

## False Assumption of Nuclear Deal

Innumerable assumptions on the need for nuclear power and nuclear weapons underlie India's enthusiasm to develop cooperation with the US in this field. However, a close examination of these assumptions reveals that there is no case for nuclear power and there is a fundamental absence of any legitimacy for nuclear weapons.

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The Indo-US nuclear agreement signed by prime minister Manmohan Singh and president George Bush has been claimed to be a landmark in Indo-US relations and a historic achievement. There is a view, however, that the agreement is in fact a continuation of the process of the last few decades [Bajpai 2005]. In any case, it has been received within the country with a variety of reactions. Most of the opposition reactions have characterised it as the proverbial curate's egg, ie, good in parts. Here, rather than discuss these reactions, an attempt will be made to scrutinise the baggage of assumptions with which the prime minister seems to have gone to the US.

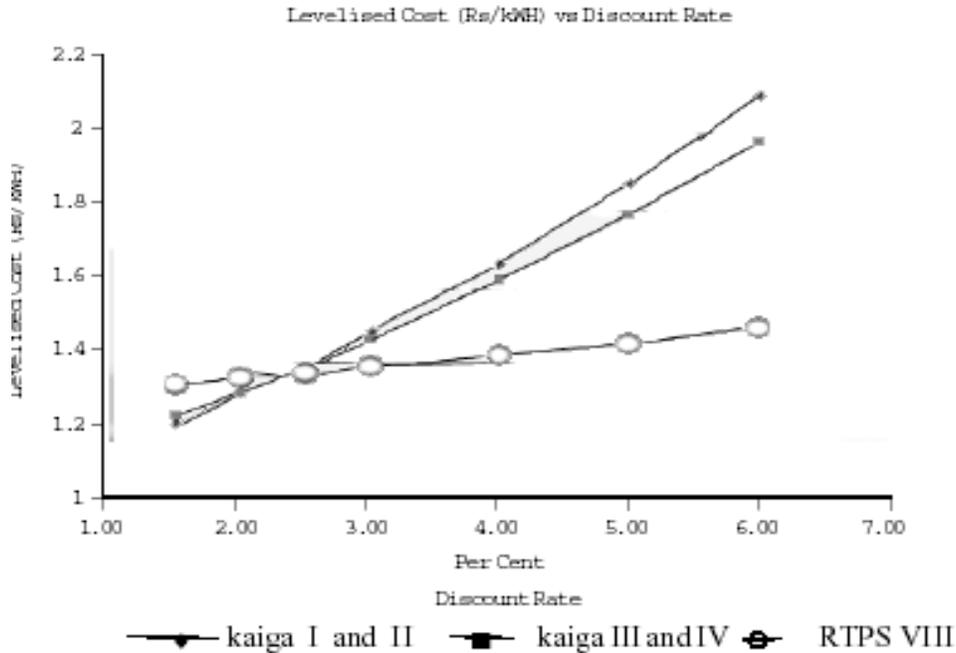
Assumption No 1: Nuclear power (NP) is important to India's electricity sector: One would have expected the prime minister in his interaction with the US president to have focused on a broad spectrum of energy initiatives including clean coal and renewable technologies. Instead, the emphasis has been almost exclusively on nuclear power. This bias is strange because NP accounts today a trivial 3 per cent of India's power, i e, 3,310 MW, out of a total of about 1,10,000 MW. In fact, NP does not even contribute as much as the 3,595 MW of wind power.<sup>1</sup> The comparative contributions of nuclear and wind power must be seen in relation to the enormous investment on NP compared to the abysmally low investment on wind power. The reason why renewable energy technologies (solar, wind, small hydro and biomass) and efficiency improvements are not part of the agreement is probably because they are not backed by lobbies as powerful as the nuclear establishment. It is also possible that the real reason for the discrimination in favour of NP is its weapons implications.

Assumption No 2: India's current NP contribution would have been higher had it not been handicapped by various constraints: India's current NP contribution is handicapped by various constraints such as (1) indigenous availability of cheap uranium for the pressurised heavy water reactors (PHWRs), (2) the unavailability of enriched uranium for its pressurised light water reactors, (3) the inadequacy of indigenous heavy water production for its PHWRs. Though all these are important [Gopalakrishnan 2005], the real constraint is probably financial. As discussed below, NP is more expensive, compared to coal-based thermal plants for electricity generation. Thus, even if the material constraints are removed (as the Indo-US nuclear agreement envisages) it is not certain that nuclear power will leap forward at the rate that is planned (20,000 MW in 2020).

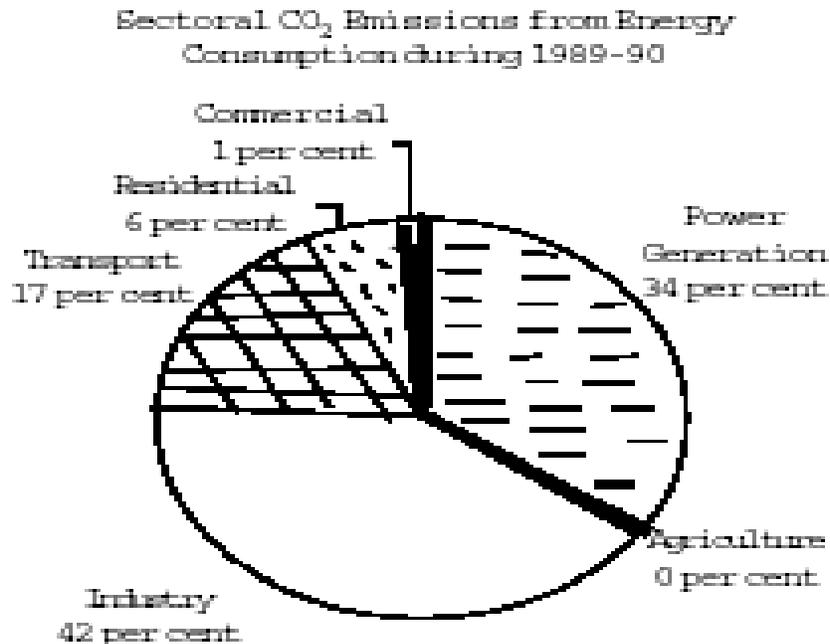
Assumption No 3: NP should play a major role in India's future energy scene: One would have expected the relative emphasis on various technologies of electricity saving and generation to be arrived at rationally from an integrated resource plan (or least cost plan). Though the methodology of least cost planning has been independently developed in India and elaborated in this journal [Reddy et al 1991] for Karnataka, it appears that the Planning Commission has not

worked out such a plan for India. In the absence of such a least cost mix, the choice of energy technologies cannot but be ad hoc and subject to the pressures of lobbies.

**Figure 1: Comparative Costs of Kaiga Nuclear Plants and Raichur Coal-Based Thermal Power Plant**



**Figure 2: CO<sub>2</sub> Emissions from the Power Sector**



Even in the case of an arbitrary choice of NP, some justification has to be given to the public. It was shown at the Kaiga debate in 1989 that when the more sophisticated and modern discounted cash flow (DCF) techniques are used instead of the Atomic Energy Commission's (AEC) crude rate of return calculations, NP becomes cheaper than coal only when unrealistically and unacceptably low interest rates are used.<sup>2</sup> In fact, it was found that in the variation of costs with interest rate there is a crossover point above which NP becomes costlier. These DCF calculations were revisited in a very recent paper [Ramana et al 2005] that updated and refined the earlier calculations. Again it was found that there is a crossover and that above an interest rate of about 3 per cent, coal is a cheaper source than NP (Figure 1). Perhaps aware of these studies, no attempt was made to justify NP on cost considerations. The prime minister did not hesitate, however, to raise doubts about the economic feasibility of the Iran-Pakistan-India gas pipeline. Apart from costs, a number of other issues militate against NP - safety, waste disposal, vulnerability to terrorist hijacking of nuclear materials and proliferation.

Against this background, the government has invoked the need to mitigate global warming and the Planning Commission claimed that NP "is an important tool for decarbonising the power sector" in the future energy scene. To scrutinise this decarbonisation mantra, it must be noted that C(total), the total GHG emissions (mainly CO<sub>2</sub>), consists of two contributions: (1) emissions from the power sector, C(PS), and (2) emissions from other sectors including transportation, C(nonPS), i.e.,

$$C(\text{total}) = C(\text{non PS}) + C(\text{PS})$$

In the case of India, the C(PS) emissions from the power sector due to the combustion of coal, natural gas and other fossil-fuels in power stations were 36 per cent of the total emissions in 1990 and 45 percent in 2000 [Shrestha and Bhattacharya 2000] (Figure 2). Hence, even if C(PS) = 0 by replacement of electricity from thermal combustion with electricity from nuclear plants, the emissions C(non PS) from sectors other than the power sector will remain large, i.e., about 55 per cent in 2000. However, in a distant future, when the dream of zero-emissions electric vehicles replacing automobiles is realised, the emissions from the transportation sector, another about 20 percent, can be eliminated.

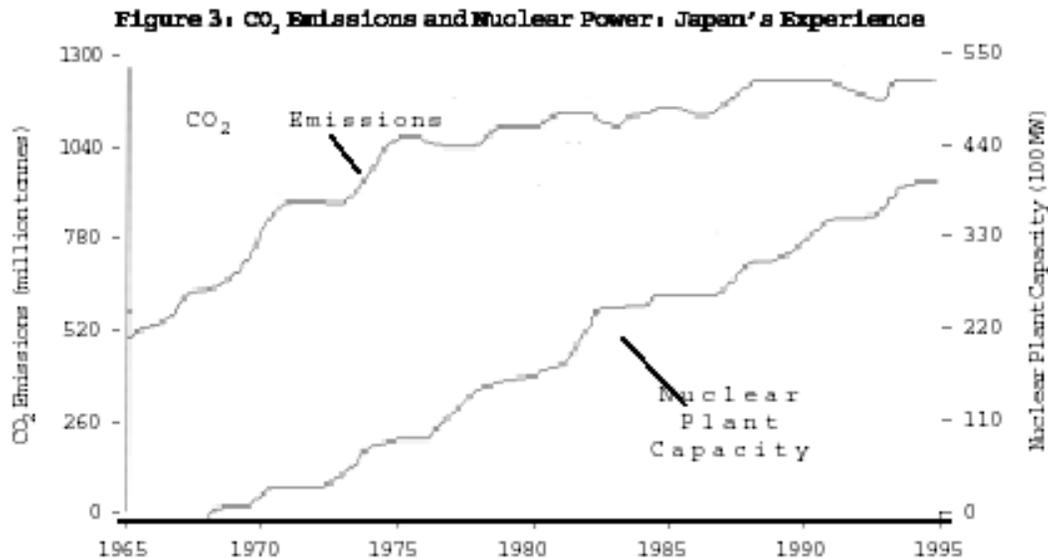
The decarbonisation hope is actually weaker when one considers (1) the fact that even the nuclear route leads to CO<sub>2</sub> emissions from the nuclear fuel cycle? and (2) the extent to which thermal sources are replaced by nuclear sources in the generation of electricity. About 0.05 million tonnes of CO<sub>2</sub> emissions are avoided per MW of electricity from nuclear sources. So, the plan of expanding nuclear power by six 500 MW stations between 2003 and 2017 will avoid 150 million tonnes of CO<sub>2</sub>, which is only about 6 per cent of the estimated 2,860 million tonnes of CO<sub>2</sub> emissions from the power sector in 2020 [Kalipada Chatterjee 2003] Thus, even assuming that the plans for nuclear power expansion are completely successful, the extent of decarbonisation of the power sector is limited.

In fact, there is no empirical evidence that the expansion of nuclear power has led to a reduction of CO<sub>2</sub> emissions. On the contrary, it has been shown [Jinzaburo Takagi 2000] that even as nuclear power has expanded in Japan, its national CO<sub>2</sub> emissions have increased (Figure 3). This observation can be explained by pointing out that nuclear power can at best - assuming that the

number of fossil fuel-based generation plants are reduced at the same time - lower the emissions from the power sector, whereas the emissions from other sectors can continue to increase.

It follows that the assumption that nuclear power is justified because it will de-carbonise the energy sector has no validity - this argument could be forgiven if it came from generalist bureaucrats or technical establishments with vested interests in nuclear technology but not after participation of an independent technical body like the Planning Commission. Even more inexcusable is the neglect of the potential role of efficiency improvements<sup>4</sup> and renewable sources in discussions of the future of the power sector.

Assumption No 4: India needs recognition as a NW state: Nuclear weapons are unique - their impacts are primarily on innocent civilian non-combatants, particularly women and children; they are intrinsically indiscriminate; they are largely uncontrollable; they are instruments of mass murder on a scale unparalleled in human history.



Source: Jinzaburo Takagi, Citizens' Nuclear Information Centre.  
 Reproduced from John Byrne, 'Ecological Justice in the Green House', 2000 (mimeo).

The security implications of nuclear weapons have been discussed in detail in the valuable 2003 volume Prisoners of the Nuclear Dream [Ramana and Rammanohar Reddy 2003]. In contrast to the dream that India's security has increased through the Pokhran II demonstrations of the bomb, it has been forcefully argued by several authors including Amartya Sen and L Ramdas that in fact India's security has decreased. As a matter of fact, the first India-Pakistan war in 30 years after 1971 took place after the development of nuclear weapons in both the countries. The economic implications have been addressed in a carefully argued essay in the same volume [Rammanohar Reddy 2003] which highlights the fundamental choice facing the country. The political implications revolve around the desperate desire of the government to be accepted by the nuclear club (US, Russia, Great Britain, France and China) as a weapons state. In addition, it was hoped that the possession of nuclear weapons would earn the country a permanent seat on

the UN security council. With deft footwork the US has relaxed its stringent categorisation and accepted India to be "a responsible state with advanced nuclear technology", i e, a de facto but not de jure nuclear weapons state. It is undeniable that India has gained in stature over the past five to seven years but is this solely due to the Pokhran II test? It could well be due to two factors: (1) the 6 per cent plus growth rate of the economy over this period and (2) the enormous growth of the BPO industry/sector that makes major US and European corporations dependent on Indian IT back-up. In other words, even without the bomb, India's standing could well have been as high in the polity of nations. Indeed, many would argue that its stature would have been even higher if it had abjured the bomb.

Assumption No 5: India can pursue its weapons programme outside the scope of IAEA inspections, i e, it can separate its civilian and military nuclear programmes without inviting inspection: It is hoped that by being recognised as a de facto weapons state, India would be accorded the associated 'privileges' of access to the nuclear fuels, etc, that are desperately needed by the NP programme. In return, India has agreed to identify and separate civilian and military nuclear facilities and programmes and place all the civilian nuclear facilities voluntarily under the safeguards regime of the IAEA.

The agreement to separate civilian and military nuclear facilities must be seen against India's prevarication on the power-bomb nexus. Starting with the pre-Pokhran I secrecy about the military implications of its nuclear power programme, there was a vehement claim that there was no military connection at all, followed after Pokhran II by the claim that there was a role in the bomb programme. Now there is an admission that there is a power-bomb nexus and there are civilian and military facilities, but they could be identified and separated and only the civilian facilities would submit IAEA safeguards. The hope is that the country can exercise the right to identify the facilities that will be excluded from IAEA inspection. It is also expected that the IAEA will respect India's definition of which facilities are civilian. It must not be forgotten that in the case of the Kyoto protocol concerning combating climate change, the US first signed it under president Clinton and then abrogated its commitment under president Bush. One must conclude that the separation of the civilian and military nuclear programmes is a hope rather than a certainty.

## **Conclusion**

The assumptions with which Manmohan Singh went to meet George Bush have been examined above and found to be very shaky if not invalid. Rejecting all the assumptions discussed above, the result is the anti-NP anti-NW perspective. Dismissing the weapons assumptions and accepting all the NP assumptions, the result is the well known pro-NP anti-NW stance of some left parties. There is even the unusual anti-NP pro-NW stand taken post-Pokhran II by some elements close to the BJP; this follows from accepting the weapons as assumptions and rejecting the NP assumptions. Unfortunately, the government has ignored the invalidity of the assumptions and adopted a pro-NP pro-NW position.

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## **Notes**

1 Of course, nuclear reactors provide continuous base-load power in contrast to wind power, which is seasonal in character. But, this drawback can be overcome if wind generation is coupled to hydroelectric generation or other sources of peak power such as natural gas.

2 The interest rates used in DCF calculations are a measure of the scarcity of capital and of the preparedness to sacrifice present consumption for future benefits - low interest rates mean that there is an abundance of capital and present consumption can be sacrificed for the sake of future benefits.

3 "Contrary to the nuclear industry's claims, the nuclear energy process chain produces significant amounts of CO<sub>2</sub> during the construction of power stations, ore extraction and transport, and so on. In fact, it is only after 7 to 10 years that a nuclear power station begins to generate electricity with a lower level of CO<sub>2</sub> emission per kWh than a gas-fired station. In the best-case scenario, a nuclear power station still produces a third of the amount of carbon dioxide produced by a gas-fired station." <http://www.10.antenna.nl/wise/537/gl/clean.html>

4 Electricity saving leads to avoided electricity generation. In fact, the adage: a kilowatt hour saved is a kilowatt hour generated, is not strictly accurate because the energy saved is at the consumption end of the transmission-distribution system whereas the energy generated is at the generation end, and in between are all the T and D losses. In fact, therefore, a kilowatt hour saved is equivalent to 1.29 kilowatt hour generated at 22.5 per cent T and D losses. In addition, efficiency improvements are cheaper, quicker and environmentally sounder.

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