GOVERNMENT OF INDIA
DEPARTMENT OF ATOMIC ENERGY

RAJYA SABHA
UNSTARRED QUESTION NO –2081
ANSWERED ON 07/08/2025

ADVANCED REACTOR DEVELOPMENT

2081. SHRI AYODHYA RAMI REDDY ALLA

Will the PRIME MINISTER be pleased to state:-

(a) the manner in which the advanced reactor designs, such as Small Modular Reactors (SMRs) and Generation IV reactors, address safety and security concerns, including potential cyber threats, and measures taken to ensure the secure operation of these reactors: and

(b) the manner in which the advanced reactors integrate multi-physics coupling, incorporating neutronics, thermal-hydraulics, and structural mechanics, to optimize design and operation, and what numerical methods will be employed to ensure accurate simulations?

ANSWER

THE MINISTER OF STATE FOR PERSONNEL, PUBLIC GRIEVANCES & PENSIONS AND PRIME MINISTER'S OFFICE (DR. JITENDRA SINGH)

(a) Following design features are considered for reactors designs such as Small Modular Reactor (SMRs).

i. Extensive use of passive safety systems and greater autonomy (to provide higher time margins for operator intervention in case of emergencies). Also, fail safe features are incorporated in designs of all safety-critical systems/components in which functional failures of components will bring the system to safe condition.

ii. Rigorous procedure are set for design, development and operation of the systems used in its installations. The safety and security critical systems are designed and developed in-house using custom built hardware and software which are subjected to regulatory verification and validation, thereby making them resistant to cyber security threats.

iii. Isolation of safety and security critical infrastructure of nuclear establishments, from Internet and the local network.

Department of Atomic Energy has a specialist group called Computer and Information Security Advisory Group (CISAG), to look after cyber security/information security of DAE units. This group undertakes the process of strengthening cyber security of all units under DAE including nuclear facilities through hardening of systems and audits.

(b) Designers and developers of nuclear reactors use peer-reviewed / regulator-approved multi-physics computer codes, which have coupling of physics, thermal-hydraulics, structural mechanics etc., to perform design optimization and safety analysis. For the upcoming advanced reactors, specific/custom-made computer codes have been developed in-house for carrying out safety analysis. Well-known and accepted numerical techniques applicable for computational fluid dynamic (CFD) simulations are being employed to study complex fluid flow problems as applicable. Codes developed in-house are subjected to extensive validation by the use of experimental data gathered from prototypes/analogous systems to ensure requisite accuracy.

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