

GOVERNMENT OF INDIA
DEPARTMENT OF ATOMIC ENERGY
RAJYA SABHA
UNSTARRED QUESTION NO. 3204
TO BE ANSWERED ON 31.03.2022

**SECTORS BENEFITTED BY RESEARCH AND DEVELOPMENT IN
ATOMIC ENERGY**

3204 Dr. Ameer Yajnik:

Will the PRIME MINISTER be pleased to state:

- (a) the details of sectors that got benefitted by research and development in atomic energy during the last three years;
- (b) the details of initiatives taken to reduce the pressure on non-renewable sources of energy in the field of power generation; and
- (c) the details of technological advancement adopted or indigenous development in nuclear sector to reduce the impact of radiation?

ANSWER

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

- (a) Following sectors are benefitted by research and development in atomic energy.

(i) Agriculture:

Using radiation induced mutagenesis along with cross breeding, fifty five varieties in oilseeds (groundnut, mustard, soybean, Linseed and sunflower), pulses (urdbean, mungbean, pigeonpea and cowpea), rice and jute have been developed and released for commercial cultivation across the country. Out of fifty five, twelve varieties (six rice, four mustard, one groundnut & one linseed) were notified for commercial cultivation during last three years.

(ii) Food Preservation:

Twenty five food irradiation plants are operational in the country out of which eight plants become functional in last three years.

(iii) Health Care:

Ruthenium (Ru)-106 has been recovered from nuclear waste for eye cancer treatment. Technology for recovery of Ruthenium (Ru)- 106 from nuclear waste and fabrication of 106Ru containing silver plaque (circular configuration) has been successfully developed. The new design of 106Ru based notched plaque was developed for the treatment of eye cancers located adjacent to optical nerve. After regulatory clearance plaques were provided to various hospitals.

Yttrium-90 labelled glass microspheres called 'Bhabha spheres' for therapy of liver cancer has been one of the recent developments.

Indigenous synthetic strategy for high value radiopharmaceutical ligands like prostate-specific membrane antigen (PSMA-617 and PSMA-11) have been developed. Radiopharmaceutical ligands delivered to Board of Radiation & Isotope Technology (BRIT), which has been used to treat hundreds of prostate cancer patients in India.

(iv) Solid Biodegradable Waste Management:

BARC has developed Nisargruna technology using biphasic biomethanation process which takes care of the biodegradable waste by converting it into two useful byproducts in the form of biogas and manure. Biogas is rich in methane contents and can be used for a community kitchen, hotel kitchen or it can be converted into electricity. More than 300 plants are operational across country with technology transfers to many private entrepreneurs out of which fourteen plants were commissioned in last three years.

(v) Municipal Waste Sludge Hygienisation:

The first dry sludge Hygienisation Plant was set up at Ahmedabad, Gujarat for treatment of 100 ton/day dry sludge. This plant which is operational since 2019, enabling use of safe sludge for agricultural applications. First loading of source Co-60 completed in the second such plant constructed at Indore. MoU has been signed with Municipality of Pune for similar plant.

(vi) Hybrid Granular Sequencing Batch Reactor (hgSBR):

A patented technology called hybrid granular sequencing batch reactor (hgSBR) has been developed for municipal wastewater treatment and transferred to 7 entrepreneurs. Three plants have been setup and being operated using this technology. The technology was demonstrated in Kumbh Mela held at Haridwar in year 2021.

(vii) Water Technologies:

Several membrane assisted technologies have been developed at BARC for desalination of brackish and seawater and purification of contaminated water for drinking purposes at domestic and/or community levels. Desalination and Water purification includes purification with respect to microbiological decontamination, arsenic removal, iron removal, de-fluoridation, salinity and hardness removal. The technical know-how of these technologies has been transferred to several private entrepreneurs on non-exclusive basis for commercial exploitation and field deployment.

(viii) National Security:

BARC has developed Bullet Proof Jackets known as 'Bhabha Kavach', for use by military & paramilitary forces.

- (b) Over the period Nuclear Power Corporation of India Limited (NPCIL) has established 22 Nuclear Power Stations. These Power Stations supply clean energy to supplement the power generated through renewables. The Nuclear Power Stations operate at high capacity factor to provide sustained / sources of clean energy and reduce pressure on Non Renewable sources.
- (c) Nuclear plants are provided with multiple barriers with high-efficiency particulate (HEPA) filtered ventilation system to control radioactive release to the environment within the prescribed release limits. In order to reduce the impact of radiation in the extremely unlikely case of an accidental release in public domain through timely administrative intervention, a Decision Support System named

Online Nuclear Emergency Response System was developed in collaboration with ISRO and kept operationally in live mode at Indira Gandhi Centre for Atomic Research, Kalpakkam.

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