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Indo-US Nuclear Deal: A Debate

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INTRODUCTION

Anil Gupta
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Understanding the implications of complex techno-political matters becomes necessary when such matters indicate the possibility of affecting the long-term growth prospects while also disturbing the short-term political stability. The Indo-US Nuclear Deal brought the UPA Government almost to the brink. Despite restrictions on the dual use technologies (one which can be used for civilian as well as defence purposes), the Indian space, computer, and atomic energy scientists have served Indian interests quite well. The fact, however, remains that a fuller exploitation of nuclear power for meeting our energy needs would require getting out of the current restrictive regime. The Indo-US Nuclear Deal seems to provide one way (some believe, the only way) out of the current impasse.

The debate was organized primarily to expose our students at IIMA to the complexity of the issues seen from political as well as techno-managerial perspectives. The issues have seldom been discussed in such detail and with so much insight as provided here by some of the most competent people in this field.

There were several issues before the panel:

- To what extent nuclear energy was critical for meeting our energy needs when its share even after a decade and a half would only be less than ten per cent?
- Should we enter into a relationship with a superpower like the US which, in the event of major disagreements on foreign policy or security issues, might cripple future supplies of fuel for the nuclear power projects?

KEY WORDS
Indo-US Nuclear Deal
Nuclear Energy
123 Agreement
Non-Proliferation Treaty (NPT)
Nuclear Suppliers' Group (NSG)
Hyde Act

- Will the Deal constrain or actually expand the choices for India to import the technology or fuel or both?
- Given the limited reserves of uranium in the country, would it be prudent to make investments in this sector without some assurance of future supplies?
- To what extent the option of thorium-based critical fuel supply chain would be viable at the current level of R&D capabilities and access to technologies?
- Can we not generate similar extent of energy from alternative means and if so, have we explored those options adequately?
- Given the emerging economic strength of India, would any superpower or nuclear supply group member country attempt to disrupt India's economic and foreign policy choices too drastically?

It is not possible that all these issues will be discussed adequately in the limited space. But, the readers would find a very illuminating debate in which some of the top experts of the country besides the leader of the Left Front-supporting UPA Government have participated.

I hope that the debate would help us all understand, analyse, and pursue the future choices with more light than heat. The private industry has already been participating in some of our strategic programmes for enhanced security in future. This Deal may increase the participation of the private sector both domestic and international in providing the energy options. At the same time, critics argue that when domestic capabilities are about to mature and deliver results, going all hog for imports will demoralize the scientists who have spent their lives in achieving the current national capabilities against all odds. It is not the first time that import of technologies in strategic sectors has been contemplated at a time when domestic options were getting concretized. The super computer is a good example. The 'Param' computer would not have developed, had we been allowed to import the super computer from abroad. The comparison, however, may not be completely valid. In the current case, it is not just the technology but also the fuel, which we need to import. The time will tell whether the current stalemate on the subject would resolve itself in a manner that Indian interests are served the best possible way without making too many compromises.

ONE, TWO, … THREE, …. GO!
But the critical question is: Which way?

Air Commodore Jasjit Singh
Executive Director
Forum for National Security Studies
New Delhi

If we are to judge the Indo-US Nuclear Cooperation Agreement which appears stymied at this stage on the touchstone of national interests, then we need to revisit some of the important issues once again before we reach the point of no return beyond which we could be jeopardizing our own future. The basic issue is that of greater access to clean sustainable and affordable (in political, economic and technological terms) energy without being held hostage to external factors.

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It is obvious that we cannot and must not allow the Agreement on nuclear power to jeopardize the strategic nuclear weapons capability in any way – a capability for which the nation has borne a heavy price for decades. Washington – and many other capitals — clearly would like to see this capability restricted if not eliminated. But the way in which the current Agreement is framed, there is little to suggest that, Hyde Act or no, this cannot become the vehicle for such hopes on the part of the Americans. But that does not imply that other methods, including the hope that India's deeper cooperation and engagement with the international community along with its rise to greater power and capability would not in and by itself reduce any need for building nuclear arsenal and hence encourage restraint especially, but very hypothetically, of systems like Inter-Continental Ballistic Missiles (ICBMs) that could target the United States at a future date. We will need to remain vigilant in future for any "non-proliferation" measures to be instituted against us and

protect our core interests. In fact, successful closure of this Agreement should forestall any tendency in a future Democrat administration to pursue the old mantra of "cap, reduce and eliminate" our nuclear capability.

One of the greatest challenge to our future growth – better termed as our Comprehensive National Development – lies in energy availability. Oil is already hovering close to $100 per barrel and is likely to only keep sliding upward in future as we move closer toward the end of the oil age; and our imports are expected to constitute as much as 90 per cent of the consumption. Outflow of capital to pay for imported oil would only keep increasing adding to import vulnerabilities. As it is, the major reserves of oil lie in regions of potential political instability and great power rivalry. We have large reserves of coal, but are still a long way from clean coal technology. The result is that our import dependency on coal for thermal power plants is likely to grow from 15-45 per cent in the coming years. Those worried about the US hegemony through the 123 Agreement need to note that almost all this coal is imported from Australia, a close ally of the US!

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Climate change and global warming is already a major issue not only in the world at large but for us also in a variety of ways. *El Nino* effect on the eastern seaboard of the Pacific Ocean affects our rain patterns now. Ice cap on the North Pole is shrinking and its long impact would be unprecedented. In our case, Indian agriculture is likely to remain Monsoon-dependent during this century; and there is a need for continuing scientific enquiry on the likely effect of global warming on weather and rain patterns in India and their consequences for agricultural growth in future. The central point is starkly obvious: We must shift as much as possible to clean sustainable renewable sources of our energy. It is here that nuclear energy offers enormous pay-offs; but these remain a non-starter without the 123 Agreement for the simple reason that we have uranium reserves for a maximum of 10,000 MW, not even half of the target for 2020! With the nuclear cooperation reaching its logical end, we would be able to generate 50,000 MW by 2050 by which time our own fast breeder systems would have taken over and thorium would be the fuel of choice.

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Much has been made of the likelihood of the US hegemony and India becoming an American client state through the 123 Agreement on the assumption that all technology, investment, and fuel supplies would come from the US. But once the Nuclear Suppliers' Group (NSG) clears the slate and the India-specific IAEA Agreement on safeguards for power reactors is agreed upon, the sources for the supply of fuel would range from Russia, France, South Africa, Niger, Australia and others besides the US. Technology for power reactors would be imported where necessary (no doubt linked to investments in this sector) from Russia, France, the US, Japan, EU and other developed countries. All of them are looking for better relations with the "rising India" with a growth rate of 9 per cent per annum. The world also understands that nuclear power for India would be critical to sustain that economic growth in increasing the share of manufacturing industry in national GDP. Russia was recently even willing to sign up additional four reactors at Kundakulam but New Delhi wisely opted to wait for the 123 Deal to go through and then get a formal nod from the NSG.

Much ill-informed opinion has been passed as expert knowledge in talking about the cost and safety of nuclear power reactors. Both these factors have altered dramatically over the past two decades since Chernobyl. Capital investment on nuclear power is high, but the recurrent costs that renewable energy like thermal power plants require are much less making nuclear energy economically competitive. There also have been concerns about the strategic assets losing out on a slippery slope. Theoretically, this can happen. But there is nothing in the 123

Agreement that points toward that direction. As regards nuclear explosive tests, it is difficult to imagine a political situation under which India would test even without any Indo-US Agreement. In fact, Prime Minister Vajpayee had committed the nation to a moratorium on testing and his Foreign Minister had assured the international community that India would not come in the way of the Test Ban coming into force which can happen only if India signs on! But the question of India's future testing of nuclear weapons is not a limitation under the proposed Agreement; at worst, consultation may be called for if circumstances do require tests.

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But the irony is that the positive side of the Nuclear Agreement has either not been understood or has been willingly ignored. Nuclear non-proliferation has been a major roadblock on the path of full and friendly relations with the United States and its allies which constitute nearly three dozen industrialized countries. Even Russia is now hesitant to deviate from the accepted norms of non-proliferation. Although all the major member countries of the NSG are believed to be willing to endorse the Nuclear Agreement with safeguards, concurrence of the US to this process is a pre-requisite in practical terms. Normalization of relations with the industrialized world is an urgent necessity if we have to achieve our goal of comprehensive national development. One finds it amazing that after the country's growth having been boxed by sanctions mostly emanating from the nuclear issues, now that we have a historic opportunity to get the big bolder behind us, we seem to be suddenly vacillating as if afraid of life without sanctions!

T P Sreenivasan
Former Ambassador of India
Governor of IAEA

After two years of the most extensive and exhaustive debate nationally and internationally, no one seems to be clear about the prospects of the Indo-US Nuclear Deal of 2005. The UPA Government, which piloted the deal with gusto till August 2007 and performed a negotiating feat by finalizing a bilateral agreement with the US (the 123 Agreement) and appeared to be prepared to go down with it, if necessary, has suddenly lost momentum. The BJP, which initiated a new strategic partnership with the US and prepared the ground for the Deal, wants it renegotiated, with no certainty that they can get a better deal. The Left, with its abhorrence of possible US domination on account of the Deal, blows hot and cold. For the first time in Indian history, India is in no position to operationalize an international agreement, which has been approved by its Cabinet. The path ahead is unclear for the Nuclear Deal.

Except for a few fanatics, who think that India can do without nuclear energy in the future, no one believes that India can afford to continue its international isolation as a non-signatory to the Nuclear Non-Proliferation Treaty (NPT). We know that we decided many years ago that the energy mix for India in the future will have nuclear energy as an important component. We also know that our civilian nuclear programme cannot be sustained at a level commensurate with our current economic growth unless we have access to fuel and technology from abroad. We know, therefore, that we need to have a deal of some kind at some time in the near future with the nuclear weapon states. In fact, India's diplomatic efforts since 1974 have been directed towards securing such a deal without signing the NPT. Till 2005, the prospects for such a deal were gloomy, particularly after India defied international opinion and declared itself a nuclear weapon state. Any Government of India in the future, regardless of its ideology, will have to seek an accommodation with the international non-proliferation regime. What is unclear is the price we are willing to pay for such an accommodation.

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For Indian diplomats, who have

been engaged in disarmament negotiations for several years, the Indo-US Joint Statement of July 18, 2005 was a dream come true. President Clinton, with all his goodwill for India, could not go beyond setting aside the nuclear issue and proceeding with co-operation in other areas, but President Bush showed an alternative to the NPT route for India to end its nuclear isolation. India virtually won the nuclear weapon state status with the same rights and obligations as the other nuclear weapon states. In return, India reaffirmed its moratorium on testing; it agreed to separate the Indian military and civilian nuclear facilities and place the civilian facilities under IAEA inspection and abide by the internationally accepted norms for export control and fissile material production. The balance of rights and obligations in the Statement ensured that we had a non-discriminatory regime in place. Against the backdrop of the bitter arguments of 31 years, the deal looked the best that we could ask for.

But a mix of ignorance, fear of the United States, and undue optimism about our own capabilities ignited protests against the Deal in India and the blind believers in non-proliferation in the United States and elsewhere raised a hue and cry. Both the Governments were pressured by their respective constituencies to become rigid, if not backtrack on the initial Agreement. In India, it was the scientific community, unaccustomed to external inspections, which raised questions. The issue of the theoretical possibility of testing by India was raised repeatedly, making India suspect in the eyes of the world. They argued that the separation plan was expensive and unrealistic and that India's deterrent as well as its fast breeder programme would be jeopardized by the Deal. The non-proliferation *Ayatollahs* in the US created the Hyde Act of the US Congress, with the objective of constraining the Administration to put forward caveats of a political nature. The cumulative effect of these debates was that the Indian and the US negotiators had their hands and feet tied as they sat down to negotiate the enabling 123 Agreement.

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It is a tribute to the negotiating skills of the Indian diplomats and the willingness of the US to go more than half way that the 123 Agreement was successfully negotiated. The contentious issues of testing and reprocessing were resolved for the purposes of the Agreement, even though doubts remained on both these issues. India has the right to test, but the US has the right to react! The reprocessing scenario is far from clear as the modalities are yet to be worked out.

The Government genuinely believed that the Agreement would move forward to the IAEA and the Nuclear Suppliers Group (NSG) before being submitted to the US Congress. But the bombshell came not from the IAEA or the NSG, but from the Leftist members of the UPA coalition when they demanded that the Agreement should not be operationalized as they saw the grave danger of US hegemony in it. It is not clear as to why they chose to oppose the Deal only after the Agreement was reached with the US. They felt, perhaps, that the US would not agree to the features we were seeking in the Agreement and, therefore, had remained silent. The Government was unaware of the strong feelings in the minds of the Left and tried to call it a bluff only to find that the Left was willing to bring the Government down on this issue. The UPA relented in the end and virtually put the Agreement in the cold storage. Not that it loved the Nuclear Deal less: it loved power more. In any event, if they gave up power, the Deal would have also fallen by the wayside.

The "unclear" deal will have to wait for better times when we have a Government which has the ability to implement agreements it negotiates with foreign governments. But it remains to be seen in what circumstances and under what conditions the Deal will be operationalized. It is a Deal, which is good for India, good for the US, and good for the world. But it has to be acceptable to the members of the ruling coalition

in India. In a democracy, the crucial test is not the merits of the issue, but its perception by the majority.

A G Gopalakrishnan
Former Chairman
Atomic Energy Regulatory Board

When a country talks about energy security, it looks at two primary issues: Where the primary energy stores are going to come from and the fact that countries which are keen on energy security stick to utilizing their own nationally available primary energy resources first. In fact, only if they are near to exhaustion, they go looking for other resources. Similarly, one bases the energy systems on technologies that one can handle within the country, especially in these days of technology barriers and difficulties in getting assistance from abroad. If we can make it ourselves, even if it is slightly less efficient, in the coming years, the smartest thing to do would be to stick to the technologies we possess. Now from this point of view, if we look at our resources, the primary and the most abundant resource is coal. Then there is hydroelectricity from the point of view of electricity generation and finally, the thorium reserve. I would not want to go into numbers but at least for 50 to 60 years of power generation and utilization, India has the necessary amount of coal under the ground. We are having problems in bringing it out of the surface— there are certain management and technology-related problems that we have to overcome.

Thorium by itself, unlike uranium, is not a fuel. Thorium has to be converted into a form of uranium— Uranium 233— which is what the breeder reactor will do ultimately.

Talking about coal technologies, in the 1960s, we used to buy boilers and equipments for power stations from abroad. From my experience as the Director of Research and Development in BHEL for ten years, I can tell you that when BHEL started manufacturing boilers and power systems according to the drawings obtained from abroad, it was found that those boilers were not working here at all because we were using it with Indian coal whose properties were extremely different from the properties of the coal for which the foreign equipment had been designed. It took about 10 years of indigenous R&D effort of our engineers, step-by-step, changing materials and designs, to come to a boiler system which looked entirely different from the boiler system from abroad but worked beautifully with 90-95 per cent capacity. And these are the kind of boilers that BHEL has got partly through its own efforts but mostly through collaborative technologies for all other parts of the system including condensors, electrical equipment, etc. Today, BHEL is a premier institution of which we can be proud of in the whole of Asia if not in the world. It can produce power stations up to 1,000 Megawatt rating, thermal and hydrostations as well as most of the components for the power plant along with companies like L&T. Thus, there is self-sufficiency in this part of technology. At times, they actually starve for orders. Also, BHEL has lately obtained the latest supercritical technology of world standards for powerstations. And, for about 20 years, they have also done work on coal gasification for which they have combined stations which would give almost 45 per cent efficiency in the long run. Thus, in substance, coal technology as well as coal itself is available in India.

Hydropower is another great resource in our country. We have been able to build various hydroelectricity projects with the help of our own engineers and our own designs equipped with our own hydroturbines, primarily because of the visionary leadership that this country had, both at the Prime Ministerial as well as the engineers' level. We really do not require foreign assistance; we can do it ourselves. We can also collaborate with Nepal and the other neighbouring countries and enhance our hydro potential.

Coming to nuclear power, although uranium has always been known as a fuel, there is a limited availability of natural uranium. Since Nehru's and Bhabha's time, it was known that only 100-10,000 Megawatt of first generation uranium fuel reactors can be made in India but all these uranium reactors will produce enough plutonium which can go in stages before we come to fast breeder reactors which can convert thorium. Thorium by itself, unlike uranium, is not a fuel. Thorium has to be converted into a form of uranium— Uranium 233— which is what the breeder reactor will do ultimately. And, finally, in the last stage, the thorium and the Uranium 233 produced by the thorium will be running the reactors. We would be totally free from the need of using plutonium and natural uranium. So, ultimately,

it is a self-sufficient system which will run on thorium and its by product. And thus, once again, we would reach a material and technological self-sufficiency.

Once the fast breeder reactor is constructed, we need to test it at least for four or five years to understand all its nuances, make corrections, and make sure that we have a system that is completely in place. Next, it has to go to a second type of breeder and only then, we can go for thorium utilization. There is a gestation period which cannot be cut short. Even during Bhabha's time, it was understood that from the time one starts, it would take around 20 years for the thorium power to exponentially keep rising. But that suits us.

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The 1974 nuclear explosion was a political decision. It was not the scientists who decided it; they helped, of course. But that has changed the entire timescale of the original programme. Because at that point when Bhabha was planning the nuclear power programme, we did not have to make our own forgings or tubes; in fact, it was not our plan to make everything else in the country. It was available from multiple sources. But, from 1974 onwards, we were totally cut off. However, the great missionary leaders like Nehru, Bhabha, and Indira Gandhi could see in this the only way to get to thorium and be free from foreign hold on us. So, they kept going and in 1998, weapon tests further disturbed the Nuclear Programme. Therefore, if it is going to take another 20 years for the breeder's thorium utilization to take place, then the country will have to patiently wait as no one else is going to make those thorium reactors for us. We almost certainly have 40-50 per cent of the breeder programme completed and we should be allowed to further complete it. So, the programme for nuclear power generation should be left alone. It is progressing well. If it is not visible, it is because the gestation time is long. So, in the meantime, disturbing the nuclear programme and saying that it is going so slow and that we will have to get 40,000 Megawatt of foreign imported reactors does not make any sense. It is merely the Prime Minister, Montek Singh Ahluwalia and others who want to bring the US into our nuclear power sector. The Western countries—that want to bring the US into many sectors, nuclear power being one of them—are starving for orders and they have found this market which they can certainly enter. But that is not the logic according to which we should plan our nuclear programme.

Now, let me skip to what I consider to be the drawbacks of imported reactors. First, the exhorbitant costs—It would cost us about Rs 10.5 crore per Megawatt as against Rs 4 crore per Megawatt for thermal energy or other coal-based systems. Our own national reactors are costing about Rs 7 crores per Megawatt but even at that cost, we have to support the national reactor programme because that is the only way we are going to get plutonium by shifting to thorium reactors. Hopefully, when we stabilize in the thorium route, our nuclear costs will start dropping. It is very clear that the 123 Agreement does not guarantee fuel supply for foreign reactors. Every year, the US Congress is going to review India's behaviour and many aspects of its foreign policy and various other things. And, if they are happy, they will release the fuel for another two years. It is going to come in bits and pieces. And, at any point of time, if we do something that they do not like, they would have an option to stop the fuel supply. That is one of the conditions of the Nuclear Deal.

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Another major question concerns reliability. We all saw what happened in Bhopal— a foreign company almost got away after the accident in which thousands of our people died. The foreign reactor manufacturers who are coming into the country have already started arguing that they want a liability-free environment to set up the reactors. That means they will come, sell the reactors, turn it on, and hand it over to the Nuclear Power Corporation of India Limited (NCPL) and walk out if that reactor causes a major accident which can also be due to manufacture or design fault, but they will be totally absolved. That is what they want. And, the government has not yet murmured anything and is in fact already in the process of modifying the Atomic Energy Act of India to accommodate the foreign countries under these conditions. In the US, there is a Price Anderson Act under which every company that sets up a nuclear power plant in the US is liable for accidents which could happen during its lifetime. They are held answerable. And, they have an Act under which $10 billion will be immediately available to the local communities for redemption of whatever loss is faced. We have no such thing. These are some of the issues about which we need to worry.

Nuclear terrorism is another concern as it could affect our reactors. The uppermost target of interest for terrorists would be the foreign reactors, before targeting the domestic ones.

Our regulatory framework needs to be strengthened to build public confidence that safety of nuclear plants would be taken care of while letting in private players. Our regulators who are supposed to look independently at the safety of these imported reactors are totally unfamiliar with foreign reactors. So, in the first 10-15 years, we will be in a very dangerous situation where our own people would be trying to learn about these reactors.

Today BHEL and L&T are supplying the nuclear components. After a great deal of struggle, they have established nuclear components manufacturing shop and capabilities. After all, money is not in plenty. So, tomorrow if we start buying nuclear reactors from abroad, to that extent, the Indian reactor programmes will slow down because there won't be enough money for the nuclear programme. If that happens, the Westinghouse shops will have 5,000-10,000 employees hired for supplying reactors to India. But the BHEL shop in Trichi, Hyderabad, and Bhopal will be turning away and rejecting people because they will not have nuclear jobs to do. So, this is also an externality and a hidden cost which need to be taken into account. No one in the national scene is talking about it, not even BHEL. There has to be international monitoring. The safeguards people who come and inspect them do not come free of cost. Also, enormous amount is spent on protecting the American assets that were bought by each country. All these eventually add to the nuclear power cost. This money will not be paid for our own reactors or our own programme.

Nuclear terrorism is another concern as it could affect our reactors. The uppermost target of interest for terrorists would be the foreign reactors, before targeting the domestic ones. The plan is to put 4-5 reactors together in an island. They would require protection from air attacks, attack from the sea, most of them being sea-shore stations. Adding up all these essential costs would add to the cost of nuclear electricity. Considering the cumulative costs, ask yourself whether there is really an urgency for rushing in for nuclear power in the name of national security.

A N Prasad
Former Director
Bhabha Atomic Research Centre

As one who has dedicated the entire professional career towards the development of nuclear energy in the country and worked hands-on in some of the most technologically complex and strategically sensitive parts of the nuclear fuel cycle, I feel proud of the phenomenal achievements of the Indian nuclear establishment during the last five decades, practically starting from scratch, inspite of being challenged to work in isolation under international embargoes and restrictions in nuclear trade and cooperation for most of this period. I wish some of these accomplishments had drawn the attention of the media and the public at least a fraction of the way the currently debated Indo-US Nuclear Deal has caused awareness among almost all the sections of the society in the country and even beyond!

Let me put the Nuclear Deal in some perspective very briefly.

Ever since the non-proliferation treaty (NPT) came into existence in 1970 with India opting out on grounds that it is a discriminatory treaty, dividing the states into 'haves' (nuclear weapons states) and 'have-nots' (non-nuclear weapon states), the US has been trying hard to use every opportunity to somehow bring India into the mainstream of global non-proliferation regime. In fact, this has become an obsession with them. Creation of the 45-member Nuclear Suppliers' Group (NSG) led by the US in response to our 1974 nuclear test is one such measure to deny us access to nuclear market and any form of cooperation with the outside world in the nuclear field. Undaunted, India stood up to the challenge and went on to develop a comprehensive capability not only in building nuclear power plants but also weapons capability. To cap it, India started building a prototype fast breeder reactor, an important step towards the utilization of abundant thorium reserves to meet our long-term objective of energy security.

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Right from the word go, five decades ago, Dr. Homi Bhabha, the founding father of India's nuclear programme, realizing the country's limited known reserves of uranium and vast resources of thorium had, with great vision, postulated the well-known three-stage programme for achieving energy independence and security. This was meant to be in place in the long run once the conventional energy sources like coal get depleted. In fact, this programme has been the guiding principle for our systematic development. It is estimated that the known uranium reserves which could generate a meager 10,000 MW of electricity, if properly managed as per the three-stage programme envisaged, can generate in excess of 350,000 MW of electricity by thorium utilization. Of course, there have been slip-ups in uranium exploration and mining which have become bottlenecks for nuclear energy production in the short term and thus need to be urgently addressed on a war-footing, politically as well as scientifically. Though imports could, on the face of it, appear attractive to get over short-term interests, the implications of the strings attached to the long-term interests of our energy security and independence need to be carefully assessed.

There is no doubt in my mind that India growing in strength to become a force to reckon with in the nuclear field, far ahead of many of the economically advanced countries, has caught the eyes of the world. The world has realized that punitive measures to restrict the determined India are not having the desired effect. In fact, in the various international meetings I have attended, India is treated with respect as an advanced country in the nuclear field. It may be in this context that the US has taken the initiative to open up cooperation with India. Inherent strength counts.

Looking at the joint statement issued by President Bush and Prime Minister Manmohan Singh on July 18, 2005, one can see the respect with which India has been addressed. There was recognition of India as a responsible state, technologically advanced and deserving to be treated at par with advanced countries like the US! Though there were some pin-pricks in the statement, the joint statement as a whole was welcomed by us hoping that there is at last a realization, though belated, of our strength and capability to play a global role as equal partner in the advancement of nuclear science and technology.

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However, as the subsequent development of this historic initiative unfolded, it is evident that all the sweet words are only restricted to paper, that too the initial joint statement. Inspite of India, with even the Prime Minister expressing concerns about the change in goal posts, the US has gone ahead and produced the voluminous Henry Hyde Act speci-

fically giving prescriptions as to how we should behave if the bilateral cooperation has to survive spelling out repercussions if we decide to cross the lines they have drawn. A shameful and demeaning treatment meted out to tarnish our pride and self respect.

As you go deep into the details of the Agreement, it becomes quite clear that as far as the US is concerned, the Deal is more to meet at least three objectives, viz., (1) bring India into the mainstream of global non-proliferation agenda by taking all possible measures to cap and work for a roll-back of its strategic programme; (2) exploit the Indian market for nuclear energy at the same time using its resources to revive their nuclear industry which is dormant since the late 1970s; and (3) make India a strategic partner in this part of the world in line with their foreign policy objectives. In essence, instead of being treated as an equal partner, India is made a client state subjected to periodic assessment of good behaviour!

The above may seem to be a harsh assessment of the intentions of the Deal and the supporters including our government may play it down by saying that the Deal will lift India out of isolation, help in ending nuclear apartheid, gain access to global market, and ensure energy security. All these claims are debatable. The 123 Agreement, the text of which is a fine work of craftsmanship in drafting and camouflaging the core issues by clever use of language is being touted as the main document governing the Deal belittling the Hyde Act which has been formulated and passed as a legal US national document with great care specifically to fix the parameters of the Deal exclusively for India. Essentially, what the 123 document seems to ensure is, during the course of the operation of the Deal, India will be given ample opportunities for consultations on any issue of divergence with the final decision resting with the US since their national laws are stringent and explicit with India having no leverage in the absence of any matching national laws. In fact, there is no provision for arbitration if there is disagreement!

What the 123 document seems to ensure is, during the course of the operation of the Deal, India will be given ample opportunities for consultations on any issue of divergence with the final decision resting with the US.....

Let me briefly touch upon some of the major concerns not adequately addressed in the proposed Agreement.

There is a systematic attempt on the part of the supporters of the Deal to underplay the significance of the consequences if India were to conduct a nuclear test in supreme national interest. While there is nothing in the Deal which legally prevents us from going in for a test if the situation so demands, the US law is very clear that the Deal will be off and they reserve the right of return of all materials and equipment supplied. After investing billions of dollars in importing reactors and building huge infrastructure, which government in future will be able to take a decision in favour of tests and face economic catastrophe? For all practical purposes, the option of testing will be as good as dead and remains only in theory. There may be strong views being expressed from influential quarters within the serving scientific community that weapon designs do not require actual testing but could be done by computer simulation. How reliable such an untested device, its quality, yield and effectiveness as a deterrent will all be questionable in view of the assumptions involved in computer simulation data. Certainly, there will be a great compromise in maintaining truly effective deterrence with fast changing global situation and in parti- cular in the region we are in with our neighbours having no such constraints. In fact, the US perhaps would not have taken up this initiative of relaxing the nuclear cooperation norms if we had not conducted the tests in 1998. One should not undermine strength. While testing is a political decision, it is unfair to make the scientists responsible for producing an effectively deployable device without the option of testing. Effective, credible deterrence and testing are complimentary.

While there is nothing in the Deal which legally prevents us from going in for a test if the situation so demands, the US law is very clear that the Deal will be off and they reserve the right of return of all materials and equipment supplied.

There is no unambiguous clarity in the Deal about the assurances of supply of uranium while at the same time our commitments are to

be in perpetuity regarding safeguards inspections. In fact, shortage of uranium being the main trigger for us to go into this Deal, this ought to be handled with great care. Our own experience in the past with the US on Tarapur Agreement has been far from satisfactory. The US will try to keep us in tenterhooks on this issue and prevent us from building a strategic reserve. Even if we are allowed to stock, in case of trouble, they may invoke the right of return. This is a serious area of concern which is also to be tied up with the IAEA safeguards agreement in terms of corrective measures we propose to take in case of disruption.

Another area of concern is full civil nuclear cooperation. Though this has not been qualified in the initial joint statement of July 18, 2005, in all further documents right up to the final version, this has been redefined leaving out major portions of the complex parts of the fuel cycle such as uranium enrichment, spent fuel reprocessing, and heavy water production stating that these are sensitive technologies. By this, it is not full civil nuclear cooperation on offer but only a part which is of commercial interest, namely, supply of power reactors. We seem to be meekly surrendering to this serious change in their stand without even protesting. Added to this, the 123 Agreement stipulates all sorts of conditions for reprocessing spent fuel of imported uranium origin while nothing is on offer as far as reprocessing is concerned and that too after our having 40 years of experience in this field. I see some deep-rooted motive in putting hurdles on our reprocessing activity which is at the core of our three-stage power programme. Here again, we are still stuck with a bitter experience of stock-piling spent fuel from Tarapur reactors without any clearance from the US for reprocessing. The way the provision for reprocessing is worded in the 123 Agreement, I suspect a trap to ultimately make the dedicated reprocessing we have agreed to build as a multinational facility or force it to come under international control.

If one were to take a holistic picture of the balance sheet of the plus and minus points, not all of which are quantifiable, the situation could be as follows. There could be respite in the short term in gaining access to uranium to fuel the operating reactors and those under construction, getting foreign investments in building additional capacity in power generation though at a much higher cost, and possible opportunity to interact with global nuclear community in certain areas. On the flip side, by making us getting hooked on to the uranium fuelled reactors, there could be less incentive to fund in a big way the fast breeder reactor programme for power generation quoting resource crunch, and slow down the three-stage programme affecting long-term energy independence using thorium making us external uranium-dependent.

The irony is that through this Deal, we are trying to achieve energy independence by becoming dependent on uranium imports with all the implications for national security! Though the percentage nuclear power contribution to the national power grid appears insignificant at present, the technological base has advanced to an extent that should help in accelerating the pace of generation in the years to come. Even with imports, the generation capacity is not expected to increase substantially. The need of the hour is patience and staying on course to redouble our efforts to reach the ultimate goal of thorium utilization which alone can bring India real independent energy security. Shortcuts like the one being contemplated through this Deal could land us neither here nor there and may leave us hanging.

The irony is that through this Deal, we are trying to achieve energy independence by becoming dependent on uranium imports with all the implications for national security!

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After the last UPA-Left joint committee on the Indo-US Nuclear Deal that was held before the then forthcoming State Assembly Elections in Gujarat and Himachal Pradesh, it was speculated that the future course of the Nuclear Deal would be influenced by the results of these elections. Now that the results are out, how does one view further progress in the finalization of the Nuclear Deal that was announced more than two years back?

Press reports suggest that the Left has not modified

its views and will continue to oppose the Deal notwithstanding any possible developments on the Indian negotiations with the International Atomic Energy Agency (IAEA) and the Nuclear Suppliers' Group (NSG) and irrespective of the final outcome of these negotiations in addressing the Indian concerns on future civilian nuclear commerce. To that extent, the future course is totally dependent on the morale of the UPA Government and the Congress Party and its allies in the government and the firmness with which the Prime Minister asserts the authority of the elected government to govern. With this simple but an extremely important caveat, how does one evaluate further progress on the Deal?

First of all, with the passage of Hyde Act and the conclusion of the US-India Agreement for civil Nuclear Cooperation (the so-called 123 Agreement), the process through which India was to become a part of international civil nuclear trade, is no more a bilateral US-India affair. It is now a subject of discussion and negotiation between India and two multilateral agencies—one official and the other unofficial—the IAEA and the NSG. Except for the fact that the US is a permanent member of the Board of Governors of the IAEA and a leading and influential member of the NSG, there is very little need for any more formal bilateral discussion/negotiation between India and the US on the Nuclear Deal. The only formality that needs to be concluded by the US is for the US Congress to agree to the 123 Agreement after the finalization of the IAEA safeguards agreement and the amendment to the NSG Guidelines. Additionally, of course, the US should concur with the approval of the India-IAEA safeguards agreement and the NSG Amendment to its Guidelines for Nuclear Transfers.

The next steps, after the amendment to the US laws to allow for the US-India civil nuclear cooperation and the successful conclusion of a bilateral US-India Agreement for such nuclear commerce—the so-called 123 Agreement—are a number of actions to be taken by India, the IAEA, the NSG and finally the negotiation of agreements—similar to the US-India 123 Agreement—between India and the other members of the NSG who are interested in engaging in civil nuclear commerce with India. In terms of sequencing, the India-IAEA safeguards agreement has to be finalized first followed by the amendment to the NSG Guidelines. Once these two processes are over, then for all practical purposes, the relevance of the US for the operationalization of the Nuclear Deal becomes almost negligible.

India is currently negotiating an India-specific IAEA-India safeguards agreement which will cover the civil nuclear facilities declared by India and one which will also address India's concerns about the security of nuclear fuel supplies in future for the safeguarded facilities. It is possible, within the boundaries of the IAEA statutes, for IAEA and India to craft a safeguards agreement that will give a major role to the IAEA in providing nuclear fuel assurance for the safeguarded Indian facilities. Given the strong support extended to the Indo-US Nuclear Agreement by the NPT nuclear weapon states, with the exception of China, and the support of the IAEA Director General to the whole process, it is not difficult to draft an India-specific IAEA safeguards agreement that would satisfy the concerns and requirements of all parties—the IAEA, the Government of India, and the members of the NSG. It is even possible that such a role for IAEA in fuel supply assurance for India can form the template for a more general fuel supply assurance role for IAEA in respect of other nuclear fuel importing states, a subject which has caught the attention of the IAEA and a number of countries with civilian nuclear programmes in recent years.

It is possible, within the boundaries of the IAEA statutes, for IAEA and India to craft a safeguards agreement that will give a major role to the IAEA in providing nuclear fuel assurance for the safeguarded Indian facilities.

The conclusion of such a safeguards agreement should, in turn, enable the NSG to modify its Guidelines for Nuclear Transfers in a manner that would satisfy both its members and the Indian government. NSG decisions are taken by consensus. However, even though some individual NSG members may not be wholly in support of the Nuclear Deal, it is not expected that any of these member countries would vote against an NSG Amendment. With the support of the major nuclear supplier countries and the assistance of the US, France, and Russia, it is possible to get an NSG Amendment that would enable NSG members to continue to supply India with nuclear fuel and facilities except in the case of a material breach of an international obligation by India of its IAEA safeguard commitments.

With the NSG Amendment in place, India can then negotiate individual "123" Agreements with other NSG members. Already a number of major suppliers of nuclear reactors and fuel have expressed a keen desire to enter into such an agreement with India especially Russia and France. Other NSG members too, such as Australia and Canada, would want to enter the lucrative commercial market in India for nuclear power. It is, of course, necessary that in negotiating such an Agreement with any other country, India is assured that the Agreement does not impose any condition on fuel or facility supply that is not part of that country's civil nuclear cooperation with any other similarly placed country. In short, from the point of view of the Indian government, taking into account the various requirements it has enunciated in the past, and the international community in respect of the non-proliferation aspects of the Nuclear Deal, there is no major hurdle in the way of a successful conclusion of the whole process.

This is not to say, however, that there would not be domestic pressures against the Agreement in either the US, India or elsewhere. The agitation and campaign against the Deal abroad would primarily be confined to the US where the usual suspects in the nuclear fundamentalist camp, the *Ayatollahs* of non-proliferation, can be expected to continue with their campaign against the Deal. Their objections, however, would not go beyond those that have already been made during the course of the passage of the Hyde Act and the 123 Agreement, i.e., the Deal would assist India's nuclear programme; it would be a violation of the NPT; it would lead to proliferation, etc. However, with the massive support the Hyde Act enjoyed in both the Houses of the US Congress, such opposition is not expected to have any impact on either the US administration or the Congress.

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However, the campaign against the Deal in India will in all likelihood continue unabated. The focus of the criticism against the Deal has, however, undergone changes over the period since its announcement. Initially, the arguments against the Deal dealt with and focused on the national security aspects of the Deal. Would the Deal cap India's strategic nuclear programme? Would India have to agree to a moratorium on fissile material production? Will it stunt India's three-stage civil nuclear programme? How difficult will it be to separate the civil programme from the strategic programme? The critics' doubts were laid to rest following the announcement of the separation plan. It was established that the Deal will not require India to halt or restrict any fissile material production, it will not cap India's strategic programme and that it will not definitely impact the three-stage programme as at the second stage itself, the breeder programme, was kept out of the civil list. The separation plan explicitly kept out of the civil list declared by India all facilities that may have had even the remotest connection with India's strategic programme. In short, the Deal will have no impact on the Indian strategic nuclear programme in any manner.

Following the announcement of the separation plan, the criticisms against the Deal shifted to the statements made by various personas in the US as the process of amending the US laws went underway with congressional hearings. When the final amendment act, the Hyde Act, was passed, the critics in India ignored the essential fact that the Act did not impose any condition on India beyond those contained in the July 15 Joint Statement and instead focused on those non-operative clauses which had imposed on the US executive some reporting requirements and which did not require or involve the Indian government in any manner whatsoever. This is not to say, however, that the Hyde Act, a long piece of legislation, did not contain many redundancies, articles and sections that merely repeated sections of other US legislative acts or reiterations of well-known US policies. Nevertheless,the Act conformed in principle to the contours expressed in the Joint Statement.

The focus of the critics of the Deal in India shifted during the US-India 123 negotiations. In particular, the critics focused on a few elements of the Sec. 123 of the US Atomic Energy Act, the issue of reprocessing of spent fuel from the US supplied nuclear fuel, and the possibility of obtaining sensitive nuclear technologies, i.e., reprocessing and enrichment technologies. The standard US 123 Agreement with NPT non-nuclear weapon states was cited to warn of great dangers in the 123 Agreement. In the final analysis, the 123 Agreement that

was negotiated between the two countries was quite unlike any 123 Agreement that the US had negotiated with any other country. The two sides had managed to draft a 123 Agreement that was in line with three major requirements: i) it should be in conformity with the US Atomic Energy Act; (ii) it should not be in violation of the Hyde Act; and (iii) it should address directly and in a concrete fashion India's concerns. Not surprisingly, given the unique nature of the Agreement, it had certain sections that could be interpreted in an ambiguous form. However, both the governments were satisfied that it fulfilled their individual concerns. The critics in India focused on some of these ambiguities which could, however, occur only in very exceptional circumstances which most analysts considered as extremely unlikely.

Realizing the ineffectiveness of their criticisms, the critics in India have now introduced an element which is of no relevance at all for the Nuclear Deal. That is the economics of nuclear power. Arguments have been made that nuclear power is not cost-effective; India would become dependent on imported nuclear facilities and fuel, etc.

The economics of nuclear power does have relevance in India's choice of energy sources in future. However, no critic of the Nuclear Deal has established any link between the Deal and the cost of nuclear power. To put it bluntly, no one has even made a case, let alone established such a link, that the Nuclear Deal, whether operationalized or not, would affect in any manner whatsoever the economics of nuclear power. Nor can anyone make a case that nuclear power would be uneconomical under all circumstances irrespective of the costs of other competing energy resources, for example, even if the cost of petroleum oil goes to US $ 200 and beyond. As common sense, not to speak of some economic knowledge, would indicate that the economics of nuclear power would depend on the relative pricing of other fuels and there is no link between the Deal and the pricing on any fuel, nuclear or non-nuclear.

What the deal does, however, is give India the option, which it does not have now, of being able to import nuclear fuel and facilities if nuclear power is seen to be competitive with other energy sources. It does not in any manner whatsoever require or force India to import such facilities or fuel if it considers nuclear power to be uneconomical.

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To presume, therefore, that a future government would engage in such imports is at best to cast lack of intelligence on part of an elected Indian government and at worst to allege that only the critics of the Deal have the Indian national security interests at heart and others have no competence, on the subject. Given the composition of the critics, it would be difficult to sustain the latter argument.

In a broader framework, the Deal would be seen in future as a landmark Agreement befitting the role and importance of the major supporters of the Agreement: US, India, Russia, France and others. For India, the Deal opens the option of enlarging the share of nuclear energy in India if that energy source remains competitive, and for the international community, it brings India once again as one of the major players in international nuclear affairs. It is not without significance that India has been consistently a permanent member of the IAEA Board of Governors ever since its inception as one of the ten countries globally advanced in atomic energy and the only one such Board member who is not part of any of the other current international arrangements such as NSG, NPT, etc. This Deal will enable India to take its rightful place in international nuclear diplomacy even though it may choose to remain outside NPT and NSG.

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The universal consensus, with few exceptions, is that this Deal will correct a long-sustained injustice and is worthy of the prime proponents of the Deal: India and the US.

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In the context of the Indo-US Nuclear Deal, there have often been charges against us that our opposition to this Deal comes and stems not actually from the Deal *per se* but from certain extra-territorial loyalties or from the fact that we are anti-development. The first argument that is posed is that it is required for our country's energy augmentation. There is no doubt about the fact that the country needs to augment its energy. By 2020, we need to be very comfortable, and for this, we may require at least five more deals, if not more. There is no dispute on this count. The dispute that we have is whether this is the best and the most cost-effective way to augment our energy resources. The answer to that question has been sought by experts from all quarters.

Let us begin with the proposition of the Prime Minister. He said that we require 40,000 Megawatt of nuclear energy by 2020. Out of that, we may obtain 10,000 Megawatt from domestic reactors which means that 30,000 Megawatt of nuclear energy would be produced by the imported reactors. Now, what is the total cost of nuclear energy per Megawatt produced by imported reactors including the cost of import, etc. A rough estimate puts the figure around Rs 11 crore per Megawat. Thus, 30,000 Megawatt of nuclear power generation from imported nuclear reactors would mean a cost of Rs. 3,30,000 crore. Comparing this figure with the cost of the best of thermal energy, the best of technologies to control pollution, etc., per Megawatt, it will come to around Rs 4 crore. There is no dearth of coal in India. According to the Planning Commission estimates, till 2050, the major source of our energy production will be coal-based. So, there is no reason why we really have to rely on nuclear energy. We can produce the same 30,000 Megawatts, using thermal energy at the cost of Rs 1,20,000 crore.

According to the Planning Commission estimates, till 2050, the major source of our energy production will be coal-based. So, there is no reason why we really have to rely on nuclear energy. We can produce the same 30,000 Megawatt, using thermal energy at the cost of Rs 1,20,000 crore.

Looking at the other alternative of hydroelectric power generation—there is no dearth of water in India. On the contrary, every year, hundreds and thousands of crores of property is devastated and lakhs of people die because of floods. We can tap these water resources. Our national hydroelectric corporation tells us that we today utilize only 20 per cent of our potential for hydroelectricity. Now, keeping all our environmental concerns in mind, the cost of one Megawatt of hydroelectricity would be Rs 3 crore. Thus the same 30,000 Megawatt can be obtained in Rs 90,000 crore. Alternatively, if we consider gas, we now have a discovery of a huge gas basin in *Krishna Godavari*. We are now talking about huge gas reserves on which the whole of the north-east is floating. We are talking of the gas supply from Iran. For this gas, again, we do not have to go anywhere. So the question that we are asking is not whether energy augmentation is needed. We fully agree that energy augmentation is a must, but the point that we want to emphasize is that energy augmentation has to be achieved using our own domestic resources, which means all the multiplied effects, all the downstream and upstream industries that will follow, will be within India. With that Rs. 1,00,000 crore, we can produce this 30,000 Megawatt. Why then should we want to spend Rs 3,30,000 crore for imported reactors? No answer has come so far. Secondly, if this is true, then by entering into this Deal and importing reactors, what are we doing? The last order for a nuclear reactor in a US multinational corporation was placed about 30 years ago.

The US itself is not augmenting its energy through nuclear sources because of the accident they had in the Pacific Island. So, if this Deal takes place, a huge number of orders will go to the US, allowing them to make profits while we would be saddled with these imported reactors. The first point is that nuclear energy being the best alternative for energy augmentation is based on false premises. And the country cannot afford such high prices. Because what is the cost definition? It would be roughly

two and a half lakh of crores, if you talk of rounded figures. It would mean enabling the opening of two and a half lakh new *Navodaya Vidyalayas* in which a 100-odd students can pass their class 12th with scholarship with this money. It would mean fulfilling a dream that we have always cherished—that every village in our country will have a school. Instead why do you have to boost the progress of General Electric ?

Alternatively, we can even use the same money for our public hospitals and build 20,000 public hospitals of the highest stature like AIIMS with this extra differential. Thus instead of spending crores on imported nuclear reactors, we can start 2.5 lakh *Navodaya Vidyalayas* or 20,000 hospitals and provide quality education and health to crores of people. Why deny that for this Deal when the alternative does not mean the loss of even a single Megawatt of power? Therefore, the first question is: When would be an appropriate time for us to make a switchover to nuclear energy? We are not saying 'No' to nuclear energy. Two generations down the line from now, the only way to get these electric lights functioning would be through nuclear energy because all other reserves would have got exhausted. But the question is when do you make the switchover and how. That is where these calculations are important.

Instead of spending crores on imported nuclear reactors, we can start 2.5 lakh *Navodaya Vidyalayas* or 20,000 hospitals and provide quality education and health to crores of people. Why deny that for this Deal when the alternative does not mean the loss of even a single Megawatt of power?

The second point is the context of the Deal. The Deal cannot be seen in isolation. It is the product of the last six to seven years of constant interactions between India and the US in what is called the strategic relationship or strategic alliance between the two countries. The foundation for this Deal was actually laid out by the Vajpayee Government in the course of six years of its rule. And this is part of a larger package. I can only quote the US Under-Secretary, Nichols Burns who said, "If you don't do it by the year end, it won't happen." I just want to remind him that when all the countries signed the CTBT, the US Congress rejected it. And then Bill Clinton said: "What can I do?" If Bill Clinton can say that, why can't we have the same right to say that our Parliament did not approve of it. We can let the Parliament decide. But, this is a larger package which will put pressure on India's foreign policy positions; there will be pressure on India's security concerns. The joint military exercises between the two countries would make sense if both the countries have a common threat perception. Now what is the common threat perception between the US, Japan, Australia, Singapore, and India? Who is such a common enemy? What is this military expense all about except drawing us into the US security strategy. And, this is where we have serious problems about India today.

Looking at the map, we are surrounded by what Henry Kissinger once called the 'Failed States.' Starting from Bhutan, Nepal, Bangladesh, Myanmar to Sri Lanka, Pakistan, and Afghanistan—-in every single of these countries, there is a very deep instability and conflict. And, India's future and betterment lies in the fact that all these countries stabilize as proper democracies. By joining a US-led coalition with Japan and Australia, what is the message that India is sending to all these neighbours? And, what is the message that we are sending to China? Is it in our national interest? We believe that these sort of signals mean being a subordinate to the US and this will be detrimental to India's position as a country which has to play an important role in the world order. In the Rajya Sabha, in response to the nine points that I had raised, the Prime Minister answered all the nine points and in fact gave 12 assurances. But after that came the Hyde Act. Six months later, from the nine assurances that he had given, three were not fulfilled. One is what is called the uninterrupted fuel supplies. They are important because if, for some reason, the 123 Agreement is terminated and the US discontinues supply of fuel, we would be stuck with these imported reactors. It would lead to

Two generations down the line from now, the only way to get these electric lights functioning would be through nuclear energy because all other reserves would have got exhausted. But the question is when do you make the switchover and how.

the aim not being fulfilled.

Secondly, we will have complete civilian nuclear cooperation. The 123 Agreement specifically says that as far as reprocessing and enrichment are concerned, these dual use technologies are prohibited to be transferred to India. So, where is this complete scientific cooperation leading us to?

There are certain issues in the actual text that need to be properly assessed before we proceed further. That is why we told the government to press the Pause button.

The third objection is that with the IAEA, we entered into a perpetual safeguard agreement. And we are told that with this 123 Agreement, we are actually bringing India back into the non-proliferation regime. But now with the permanent safeguards that India will have, 90 per cent of India's reactors will be under IAEA safeguards which means that even if the 123 Agreement is terminated and fuel is not supplied to us, in perpetuity, we are under the inspection of the IAEA. We are entering into these inspections in order to facilitate this 123 Agreement. If this breaks down, why should we continue with that? Why should the IAEA and the government always cooperate?

So, what we are telling the Prime Minister and the Government is that apart from the final details which they will explain, it should be considered that unless these things are corrected and assured, this Deal is not in India's favour even from the text point of view. From the conflicts point of view, of course, it is not. And here, we have to draw attention of the whole world and ourselves. The 123 Agreement exists between, let us say, the US and China and in case of a dispute between these two countries, the law that would prevail to take care of the issue would be an international law. For India, in case of a dispute on any of these issues, the law that will finally prevail would be the US domestic law which is the Hyde Act. If China has an international law then why not for us? What does the 123 Agreement in Japan say? That in case of a dispute, an Arbitration Council will be set up to resolve the dispute, with one representative from Japan, one from the US, and a third one from a third country agreed upon by both and the Chairperson of this Arbitration Council whose verdict is to be accepted by both. If Japan has an Arbitration Council and for China, it is as per an international law; for India, please tell us, why it should be an US domestic law?

These are certain issues in the actual text that need to be properly assessed before we proceed further. That is why we told the government to press the Pause button. We are not telling them to Eject; we are not telling them to stop, but just to press the pause button. Let us consider this. Let the Parliament discuss it and then we would proceed with a clearer picture about the things we are not comfortable with at all. Even if China agrees to it, we will still oppose it on these counts. And secondly, when would China and Pakistan gain? China and Pakistan would gain when there is a cap on India's strategic programme because their strategic programmes can continue while we would cap ours. Now, who is capping India's strategic programme is a different matter. We are opposed to it; we are opposed to nuclear weapons in India or in the world; that is a different matter. But, the fact remains that this Deal caps India's strategic programme. And therefore there is bound to be arguments. We have reactors; we will continue with that. But the Deal which effectively caps India's strategic programmes is the one that gives relative advantage to both China and Pakistan. So, it is those who are advocating this Deal are actually the ones helping China and Pakistan as opposed to those like us who are opposing it. And that is why I appeal to all of you to reason things out.

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The joint statement signed between the US President George Bush and the Indian Prime Minister Manmohan Singh in Washington DC on July 18, 2005 (J 1805) covered a wide spectrum of areas wherein the two countries could beneficially cooperate but the one strand that has received continuous attention and incisive comment is the one pertaining to the possibility of civilian nuclear domain. This was perhaps predictable, given the tec-

Through J 1805, India would in effect not only re-order its estranged relationship with the US but the rest of the nuclear and hi-tech world.

tonic import of what was mooted by the two leaders in the nuclear field and this is borne out when the entire issue is viewed contextually at three spatial levels, viz, global, bi-lateral, and domestic.

Over the last two and a half years, J 1805 has become a lightning rod for different constituencies in the US, India, and the global community that is concerned with matters nuclear. Consequently, there has been a considerable churning of multiple inter-related and complex issues and a fair amount of heat, dust and some light that has been generated. At one point in this period, it appeared as if the very survival of the Congress-led UPA government was at stake due to the ontological differences that were raised by the Indian Left parties over the desirability of proceeding with J 1805 and having a closer relationship with the US.

J 1805 is, strictly speaking, a 'joint statement' of grand intent as it were, and over the last 30 months, it has morphed into an Agreement – albeit potential – and the discourse in the media has further refined this into the Indo-US 'Nuke Deal' – which it will be if the letter and spirit of the July meeting is fully realized.

However, that danger appears to have passed – for the present – though the fall-out of the Gujarat elections will have non-linear ramifications for the domestic political matrix in India *vis-à-vis* J 1805. Incidentally, J 1805 is, strictly speaking, a 'joint statement' of grand intent as it were, and over the last 30 months, it has morphed into an Agreement – albeit potential – and the discourse in the media has further refined this into the Indo-US 'Nuke Deal' – which it will be if the letter and spirit of the July meeting is fully realized.

A brief review of the global nuclear narrative since Hiroshima of August 1945 and the post-Cold War, post 9-11 trajectory may better contextualize the deeper import of J 1805 and the cost-benefit analysis for the two principal interlocutors. Soon after the US demonstrated its brief atomic hegemony, the former USSR also acquired this distinctive strategic capability with its mass-destruction characteristics by the mid-1950s, thereby laying the foundation for bi-polarity that was the *leit motif* of the Cold War. Within that decade, three more nuclear weapon powers joined the so-called Club with China following the UK and France.

Soon thereafter, the major powers decided to retain this exclusive status and introduced the nuclear non-proliferation treaty (NPT) that sought to prevent other countries from acquiring nuclear weapon status. India, directly affected by the Chinese bomb, rejected the NPT for its discriminatory nature and remained steadfastly outside the regime and championed the cause of universal disarmament and peaceful use of nuclear energy. Simultaneously, India nurtured its modest nuclear infrastructure that was built around Homi Bhabha's vision of a three-stage programme that would harness India's vast thorium reserves for nuclear energy.

A deep abhorrence for the apocalyptic nature of the nuclear weapon introduced an ambivalence in the Indian response to determinedly acquire the nuclear weapon notwithstanding the fact that China's October 1964 nuclear test had altered the strategic balance in Beijing's favour. But driven by a mix of insecurity impelled by a hostile global and regional ambience and latent nationalist fervor, India conducted what is termed a Peaceful Nuclear Explosion (PNE) in May 1974. The Nuclear Club was aghast and angry and soon formed a closed cartel and a technology denial regime led by the US that was specifically directed against India. Progressively, India became an outsider, an outcaste, and a pariah in a nuclear apartheid world. A defiant India became more and more insular by way of its interface with the rest of the hi-tech and nuclear world.

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With the end of the Cold War in

December 1991, the Nuclear Club became more exclusive and both France and China formally joined the NPT. The dominant global community sought to fetter India through two other initiatives – the CTBT and the FMCT – the comprehensive test ban treaty and the fissile material cut-off treaty respectively. Concurrently, China assisted Pakistan in its covert missile and nuclear weapon programme that encouraged Islamabad to acquire a credible WMD profile and the attendant confidence to increase its strategy of terrorism and low intensity conflict against India.

Post 9-11, the world had to acknowledge the nature of the new nuclear realities and attendant challenges in the 21st century which encompassed deviant regimes, non-state entities, and the spread of nuclear know-how and fissile material. The NPT as a regime was clearly inadequate to address this new reality.

Consequently, Delhi was driven to review its posture of nuclear ambivalence and after a tentative attempt by the then Prime Minister Narasimha Rao in December 1995, India, under the BJP-led NDA Government, declared itself as a state with nuclear weapons in May 1998. (Pakistan followed suit soon after.) The Vajpayee government sought to assuage global concerns by announcing a voluntary moratorium on further testing and a no-first-use policy. Yet, the global nuclear regime was challenged and the US which spearheaded the prevailing non-proliferation drive sought to further ostracize India – but in vain. By March 2000, the Clinton administration came around to accepting the Indian decision – albeit reluctantly. India was still an outsider and the US was still keen to 'roll-back, cap and eliminate' the Indian Nuclear Weapon Programme.

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It is against this complex and tangled backdrop that the Bush administration reviewed the US nuclear policies and decided to make a radical shift. India was to be accorded an exceptional status by admitting it into the global nuclear fold. J 1805 was unveiled and its radical scope took the principal interlocutors and the world by surprise. The US and India arrived at a *modus vivendi* by which India would be allowed to retain its modest nuclear arsenal in return for placing 14 of its 22 reactors under international safeguards. To facilitate cooperation in the civilian nuclear and hi-tech sector, the US agreed to amend its domestic laws that prohibited such interaction, (hence the Hyde Act) and encourage the other NSG members to accord India similar exceptionalism. Thus, through J 1805, India would in effect not only re-order its estranged relationship with the US but the rest of the nuclear and hi-tech world. And furthermore, India would be able to access the global market for uranium ore – which is a scarce domestic resource – to advance its three-stage power programme, even while husbanding its modest strategic arsenal.

Thus an objective cost-benefit analysis would suggest that India is getting the best possible 'deal' against the backdrop of prevailing global realities. Yes, India is accepting certain conditions and some elements of the US legislation that need to be reconciled but the big picture is stark. Currently, India remains isolated due to its peculiar nuclear status and it is paradoxical that when globalization and unfettered interaction across the political, economic, and hi-tech tracks is the norm of the 21st century, India alone among the major powers is an 'outsider.' To the extent that the world is moving towards a knowledge economy and access to the global high and new technology domain is a desirable direction, India needs to position itself most favourably.

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J 1805 allows for such a change in orientation, which in turn will permit a much greater harnessing of India's proven HR talents that are in sync with the trajectory of the 21st century.

To predicate India's long-term national interests on a single exigency – the unencumbered right to conduct another nuclear test – is to completely miss the strategic contours of the future. A rare concatenation of circumstances in the US and India allow for J 1805 to remove the fetters that have been placed on India for almost 32 years. Rejecting this due to exaggerated anxieties and distorted interpretations about what such exceptionalism entails for India would be indicative of imprudent and feckless management of national priorities.

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The Nuclear Deal with the US has disrupted public discourse multiple times in the recent past. It is amazing how our public discourse is typically filled with opinions flying left, right, and centre – opinions that each one of us fits with our own world views – and the proverbial scratch on the surface reveals that not much exists beneath the surface at all. 'Too much punditry, too little analysis' is a description that characterizes the greater majority of our public debates, with even 'informed' analyses in reputed publications typically failing to connect all the dots.

There are broadly two axes along which the Deal can be analysed—the first is energy economics and the second is strategy and foreign policy. I am convinced that the Deal is favourable along both dimensions, but let us look at the issues one by one.

First, the relevant facts – the duration of the Deal is 40 years, and the proposed energy transfer in the period is about an installed capacity of 60,000 MW. Either party can terminate the Deal with a notice period of 1 year in this interim 40-year period, and with a notice period of 6 months at the end of the Deal. The objective of the Deal is to "enable full civil nuclear cooperation with India covering aspects of the associated nuclear fuel cycle." The resultant business is likely to be to the tune of $150 billion, of which the lion's share is likely to go to the American nuclear power companies.

So, what are the implications for India's energy scenario? To evaluate that, a look at our current position is necessary. We currently have an installed peak capacity of 160,000 MW, including captive generation sources. This implies a peak shortfall of 11.7 per cent or about 21.2 MW. (This is just the installed capacity, ignoring the severe T&D losses). The Integrated Energy Policy (IEP) Report of the Expert Committee of the Government of India, dated 9th August 2006, shows that even though the elasticity of per capita energy consumption per capita of GDP growth has been falling over the years and is less than 1 now (meaning that if x% is the annual increase in energy demand and y% is the annual increase in GDP, then x<y), the energy needs per capita are still likely to increase at a rate of 6-7 per cent p.a., averaged over the next 25 years. It estimates that in 2031-32, we will need an installed capacity of 800,000 MW. Where is this 800,000 MW going to come from? From "pursuing all possible fuel options," in the words of the Expert Committee. The 800,000MW figure is inclusive of an estimated 63,000 MW of nuclear power, 150,000 MW of hydel power, and thermal power increase of 5.1 per cent p.a. India's uranium reserves are good enough for only about 10,000 MW, representing the limiting value for our PHWR reactors.

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Opponents of the Deal have continuously touted the figure of Rs. 11 crore per MW, the estimated costs of the nuclear power generated through imported fuel and reactors. This figure, they claim, is significantly higher than the Rs 7 crore per

MW for power from indigenous nuclear sources, Rs 4 crore per MW for power from thermal sources, and the even lesser cost per MW for hydel power. These figures are a little tricky. It is fair, for example, to ask why the relevant power figure for comparison was taken as 30,000 MW and not 53,000 MW (estimated requirement minus indigenous resources). Ventures with higher fixed costs (import of reactors, fuel etc.) become increasingly attractive for higher volumes. The long run marginal cost of producing 1 business unit (1 KWH) of energy through nuclear sources was estimated at about Re 1.00 for nuclear energy and about Re. 0.90 for thermal energy, (at 1984 prices) in a paper by Prof Y K Alagh (1997). The comparison becomes favourable for nuclear power when the distance to which coal has to be transported exceeds a 1,000 Km, due to the high transportation cost of coal.

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According to the IEP Report, Indian uranium is extracted from the ore that has 0.1 per cent useful content as opposed to the international standards of 12-13 per cent. This makes indigenous nuclear fuel 2-3 times costlier than the imported fuel. With all these figures, it seems hard to accept the cost considerations that have been drawn for a capacity of 30,000 MW. The dissonance is further magnified by the fact that the IEP Report has suggested that India change its energy policy from "minimum initial cost purchase" to "minimum life cycle cost purchase."

However, let us for a moment assume that comparison to be absolutely correct. Does that change things? Not really. The inherent assumption that we could use alternative sources to generate the 30,000 MW is itself flawed. The IEP Report assumes 150,000 MW of hydel power, which is 100 per cent of the known hydel power potential of India. It also assumes a constant growth of 5.1 per cent p.a. for thermal power, which has been the current trend. India needs those 30,000 MW of nuclear power even after exploiting these alternative options to their reasonable maximum. The scenario that we are looking at, thus, is not one of high cost power *vs*. low cost power, but one of some power *vs*. no power. One is reminded of Homi Bhabha's succinct remark that puts this situation in its proper perspective – "No power is costlier than no power."

India's mineable coal reserves are estimated to last another 45 years (at 5.1% growing usage p.a.) and the known oil reserves are likely to last 23 years of production and 7 years of consumption. With increasing oil prices and depleting coal reserves all around the world, there seems to be no way except to go for nuclear power. The IEP Report says that "Nuclear energy theoretically offers India the most potent means to long-term energy security." It is true that energy security has to be achieved in the long term through indigenous sources, and that the indigenous thorium-based FBR programme is theoretically the best way to achieve nuclear power security. However, to let go of the opportunity of imported uranium-based power generation in the hope of an unmitigated success of the FBR programme would be extremely damaging in the medium term, and implies continuing peak load power capacity shortfalls.

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Next, we move on to the strategic and foreign policy implications. The opponents of the Deal have raised four main considerations on this front, namely:

1) The Deal does not guarantee assured nuclear fuel supply, and only promises to "seek to amend domestic laws" to ensure the same.

2) The Hyde Act is likely to prove a major bug-bear, and the necessity of "congruence" of the Indian foreign policy with that of the US impinges upon our autonomy and will be interpreted as strictly as possible by the US.

3) In the event of a unilateral termination of the Agreement by the US, we will be left with unusable nuclear reactors that will impose maintenance and safety costs for no benefits at all.

4) IAEA safeguards will continue in perpetuity even though the Deal is terminable.

Let us deal with the last consideration first, because the first three are closely inter-linked. What exactly are the IAEA safeguards that we have to adopt? Simply that any reprocessing performed on the nuclear fuel imported through this Deal will be in a newly created reprocessing facility that will be open for IAEA inspection (typically, these inspections are inventory checks of weapons-grade nuclear materials). Any reprocessing done in this facility will be open for IAEA inspection. But do these safeguards extend to all reprocessing performed in India's reactors? Not at all. It is perfectly possible for India to strike similar deals with other NSG nations and reprocess the fuel obtained through those deals at separate facilities with separate safeguards. Even if the US is likely to put pressure on most NSG nations to have similar safeguards, the option of Russia remains perfectly tenable.

The first three considerations become relevant only in the event that the US goes ahead with a unilateral termination of the Deal. Since the large US business houses are going to have a stake in the profits generated by the Deal, their pressure and lobbying is going to act as a deterrent to the possibility of this scenario. More significantly, the information and technology transfer is going to aid India on the path of creation of indigenous reactors that can process higher grade uranium that can be imported from the non-US NSG countries. This acts as a genuine buffer to the shock of a unilateral termination.

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Interestingly, this is what Article 5.6(b) of the Deal reads like:

- The US is willing to incorporate assurances regarding fuel supply which would be submitted to the US Congress.
- The US will join India in seeking to negotiate with the IAEA for India-specific fuel supply agreement.
- The US will support an Indian effort to develop a strategic reserve of nuclear fuel to guard against any disruption of supply over the lifetime of India's reactors.
- If, despite these arrangements, a disruption occurs, the US and India would jointly convene a group of friendly supplier countries to include countries such as Russia, France, and the UK to pursue such measures as would restore the fuel supply to India.

The language is ambiguous, but not by diplomatic standards. Please find me another instance where India has been able to negotiate a deal with a superior power with such major concessions. Is it at all possible for the US to guarantee fuel supply in contravention of its domestic laws? Can the UPA, for example, promise the US that the deal will definitely go through?

And what about the Hyde Act? Without delving into legalese, the essence of the matter is that the Act is definitely restrictive, but four prominent exemptions have been granted to India. The first one was the exemption of the requirement of IAEA fullscope safeguards. The second was an exemption that made sure that India's detonation of a nuclear device after the passage of the Atomic Energy Act (1978) of the US does not hinder the Deal. The third waived the sanction on exports to India. The fourth exemption ensures that India's unsafeguarded nuclear activities that are independent of the nuclear transfers as part of the Deal cannot be invoked as a reason for termination. The Hyde Act remains an issue of contention, but seems like one that has to be negotiated with, rather than something that can be made a reason to ditch the Deal.

The arguments in favour of the Deal are many, the detractions few. It would be a great loss to India if the Left succeeds in its attempts to stall the deal.

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It is a commonly held misconception that Nuclear Deal is a panacea for India's burgeoning energy deficit reduction and a means to rejuvenate the supposedly ailing domestic nuclear industry. The implementation of the Deal essentially allows India to secure uranium for conventional nuclear power generation without any concomitant technology transfer. India's strategic three-stage programme which holds the real promise for securing India's long-term power needs will remain unaffected by the Agreement. We elaborate on these two points in what follows.

India's long-term energy security is dependent on the successful culmination of the three-stage fast breeder reactor programme that allows India to harness its vast thorium reserves and increase nuclear power capacity in excess of 50,000 MW.

India currently has an installed capacity of 140,000 MW, precluding captive generation capacity. Nuclear power accounts for a minuscule 3 per cent of this installed capacity. It, however, accounts for 16 per cent of the worldwide installed capacity. In France, nuclear power accounts for a whopping 75 per cent of the installed capacity. India's below average ratio can primarily be attributed to the nuclear fuel and technology embargo in place since 1970. This has proved to be a blessing in disguise and has allowed the Indian establishment to develop critical competencies along the entire nuclear value chain from fuel mining and fabrication, reactor design and construction, and waste management. The bottleneck in expanding nuclear capacity since then has been a lack of access to uranium from the NSG countries, not technology. The Nuclear Deal essentially serves to set that right by allowing us access to uranium from the NSG countries. This will only marginally meet India's power requirements in the 2020 period as the following simplistic computation shows.

Extrapolating the recent trend of 7-8 per cent annual increase in the installed generating capacity, we are looking at an additional capacity of 200,000 MW that needs to be installed by 2020. Assuming that the Nuclear Deal in its present form is implemented, an additional capacity of 30,000 MW will be created from foreign imported reactors and purchase of enriched uranium from the NSG countries. This will account for a mere 8 per cent of our annual power consumption needs in 2020. Further scaling up is not feasible and will drive up fuel costs to make nuclear power relatively more expensive. The 8 per cent capacity shortfall, if the Deal were not implemented, can be met in myriad ways. Further, power from imported reactors is bound to be more expensive than that produced from the domestic ones. It should be obvious that the Deal's energy implications in the context of the Indian economy are not significant.

India's long-term energy security is dependent on the successful culmination of the three-stage fast breeder reactor programme that allows India to harness its vast thorium reserves and increase nuclear power capacity in excess of 50,000 MW. The first stage of the programme employs the pressurized heavy water reactors (PHWRs) fuelled by natural uranium, and light water reactors, to produce plutonium. In the second stage, fast neutron reactors burn the plutonium to breed U-233 from thorium. Then in stage three, advanced heavy water reactors (AHWRs) utilize the mix to generate two-thirds of the power from thorium. In 2002, the regulatory authority issued approval to start construction of a 500 MW prototype fast breeder reactor at Kalpakkam which is expected to be operational in 2010. This will take India's ambitious thorium programme to stage two. Needless to say, the success of the three-stage programme will drastically alter nuclear economics and render irrelevant extant nuclear regime and concomitant treaties. It is fairly clear that our supreme national interest lies in focusing on this indigenous programme, which was conceived

The success of the three-stage programme will drastically alter nuclear economics and render irrelevant extant nuclear regime and concomitant treaties. It is fairly clear that our supreme national interest lies in focusing on this indigenous programme, which was conceived way back in 1958-59, keeping in mind our paucity of uranium reserves and abundance of thorium.

way back in 1958-59, keeping in mind our paucity of uranium reserves and abundance of thorium. It must be stressed that the Indo-US 123 will have no direct bearing on India's indigenous programme. The imported fuel, under the terms deal, cannot be used for the three-stage programme. However, implementing the Deal may have an indirect deleterious bearing on this programme. The Deal will allow the Westinghouses and GEs to set shop in India. The *de facto* privatization and investment in imported foreign reactors are bound to slow down the strategic programme by consuming the scarce national resources (both human and financial). This aspect needs to be looked very closely into. The Nuclear Deal does not open up new vistas for technological collaboration nor does it bolster our indigenously built-up capabilities. It only allows us to meet 5-8 per cent of our medium-term energy needs at a very high financial cost. Given this background and the political implications of the Hyde Act, the Deal's real significance lies in the strengthening of the emerging strategic relationship between the world's most powerful democracy and the world's largest democracy and not in enhancing India's energy security. Lord Palmerstone, the 18th century British statesman once famously said "Nations have no permanent friends or allies, they only have permanent interests." An energy deficit and rapidly growing India's permanent interest lies in securing its long-term energy needs, and that is something this Deal does not address.

The Nuclear Deal does not open up new vistas for technological collaboration nor does it bolster our indigenously built-up capabilities. It only allows us to meet 5-8 per cent of our medium-term energy needs at a very high financial cost.

CONCLUSION

Anil Gupta

Air Commodore Jasjit Singh, one of the foremost defence analyst of our country defends the Deal convincingly. He makes three arguments: (a) The Deal would reduce, not enhance, the dependence on the US for technology and fuel. Many countries are in line, whether Russia or France, willing to do business with India in this area as soon as the Deal is through; (b) The Indian options for nuclear test, if situation so demands, are not foreclosed in the Deal though the test may not be warranted even on other grounds; and (c) The need for nuclear energy in the future is only going to increase, not decrease, given the high oil prices, lack of good quality coal, and limited alternative options. The case for the Deal is strongly made.

Sreenivasan believes that the deal was a major diplomatic achievement conferring on India the status of nuclear weapon state and at the same time, providing it a non-(nuclear) NPT (Non Proliferation Treaty) route for gaining access to technologies and fuel. In his view, any negotiation can only lead to a compromise solution. The deal to him appears the best possible outcome.

Gopalakrishnan argues that indigenous capacity for making turbines and power plants will seriously be impaired if we went for large scale imports. He feels that coal and hydro options are worth exploring further. Within nuclear energy, the thorium conversion technologies have a future and India can develop the same, given some more time. The cost per Megawatt of nuclear energy is also said to be much higher than other sources. He recommends investment in indigenous capacity building relying on thorium of which we have enough reserves. He does not support the Deal.

Prasad recalls the foresight of Homi Bhabha who had visualized the need for thorium- based energy generation more than 50 years ago. Having spent his life in developing technologies at Bhabha Atomic Research Centre, he makes a strong case almost echoing the sentiments of Gopalakrishnan. He believes that if scientists were given some more time and resources, India might become the pioneer in thorium-based nuclear energy generation technology. India would then not need the imports and in fact might become an exporter of this technology.

Balachandran makes an interesting point that having started negotiations with IAEA and NSG, the matter is no more bilateral in nature. He identifies the steps that are to be taken after negotiations with IAEA and NSG fructify. There is a big uncertainty about the view of the Left parties to the agreement, notwithstanding the assurances that IAEA and NSG provide. He argues that relative economics of different sources of energy will

have to be evaluated from several angles including emerging scarcity, reliability and other considerations. He underlines the fact that India has been a member of the IAEA Board of Governors ever since its inception as one of the ten countries globally advanced in atomic energy. It is the only member which is not part of NSG and NPT.

Sitaram Yechury, one of the most eloquent leaders of the CPI (M) which is stalling the Nuclear Deal negotiations at present, addresses political as well as technical charges against their position upfront. He acknowledges the need to augment energy options for India. He disagrees with those who believe that the Indo-US Deal is the best alternative at the moment. While dealing with the coal-based energy option, he does not address the issue of domestic coal quality and the fact that India imports a huge lot of coal from Australia, has still not found a way of dealing with fly ash produced by power plants and, of course, the problem of carbon emission. He considers hydro power as an area of future growth apart from gas-based power stations. He makes an important point about the lack of clarity in the Deal about uninterrupted fuel supplies. It is a different matter that as noted by other supporters of the Deal, there could be non-US suppliers willing to provide the fuel. Should India continue to let 90 per cent of its reactors be under IAEA safeguards if the 123 Deal was scrapped. He also regrets that unlike the US-China Deal, the Indo-US Deal would be governed by the Hyde Act of the US instead of the international laws. He has a point—when Japan Deal has a provision for Arbitration Council, and the China Deal has resorted to international law, why should the Indian Deal require submission to the US domestic law? This is a question, which the defenders of the Deal have not answered satisfactorily.

Commodore Uday Bhaskar looks at the issue from global, bilateral, and domestic levels. By placing only 14 out of 22 reactors under international safeguard, Indian nuclear arsenal aspirations are being respected. He supports the Agreement.

Ritwick, a PGP I student, defends the Deal and argues primarily on the relative cost of different sources of energy. He makes an interesting point about the calculation of the costs with different output estimates. He refers to Article 5.6 (b) which provides considerable leeway for exploring the options of fuel supply through Russia, France, and the UK, should a disruption from the US occur for any reason.

Krishna, a PGP II student, asserts that a mere 8 per cent share of nuclear energy in 2020 is not good enough to undertake such a Deal. He believes that power from imported reactors is bound to be more expensive than the domestic ones but gives no reason for that. In fact, as Ritwick argued, the imported fuel would be less costly than the domestic fuel, given much smaller quantity of useful content in the Indian ore.

Sreenivasan, Commodore Bhaskar and Balachandran support the deal on various strategic grounds including the defence considerations. They do not say in so many words but imply that restrictions on dual use technologies have affected our defence preparedness and this deal might provide a way out for our scientists to pursue domestic options. The import is possible but not obligatory. If it is not in our interest to generate power at high cost, we don't have to create facilities for the purpose to that extent.

Would this Deal indirectly strengthen our domestic capacities for thorium-based options or thwart it would depend upon the foresight our planners would show. There is a strong case for strengthening indigenous capacities. A way out seems to be to have the Deal but not expand too much of nuclear power options through imported reactors.

On the whole, the debate has provided many issues to think about and many ideas to pursue further. We still do not know as to how advanced our thorium-based nuclear energy generation programme is. Further, would not that programme get strengthened once we get out of the embargo on our purchases after our previous blast. Would this Deal indirectly strengthen our domestic capacities for thorium-based options or thwart it would depend upon the foresight our planners would show. There is a strong case for strengthening indigenous capacities. A way out seems to be to have the Deal but not expand too much of nuclear power options through imported reactors. Instead, we could rely on domestically made reactors while using imported fuel as long as our indigenous supplies do not get stabilized. This is an option that might satisfy both the sides in the country.