Republic Day Speech
by
Director, BARC

Dear Colleagues, friends, ladies and gentlemen,

It is my proud privilege to extend my greetings to all of you on the occasion of the 69th Republic Day. 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. As you all know, the preparation of the document was a monumental effort, putting into place a system of governance of the nation which has stood the test of time. It provides the framework for fundamental rights, directive principles of state policy and the fundamental duties of all citizens. We at BARC have performed our duties by carrying out R&D in the field of nuclear science. I shall now briefly mention some of our recent activities, milestones and achievements.

A. I shall begin with our contributions to the nuclear power programme and research reactor development activities.

1. Fabrication of high efficiency phosphor bronze packing and column internals, to be used to set up 14 sections of upgrading columns in the upcoming heavy water based nuclear power plants has been completed. 6 out of the 14 column sections have been activated, tested and made ready for shipment to NPCIL site at Kaiga for KAPS 3 & 4 reactors.

2. In-situ inspection for calandria tubes was developed for the first time with BARCIS tool using ultrasonic based techniques for detection of flaws and measurements of wall thickness and ID.

3. Dhruva reactor continued to operate satisfactorily. Required numbers of fuel bundles having metallic uranium were also supplied. Installation and trial testing of Dhruva Simulator has been completed at Dhruva reactor complex.

B. Successes and milestones in fuel reprocessing and waste management - one of our strength areas- continue to be chalked up.

1. The Joule heated Ceramic Melter at the Waste Immobilisation Plant at Kalpakkam has been hot commissioned and the first Vitrified product canister has been produced. The commissioning of this high capacity facility will help in faster immobilisation of the entire existing and freshly generated HLW inventory.

2. Reprocessing plants continue to perform well and the plants at Tarapur and Kalpakkam have achieved required through-put. The waste management plants at Tarapur at Kalpakkam have successfully catered to all the regular waste management requirements of BARC and NPCIL plants at these locations.

C. Developing and transferring technologies for societal applications is an important component of our mission and we have made several significant contributions in this regard.

1. A high-yielding cowpea mutant TC 901 developed by BARC has been proposed for summer growing regions of North Zone and considered to be superior over check varieties. This mutant is free from diseases like yellow mosaic virus and root rot under field conditions. Hence the variety has been identified for release.

2. After the successful implementation of the Litchi preservation programme, a process has been developed which can extend the shelf life of pomegranate for more than three months and thus enable the export through sea route and reduce the freight substantially. This has helped successful export of irradiated pomegranate on a trial basis.

3. Procedures for production and QC of ^{131}I Lipiodol Injection, a therapeutic Radiopharmaceutical for Hepatocellular Carcinoma (HCC) has been developed and DAE-RPC approval obtained for production and supply. Technology for the large scale production and commercial supply of ^{131}I Lipiodol to hospitals has been transferred to BRIT.

D. BARC has developed and deployed several new technologies.

1. The technology development of Indian Cargo Scanner has reached a reasonable level maturity with the integration of the 6 MEV LINAC into the scanning portal, delivering satisfactory radiographic imaging information. Activities for the next phase have been initiated.

2. Synthetic diamond based gas sensor has been developed to detect sub ppm levels of hydrogen sulphide. The sensor operates at room temperature, requires low power and possesses an enhanced life expectancy of greater than 3 years. It is hence suitable for operations in corrosive and radioactive environments. The technology has been transferred to a private entrepreneur.

3. An indigenously developed Diamond Turning Machine has been made in the country with technical collaboration of an institute specializing in machine tool development. It has applications in ultra-precision machining and finishing of components in various sectors and is an import substitute product.

4. A table top static gas sensing unit, suitable for monitoring or recording the response of 16 sensing elements simultaneously under controlled conditions of operating temperature and gas environment has been developed and the technology transferred to entrepreneurs.

5. BF3 gas filled position sensitive neutron detectors with optimized geometry, acceptable efficiency and position resolution have been developed and successfully tested. These devices may be an alternative to the neutron detectors using high purity ^{3}He gas based detectors.

I would like to add here that more than 100 DAE technologies have been transferred during last year. Outreach events were also held in 9 states across India, to propagate the benefits of BARC technologies, thereby reaching out to the common man as well as potential entrepreneurs.

E. We continue to strive in the fields of both basic and directed research aimed at seeking answers to some fundamental questions as well as solving technical challenges of the Department.

1. A process for obtaining sacrificial materials from red-mud for core-catcher application in Indian thermal nuclear reactors has been developed. Sintered model bricks with different porosity were fabricated and tested. They were found to be mechanically strong and display low water leach ability.

2. An in-situ experimental setup has been indigenously designed and installed at the Energy Scanning EXAFS synchrotron beamline at Indus-2 to probe heterogeneous catalysis reactions in real-time. The system has been tested by monitoring structural changes of Cobalt nano-particle catalyst in silica matrix during catalytic reaction of production of methane from carbon dioxide and hydrogen.

3. The utilization of the Pelletron LINAC facility was extended to several ongoing experimental studies - such as mutation of seeds, qualifications of electronic components and corrosion studies of steel feeder pipes of PHWR. This helped in providing valuable new information in support of departmental programmes.

4. Velocity Map Imaging through Momentum Spectroscopy for experimental investigation of mechanical momentum distributions of free particle, products of disintegration and scattering of atomic and molecular systems, has been successfully developed for use in experimental studies of these phenomenon.

5. The use of Air-plasma torch technology for treatment of cellulosic and e- waste for efficient volume reduction has been successfully demonstrated. Trials are now being planned for applications in nuclear recycle group.

F. Research and development work on developing and producing materials with special properties is one of our thrust areas.

1. A pilot plant for production of fluorinated oil of high viscosity and very low vapour pressure used for special applications has been successfully commissioned.

2. Heat shrinkable Ni-Ti-Fe shape memory alloy hydraulic couplings were successfully designed and fabricated for joining 10mm Ti half alloy tubes of the Light Combat Aircrafts under a collaborative project with Aeronautical Development Agency, Bengaluru.

3. A modified HastealloyN alloy for use as structural material of high flux, high temperature molten salt reactor has been successfully prepared by both vacuum and air induction melting routes.

G. I would also like to mention some other tasks performed and milestones achieved:-

1. BARC Cloud Computing Service, 'MEGH', has been upgraded with the addition of 24 new servers and the replacement of software with a new version possessing additional features such as block storage, virtual machine snapshots and virtual machine migration. The system has been released to users.

2. BARC expertise has been shared with various agencies in India and abroad by conducting training and courses in Nuclear and Radiological Emergencies.

3. The BARC Training School reached the landmark milestone of 60 years of continuous operations, maintaining high standards of excellence and generating human resources for the activities of the Department.

I have summarised some of the major activities, milestones and achievement in the short time available, which is intended to bring out the essence of our activities. However, I would like to reiterate that the organisation and its activities are a triumph of team work and cooperation. I acknowledge the hard work and co-operation from all my colleagues in achieving the goals and outputs mandated on us. However, all of us do realize that these achievements could not have been made possible without the support and the untiring efforts of those who have worked behind the scene. These enablers include Medical, Administrative and Engineering Services Group. Special thanks are also to Landscape and Cosmetic Maintenance Section, who have maintained the beautiful ambience of BARC. I also express my deep appreciation for the BARC Security, Fire Services and CISF personnel for their commendable contribution towards ensuring safety & protection of this large establishment.

Dear colleagues, in the beginning I mentioned about the fundamental rights in the constitution. I would also like to mention that, while the fundamental rights are enshrined in the constitution as our inalienable rights, we need to pay attention to the fundamental duties which are enumerated. In my view, these should have the greatest bearing on our conduct and activities, not only as citizens but also as members of this great organisation. Of special relevance are the clauses stating that we should develop scientific temper, humanism and the spirit of inquiry and reform and should strive towards excellence in all spheres of individual and collective activity, so that the nation constantly rises to higher levels of endeavour and achievement. I

have no hesitation in stating that we have stood by these lofty ideals, which has led to our mastery of the nuclear sector and helped in making enormous contributions towards the growth of nuclear science and technology.

Finally, I take this opportunity to acknowledge and thank each and every individual who has directly or indirectly been instrumental in the success of these as well as all other activities. Nation building is an onerous exercise and there are no shortcuts to success and progress. The key is to remain focussed, imbued with the humility to learn, assimilate and implement. The organisation will continue to support and encourage all well-meaning efforts and activities in a holistic manner, so that we remain committed steadfastly to the path of progress in the future as well.

Thank you and Jai Hind