Fukushima: India at crossroads

Following the nuclear accident in Fukushima, there has been a renewed debate on nuclear energy, with many governments putting on hold current plans for additional nuclear plants. While taking lessons from Fukushima for enhancing safety is necessary, it is not sufficient. This note highlights some issues relating to nuclear safety, costs, need and public debate that merit serious attention.

Safety of nuclear power plants is crucial as it relates to not only immediate damage due to accidents, but also to long-term damage over several generations. Although the newer nuclear power plants have numerous safety features, including redundancy and passive systems, it is not possible to fully anticipate and account for all human errors, and unusual or 'beyond design' events.

The design of nuclear power plants utilizes probability risk assessments to ensure that accidents are unlikely. However, it has been noted recently that there are many difficulties with such an approach[1,2], so that although the probability of core damage in new reactors may be theoretically as small as one in million reactor-years, the real-life frequency of a nuclear accident is as high as 1 in 3000 reactor-years based on the 15,000 reactor-years of operation of nuclear power[2] and the known core damage in five reactors (Three Mile Island, Chernobyl and three reactors in Fukushima). For the currently existing ~400 nuclear reactors, the real-life frequency suggests the possibility of an accident once every eight years.

The promise of nuclear energy being 'too cheap to measure' has not been borne out by realities over the past six decades. Nuclear energy has generally been assumed to be cheaper than that obtained from renewable energy sources. However, a recent analysis has shown that there is a crossover in costs per kilowatt of power, so that solar power may be cheaper now[3]. Furthermore, the potentially favourable economics of renewable energy relative to nuclear power will be enhanced by the increasing costs for nuclear power associated with additional safety-related modifications in the light of Fukushima, and the reduction in costs associated with renewable energy plants due to scaling-up. The Fukushima accident is estimated to cost in excess of US$ 130 billion (ref. 3); for comparison, the Indian nuclear liability law covers damage to ~US$ 330 million.

The Fukushima accident involved an evacuation of ~200,000 people from a distance up to 30 km from the nuclear plants. A recent study has shown that worldwide there are 21 plants having more than 1 million people and three plants having more than 6 million people in an area with a radius of 30 km (ref. 1). The National Disaster Management Authority, Government of India, has limited preparedness for handling or limiting damage from nuclear disasters; the existing 18 emergency response centres are inadequate for India's population density, and there is an urgent need to augment the very limited number of doctors with appropriate expertise, equipment and other personnel necessary to deal with nuclear emergencies[4]. So far, there have apparently been no mock drills to validate the approaches being developed for nuclear emergencies. It appears to be an insurmountable problem to evacuate in a timely manner half million or more people from near a nuclear plant in case of a serious accident in India. Thus, the much higher population density coupled with the lack of emergency preparedness forebodes a major humanitarian and ecological catastrophe in case of a nuclear accident in India.

It is therefore necessary to examine critically whether India needs nuclear power. A 2006 Planning Commission report on energy indicates that the share of nuclear power to the total commercial primary energy will increase from ~1.5% in 2003–2004 to ~5.9% in 2031–2032 (ref. 5), even if the very ambitious plans for several new nuclear plants are successful. It has been estimated that for 2008, the total loss of electricity in transmission and distribution is a high ~23% in India, compared to values of ~5 to 6% for Germany and China[6]. Clearly, a reduction in losses to approach international standards can easily provide substantial energy over and above the 5.9% potential energy contribution from nuclear power; increasing efficiency offers another means for effectively increasing available energy. Furthermore, the costs for renewable energy have been reducing substantially; renewable energy is likely to be cheaper than nuclear power[3], especially if all the subsidies, including insurance are taken into account properly[7].

The Fukushima disaster has re-opened the debate on the need for nuclear power in India, as it has in many other countries. Germany has established a commission consisting of members from civil society, science and politics to facilitate public discussion and a critical analysis of nuclear power[8]; such an approach is also suitable for India. India is at the crossroads in terms of energy choices and directions for the future. No irreversible action should be taken with respect to signing-on or planning construction of new nuclear power plants until there is a wider vigorous discussion and informed debate within the scientific community and civil society, on the need for nuclear power and consideration of alternate energy approaches.

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