United Arab Emirates and Oman. India also launched an initiative to get together key Asian producers and consumers of energy to work out a strategy that would protect their respective long-term interests. But this has not been followed up with sufficient vigour over the last couple of years.

With the US occupation of Iraq likely to be long-term, and a real danger that Iraq could break up, India has to be alert to ensure that the oil reserves of Iraq and other Persian Gulf States do not come under the control of outside powers which may be in a position to deny them to India. There are transportation security risks too. Unless India can secure the Sea Lines of Communication (SLOCs) between the Persian Gulf and India, hostile countries could use India's energy vulnerability to exert pressure on India. The development of Gwadar port in Pakistan with Chinese assistance has caused understandable concern among Indian security planners. Hence India cannot afford to have a passive approach to issues of Gulf security. Fortunately, the Gulf countries themselves are keen that the

major Asian consumers of Gulf energy should get involved in helping to ensure the stability of the Gulf countries.

In order to diversify its sources of oil supplies, as well as to ensure that India's imported oil dependence does not go beyond the existing level, approximately 70 per cent, India has embarked on a policy of making equity investments in oilfields abroad. In the last few years, Indian oil companies, both publicly and privately owned, have made significant investments in discovered or producing oilfields as well as exploration blocks in countries as diverse as Russia, Sudan, Vietnam, Myanmar, Iran, Iraq, Yemen, Oman, Syria, Egypt, Libya, Colombia, Brazil, Cuba and Nigeria and some other countries in West Africa. While such measures will certainly help in getting assured supplies as well as giving some protection against high oil prices, they will have only a marginal impact on India's energy dependency on the Gulf. The anticipated output from all the existing and potential properties abroad is at best expected to contribute not more than 25 per cent of India's incremental demand of oil. Nor would Indian equity oil assets abroad mitigate transportation security risks. Thus, equity oil assets abroad cannot really provide energy security. They are, however, commercially profitable for the oil companies and as such should be encouraged.

Gas

In the 21st century, gas is slated to play only a marginally more important role in the global as well as in India's energy mix, but it has attracted attention since it is a 'clean' fuel and the global reserves are relatively unexploited. Natural gas has a Reserves-to-Production ratio (R:P ratio) of 63 against oil's 40.5, which means that at the current rate of production currently known gas reserves will last 63 years. India is fortunate that rich sources of gas are available in India's vicinity, which can be imported in large volumes by pipeline, an option that is not at all available to many large gas-consuming countries. Techno-economic considerations are likely to dictate a mix of liquefied natural gas (LNG) and gas pipeline options for India. Ideally, it

would probably be more economical to use LNG in the southern States that are near existing and planned LNG terminals, natural gas from Myanmar and Bangladesh by onshore/offshore pipelines for the eastern States, and Iranian and Central Asian gas by pipelines for the western and northern States.

Gas-rich and proximate Qatar and Iran are the obvious sources for India to tap. Since 2004, India has been importing a small quantity of gas, in the form of LNG, from Qatar to supplement domestic production, but as there remains considerable unsatisfied demand India is negotiating with Qatar for additional LNG contracts. India had signed an LNG contract with Iran in 2005 but that is currently on hold since Iran wants to renegotiate its terms. A number of LNG terminals are being built on both the western and eastern coasts of India to handle imported gas from proximate sources like Qatar, Iran and Oman, as well as more distant countries like Algeria and Australia with which too India in negotiating purchase of LNG.

Currently other Gulf countries like Saudi Arabia and UAE that possess considerable gas reserves, albeit not on the scale of Qatar and Iran, are not gas exporters. Most of the gas they produce is used either for domestic consumption or for re-injecting into oilfields to boost oil output. Nevertheless they seem to be open to a variant model of gas exports, which India has successfully initiated with Oman, and is discussing with Saudi Arabia. This involves setting up joint ventures in the Persian Gulf countries, using local gas resources, to set up gas-based fertilizer plants whose output the Indian joint venture partner guarantees to buy back. The advantage of such a model for the gas-producing countries is that the fertilizer plants would generate local employment and the country would export not just natural gas but value-added products using gas as fuel.

Gas Pipeline Projects

India was also trying to bring to India gas by pipeline from offshore fields in Myanmar where it is an investor, but has been upstaged by China. While India dithered whether it should

go in for a pipeline across Bangladesh or via the Northeast Region of India, China moved swiftly and clinched the deal, leveraging its economic, military and political clout with the Myanmar regime. India perhaps did not properly coordinate the technical discussions with the diplomatic efforts. India has recently managed to get rights to some additional offshore exploration blocks in Myanmar and if the reserves are large enough a gas pipeline could still be constructed from Myanmar to India. This episode brings out starkly the overwhelmingly geo-political considerations in concluding large oil and gas deals, and the stiff competition that India faces from China.

For gas imports by pipeline, the most promising, but also the most controversial, has been the Iran–Pakistan–India (IPI) gas pipeline project. Although it is a logical project since Iran is a major producer of gas while both Pakistan and India are large consumers with a growing demand, for many years India refused to countenance such an idea since it did not trust Pakistan not to disrupt supplies. It was only after Prime Minister Vajpayee's visit to Islamabad in January 2004 and the initiation of the India–Pakistan composite dialogue to address outstanding bilateral issues that India agreed to de-link the question of the gas pipeline from outstanding bilateral issues such as granting India MFN treatment in trade, and transit rights to Afghanistan. The Indian Government's decision, which itself reflects how important energy security issues figure in its foreign policy priorities, led to a series of trilateral and bilateral meetings between Iran, Pakistan and India since 2005. Iran and Pakistan appear to have resolved most of the issues between them and intend to sign an agreement for an Iran–Pakistan gas pipeline regardless of India's decision.

Indian participation in the IPI gas pipeline project remains uncertain. There are still some differences between India and Pakistan over transit fees. Iran needs to satisfy both India and Pakistan on issues like certification of reserves, quality of gas to be supplied, pricing, and financial and management project structure. India's security concerns can perhaps be managed. Modern technology can mitigate security risks from non-State terrorist groups, and any attempt by Pakistan to deliberately cut off gas supplies is likely to lead to India retaliating by cutting

off water supplies to Pakistan from the Indus and its tributaries flowing from India into Pakistan. More than the financial and security issues, it is political considerations that are holding back India's participation. Official denials notwithstanding, India has given the impression that it is deliberately going slow on the IPI project because of US pressure. While it may be difficult to get technical and financial support for this pipeline project from the Western countries, Russia's Gazprom, which is rich and technically competent, has shown interest in the IPI project. It serves Russia's long-term interest that Iranian gas gets diverted to markets like Pakistan and India, as that would leave the lucrative European market free for Gazprom to continue exploiting without facing competition from Iranian gas.

Another gas pipeline proposal that has been under consideration for some time is the Turkmenistan–Afghanistan–Pakistan–India (TAPI) project. However, there are many questions that need to be addressed before India can seriously commit itself to a gas pipeline from Turkmenistan to India. The extent of Turkmenistan's proven gas reserves is not known. Turkmenistan has already pledged considerable quantities of gas to other countries. Aware of Russia's many other leverages against it, Turkmenistan will keep its traditional commitments to it, especially after the significant price increase it managed to negotiate with Russia in 2008. Turkmenistan has made generous promises to gas-hungry, cash-rich China, and a gas pipeline construction from Turkmenistan to China has begun. Europeans keen to reduce their dependence on Russian gas are also wooing Turkmenistan. This gives rise to legitimate doubts whether Turkmenistan has any surplus gas to sell to Afghanistan, Pakistan and India. Without assurances on this front, it may not be prudent to make huge investments in a politically risky country like Turkmenistan. India will also have to bear in mind Russia's opposition to the TAPI project. Finally, the security situation in Afghanistan and in the Afghanistan–Pakistan border regions in the North West Frontier Province (NWFP) and the Federally Administered Tribal Areas (FATA) creates serious doubts about any international consortium's ability to construct and maintain a pipeline.

Despite so many uncertainties surrounding the TAPI project, India has recently joined the ADB-sponsored TAPI project consortium. India's interests are better served if it is part of such a project than outside it. A Turkmenistan–Afghanistan–Pakistan gas pipeline that leaves out India would enable Pakistan to emerge as the key country outside the Central Asia region with which Turkmenistan, and later the other Central Asian countries too, would be anchored economically, politically and strategically through oil and gas pipelines, roads and railways. This would give Pakistan the dominant influence and strategic depth it has been long seeking against India, and be a disincentive for its military leadership to normalise relations with India. On the other hand, a gas pipeline across Afghanistan would help to stabilize Afghanistan by generating much-needed income and jobs in that country, and would go a long way in persuading the youth to turn away from insurgency. A stable, united Afghanistan is in India's interest, but not if it becomes an economic appendage of Pakistan.

Between the IPI and the TAPI projects, the IPI project may be preferable from India's point of view since it involves only one transit country as compared to two for the TAPI project. Geopolitically, Iran is no less important than Afghanistan. Moreover, Pakistan is unlikely to let India get in on the TAPI project—which involves Afghanistan and is therefore more sensitive for Pakistan—if there is not already an agreement on the IPI project. Although currently the IPI project is on a much faster track than the TAPI project, it is not ruled out that in due course both the IPI and TAPI pipelines could come up and even be linked to create a network of pipelines in this region as in Europe.

At the same time, it would be prudent for India to spread its risks and not to rely exclusively on gas pipeline transit routes via Pakistan. The only possible alternative, or supplement, to IPI and TAPI projects is gas from Russia and Central Asia. A 'new Great Game' is under way in Eurasia. The major global players, namely the US, China and Russia are already entrenched there. India must get involved in Eurasian oil and gas projects, not only for its energy security, but for political and strategic considerations too. Among the regional players,

Pakistan wants to dominate Afghanistan and keep India out of Central Asia. If India wants to have meaningful influence in Central Asia, it must remain integral to Eurasian energy politics. Admittedly, India has relatively few cards to play, but it could try to leverage its position as a geographically proximate, major potential market for Eurasian energy.

Eurasian Options?

How important are Russia and Central Asia likely to be in India's overall energy security strategy? Russia clearly views its energy resources as a key strategic asset and a powerful foreign policy tool. It also exercises considerable, often decisive, control over Central Asia's oil and gas exports. On political considerations, in 2000 Russia allowed India, as a long-time trusted friend and strategic partner, to invest in Russia's energy sector (the Sakhalin-1 project) on very favourable terms. Today, a more hard-nosed Russia may no longer be so willing to give India favoured treatment in the energy sector. Assuming that there is political will on both sides, India must urgently initiate a serious energy dialogue with Russia. India should be ready to make significant investments on competitive terms in 'greenfield' upstream oil and gas projects. OVL's success in taking over Imperial Energy, which has assets in Russia, is an encouraging sign.

There could be a slight window of opportunity for India to access, as a partner with Gazprom, the giant Kovykta field in east Siberia (near Lake Baikal), over which Gazprom has recently managed to regain control from BP–TNK. Although there is an understanding that gas from Kovykta would be used for export to China and South Korea, after taking care of demand within eastern Siberia, China's interest in Kovykta may have weakened now that China has managed to access Turkmen gas. The planned gas pipeline from Turkmenistan to China via Uzbekistan and Kazakhstan, agreed upon in January 2008, would inevitably pick up supplementary gas from Kazakh and Uzbek fields located along the pipeline route. Russia too

may prefer to sell Kovykta gas to India rather than China in the changed circumstances. All three countries could benefit if they could agree on a swap arrangement under which Turkmen and other Central Asian gas contracted for by China could be sent to the more proximate market of India, while China could get gas from Kovykta or other Siberian gas resources in which India has an interest that are located closer to China's main consuming centres.

India must try to develop an understanding on energy with China. Both are major energy consumers often seeking energy from the same sources and their competition is only benefiting the energy producers. China also holds the key to finding a viable transportation route from Eurasia to India. Any energy pipeline from Eurasia to India that does not cross Afghanistan/Pakistan has to be routed via Xinjiang and then across the Karakoram and the Himalayan mountain ranges. Apart from the considerable technical challenges, the political obstacles to such an alignment are likely to be more daunting, since the pipeline route would have to be laid across the Aksai Chin area disputed between India and China. Although difficult, an India–China understanding on a pipeline across Aksai Chin should not be ruled out if the two countries conclude that such a project would bring significant long-term energy and strategic benefits to both.

A gas pipeline across the Karakoram–Himalaya ranges could lead to the development of a major energy corridor between Eurasia and the Indian Ocean. Oil pipelines too could be built along the same alignment, with the oil flowing in the opposite direction. This would be technically much more challenging, since it is much easier to transport gas, which is lighter, than oil at high altitudes and low temperatures. This project could be of great interest to China, which is reportedly examining a Pakistani offer of creating an energy corridor for oil from the Persian Gulf to China via Pakistan. India could offer a similar transit oil corridor. An Indian transit route may not only turn out to be more secure and technically feasible, but also have the advantage of creating a mutual dependence—Chinese dependence on India for transit of Gulf oil destined for China, and Indian dependence on China for transit of Eurasian

gas destined for India. Both China and India would gain from cooperating in creating a north-south energy corridor from Eurasia to the Indian Ocean. They would get assured energy supplies for their own domestic needs, and become central to the energy flows out of Eurasia. Even though they may be competitors for finite global energy resources, India and China do share a larger long-term interest that the energy resources of Eurasia remain available to meet Asia's demand too, not just of the West. To ensure this, the two countries will need to cooperate and use their clout as large and growing consumers of energy. If they act quickly, boldly and imaginatively, they can offer a viable, more secure pipeline route for export of Eurasian gas than the alternatives currently being considered.

Such an energy corridor would bring both China and India significant non-energy benefits too. China could earn sizeable pipeline transit fees. Investments for pipeline projects would provide employment opportunities and stimulate Xinjiang and Western Tibet's economic development and contribute to their stability. China may welcome more people-to-people contacts and economic ties between Xinjiang and India—as an outlet for the growing frustration of the Uighurs and to relieve the drain on China's own financial resources—in preference to linkages of Uighur separatists with fundamentalist elements in Pakistan. China probably inwardly fears that the festering problem of Xinjiang separatism, which is also linked to the situation in the Central Asian Republics, has the potential to spin out of control. If China concludes that closer economic ties of Xinjiang with India serve its long-term interests, it may welcome proposals for sub-regional cooperation for Xinjiang along the lines of, and perhaps as part of a package deal including, China's own 'Kunming Initiative' for sub-regional cooperation between China's Yunnan province, Myanmar, Bangladesh and India.

The gains to India from Eurasian–Indian pipeline projects would be manifold. Availability of a cheap and plentiful clean energy source like gas would go a long way towards resolving growing problems of deforestation and environmental degradation in the Himalayas. This would stimulate the economic development of Jammu and Kashmir (J&K) as well as Himachal Pradesh. Most important, this could open the way for

a long-term solution to the festering problem of Kashmir that erupted violently once again in 2008. It is only if the emotionally alienated Kashmiri people, particularly the unemployed frustrated youth, become part of Indian mainstream economic and political life and concretely benefit from such an association that they will turn away from militancy and separatism. This makes the economic angle as important as the military and political ones in finding a long-term solution to the Kashmir issue. Geographically remote from India's heartland, J&K has not attracted private investment, and tourism has not proved to be a sufficient catalyst for the state's economic development. As a state in the Central Asian geo-strategic space, J&K could benefit enormously from a re-opening of its traditional links with Xinjiang and western Tibet via Ladakh.

An energy project between India and China traversing sensitive and strategic areas like J&K and Xinjiang would have a positive fall-out on overall bilateral relations. Notwithstanding mutual security concerns, suspicions and disputed borders between India and China, proposals for energy pipelines should be pursued, just as India and Pakistan have agreed on road links across the Line of Control in J&K and are actively discussing a gas pipeline from Iran to India crossing Pakistan. Major joint energy projects like pipelines would give an enormous boost to economic relations, hardwire India and China into an inter-dependent relationship, and help generate greater mutual trust and confidence. If both China and India remain stable and grow more prosperous and powerful, they need to work out a non-hostile and cooperative relationship. Moreover, there will be a more stable Pakistan–China–India strategic equilibrium if China feels that its long-term national interest lies in closer ties with India too, rather than an exclusive strategic relationship with Pakistan, cemented by shared animosity towards India. India could reassure both China and Pakistan that Eurasian gas flows would be shared with Pakistan through pipeline extensions from J&K to Pakistan Occupied Kashmir (POK) across the Line of Control and from the Indian state of Punjab to Pakistan's Punjab province across the international border. By building a reciprocal Pakistani dependence on Eurasian gas transiting

via India, this arrangement would assuage India's security concerns relating to IPI/ TAPI gas transiting Pakistan.

Agreement on an India–China energy pipeline project could perhaps create a better climate in India for eventually resolving the border dispute with China along the Line of Actual Control. Both sides have reiterated, during the visit of Indian Prime Minister Manmohan Singh to China in January 2008 that there has to be a political solution to the India–China border dispute on the basis of the April 2005 Agreement on Political Parameters and Guiding Principles. The 1962 Indian Parliament resolution on the subject complicates the task for any government to settle with China on the basis of the existing ground realities. Decision-makers in India presumably recognize that China is unlikely to give up control of Aksai Chin across which it has built a strategically important road. In case the Indian military agrees that Aksai Chin is not critical to India's security, perhaps the Aksai Chin problem can be finessed. It is likely that there would be acceptance by the Parliament and the public of a settlement broadly along the Line of Actual Control in the Western sector if the Aksai Chin road built by China at great cost and effort is seen to benefit India economically by serving as a major economic artery linking India and China, including gas and oil pipelines in both directions. While this would not resolve all the issues in the long-standing India–China border dispute, a large strategic energy-related project across the disputed border would definitely constitute a huge confidence-building measure.

The technical difficulties in a Eurasia–India pipeline project cannot be underestimated. Starting from the reasonable assumption that pipelines can be built more easily and cheaply along existing road and rail alignments, as that clearly facilitates transport of heavy equipment for pipeline construction, a gas pipeline from Eastern Siberia could be easily built up to the railhead of Kashgar in Xinjiang. While a proper topographical and techno-economic feasibility study would have to be done to determine the optimal pipeline route from Kashgar to India, preliminary studies have shown that the best route may be along the existing Aksai Chin road alignment, with entry into India either at Rutog or Demchok. Both these places have easy

connectivity to the existing road from Leh in the Ladakh region of J&K to Manali in Himachal Pradesh.

If, on detailed examination, it turns out that gas pipelines are technically difficult and economically too expensive to construct across the Karakoram and Himalayan ranges, the project could be modified. Eurasian gas could be used to set up gas-fuelled power plants in Central Asia and Xinjiang, and the electricity generated sent across the Karakoram–Himalayas ranges through transmission lines and towers. This would provide value addition to the gas reserves, create local employment and promote regional economic development. Another complementary approach would be to set up hydropower plants in Kyrgyzstan and Tajikistan, both of which have enormous hydropower potential, for export of electricity to South Asia. It might be cheaper and simpler to import hydropower from north of the Himalayas than to set up hydropower projects in the Himalayas. Political hesitations on the part of Nepal, apart from environmental concerns, geological surprises and the problem of resettling displaced populations have prevented hydropower projects from taking off meaningfully in South Asia.

A successful Eurasian energy project is possible only if Russia, as a major energy producer, develops a strategic understanding with India and China, both major energy consumers. If the three countries agree in principle that they should have strategic cooperation in the field of energy, the details can be quickly worked out. Perhaps this could constitute a concrete project within the Russia–India–China—trilateral framework, where energy is an agreed area of cooperation. It could also be considered subsequently within the framework of the SCO, where Russia, China, Kazakhstan, Uzbekistan, Kyrgyzstan and Tajikistan are members, while India, Pakistan, Iran and Mongolia are observers. Turkmenistan and Afghanistan, while neither members nor observers, nevertheless have an interest in the SCO.

In the geopolitical realities of the 21st century, bold, innovative and visionary approaches are needed in inter-state relations, including in the area of energy security. A grandiose Eurasian energy project as outlined above requires a conceptual

breakthrough in current geopolitical thinking among decision-makers in key countries around the world. If this ever happens, there would be favourable long-term consequences for the whole world. The Central Asian region could be transformed into a strategic space uniting major Asian energy producers, consumers and transit countries in a web of interdependence. Instead of being the battlefield of a new 'Great Game', Central Asia could become the crossroads of a 21st century 'Silk Route', with gas and oil pipelines replacing caravan convoys. The Himalayas–Karakoram region could become a frontier zone of peace, friendship and development, rather than of confrontation and conflict. A mega-project like this would also act as a huge stimulus for the global economy. It would not only bring all-round economic advantage, prosperity, social and political stability, but also create a solid and enduring foundation for greater trust, confidence and understanding, extensive people-to-people ties and communication links that will hopefully lead to new, lasting and stable political and strategic relationships.

Given its location and size, its growing economic and military strength, and its position as a significant consumer of energy, India will be very much a part of global energy geopolitics in the coming years. Since energy flows and energy projects are often key determinants of many bilateral relationships, and invariably have a regional, at times even a global, significance, India needs to give much greater and more focused attention to energy issues in its foreign policy. India should no longer assume that global markets will necessarily provide solutions to its long-term energy requirements. Nor can energy security considerations be fitted into existing paradigms of foreign policy. Rather, foreign policy will have to be reshaped to take account of India's continued dependence on imported energy. Aspiring to play an increasingly central role on the world stage, India has to evolve a determined, coordinated and sustained long-term strategy to ensure its energy security. India needs to develop a holistic energy policy that meshes into an overall strategy covering domestic policies and reforms in the energy sector, foreign policy, national security, economic development and environmental concerns. As a result of high oil prices, as

well as the political and public debate on the IPI project and the India–US nuclear deal, there is much greater awareness in India today about the importance of energy security. This opportune moment must be used to put in place policies that will ensure India's energy security in the coming decades.