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India's nuclear policy dilemmas

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The recent meet of the Nuclear Suppliers' Group gives rise to concerns over whether India can rely on foreign suppliers for technology transfer. India should take this into consideration when it opts for new reactor systems.

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The Nuclear Suppliers' Group (NSG) statement issued on June 24 has aroused concern over the extent to which India can rely on the cooperation of foreign partners, including the US, for its civil nuclear programme. The 46-member NSG had “agreed to strengthen its guidelines on transfer of sensitive enrichment and reprocessing technologies”, besides continuing “to consider the implementation of all aspects of the 2008 statement on civil nuclear cooperation with India”. The NSG members also discussed the body's relationship with India.

EUPHORIA AND AFTER

The euphoria generated by the 2008 Indo-US nuclear deal and the NSG waiver has been tempered as a result of later developments. The road to finalising nuclear power plant projects is filled with obstacles and potholes, including public opposition to nuclear plant sites, liability issues, and nuclear safety concerns, as highlighted by the Fukushima disaster. The NSG statement is being seen as yet another.

India's civil nuclear liability legislation, passed after a difficult debate, includes provisions on supplier liability; this has been objected to by foreign entities as an obstacle to foreign suppliers of power reactors. In retrospect, India's main gain came from the 2008 NSG waiver, achieved with considerable US diplomatic pressure.

The shortage of natural uranium fuel for India's Pressurised Heavy Water Reactors (PHWR) was relieved and imported fuel enabled better capacity utilisation of the reactors. Nuclear Power Corporation of India Limited's (NPCIL) capacity factor which had dropped to an all-time low of 50 per cent in 2007-08 has spurted to 78 per cent in the current year. Uranium supplies are being sought from countries such as Kazakhstan, Mongolia, Argentina, Russia and Niger. However, the potential restrictions on reprocessing technology also present a difficult problem.

TECHNOLOGY ON OFFER

India's long-term nuclear programme for decades has been based on a three-stage strategy. Natural uranium in PHWRs would produce plutonium, to be extracted after reprocessing, which would in turn be used to breed thorium into Uranium-233, ultimately resulting in a sustainable use of India's ample thorium reserves. The indigenous PHWRs, based on Canadian technology, are the bedrock of this programme.

India has developed and upgraded its technical capability to manufacture these reactors from 220 Mega Watt electric (MWe), to 540 MWe and now up to 700 MWe capacity. Four of the largest new units are coming up at Rawatbhata and Kakrapar. The PHWRs offer some advantages, like refuelling without shutdown, lower radioactivity of spent fuel, and absence of large costly components like reactor pressure vessels. Building more reactors of this type would give a boost to the Indian industry and technology besides creating more jobs.

Post the civil nuclear deal, foreign suppliers have focused on supply of advanced Pressurised Water Reactors (PWR) to India. These include the most advanced 1600 MWe European Pressurised Reactor (EPR) from AREVA of France to be set up at the Jaitapur nuclear park. These reactors use enriched uranium fuel, need to be shutdown for refuelling, and use a large steel reactor pressure vessel (RPV) weighing over 500 tonnes, that is 12 metres long and five metres in diameter.

There are only four manufacturers of such large single piece RPVs — the best in Japan (Japan Steel Works), two in China and one in Russia. A backlog of orders could hence delay projects. These large RPVs have to be transported to the site.

PROBLEMS WITH PWRS

During PWR operation, the RPV suffers intense neutron bombardment and material damage (embrittlement), and its life-span is around 40 years. Extension of the life span is being discussed in Europe and US, but this can, at the most, be for another 20 years, with increasing risk of failure.

Once its life-span is over, the reactor has to be decommissioned, as the RPV cannot be replaced. Thus, going in for the high-end PWR technology will mean increased reliance on foreign suppliers, including fuel.

If India is denied reprocessing technology on the grounds that it has not signed the Non-Proliferation Treaty (NPT), then the issue of spent fuel from PWRs will become problematic. India will have to store this fuel for eternity, or transport it to foreign reprocessing plants, or negotiate to get it reprocessed in its own reprocessing plants, which will involve inspections and safeguard arrangements. The government should exercise caution in this regard.

INDIGENOUS PROGRAMME

Enrichment technology is not as critical for India, as its mainstay, the PHWRs, can use natural uranium. Enriched uranium is required only for strategic purposes including submarine propulsion reactors, and capacity can be built-up indigenously for this purpose. Uranium-233, if available from thorium, could also be used, although this may require some adaptation.

On the other hand, India could give clear signals to the NSG members that it expects to be treated on par with a Nuclear Weapons State party to the NPT, with similar rights and obligations. Denial of nuclear technology and equipment will result in India being compelled to accelerate its indigenous nuclear power programme, resulting in a build-up of unsafeguarded nuclear facilities and installations. Is this really the objective of the NSG?

The announcement of large uranium deposits at Tumalapalli in Andhra is to be welcomed, as it gives India better nuclear fuel supply security.

However, the grade of the deposit is low — only 0.048 per cent uranium content compared with Canada's best deposit which has 12.6 per cent uranium content. Therefore, the cost of production of uranium is likely to be high and there could be considerable impact of wastes from the extraction process.

Thus, India's nuclear programme needs to maintain a careful balance between going in for foreign PWRs with high technology but increased foreign dependence on equipment, technology and fuel, and continuing with its robust nuclear power programme, including development of a prototype fast breeder reactor and Advanced Heavy Water Reactor (AHWR), culminating in use of thorium as fuel.

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