Republic Day Address
of
Director, BARC
2019

Dear Colleagues, friends, ladies and gentlemen,

it's my privilege to extend my greetings to the gathering on the occasion of the 70th Republic Day celebration. The constitution of India was gifted to the nation on this day by the constituent assembly in 1950, proclaiming the country as a sovereign democratic republic. The vision and foresight of the framers of the constitutions is evident from the fact that the Indian constitution lists the development of scientific temper as one of our fundamental duties. The pursuit of science and its applications was rightly regarded by them to play an important role in shaping the socio-economic progress of the nation. In this context, our founder Dr Homi Jehangir Bhabha has played an important role in framing science policy and building up the Science & Technology infrastructure and capability in post independent India. The resolve to develop technologies for atomic energy in a self-reliant manner was the cornerstone of his policy. The organisation and the nation have reaped the fruits of his vision, initiatives and commitment to this paradigm.

As you are aware, we have a broad-based mandate and a few salient contributions will be highlighted under each category to highlight the range and depth of our activities and programmes.

The front-end activities are carried out across several domains and some important contributions are as follows:

1. Research reactor Dhruva continued to operate with a high level of safety and availability. During the period, total 539 isotopes were delivered to Radiopharmaceutical Division.

2. 16 nos. of the Hydrogen sensors have been supplied and demonstrated at FBTR, Kalpakkam.These are extremely important first level safety systems, capable of detecting 100 ppb to 2000 ppb of Hydrogen from Sodium coolant loops.

3. TRISO coating over natural UO_2 microspheres has been successfully achieved for the first time with all the coated layers meeting international standards. The technology developed will be used for production of TRISO coated fuel particles for upcoming Indian High Temperature Reactors.

4. Post Irradiation Examination of MAPS Pressure Tubes for establishing the Root Cause of leakage has been completed.

5. Severe Fuel Damage Study Facility has been established at BARC to study the PHWR fuel bundle degradation behaviour under severe accident conditions. The generated data will be useful towards validation of fuel bundle degradation models.

6. Water and Steam Interaction Facility – WASIF- has been set up at SRI, Kalpakkam to study direct contact condensation and water hammer behaviour in nuclear reactors during accident conditions. An indigenous numerical code has been developed, benchmarked against international codes and being validated by in-house experiments in the facility.

7. Calandria Tube Rolled Joint Detachment System for removal of calandria tube of 220 MWe PHWR has been developed and deployed successfully to remove calandria tube of Q15 lattice position of KAPS-1 unit. This is the first instance of a calandria tube being successfully withdrawn from Indian PHWR for surveillance purposes. Technology can be deployed in future for examination of PHWR calandrias on a routine basis.

Spent fuel is treated as a valuable resource and several activities in the sphere of recycling and waste management are worth mentioning

1. Reprocessing plants of NRB at Kalpakkam and Tarapur achieved a record throughput in the calendar year ending December 2018. Joule heated Ceramic Melter, hot commissioned in December 2017 at WIP Kalpakkam functioned throughout the year without any stoppage.

2. Ru-106 Plaque for cancer treatment has been developed after extracting it from HLW stream under AERB certification.

3. Yttrium-90 as a therapeutic radioisotope, separated from high level liquid waste by a supported liquid membrane technology developed by NRG, BARC has been approved for formulation into radiopharmaceutical and clinical use in patients.

Research and Development activities have delivered several processes, products, materials and technologies, some of which are as follows

1. A 5 m3/day thermal Brine Concentrator Unit, has been commissioned which concentrates brine from salinity 5- 7% to close to its saturation limit, ensuring conversion of waste brine into valuable resources, in addition to recovery of distilled water.

2. A method has been developed to determine total iron content in secondary coolant water of nuclear reactors at ppb levels using a spectrophotometer. The method can also be extended to thermal power plants, steam generator systems, and other industries which use heating and cooling reactor systems.

3. An experimental facility **Dhruva Utilisation for Research using Gamma Array -acronym DURGA** consisting of four clover Germanium and six $LaBr_3(Ce)$ scintillation detectors has been developed at Dhruva reactor to study nuclear spectroscopy of neutron rich nuclei produced in thermal neutron induced fission of ^{235}U.

4. An eddy current based handheld thickness estimation system has been developed and customized to inspect the thickness of Inconel-600 process vessels. The device can examine plant areas normally difficult to access due to its compact design. The system has a measurement resolution of 100 microns.

5. Technologies for Production of Tungsten Metal Powder, and Fabrication of Tungsten and Tungsten Heavy Alloy shapes were successfully developed. The developed technologies were transferred to a private entrepreneur.

6. A new sample transfer mechanism was developed and installed for the Photoemission Electron Spectroscopy Beamline at Indus-2 synchrotron source at Indore. More than 100 users from all over India have carried out measurements using this facility.

Contribution to health care and agricultural sectors is being highlighted by two important developments during this period

1. Trombay cowpea mutant variety TC-901 has been released and notified by the Central Sub-Committee on Crop Standards Notification and release of Varieties -Ministry of Agriculture and Farmer's Welfare. The official number of Trombay crop varieties now stands at 43. TC901 is expected to enhance the summer pulse production of the country in a significant manner.

2. A novel 68Ga-based Arginine-Glycine-aspertic acid (RGD) peptide derivative radiopharmaceutical has been indigenously developed and clinically evaluated in human patients for non-invasive monitoring of breast cancer and lung cancer by PET imaging.

Our commitment to safety is reflected in two important activities carried out on this facet of our organisational activity

1. Densification of Indian Environmental Radiation Monitoring Network - IERMON- continues with the installation of thirty Environmental Radiation Monitoring systems at Chennai to detect any abnormal increase in environmental radiation in the vicinity. IERMON has thus achieved the target of 510 Systems around the country. The systems will be augmented with the recently designed satellite communication based ERM-SAT being integrated into the network.

2. Computer Division, BARC has developed a Small Form-factor Embedded VPN, known as **Indian Network for Detecting Radon**

Anomaly -acronym INDRA- for Countrywide Radon Monitoring Secure network which enables detection of Radon Anomaly. This VPN has been installed at 30 locations across the India and connected to the central server located in BCCA, Anushaktinagar.

Work on infrastructure augmentation is also important and few important tasks implemented towards this objective are as follows

1. At BARC-Vizag, activities of the Pulsed Power & Electromagnetic Division (PP&EMD) have been completely shifted with machinery and personnel to Pre-Engineered Buildings at the BARC-Vizag main campus site at Atchuthapuram. The 'Administration Block' has also been inaugurated at the new location at Mekrashi Hill Township.

2. New RSMS sub-station building, new Rectifier building near Hall-7 and New DG building in Dhruva has been completed.

3. Environmental and Coastal Regulatory Zone clearances have been obtained from Ministry of Environment and Forests (MoEF), Delhi for setting up new Special Metal and Oxide Plant at Pazhayakayal, Tuticorin, Tamilnadu.

Dear Colleagues, the list of achievements read out by me is not a comprehensive account of all the ongoing tasks, projects and programmes. I have only shared a few achievements in the limited time available. I would like to reiterate that we value the contributions of all employees of this organisation in equal measure and urge them to continue to give their best to the organisation and the nation.

I would also like to gratefully acknowledge all personnel providing auxiliary and support services for their contributions towards the success of our programmes. This includes the Administrative Group, Medical Services Group, Engineering Services Group, BARC Safety Council, Security, CISF, Fire Safety Services, Landscape and Cosmetic Services, Transport Section, Catering Services and many more, who are undoubtedly the backbone of this organisation. Our thanks are also due to all the personnel of BARC Credit Society, State Bank of India and Indian Post who are stationed at our campus and provide services to our employees. Special thanks are also due to the unions and associations for their support and cooperation.

At the end, I would like to congratulate all personnel for the commitment and excellence and urge them to continue to carry forward the good work in a spirit of teamwork and with a sense of service to the organisation and the nation.

Thank you and Jaihind.