Clear on Small Nuclear

- ***Amitabh Kant****

One of the highlights of the Budget was its emphasis on nuclear energy constituting a significant part of the energy mix for Viksit Bharat and the Governments pursuit to partner with private sector for development of Bharat Small Modular Reactors (SMRs). The rise of SMRs in the post-Fukushima era has been on account of their small footprint requiring less than a tenth of a hectare, suiting space-limited areas and promoting sustainable nuclear power. They can be installed with no time and cost overruns and have the ability to consume power locally at the SMR site itself. Compact, safe SMRs can enhance nuclear infrastructure, with modular designs for various use cases, including remote areas and industrial settings. SMR's ability to integrate with renewables can offer a resilient grid and manage intermittency. Costing around INR 4.0/kWh, they can also be valuable contributors to industrial processes, demonstrating versatility beyond traditional electricity generation.

To accelerate the adoption and further manufacturing of SMR and its components there are six critical areas where India needs to take expeditious action:

Private Sector Participation: To achieve 100 GW of nuclear capacity by 2047, it is crucial to open the nuclear sector to private players. This would involve amending Sections 3 and 22 of the Atomic Energy Act, 1962, to allow private sector participation in SMR development. Existing PSUs or JVs can form partnerships with the private sector, utilizing their surplus for technology transfer, as required. To facilitate this, appropriate amendments should be incorporated into the Atomic Energy Act of 1962.The Atomic Energy Commission should also aim to segregate the strategic and commercial nuclear sectors, framing a distinct policy for private sector regulation.

The current nuclear capacity accounts for less than 3.3% of total power generation. 9 reactors with a capacity of 6700 MW are under implementation. These projects are facing time and cost overruns. Nuclear plants in India are owned and operated by the public sector. Nuclear Power Corporation of India (NPCI) under the Department of Atomic Energy (DAE). Current regulations do not permit private ownership and management of nuclear power plant and nuclear fuel cycle facilities. The 2016 amendments of Atomic Energy Act 1962 allowed NPCI to form joint ventures with Central PSUs. Three joint ventures companies were formed but none of them have taken off. In contrast, in USA the Atomic Energy Act was amended in 1954 to allow private sector ownership of nuclear facilities and promotion of public-private research. The UK nuclear industry was partially privatised in 1996. In 2019, the Brazil Government announced construction of latest technology nuclear reactor and small modular reactor to include private players to share the financial risk. In 2020, South Africa announced new nuclear power capacity of 2500 MW including SMR with private and consortium based approach. SMRs are attracting interest in Canada, USA, EU countries and Middle East. Most of the initiative for R&D and investment and SMRs is happening in the private sector. The opening of the nuclear power to private sector participation in India would lead to increased competition, transparency and reduction in high capital expenditure. It would also establish manufacturing and exports of SMRs from India.

Dedicated Nuclear Waste Agency and Policy: To address the imperative of safeguarding local flora, fauna and communities from any potential nuclear hazard, it's crucial to establish a

National Radioactive Waste Management Agency. This organization should be tasked with the preparation of a dedicated Nuclear Waste Policy managing accidental radioactive material.

Additional Insurance cover under the Civil Liability for Nuclear Damage (CLND) Act, 2010: The Act places responsibility on technology providers and operators for nuclear liability. Concerns have been raised regarding the limited capacity for funding this liability, both through insurance and government assistance. For instance, the Act outlines that operators must cover damages up to INR 1,500 crore in case of an accident, either through insurance or other financial means. If damages exceed this amount, the government is expected to intervene, though its liability is capped at the rupee equivalent of 300 million Special Drawing Rights (SDRs), approximately ₹2,100 to ₹2,300 crore. To address gaps in insurance coverage, the government offers refundable bridging loans on commercial terms to meet operators' liabilities. This financial pool needs to be expanded to include Small Modular Reactor (SMR) projects, to instil confidence in the private sector.

Accelerated Technology Transfer to India: India needs to launch a massive SMR construction programme for creating jobs through domestic manufacturing and exports. The first few SMRs are becoming operational in USA. Government of India should work in partnership with USA to provide Specific Authorization 10CFR810 for technology transfer. This would enable companies to expedite industrial operation for manufacturing in India.

R&D & collaboration: India's nuclear sector should also consider the availability of "coal-to-nuclear" technologies. Effective industry and academia collaboration for R&D and component-level manufacturing of SMR plants should be supported under the already announced INR 100,000-crore corpus to promote research by the private sector and under the Make in India initiative.

Inclusion in Green Taxonomy: Nuclear power presently supplies approximately a quarter of the globe's low-carbon electricity, furnishing significant quantities of dependable, dispatchable energy that enhance stability and resilience within the electrical grid. It serves as a backup for variable renewable sources like solar and wind during periods of insufficient sunshine or wind which should make it compliant to be included in the broader green taxonomy frameworks so that the investment is attracted for deploying SMRs. European Parliament has also recently voted in favour of such an inclusion for their region. India's consolidated FDI regime should also be relaxed for SMR installations.

Small Modular Reactors are the future for delivering low-carbon electricity, managing renewable intermittency and ensuring baseload concerns of switching to renewable. Unlike large nuclear projects they can be executed anywhere expeditiously and can be mass produced. Time for India to technologically leapfrog in nuclear energy.

** The author is India's G20 Sherpa and former CEO, NITI Aayog. Views expressed are personal.*

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