GOVERNMENT OF INDIA
DEPARTMENT OF ATOMIC ENERGY
RAJYA SABHA
UNSTARRED QUESTION NO – 3204
ANSWERED ON 21/08/2025

REPOSITORY SYSTEM FOR HIGH-LEVEL RADIOACTIVE WASTE

3204. SMT. RAJANI ASHOKRAO PATIL

Will the PRIME MINISTER be pleased to state:-

(a) whether India has a centralised and safe long-term repository for high-level radioactive waste generated from nuclear reactors;
(b) protocols followed for temporary and permanent disposal of spent fuel and other nuclear waste;
(c) whether any radioactive contamination incidents have been reported in the last five years;
(d) the status of public disclosure and environmental monitoring around nuclear sites; and
(e) whether India has signed or proposed new international collaborations for nuclear waste management and reactor safety?

ANSWER

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

(a)&(b) Safe management of nuclear waste has been accorded high priority right from the inception of our nuclear energy program. Nuclear Power Plants (NPPs) are also designed and operated in the manner so as to minimize the generation of radioactive waste. India follows a closed nuclear fuel cycle, where domestic spent fuel is reprocessed and most of its components are recycled back as fuel for future reactors. High level radioactive waste generated during reprocessing is immobilized into an inert glass matrix by vitrification and then stored in Solid Storage Surveillance Facilities for interim storage. This practice is at par with international practices following the guide lines of International Atomic Energy Agency (IAEA). Research and development are in progress on partitioning technologies, for recovery of long-lived radioactive constituents and separation/ extraction of the useful radioisotopes for waste volume reduction, and incineration of long-lived actinides to inactive or short-lived radioactive wastes is likely to obviate the need for a long-term repository in the decades to come.

Under the closed fuel cycle, the spent fuel discharged from the reactors are stored underwater in large pools known as Spent Fuel Storage Bay (SFSB) which are available at all NPP sites. This is an interim storage facility for cooling down the

spent fuel bundles for a specific period of time before shifting them for reprocessing to the reprocessing plants.

The SFSB is a seismically qualified structure having water recirculation and filtration system. The spent fuel bundles are stored in seismically anchored racks which are placed at the bottom of the pool. Adequate water level is maintained over the spent fuel bundles for providing biological shielding and cooling. The water level of these pools is being monitored continuously and the ventilation system of the SFSB takes care of the air borne activity, if any.

As a long term measure, spent fuel is stored in specially designed Away from Reactor (AFR) Facilities. The AFR Spent Fuel Storage Facility is functionally similar to the SFSB except in terms of capacity. The design ensures that there would not be any adverse impact of the facility on the personnel, the public and the environment.

Nuclear wastes arising from nuclear fuel cycle facilities are safely disposed/managed under the provisions of "The Atomic Energy Act. 1962", subsequent amendments and the Atomic Energy (Safe Disposal of Radioactive Wastes) Rules 1987. As a waste management philosophy, no waste in any physical form is released/disposed to the environment unless the same is cleared, exempted or excluded from regulations. A comprehensive radioactive waste management is established taking into account the operational capability for the management of radioactive waste and an independent regulatory capability for its overview.

Radioactive wastes generated at nuclear power plants, during their operation and maintenance, are of low & intermediate activity level and are managed at the site itself. These wastes are treated, concentrated, compacted, immobilized in solid materials like cement and disposed in specially constructed structures such as reinforced concrete trenches and tile holes, located at the site. The disposal facilities are kept under constant surveillance with the help of bore-wells laid out in a planned manner by routinely monitoring the underground water and soil samples to confirm effective confinement of radioactivity present in the disposed waste. This practice is at par with international practices following the guide lines of International Atomic Energy Agency (IAEA).

Atomic Energy Regulatory Board (AERB) issues authorization under the Atomic Energy (Safe Disposal of Radioactive Wastes) Rules 1987 (G.S.R.125) for safe transfer / disposal of radioactive wastes from nuclear power plants within the authorized limits through designated routes. The authorization specifies the limits in terms of quantity and radioactivity content of the radioactive waste that can be

disposed and the designated routes for disposal. These authorizations are valid till the period specified by AERB and are renewed after review of the performance of NPPs. AERB verifies compliance to the authorized limits through safety review and regulatory inspections.

(c) No cases of radioactive contamination attributable to nuclear facilities are reported during the last five years.

(d) The Environmental Survey Laboratories (ESLs) of Bhabha Atomic Research Centre, established at nuclear sites regularly monitor different environmental matrices around sites and demonstrate compliance of regulatory limits stipulated by Atomic Energy Regulatory Board (AERB), ensuring safe operation of sites. The ESL reports are submitted to AERB. The outcome of the reports is published annually by AERB and are available on their website regularly. Additionally, ESLs regularly organize periodic public awareness programs for villagers and educational institutes to address public concern on operation and safety of nuclear sites.

The environmental impact of the disposal of radioactive waste is studied by Environmental Survey Laboratories (ESLs) established at each site by the Bhabha Atomic Research Centre (BARC) as per requirements specified by AERB. ESLs carry out pre-operational survey around the plant site up to a distance of 30 km radius to establish the pre-operational baseline radioactivity levels around the site. During operation of nuclear power plants, environmental samples from aquatic, atmospheric & terrestrial domains up to a distance of 30 km around the sites are collected periodically and analysed for radioactivity, as per the requirements prescribed by AERB, to assess the impact of nuclear power plant operation on the surrounding environment and the public. The reports of the environmental surveillance by ESLs are reviewed by AERB and it is seen that the there is no adverse impact on the people and the environment due to operation of the NPPs.

AERB has specified the radiation dose limits for exposure from ionizing radiations for members of the public residing in the vicinity of the nuclear power plants. These limits are in line with the recommendations of the International Commission for Radiation Protection (ICRP) and is followed internationally. The actual dose to a member of public residing in the vicinity of the nuclear power plants remains a small fraction of the AERB specified limit of 1 mSv/year prescribed by AERB. This data for different NPP sites is available in annual reports of AERB published on its website.

(e) India has not signed/ proposed new international collaborations for nuclear waste management. India being member state of International Atomic Energy Agency (IAEA) participates regularly in technical events organised by IAEA for knowledge sharing.

India is a contracting party to the Convention on Nuclear Safety (CNS) and actively participates in the regular peer review process under the CNS. Safety status of Nuclear power plants is regularly reported in the national reports which are peer reviewed in the review meetings that take place once in three years.

AERB participates in various Technical and consultants' meetings organised by IAEA on a range of topics related to Nuclear Power plants, fuel cycle facilities, radiation facilities, transportation of radioactive materials and illicit trafficking of radioactive materials. AERB has also been participating in IAEA Coordinated research Programme (IAEA-CRP). AERB takes part in the development of IAEA documents. AERB experts are serving as members in IAEA Safety Standards Committees. AERB plays an active role in strengthening the global safety regime and towards this contributes in various meetings, peer review missions and development of safety standards of IAEA. It also utilises experience gained through these safety-cooperation activities towards further augmenting safety regulatory system within India.

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