

DOCUMENT CONTROL SHEET

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- 2 **Title** : Technological Assessment of Select Light Water Reactors to Accelerate Nuclear Power Expansion in India
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- 7 **Originating School** : Natural Sciences and Engineering
- 8 **Programme** : Energy, Environment, and Climate Change
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11 **Abstract:**

Twenty-four countries in the World have signed a pledge to triple their nuclear power by 2050. Studies conducted by NIAS and IIM-A indicate the need to accelerate nuclear capacity additions to achieve Net Zero with Energy Security in addition to meeting our Human Development Goals. The scenarios developed by IIM-A indicate that the Net Zero 2070 scenario with a thrust on nuclear power (NZ1) has the lowest Levelized Cost of Electricity (LCOE) followed by the scenario with a thrust on renewable energy (NZ3). The installed capacities of nuclear power by 2070 in NZ1 and NZ3 scenarios are 331 GW_e and 207 GW_e, respectively. While DAE has announced a target of 100 GW_e for India's nuclear power generation capacity by 2047, the action plans for reaching this target are still under preparation.

Further, the Government of India has announced a Carbon Market mechanism that involves a compliance mechanism with specific emission intensity targets for energy-intensive sectors and a voluntary credit mechanism for the non-obligated entities to incentivize GHG emission reduction.

The rapid expansion of NPPs is a reliable and efficient way to reduce the emission intensity of energy-intensive industries and achieve multiple SDGs since nuclear power can generate firm, zero-carbon electricity at affordable tariffs while providing important co-benefits such as high-skill jobs in technology, manufacturing, and operations, besides enhancing community development.

Large-sized nuclear power plant (NPP) units with a rated capacity of 700 MW_e or more are crucial for the civilian nuclear sector since they enable efficient land utilization, and provide economies of scale, facilitating rapid capacity enhancement.

However, since commercial nuclear reactors are envisaged to supply clean and affordable baseload power to the utilities, the possible technological options should be evaluated in detail through a multi-disciplinary lens. This report provides a detailed comparative evaluation of five prominent variants of large light water reactors (LWRs) of foreign origin and an indicative ranking among the studied reactor technologies is provided as input to policymakers and eligible Indian energy companies interested in putting up large LWRs.

- 12 **Keywords** : Boiling Water Reactor; Carbon Trading Scheme; Climate Change; Light Water Reactor, Pressurized Water Reactor; Net Zero.
- 13 **Security Classification** : Restricted